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SPECIAL RTTY ISSUE

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THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in amateur radio

TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power." SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

TS-930S Optional Accessories: AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type. SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160~6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.

KENWOOD

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TS-430S "Digital DX-terity!"

TS-430S

Digital DX-terity...that outstanding attribute built into every KENWOOD TS-430S that lets you QSY from band to band, frequency to frequency, and from mode to mode with the speed and ease that will give you a dominant position in DX operations.

KENWOOD'S TS-430S, a revolutionary, ultra-compact, HF transceiver has already won the hearts of radio Amateurs the world over. It covers 160-10 meters, including the new WARC bands (easily modified for HF MARS). Its high dynamic range receiver tunes from 150 kHz-30 MHz. It utilizes an innovative UP conversion PLL circuit for superior frequency stability and accuracy. Two digital VFO's allow fast split-frequency operations. A choice of USB, LSB, CW, or AM, with FM optional, are at the operators fingertips. All Solid-state technology permits inputs of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.

Eight memories store frequency, mode, and band data, with Lithium battery memory back-up. Memory scan and programmable automatic band scan help speed up operations. An IF shift circuit, a tuneable notch filter, and a Narrow-Wide switch for IF filter selection help eliminate QRM. It has a built-in speech processor. A fluorescent tube digital display makes tuning easy and fast. An all-mode squelch circuit, a noise blanker, and an RF attenuator control help clean up the signal. And there's a VOX circuit, plus semi-break-in, with side-tone. All-in-all, it just could be that the expression "Digital DX-terity" is a bit of an understatement.

TS-430S Optional Accessories:
In typical KENWOOD fashion, there are plenty of optional accessories for this great HF transceiver. There is a special power supply, the PS-430. An external speaker, the SP-430, is also available. And the MB-430 mounting bracket is available for mobile operation. The AT-250 automatic antenna tuner was designed primarily with the TS-430S in mind, and for those who prefer to "roll their own," the AT-130 antenna tuner is available. The FM-430 FM unit is available for FM operations. The YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters, the YK-88SN SSB filter, and the YK-88A AM filter may be easily installed for serious DX-ing. An MC-60A deluxe desk microphone, MC-50 and MC-85 communications microphones, an MC-42S mobile hand mic., and an MC-55 8-pin mobile microphone, are available, depending on your requirements. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter 160~6 meter, SW100A SWR/power/volt meter 160-2m, HS-4, HS-5, HS-6, HS-7 headphones, are also available.

More information on the TS-430S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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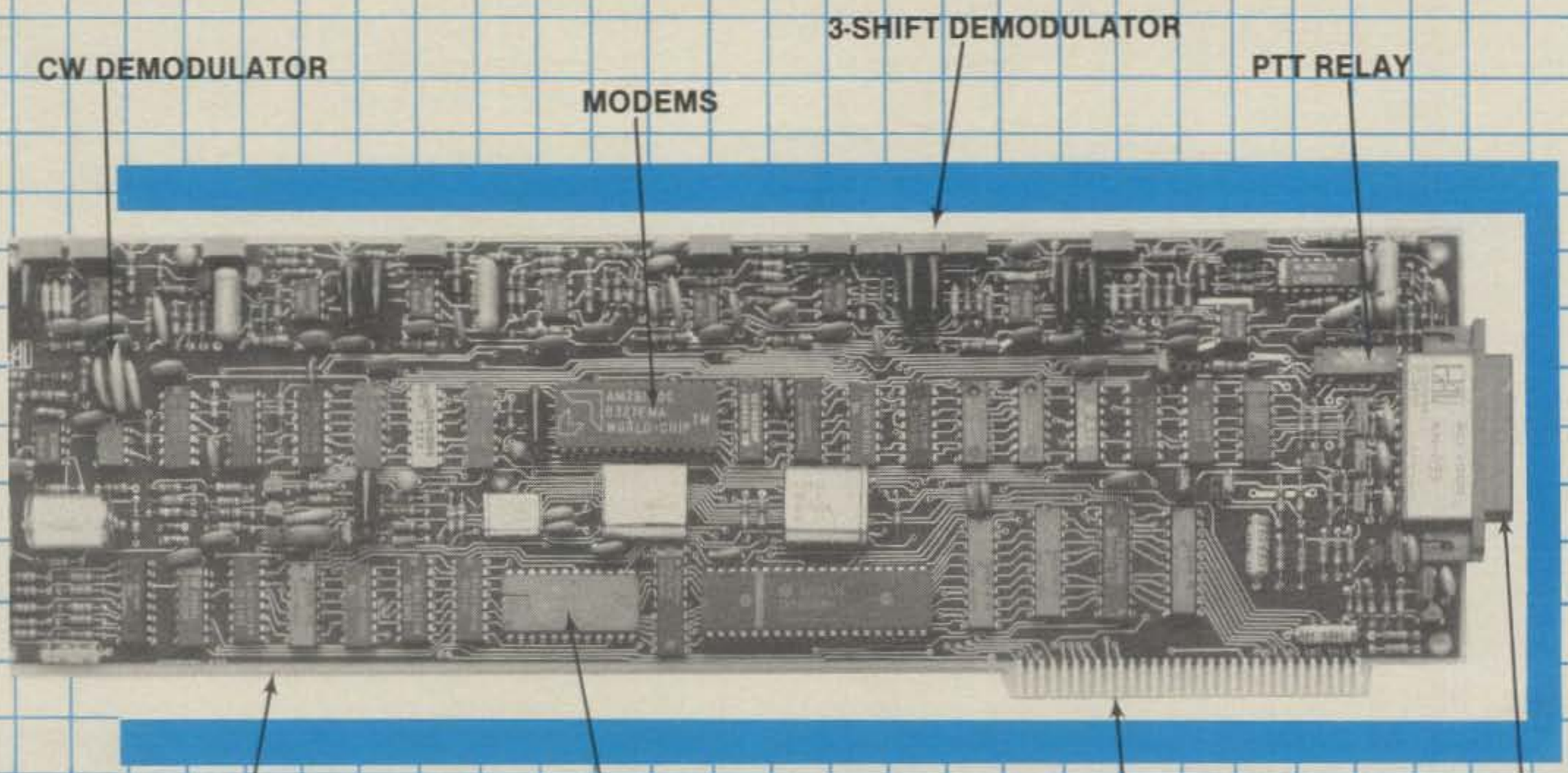

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CQ The Radio Amateur's Journal

ON THE COVER: Bob Warren, N2AUB, of Goshen, New York is really into RTTY as you can tell by this photo by Larry Mulvehill, WB2ZPI.

NOVEMBER 1984 **VOL. 40, NO. 11**

FEATURES

DEPARTMENTS

Zero Bias AN EDITORIAL

This November we carry on our tradition of an RTTY special issue. As usual, we called on as many experts in the field as we could round up. Several others had promised material which unfortunately didn't arrive. This yearly special has proven to be very, very popular with amateurs throughout the world.

With computers in even more shacks this year than last, our *CQ* Reviews articles are focused on various interface units. With Christmas coming up, some of these gems might find their way to under your tree, if you start hinting now. If you have a computer and you are wondering what else you can do with it, look no further. RTTY can be a whole new world of amateur radio enjoyment. You are only limited by your imagination.

I do have a couple of articles that were prepared for this issue but didn't make it, and these will appear next month. There just wasn't enough room to include everything we wanted. Next month we'll also have Part II of K9GWT's article on RTTY codes.

This month also means September for us—the month in which this issue was prepared. This September marked our fifth anniversary. In September 1979 Dick and I bought *CQ* and moved our offices to beautiful downtown Hicksville. It doesn't seem like five years, though, except when you think of it in terms of about 120 hamfests. Here's to the next 120!

On the Road

Speaking of hamfests, Arnie, Herb, and I were at the local LIMARC Fleamarket last weekend. As I've said before, this event attracts about 3000 to 5000 amateurs, the actual number known only to the ticket sellers. It just *seems* big, and *is* big. This year the weather almost ruined it. The weather was perfect—sun and a cool but not cold breeze. They (LIMARC) have a tradition of either blizzard or torrential rain for this outdoor event. A lot of us got up early and saw the perfect weather and thought that the fleamarket must be the next week, or that we had missed it entirely. Somehow everyone got there, had a good time, and loaded up on some new "good stuff."

This week Dick and I head out to Chicago for Radio Expo, while Herb and Arnie set up shop at the hamfest in Virginia Beach. Next week we'll be off to the New England Convention in Boxboro, Massachusetts, followed by the West Gulf Convention in Houston, and winding up the season in Santa Maria, California for the Southwestern Convention. The next four weekends are going to be quite busy.

The tail end of the summer saw Lew McCoy, W1ICP, accompanied by his wife, Martha, representing us at the Flagstaff, Arizona Hamfest. I was out there a couple of years ago and can attest to the beauty of the area and a very enthusiastic crowd. Lew and Carl Dane, W1FXK, kept the *CQ* flag flying at the big one in Tacoma, Washington later on in August.

The smiling face of Lew McCoy, W1ICP, at the Flagstaff, Arizona Hamfest. The sign referring to exam info is an interesting story that Lew managed to get for us. We plan to run it in the next month or so.

Controversy

Someone recently remarked that there wasn't any controversy brewing in amateur radio magazine editorials. Thinking about it, I guess they were right. The closest thing to a hackle raiser that we've experienced here is a letter to the editor on no-code. This has always been an emotional issue, and we did indeed get pro and con letters in rebuttal and support. I think that we've all matured past the stage where we take cheap shots at each other, and perhaps nothing outrageous has happened.

160 Meters Down To 159.95

Both amateurs and employees of the Commission were caught off guard on September 13, when the Commission approved for release PR 84-874 NPRM to amend Part 90 of the Commission's Rules to allocate the band 1900–2000 kHz (160 meter band) to the Radio Location service. The move is meant to accommodate radio location operations in the band 1600–1700 kHz, which will be displaced by the future expansion of the AM broadcast band. As we go to press, comments are due October 26, with reply comments due November 23. This is a highly controversial action, since it was thought the FCC would first deal with the noncontroversial spectrum allocation matters coming out of the WARC.

On Again Off Again

A few weeks after CW Communications announced that they were putting *73* magazine up for sale (it didn't fit in with their microcomputer publications), they apparently changed their mind. On Friday, September 14, CW Communications made a further announcement, stating that they intended to continue publishing *73*. The spokesman said that although Wayne had first option to buy it back, he declined, saying that it would take up too much time, time that he needed for new projects. Wayne would, however, continue to supply editorials for *73*. After closing three of the six magazines CW bought from Wayne, it does seem odd that they would opt to keep *73* going, when they didn't even try to *sell* the other three. It looks like Wayne lucked out, selling when he did.

CQ World-Wide Contest

By now the *CQ* WW Phone Contest is history, and the C.W. extravaganza is coming up at the end of the month. With a couple of days respite after Thanksgiving (to allow for massive digestion problems) you can be fresh and ready to enter the big one. This is also a test to measure your tolerance for leftover turkey. Since you will be on c.w., you can be stuffing your mouth with turkey sandwiches, turkey burgers, turkey croquettes, and turkey salad. It's a high protein contest food. Perhaps next year we can publish diets suited for contesters, much the same way they publish the diets of olympic athletes. It's another way of increasing the endurance needed for a winning score. While those brain cells and aural senses are at peak form, please remember to send all of your contest logs to the *CQ* offices this year.

New CQ Checkpoint

The Southern California DX Club has been appointed a checkpoint for *CQ* Awards. If you have cards to be checked and you don't want to trust the post office to take good care of them, contact Chris Williams, KG6AR, 1117 S. Del Mar Ave., San Gabriel, CA 91776.

December

It's never too early to start hinting around for Christmas and holiday gifts—from an accessory for the big rig to the big rig itself, and any and all things in between. Check out the ads in *CQ*. All of our advertisers would be more than happy to make your holiday season more joyful this year. You might also think in terms of giving gift subscriptions to *CQ* to some of your friends.

73, Alan, K2EEK

ENGINEERING MAKES THE DIFFERENCE

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The fact that the Computer Patch Interface unit by Advanced Electronic Applications, Inc. is known as the best value on the market is no accident. The CP-1 was designed by Al Chandler, K6RFK (PHD-E.E.), an active RTTY user since 1963.

Given a cost per unit budget for the CP-1, Al designed as much performance as possible into the Computer Patch, including a unique new tuning indicator, referred to by one of our customers as the "Dead Eye Dick" tuning indicator. This indicator is ideal for RTTY and CW, in that it is both fast to tune and (within 10 Hz) as accurate as scope tuning. It also performs under poor signal to noise conditions in which other indicators provide no useful data.

Al's variable shift tuning was designed to move the space filter center frequency from 2225 Hz to 3125 Hz without changing the bandwidth (by varying the Q of the filter). All this is accomplished using a precision ganged potentiometer to assure proper tracking of the multiple filter stages. We could have used a pot costing a tenth as much by simply using a two-pole filter design, but we feel the advantage of a sharper filter reduces the noise bandwidth significantly and allows the variable shift control to be used like passband tuning for extra elimination of adjacent channel interference.

Some manufacturers are concerned that amateurs might try calibrating their own equipment and, therefore, have used non-adjustable components, which results in sub-optimal performance. Although more costly, trimpots used in AEA equipment allow factory adjustment for performance to design specifications. Competently designed active filter circuits need not be adjusted after leaving the factory; however, for specialized use the owner can easily change filter parameters.

Mindful of the fact that many of our customers are new to RTTY, Al made the CP-1 tuning as forgiving as possible, while providing the most critical operator a piece of equipment in which he could be proud. Even old "pro's" are surprised at the poor signal conditions under which the CP-1 will still provide good copy.

You can now experience the BEST RTTY, CW, and AMTOR offered. Couple the CP-1 with our new AEASOFT™ software packages designed for the MARS, SWL, or amateur radio operator, and you will feel a pride reminiscent of what "made in U.S.A." brought in years gone by. Please do not hold the low price of the CP-1 against us. This is one case where you get much more than you pay for relative to any of the competitive units. For more information send for our FREE catalog.

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FM mode is still the FUN MODE to many people, and the LS-202A works all the repeater frequencies from 144 to 148 MHz with the normal ± 600 kHz offset. Good, crisp audio comes from the internal mic, and there is the capability of using an external speaker mic of the popular variety.

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Freq. Range	144.000–147.995 MHz
Synthesizer	5 kHz Steps + VXO
Modes	USB (A3J), LSB (A3J), FM
Voltage Range	6–12 VDC
Current Drain	30 mA RX Standby 750 mA TX Peak
Power Output	2.5 W PEP (9 V) 3.5 W PEP (10.8 V)
Receiver Bandwidth	2.4 kHz (– 6 dB) SSB 15 kHz (– 6 dB) FM
Sensitivity	0.25 uV (12 dB S/N) SINAD
IF Frequencies	10.695 MHz SSB, 10.695 MHz and 0.455 MHz FM
Spurious	– 60 dB

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The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF. Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 160 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

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Bottom row: HL-160V25 25W in 150W out 2m • HL-160V - 3 or 10W in for 160W out 2m • HL-90U 10W in 90W out UHF • HC-2000 2KW antenna tuner • Second Row: HL-110 3 or 10W in 100W out 2m • HL-82V 10 in 80W out 2m • HL-45U 10W in 45W out UHF • HC-400 200W antenna tuner and VSWR Power Meter • Third Row: HL-30V economy HT amp 3W in 30W out 2m • HL-32V 3W in 15 or 30W out 2m SSB or FM portables • HL-20U .2 or 3W in 20W out UHF • HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 • Also shown is the MICRO-7 Utility UHF transceiver and headset.

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ENCOMM E

Our Readers Say:

A Rebuttal

Editor, *CQ:*

I have just read the opinions of your reader, Mr. C. Alexander Brown of Ottawa, Canada, re "Living in the Past?" in the September issue. Basically, Mr. Brown is of the "No Code" camp.

I am 63 years old, retired about a year. I obtained my first license in 1939 in Chicago, Illinois. Following WW II I got W9GUP back. Also held W2MWI NYC in 1940–41, and W4GDB in Atlanta in 1939–40. I have held W5PQJ in Albuquerque for over 36 years. My working electronics life spans over 42 years: Western Electric, Johns Hopkins Applied Physics Lab, and Sandia Labs. I hold both an Advanced ham ticket and a First Class Radiotelephone and Radar Endorsement Commercial ticket. I am a Senior member of the IEEE. All of the above is highly irrelevant to the question of No Code, of course.

I operate both h.f. and s.s.b., and Morse code (International), and I continue to thoroughly enjoy c.w. No, I am far from being a 35 to 40 wpm operator. Mr. Brown fails to understand the very real problem with using a keyboard and computer to communicate. I have worked a very limited number of stations using keyboards. First, I should like to say that they are a genuine pleasure to copy. I "try" to send like a keyboard using my Vibroplex paddle and electronic keyer (my one concession to a "better" way over the straight key for long periods of sending c.w.). But back to Mr. Brown's delight in keyboard operation. If, and a mighty big *if*, band conditions are such that both stations are receiving a signal sufficiently strong to provide a "lock" on the received signal, the keyboard is a pleasure. However, such is the exception and not the rule, particularly when operating c.w. with a very, very Q3-S1 or S2 signal. Under these conditions the keyboard is utterly useless. Given these poor receiving conditions and adding QRN and QRM, the keyboard is like a canoe without a paddle, or words to that effect. Under the guidance of that marvelous filter called the brain, a good c.w. operator can, and by divine providence can still, dig a modicum of intelligence out of this ethereal pattern of dots and dashes.

I believe that Mr. Brown's strong point is the need for self-imposed discipline and the need to understand the rules and regulations (ethics) of both the FCC and of society in general. At least he hasn't called for the complete elimination of c.w., even if one has to use a keyboard to achieve it. I am *not* against the use of computer-aided communications or keyboards, if you can afford it. I simply say that no amount of electronics has yet come on the scene which surpasses the human brain in filtering out in c.w. or speech (the cocktail conversion analogy) the message from the grist.

I predict that c.w. will be with us, whether as a requirement or as a sheer pleasure mode of operation on the ham bands. Further, no matter how sophisticated military communications becomes, hand-sent, human-brain copy will endure. It will endure for no reason other than simple *reliability*.

Perhaps the c.w. requirement does perpetuate an "elite" group. But then again, this is a philosophical argument, not a technical one. As a matter of record, I own a computer and am attending classes in computer applications at present. Still, I have no real desire to go the c.w. keyboard route. The "ether" is not yet too kind to the computer-minded limited by economics to low-power transmitters, poor band conditions, and inelegant antennas.

I still hope that some day computer/keyboard c.w. will reign supreme for all. This operator, however, will still enjoy c.w. the "hard way."

As far as computer hobbyists are concerned, I am constantly amazed by their ability to make those "dumb machines" perform the absolute miracles they do so very well.

Louis J. Frenkel, Jr., W5PQJ
Albuquerque, NM

More Ambition Is The Answer

Editor, *CQ:*

In response to C. Alexander Brown's letter in September 1984 *CQ:*

If the computer hackers cannot behave themselves in the growing world of computer science, what makes you think they would behave in the amateur radio service? If a person is intelligent and ambitious enough to commit "computer crimes," it seems a bit foolish to say that he cannot learn Morse code. I have found Morse much simpler than some of the more advanced phases in computer science. So, just where did the valid argument for a no code license go? Less procrastinating and more ambition would put all of those who are just clammering to get into our ranks in, in no time flat.

Fred Peerenboom, N8FDJ
Kingsford, MI

"Ticket Talk" a Hit

Editor, *CQ:*

I just finished reading Dick Bash's new column, "Ticket Talk," in *CQ*. I just wanted to say that I liked it and that it was well done. I'll be looking forward to the next issue!

Cal Waterbury, WB5TOE
Waco, TX

AEA

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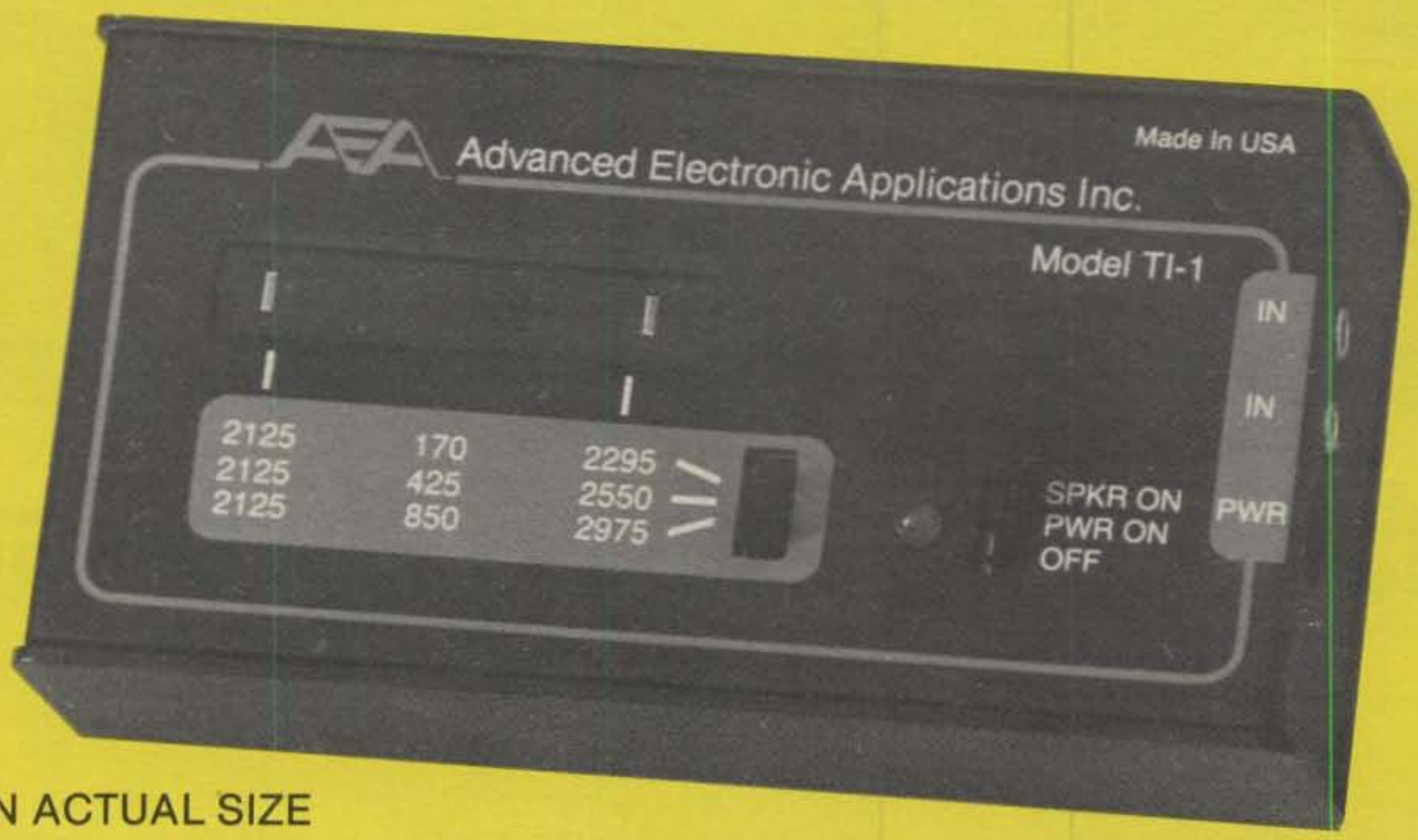
BREAKTHROUGH

THE TI-1 RTTY TUNING INDICATOR



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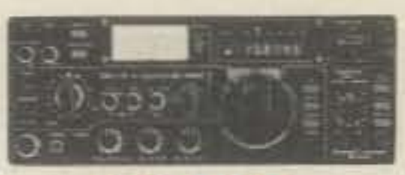

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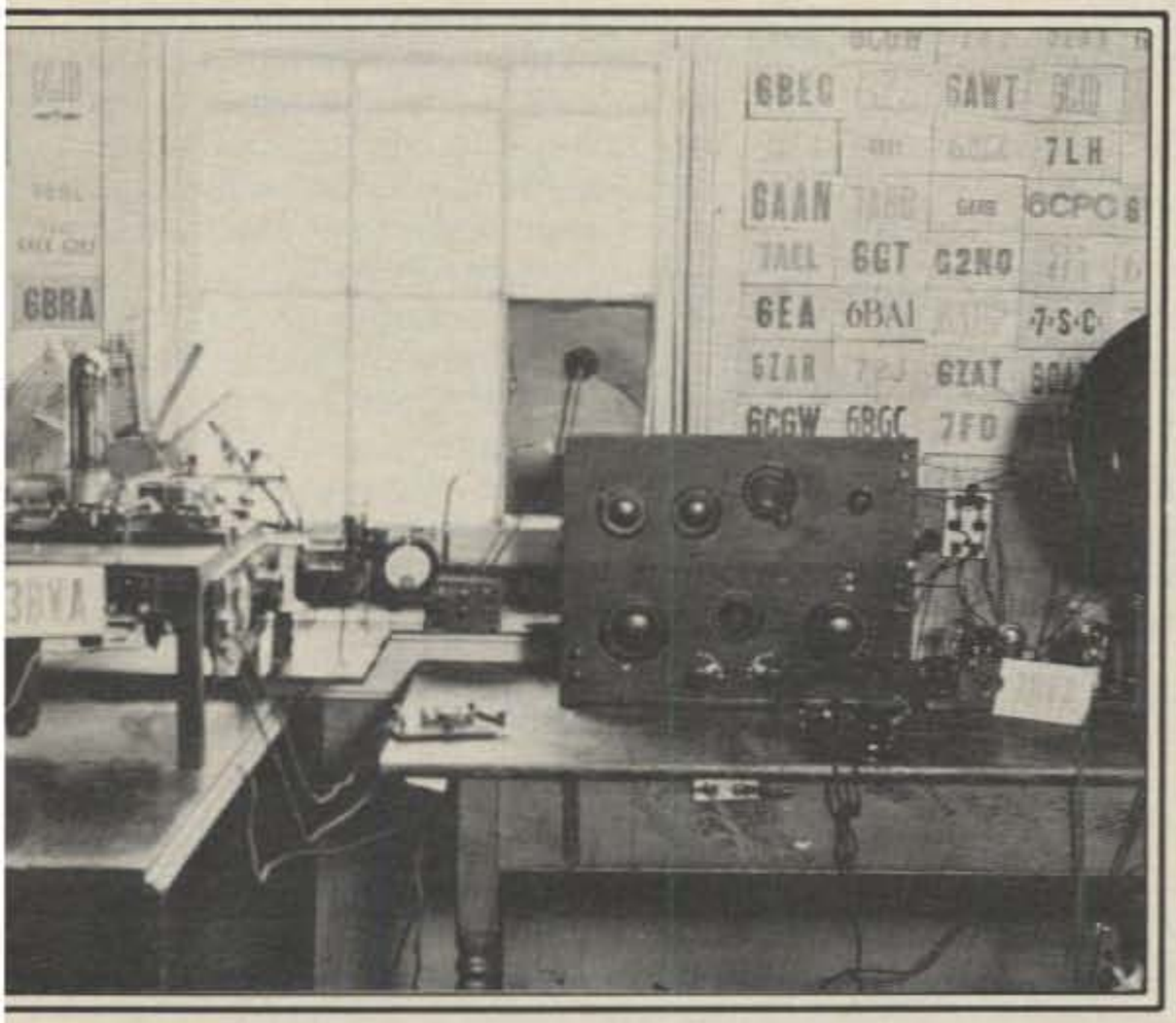
An early photo of the first of Fred Link's amateur c.w. efforts. This picture shows a 50 watt c.w. unit that followed an earlier system using a pair of VT-2 valves in a self-rectified push-pull MO circuit. This station operated as 3OV and was preceded by a non-sync rotary spark of ½ kw rating licensed as 3OV.



Fred M. Link, W2ALU, President of the Radio Club of America.

A CQ Exclusive Interview With:

Fred M. Link, W2ALU
The Years 1915–1959

BY DR. THEODORE J. COHEN*, N4XX

Born in York, PA on October 11, 1904, Fred Link's early exposure to "wireless" led him to amateur radio, a formal education in electronic engineering, and a life long career in electronics and radio communications that has included major contributions in fields such as television transmission and narrowband f.m. radio. In fact, his development and installation of the first f.m. system for the Connecticut State Police in 1939; the subsequent development of the famous WW II AN/TRC 1, 2, 3, and 4 series radios; and the commercial f.m. systems produced by Link Radio have earned him the name "Father of Two-Way Mobile Radio."

An employee of DeForest, a business associate of DuMont, and a friend of amateurs around the globe, Fred's involvement in amateur radio has been "total." He was first licensed in 1919, and through the years he has operated as 3OV, 3BVA, and W2ALU. He is a Life Member of QCWA and a Fellow and Life Member of the IEEE. He is also a Fellow and President of the Radio Club of America, which honored Fred in 1983 by presenting him with the Allen B. DuMont Citation for important Electronic Contributions to the Science of Television.

An interview such as this can barely do justice to a man who has played such an important part in the development of modern-day communications. But the story of Fred Link's life is the story of radio itself, and a story in which we all have an interest. It is with great pleasure, therefore, that we now present an exclusive CQ interview with Mr. Fred Link, W2ALU: The Years 1915–1959.

*8603 Conover Place, Alexandria, VA 22308

CQ: Fred, when did you first become interested in radio, and what sparked that interest?
Link: Ted, just before World War I, I had a wish as a Boy Scout to be the first Eagle Scout in Pennsylvania. This in turn required me to obtain a Merit Badge in a classification called "Wireless." I subsequently took and passed all the Merit Badge requirements, including wireless, and became an Eagle Scout in my home town of York, Pennsylvania. The construction of an experimental wireless set, of course, was prohibited during the War, but two things helped me keep up my interest. The first was the code . . . it had always intrigued me. Second, I worked in an electrical operations company as an apprentice electrician instead of going to high school, so I was active where components like wire, insulation, and hardware were readily available.

CQ: And after the war?
Link: When the Department of Commerce authorized amateur radio after the war, I encouraged my Boy Scout troop, No. 7, headquartered at the York YMCA, to get a license. We were issued the call sign "3OV," and I basically was the caretaker and person who constructed and operated the equipment.

CQ: Of what did that first station consist?
Link: Let's see . . . that was back in 1919. As I recall, we had a ½ kw non-sync rotary spark transmitter with a Packard transformer. The design of 3OV was so inept that the antenna was nothing more than a shock-excited wire. I have no idea what the center frequency was, but I would guess it was around 250 meters. It was certainly well above the bottom limit of 1500 kHz, or 200 meters. But it didn't make much difference, since there was no one to hear the station other than a few nearby amateurs such as 3ZO in Parkesburg, Pennsylvania, and some local broadcast listeners and experimenters. Even today I can recall enjoying the whiff of the ozone, hearing the musical whine of the non-sync gap, and watching the lights in the YMCA blink with each touch of the key.

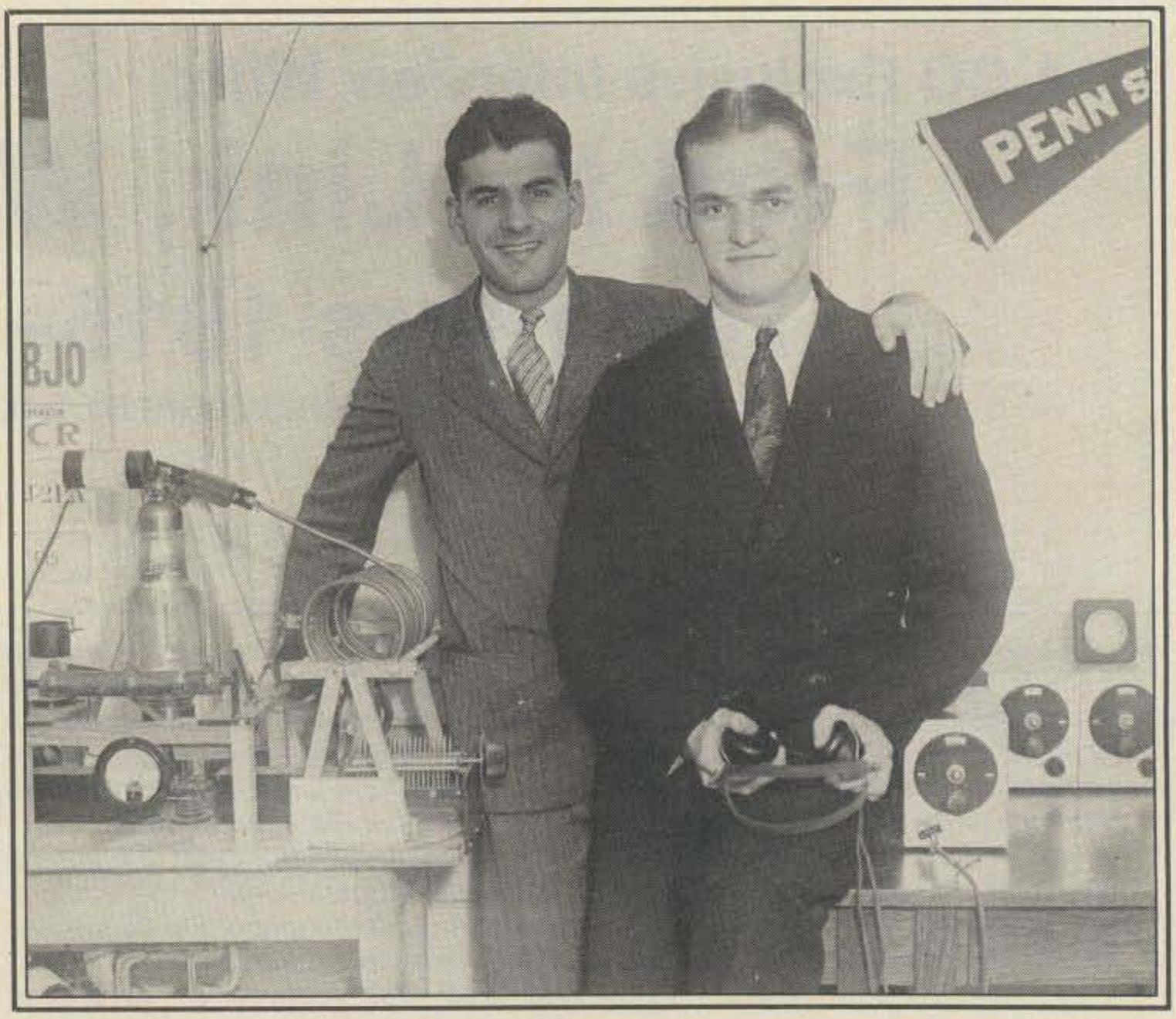
CQ: What about c.w.? Wasn't it beginning to make its presence felt after the war?
Link: Of course! Since the YMCA closed early each day, it put a damper on my desires to do better as an amateur operator. This led me to apply for, and receive, a license for a c.w. system: my callsign was 3BVA. In those days, you know, it was considered sacrilegious to mention c.w. in the same breath with the *"Lord of the Region . . . Spark!"* Anyway, with the "liberation" of two WE 205 tubes from the local telephone company, I set up a push-pull, back-to-back master oscillator transmitter on what I considered an impossible frequency of about 2000 kHz. I then worked "down" the ladder to the *extremely high frequency band* we called 40 meters! This was during the period 1921 to 1924. I later upgraded the station using a pair of 203 tubes (*50 watts each —ed.*) with an "electrolytic" rectifier. Using that station I was able to work everything on the air in those days.

"In the early days, it was considered sacrilegious to mention c.w. in the same breath with the 'lord of the region . . . SPARK!'"

CQ: But what about your education, Fred?
Link: Well, I ultimately completed enough courses at night school and during an extra year at York High School to be accepted at Penn State. In addition to my somewhat delayed high school diploma, I also had a Journeyman's Certificate as an electrician. Upon entering State, one of my first moves was to tie in with the group operating the school's experimental station, 8XE, where I immediately became a member of the staff. I graduated from Penn State in 1927, and moved to New York City to work for the New York Telephone Company.

CQ: Some old timers say that you and someone named Knight were the "band boys" of the day around 1927–1930. What was that all about?
Link: Well, in the late '20s I got to know a fellow named Johnny Knight, 4DX, from South Carolina (*now W6YY in California —ed.*). Johnny finished up his enrollment at the Naval Academy in Annapolis around the time I was finishing college, and since we were both planning to go to New York to work for the AT&T system, we arranged to meet and get rooms together at the Brooklyn 9th Avenue YMCA at Prospect Park. Our intent was to put together an amateur radio station at the "Y" in time for the initial ARRL-sponsored DX contest in 1927. This we did, and the station was issued the call 2ALU, which I still retain.

Anyway, we put together a 1 kw transmitter which went on the air for the first time at the start of the contest. Johnny operated during the day and worked at night, while I operated at night and worked during the day. We only lasted about four days of the two-week DX contest because of the interference we caused to broadcast stations, the blinking lights at the YMCA, and the unfavorable news stories in *The New York Times* which pinpointed the source of the broadcast interference reported as far away as Philadelphia as being "*caused by the amateur radio station of Knight and Link–W2ALU, who are employees of the AT&T system.*" That not only put an end to any thoughts we might have had regarding careers with the Bell System, but it also



A photograph of Fred Link (left) and John Knight in their Prospect Park YMCA room in Brooklyn about the time of the 1927 ARRL DX Contest. The rough construction of W2ALU is the first effort, which was later increased to use of two type-206 500 watt tubes with a three-phase, half-wave, rectified power source. Did it ever work!

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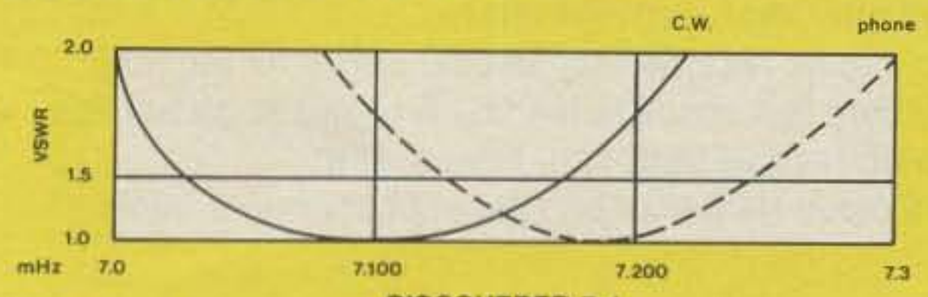

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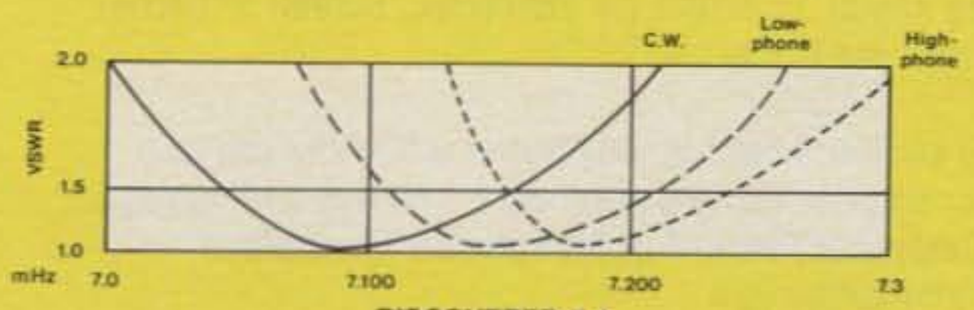
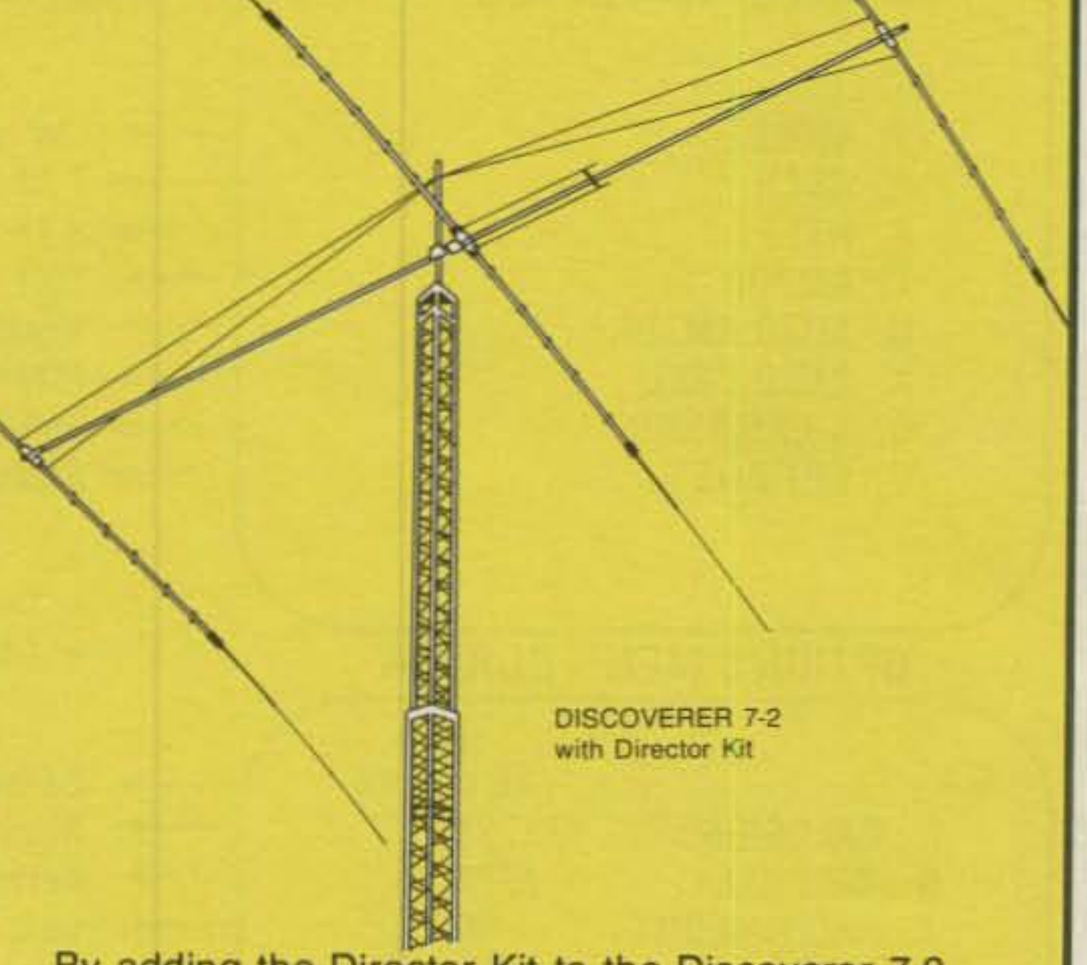


DISCOVERER 7-2



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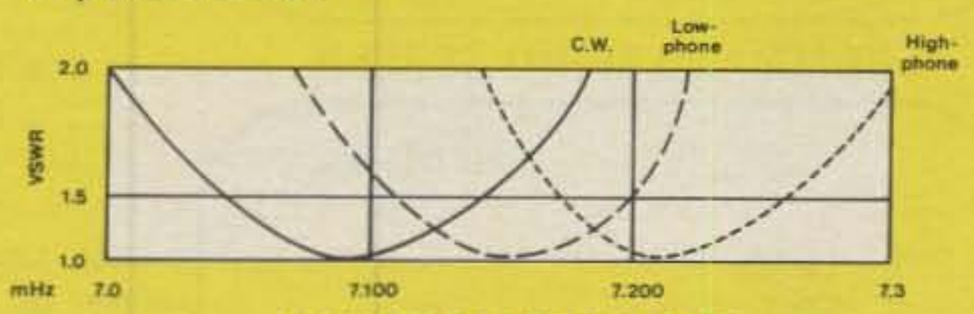

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MAIN MENU SCREEN

```
                                hh:mm:ss

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OPTIONS MENU SCREEN

```
                                hh:mm:ss
 I. CALLSIGN          ??????
 S. SELCALL             ????
 T. ARQ TIMEOUT           30
 U. USOS                  ON
 M. MORSE FILL (BT)      OFF
 R. RTTY SYNC (NUL)      OFF
 A. AUDIO FEEDBACK       OFF
 C. AUTO CR               ON
 L. AUTO LF               ON
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 W. WRAP-AROUND           ON
 K. CW BREAK-IN          OFF
 O. OUTPUT MODE         WORD
```

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COMMAND MENU SCREEN

```
                                hh:mm:ss

 L. LOAD
 E. EDIT
 M. MOVE
 S. SAVE
 X. SET XMT BUFFER SIZE
 C. SET COLOR
 T. SET TIME
```

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expedited our eviction from the YMCA, and, of course, ended our participation in the DX contest! That episode, by the way, led to our involvement as the leading contact for the Byrd Expedition at Little America . . . it also led to quite a number of other featured stories in the press of the day. (*It is interesting to note that despite their being on the air less than 50% of the time during that DX contest, W2ALU placed second internationally, with only W2TP rated higher. For their efforts, Knight and Link received a number of very valuable electronic components which had been donated as prizes by various manufacturers—ed.)*

"DuMont wanted us to leave the Bell System and join DeForest because we were 'hot news.'"

CQ: So there were you and Knight . . . on shaky ground with respect to your jobs and without a place to sleep! What did you do?
Link: Well, after leaving the Brooklyn YMCA, we moved to Riverside Drive in New York City and built and modified a station running about 500 watts output. Meanwhile, as a result of the "bad" publicity generated by W2ALU during the DX contest, Knight and I gained international notoriety. We also received a number of offers from business, including one from Dr. Allen DuMont, Chief Engineer at DeForest Radio Company. Dumont—who, by the way, was an amateur himself—wanted us to leave the Bell System and join DeForest because, as he said, we were "hot news" . . . *not necessarily good, but at least notorious!!* We took this offer and went to work for the DeForest Radio Company in Jersey City, New Jersey; later, the plant moved to Passaic, New Jersey. Our salaries were at least double the going rate of the time at New York Telephone Company, which was $30 a week for graduate engineers. In any event, this really was the beginning of my commercial activity in radio. Prior to this my radio activity was totally amateur related, and I was heading for a career as an electrical engineer.

CQ: Fred, before we go on, could we pause for a few recollections on the nature of the operators in the Amateur service during those early years?
Link: Amateurs in the period 1919–1923 were a bit closer than they are today. And since our numbers were relatively small, it seemed that we knew everyone who was active in our particular call area. We also got to know a lot of distant friends who we never met in person, yet we felt that they were very close to us and very much a part of our personal lives. Many of

"Our first assignment, in 1928, was to design and build three TV transmitters for the Jenkins Television Company, a subsidiary of the DeForest Radio Company."

those early amateur contacts became, in later days, my highest-regarded personal friends, and they still are, some 60 to 70 years later. We were quite a close-knit group in the early days, and I'm happy it was my good fortune to be a part of it.

CQ: Let's get back to your work at DeForest Radio Company. What did you and Knight do?
Link: Our first assignment, in 1928, was to design and build three TV transmitters which were to be installed in Washington, D.C., Jersey City, New Jersey, and Boston, Massachusetts, for the Jenkins Television Company, a subsidiary of the DeForest Radio Company. These TV transmitters were unquestionably the first commercial TV transmitters ever constructed . . . and this was about 1929 or somewhat earlier. They used a synced flying spot scanner mechanical system, while the receivers used a 2 inch by 2 inch flat-plate neon tube that was modulated and scanned by a synced scanner.

"I was given charge of the development and production of a line of power transmitting tubes . . . something that turned out to be a boon to our amateur friends."

CQ: What were some of the other projects you worked on?
Link: After the TV transmitter work, both Knight and I became involved in designing and building the very early commercial police radio transmitters. In fact, the systems we built for the Michigan State Police and the Los Angeles Police Department around 1930 quite possibly represent some of the very earliest *commercial* police radio hardware ever constructed. We also worked on the design and construction of three 10 kw very low frequency—say, 60 to 100 kHz—transmitters for Hearst Radio News. These were installed at Redwood City, California, Tinley Park, Illinois, and Carlstadt, New Jersey, to handle news using the Finch Facsimile System.

At the same time we were working or these radios, I was made an assistant tc DuMont and was given charge of the de

velopment and production of a line of power transmitting tubes . . . something that turned out to be a boon to our amateur friends.

CQ: How so?
Link: Well, by agreement with Dr. DuMont, who was at this time both the Chief Engineer and General Manager of DeForest Radio Company, I had an understanding that defective—but usable—tubes which were not salable would not be junked, but instead would be given to deserving and prominent amateurs as a publicity gimmick. Actually, some of these less than top quality tubes were quite often the best performers. For example, a tube with a sucked-in envelope could not be sold, but you knew that this tube was really degassed to a degree that its performance would be superior . . . and it usually was! Anyway, word got out that if one could make a good case for receiving a tube, I would send along a free tube capable of handling 50 watts or more. We gave away a surprising number of tubes, and though the ratio of good-to-defective vacuum tubes was not too high, we always had available "semi-defective" tubes for our friends. I might add that this giveaway scheme generated a lot of calls to W2ALU, and *we were never at a loss for contacts!*

CQ: What about your amateur activities during this period? From where did you operate?
Link: Initially, after the Brooklyn YMCA situation, we lived on Riverside Drive. Our station, W2ALU, was set up in New Jersey and was operated by remote control. In fact, we operated one of the *first totally remote-controlled stations!* Later, about 1930 or 1931, Johnny Knight and I had an apartment in Passaic Park, and remotely controlled a "new" W2ALU transmitter which was located at the DeForest plant. From time to time we had high-power tubes in use that we knew were handling over 2 kw input! Needless to say, we maintained our reputation as the "big noise from the east." And as manager of the DeForest Power Tube Division, I always had big tubes available for a lot of my amateur friends.

CQ: What kind of person was DeForest?
Link: Dr. DeForest was always very good to me, and he seemed to enjoy the times we were together. You see, I provided his transportation from the 125th Street Ferry subway stop in New York City to Passaic—and back again—every two weeks so he could get his "check." There was plenty of time to talk, and these rides gave me a chance to ask a lot of questions. At this stage of his career Dr. DeForest could still have been a tinkerer and experimenter, and maybe even an inventor. But I have the feeling that his days of greatness were already history. In any case, he was not a manager, nor was he an organizer. But he definitely was interesting!

"Allen DuMont was a truly great man and inventor. . . . I have never known or met anyone I would compare with him."

CQ: And your association with DuMont continued during this period?
Link: Oh, yes! My association with Allen DuMont continued through the life of DeForest Radio Company—which was liquidated because of the Depression in 1931—and on into the years that I ran Link Radio (*1931–1951—ed.*). In the '30s DuMont was developing a practical, high-intensity, long-life cathode-ray tube. This CRT, in fact, made TV as we know it today a reality. In fact, it is DuMont's work that should get all of the credit for making TV such a great technological achievement. Even though Link Radio was expanding during the early 1930s, I continued to work closely with DuMont, and, in fact, designed and built his complete line of early cathode-ray oscilloscopes and test equipment. Later I constructed the complete lot of all the DuMont high-power v.h.f. TV transmitters that were the first major items of this type to get TV rolling after WW II. DuMont was both a business associated and a friend, and I maintained contact with him right up to the day he passed away in the early 1960s.

The QSL card of the 1920–23 period.

CQ: That must have been quite a loss to you, Fred.
Link: Ted, I consider the help given me by Allen DuMont to be the greatest single contribution to whatever I have become or achieved in the radio industry. Allen DuMont was a truly great man and inventor . . . . I have never known or met anyone I would compare with him, and I think I have known practically *all* of the big names in our industry.

CQ: You began working on f.m. mobile radio systems in the 30s, and built the first successful f.m. mobile radio system for the state of Connecticut in 1939. Could you tell us a little about the efforts leading up to that accomplishment?
Link: The story of the development of f.m. radio for communications would take ten pages. Let me simply say that with Armstrong's invention and his effort to prove his viability of f.m., he stressed its value for quality broadcasting and based his position on his use of very wide band 100 kHz deviation. So when at the time *little-known people* such as Dan Noble and Fred Link dared to design and produce an f.m. system that was based on a 15 kHz deviation,

This was the last printing of QSL cards for W2ALU—about 1930. Says Link, "I do not recall even having a later edition as by this date. With the Wall Street collapse and being out of a job, amateur radio was not at the top of our 'hit' parade, unfortunately. It was about this period (1931–32) that I did a lot of work with Dr. DuMont before we had businesses going."

we had big problems with Major Armstrong! However, it was this initial "low deviation" f.m. system that Noble and Link Radio used for the initial Connecticut State Police f.m. system in 1938–39. This system, by the way, proved to the Signal Corps and the U.S. Government that narrowband f.m. had value, and it subsequently became a major communication mode. Your readers may remember the AN/TRC 1, 2, 3, and 4 series radios which were designed and built by Link Radio, and which played such an important part in WW II.

CQ: So it took the military behind narrowband f.m. to get this mode moving?
Link: I feel strongly that the impression made on Col. Roger B. Colton, Maj. Jimmy O'Connell, Capt. Lanzer, and a dozen other early Ft. Monmouth officials in 1939 by the performance of the Connecticut State Police Radio System was the turning point that put f.m. over as the dominant way to get top performance for mobile radio. That was the real beginning of "two-way" radio as we know it today.

CQ: During WW II Link Radio played an important part by providing critical communications and electronic equipment. The company was obviously successful. Why then did you decide to sell out in 1950?

"The Connecticut State Police Radio System was the turning point that put f.m. over as the dominant way to get top performance for mobile radio. That was the real beginning of 'two way' radio as we know it today."

Link: I was the sole owner of Link Radio. There were no partners . . . not even banking partners. I ran the whole show personally, with only my wife and daughter on the books as officers and part owners. After the war, Link Radio was simply too big for a single owner, and I finally decided to sell the company with the intention of retiring. However, the people to whom I sold Link Radio had problems that eventually led to the company's liquidation of the operation by 1954. At that time I collected the key surviving employees and took them with me to DuMont Laboratories, where we established a communications division. I stayed five years, finally leaving DuMont Laboratories in 1959 to again retire.

CQ: What did you do at DuMont Laboratories during the 1950s?
Link: I was Director of Operations for DuMont's Land Mobile Radio business. This operation was successful, *but not to the point of testing Motorola for leadership.* However, it was doing an important job for me—providing hardware and service to the many Link Radio friends and customers who were left hanging when my original company, Link Radio, was forced into liquidation around 1954–55.

CQ: Fred, this has been most interesting. I suspect, however, that the last 25 years have been anything but a retirement for you! Perhaps we can explore them at a later time.
Link: Ted, let's wait and see. CQ

The Diamond Jubilee Yearbook of the Radio Club of America will be available in November 1984. This prestigious publication will review the history and progress of that organization for the past 75 years, and will be of interest to all who delight in reading about the early days of radio. Copies may be obtained from John W. Morrisey, 45 South Fifth Street, Park Ridge, NH 07656 ($10 each for RCA members; $20 each for non-members).

Bits, Bytes, and Bauds is not a legal firm or a vaudeville act. These are the component parts of modern RTTY signal transmission. What they are, what they do, and how they work are the subject of this two-part series by K9GWT.

Understanding Modern RTTY Codes and Modes—Part I

BY BILL HENRY*, K9GWT

Radio amateurs have been using digital communications since the late 1940s. At that time most of us used machines manufactured by the Teletype Corporation, and we therefore called this mode "Radio Teletype," or "RTTY" for short. These early mechanical machines were surplus and operated with only one code (Baudot) and with either one of two speeds (60 w.p.m. in the U.S. and 66 w.p.m. in Europe). As the commercial teleprinter market developed, other speeds were added and we could soon operate RTTY at up to 100 w.p.m. still using the Baudot code. The advent of computers brought the ASCII 8-bit code and speeds up to 9600 w.p.m. or higher (9600 baud, or 960 c.p.s., is the new "speed" parameter). A desire for an error-free radio teleprinter in ship-to-shore communications introduced the ARQ or SITOR code, now called AMTOR in amateur radio circles. Recently, amateurs have adapted another commercial data transmission standard to our radios so that relatively large blocks or "packets" of text and information ("data") are sent error-free at high speed. This, of course, is called "Packet Radio." All of these techniques (and others) are generically known as "RTTY." This article will explore the similarities and differences among these various codes, speeds, and modes of RTTY operation.

TTY Data	Loop Cur.	Paper Tape	Digital State	TTL Volts	RS232 Volts	MIL188 Volts	AMTOR State
Mark	On	Hole	1	> +3.5	< −5.0	+6.0	B
Space	Off	No Hole	0	< +0.7	> +5.0	−6.0	Y

Table I– Comparison of various RTTY signal standards.

Audio Tone Frequencies (Hz)

TTY Data	High Tones	Low Tones	Marine Tones	"103 Modem" (Orig)	"103 Modem" (Answer)	"202 Modem" (HDX)
Mark	2125	1275	1615	1270	2225	1200
Space	2295	1445	1785	1070	2025	2200

Table II– Common RTTY demodulator tone frequencies.

Basic RTTY Terms

RTTYers, like other specialists, have their own special langauge, or vocabulary, that can be very confusing at times. In fact, we all have faced this "language barrier" when first introduced to RTTY. A short examination of how we construct the digital codes will solve this problem.

Signal Polarity

Teleprinters operate with signals that may have only two conditions, **on** or **off**, a "binary digital" code. In early land-line teleprinter systems the two states were represented by current flow in the signal wire. The signal line was called the "RTTY Loop," so the "on" current is called the "Loop Current." Because of early strip-pen recorders used for land-line telegraph, the *current-on* condition is called the "Marking" or **MARK** condition; the *current-off* condition is called **SPACE.** Thus, the terms MARK, SPACE, and LOOP all date back to early land-line telegraph and teleprinter systems. In modern computer terms we would more likely call the mark state a logical "1" and the space state a logical "0." This signal polarity is further confused by various other commercial standards. Some of these standards are shown in Table I.

When audio tones are used in radio and telephone line circuits, the representation of mark and space states is expanded as shown in Table II. Other tones, frequency shifts, and reverse polarity may also be used by commercial RTTY stations.

Finally, consider the actual radio frequency(s) transmitted when FSK (F1) or AFSK (A2 or F2) is transmitted. The resulting spectral diagrams are shown in fig. 1. Notice that by amateur radio standards when FSK emission is used (below 30 MHz), we always transmit the mark as the higher of the two radio frequencies. We had a saying when this standard was set: "Low Space Means Fine Teletype" (you figure out the acronym). Unfortunately, this standard is not followed for commercial RTTY stations, and either polarity may be found on shortwave stations. The standard for commercial ma-

*Box 365, Urbana, IL 61801

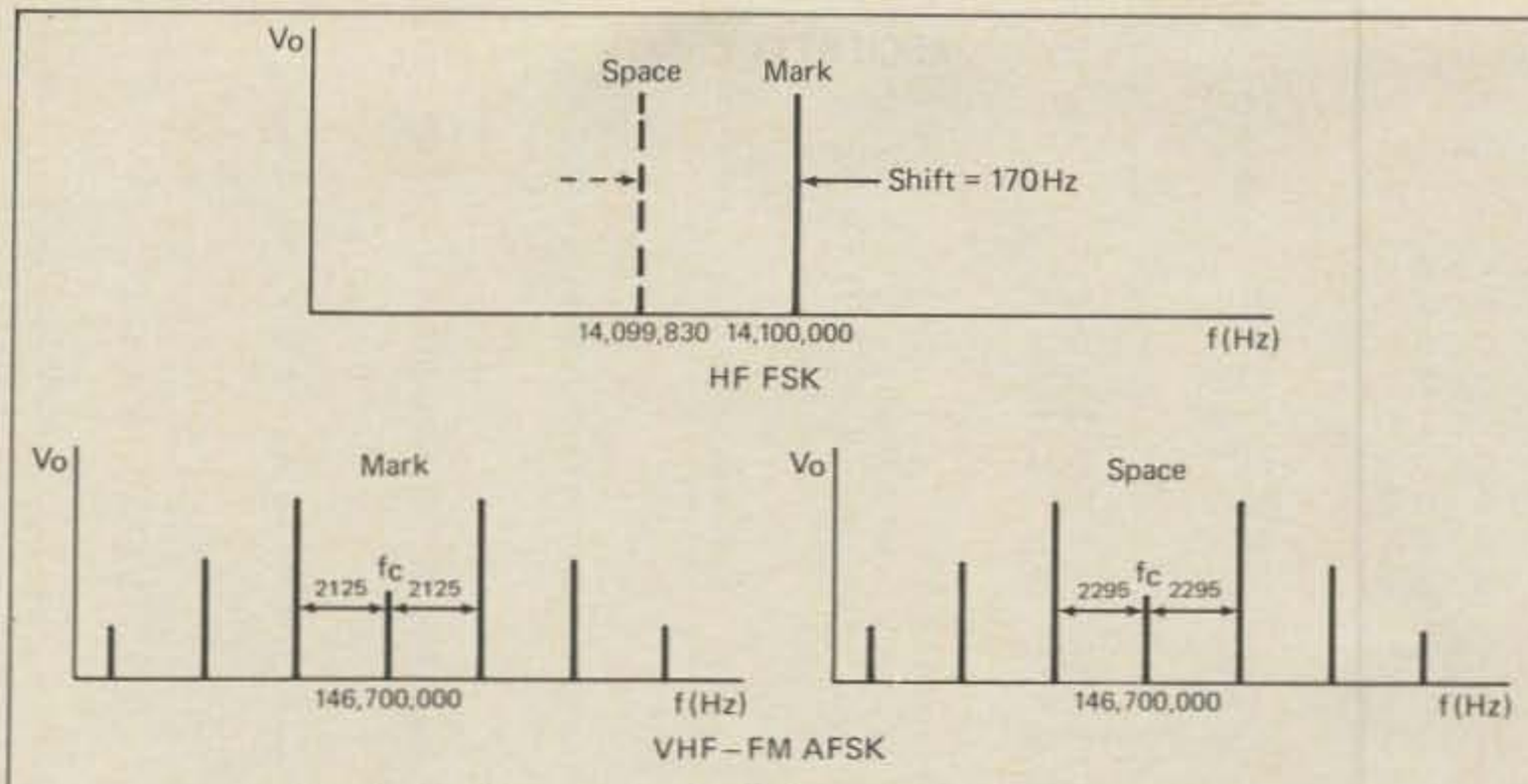


Fig. 1– Radio spectra for h.f. and v.h.f. RTTY signals.

rine RTTY (and SITOR) is the reverse of the amateur standard.

Data Codes

RTTY is sent on a wire-line or radio circuit by using a combination of these mark-space pulses. A single pulse can represent two states—either "on" or "off" (mark or space). To send all 26 letters, 10 numbers, and some control and punctuation symbols, we need more than just one pulse or *bit*. The number of binary bits required to represent a character varies with the code used. If 2 bits are used, a total of 4 combinations exist; 8 combinations for 3 bits, 16 for 4 bits, and 32 for 5 bits. The number of combinations or states available increases by a multiple of two for each bit added to a binary code. Each bit is independent of the other and represents either an on or off state. Therefore, the possible combinations for each on or off state rise exponentially with the addition of bits. This usually is diagrammed in a truth table. On and off are two possible states. Adding 2 bits equals 2^2, or 4 combinations, and adding 3 bits equals 2^3, or 8 combinations, and so on.

Baudot Code

The simplest RTTY code in use is the 5-bit Baudot code (sometimes also called the Murray code). As discussed above, a total of 32 different states or characters may be represented with a 5-bit code. Since this is still not enough combinations to represent all 26 letters plus 10 numbers, most code combinations in Baudot are used twice. We do this with a memory in the printer and keyboard that may be set to either print the **LETTERS** case or the **FIGURES** case. This is much like the operation of the shift key on a standard typewriter. Therefore, a Baudot TTY machine has two special keys, one labeled **FIGS** and another labeled **LTRS**, and each *letter key* (LTRS) also serves as a *number or punctuation* character when in **FIGS** case. The old Baudot machines had only three rows of keys and took a little getting used to for a typist! Fortunately, modern electronic keyboards have an electronic memory built-in that automatically inserts the LTRS and FIGS characters when required. A "standard" typewriter keyboard may therefore be used on these electronic terminals. An obvious limitation of the Baudot code is that it cannot represent both upper- and lower-case letters. In the U.S., TTY machines print only upper-case, or capital, letters. In Europe some machines print only lower-case letters.

There are two slightly different versions of the Baudot code in common use by radio amateurs. The two codes are the same for all letters, numbers, and control characters, but they have a few differences for punctuation symbols. In the United States we use a code that was used in the surplus TTY machines we started with in the late 1940s. This code is *not* the international standard, but is compatible in most respects. Either code is equally legal for U.S. amateur use, since the FCC only defines code combinations for letters, numerals, and the slant or fraction bar in *Part 97.69* of the *Rules and Regulations*. Amateurs in other countries have adopted the *Comite Consultatif International Telegrafique et Telephonique* (International Telegraph and Telephone Committee), *CCITT#2 Code*. Both codes are shown in Table III.

As can be seen, there are only six FIGS case differences between the two Baudot codes, the most noticeable being the interchange of the signal bell and apos-

The Baudot Code

Bit Number 5 4 3 2 1	Letters	U.S. Figures	CCITT#2 Figures
0 0 0 0 0	Blank	Blank	Blank
0 0 0 0 1	E	3	3
0 0 0 1 0	Line Feed	Line Feed	Line Feed
0 0 0 1 1	A	—	—
0 0 1 0 0	Space	Space	Space
0 0 1 0 1	S	Bell	'
0 0 1 1 0	I	8	8
0 0 1 1 1	U	7	7
0 1 0 0 0	Carriage Return	CR	CR
0 1 0 0 1	D	$	WRU
0 1 0 1 0	R	4	4
0 1 0 1 1	J	'	Bell
0 1 1 0 0	N	,	,
0 1 1 0 1	F	!	!
0 1 1 1 0	C	:	:
0 1 1 1 1	K	(	(
1 0 0 0 0	T	5	5
1 0 0 0 1	Z	"	+
1 0 0 1 0	L	)	)
1 0 0 1 1	W	2	2
1 0 1 0 0	H	#	unassigned
1 0 1 0 1	Y	6	6
1 0 1 1 0	P	0	0
1 0 1 1 1	Q	1	1
1 1 0 0 0	O	9	9
1 1 0 0 1	B	?	?
1 1 0 1 0	G	&	&
1 1 0 1 1	FIGS	FIGS	FIGS
1 1 1 0 0	M	.	.
1 1 1 0 1	X	/	/
1 1 1 1 0	V	;	=
1 1 1 1 1	LTRS	LTRS	LTRS

Gray tint indicates FIGS case differences between U.S. and CCITT#2 Baudot.
FIGS-H used for motor stop on some machines.
1 = Mark = hole in paper tape.
Bit 1 transmitted first in serial data system.

Table III– The Baudot code.

trophe symbols (FIGS-S and FIGS-J). Communications between U.S and European amateurs therefore may include extra signal bell rings! Devotees of RTTY art therefore include both the apostrophe and signal bell if the apostrophe is needed to make up the picture. The variations between quotation ('') and plus (+) and between semicolon (;) and equals (=) do not normally cause any great problems except when receiving press from commercial RTTY stations outside the U.S. The apostrophe symbol (') is generally used for quotation in CCITT#2 systems, which of course will ring the U.S. station's signal bell. The only way for a U.S. station to get absolutely correct copy in this case is to have a printer or terminal that can be changed to the CCITT#2 code. As will be discussed shortly, the definition of AMTOR/SITOR by *Comite Consultatif International des Radiocommunications* (International Radio Consultive Committee), CCIR 476, specifically requires conversion to the CCITT#2 code format. This is why the **OVER** signal for AMTOR may be referred to as either quotes-query (''? = U.S. Baudot) or plus-query (+? = CCITT#2 Baudot).

The **FIGS-D** character deserves some special consideration. In the U.S. this code is used to represent the dollar sign (**$**). However, CCITT#2 systems use this code to trigger a **W**ho a**Re** yo**U** (WRU) answer-back message. When FIGS-D is received and WRU is enabled, the CCITT#2 terminal automatically transmits the call sign or other identification, thus blocking any reception until the WRU message is completed. Therefore, use of FIGS-D (U.S. $) is not recommended for international communications. This can be particularly confusing when AMTOR/SITOR is used, since the FIGS-D character is commercially used to trigger the WRU feature.

There is another set of FIGS characters that has been used in Baudot RTTY systems. This is the so-called **WEATHER CODE**. The weather code substituted arrows and cloud-cover symbols for most of the FIGS case punctuation of U.S. or CCITT#2 Baudot. Use of this code has been discontinued by the weather services because of incompatibility with computers and the ASCII code.

ASCII Code

The Baudot code served radio and wire-line communications systems well, but it lacked enough different codes to support the symbols and control features needed to communicate with modern computers. Therefore, a much expanded code was devised by American National Standards Institute, Inc. (ANSI). This code is called the "American National Standard Code for Information Interchange" (ASCII, commonly pronounced "as-key"). The ASCII code contains 8 bits of data and therefore could support a character set of 256 different symbols. However, only 7 of the 8 bits are generally used for information, so the standard ASCII character set is limited to 128 symbols. The eighth, or "parity," bit* is sometimes used for a simple error-detection system. The ASCII code has also been adopted as the international CCITT#5 code with some variations in symbols and codes. The U.S. ASCII code is shown in Table IV.

The ASCII code is arranged so that numbers and letters occur in binary bit order. This is a notable departure from the Baudot code, which was arranged by Murray so that the most frequently used letters are represented by the *least* number of holes in a paper tape. The ASCII code was designed to optimize computer collation and sorting.

Although ASCII is used extensively for computer communications, there are many different interpretations of how the control characters in the first two columns are used. This is particularly true in the case of "flow-control" or "handshaking" communications protocols. These are forms of recognition between computers to accept data via the use of preestablished procedures. In some systems DC1/DC3 are used for stop-start symbols. Other systems may use ACK/NAK or separate control wires in an RS3232 connection. It is best to consult the manufacturer's manuals to determine specific ASCII requirements for a given computer or terminal.

To date, ASCII has seen limited amateur radio use, except for exchange of computer programs and in conjunction with packet radio systems. The reason is that there are still many of the older Baudot machines in use which cannot decode ASCII. Also, there actually is little need for the extra characters or higher speeds of ASCII for normal amateur communications. Because ASCII is generally operated at data rates of 110 baud and higher, the error rate on h.f. is typically higher than if 45 baud Baudot were used. As more advanced communications techniques (such as packet radio) are developed, ASCII will become more common on amateur frequencies. There is very little commercial use of ASCII by shortwave RTTY stations, and government stations using h.f. ASCII communications also generally employ encryption. ASCII is growing in popularity for v.h.f.-f.m. operation, particularly when computer programs are to be exchanged at 300, 1200, or higher baud rates.

**A "parity" bit is a bit added to a group of bits so that the number of ones (1) in the group is, accoding to design, even or odd.*

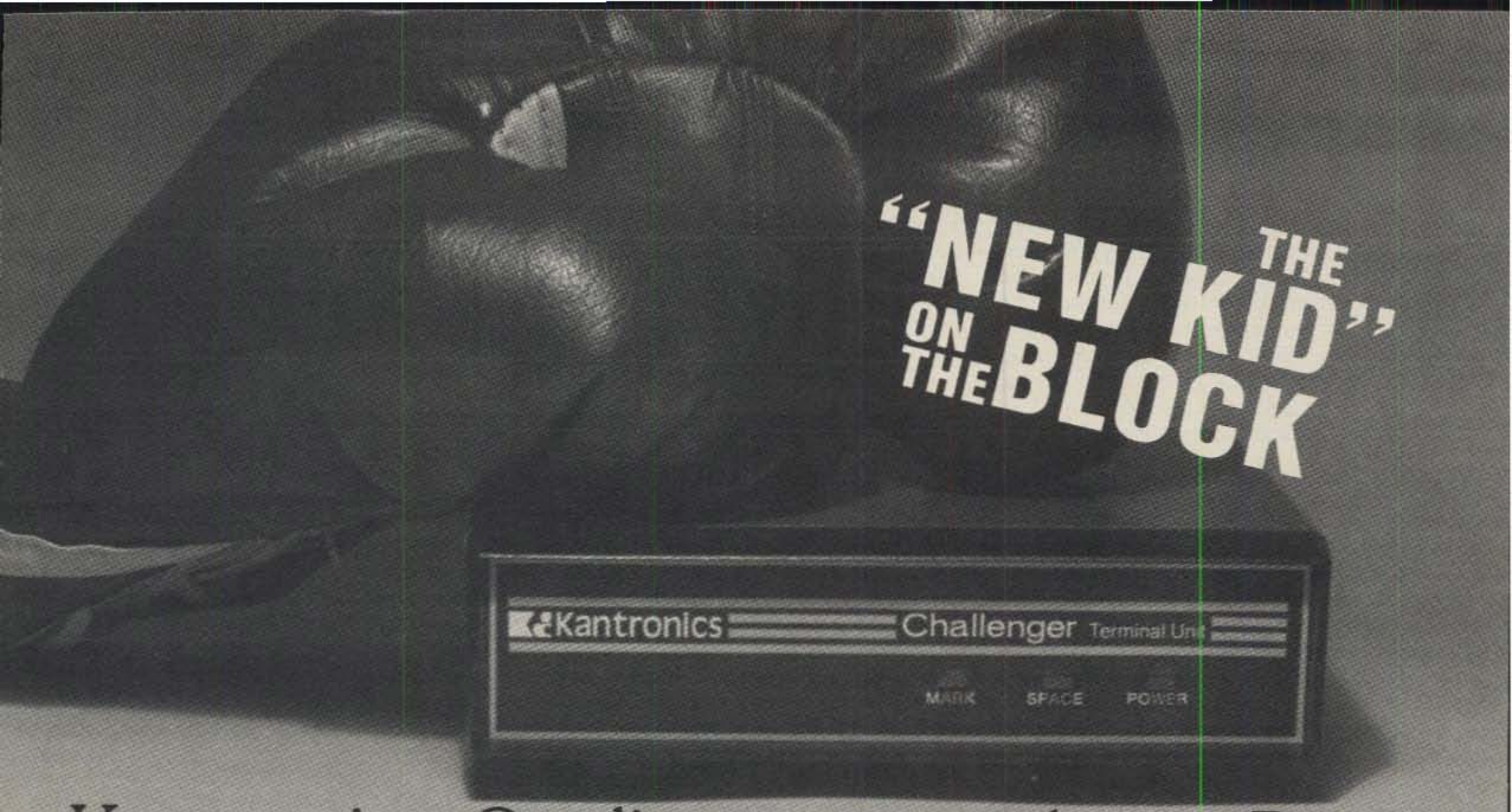
ASCII RTTY Code

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

ACK = acknowledge
BEL = signal bell
BS = backspace
CAN = cancel
CR = carriage return
DC1 = device control 1
DC2 = device control 2
DC3 = device control 3
DC4 = device control 4
DEL = delite (rubout)
DLE = data link escape
ENQ = enquiry (WRU)
EM = end of medium
EOT = end of transmission
ESC = escape
ETB = end of block
ETX = end of text
FF = form feed (home)
FS = file separator
GS = group separator
HT = horizontal tab
LF = line feed
NAK = not acknowledge
NUL = null
RS = record separator
SI = shift in
SO = shift out
SOH = start of heading
SPC = space bar
STX = start of text
SUB = substitute
SYN = synchronous idle
US = unit separator
VT = vertical tab

1 = Mark = hole in tape.
Bit 1 transmitted first in serial data.

Table IV– The ASCII RTTY code.



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The new **Kantronics Challenger** makes you the winner with superior performance at a knockout price. The **Challenger** terminal unit is designed for RTTY/ASCII/AMTOR operation with any of the Kantronics software programs. Compare our specifications with the competition, then check the price.

Challenger's four pole switched capacitance filter gives sensitivity and selectivity found in units costing much more. And with only 5mvRMS of audio required to drive **Challenger**, you can really chase the weak signals. With features like Scope Outputs, Direct FSK or Crystal Controlled AFSK, and an Extruded Aluminum Case, you know this is Kantronics quality.

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Kantronics Software

Hamsoft — Send/Receive CW, RTTY, ASCII ★ Split Screen Display ★ Message Ports ★ Type-Ahead Buffer ★ Printer compatibility.

Hamtext — Includes all features of Hamsoft plus Text Editing ★ Receive Message Storage ★ Variable Buffer sizes ★ Diddle ★ Word Wraparound ★ Time and Text Transmission.

Hamsoft/Amtor — Includes all features of Hamsoft plus communication in all three modes of AMTOR.

Amtorsoft — Includes all the features of Hamtext but is for use with AMTOR ONLY. The Apple program is available only as a Hamtext/Amtorsoft combination.

Supertap — Receive Only CW, RTTY, ASCII, AMTOR ★ Decode inverted, bit inverted, and unusual bit order ★ Multiple line display ★ "SCOPE" feature for baud rate measure.

Specifications

Input Filter — Four pole Switched Capacitance Filter with 170Hz Shift RTTY bandwidth of 260Hz nominal. Copies any shift.

Audio Input — Minimum level 5mvRMS. Input impedance is 600 ohms unbalanced. Accepts baudot or ASCII code up to 300 baud. Max input level is 12VRMS.

AFSK Output — Crystal controlled. Mark-2125Hz; Space-2295Hz (170 shift). Level 100mvpp (35mvRMS) standard. Optional 500mvpp (175mvRMS). Output impedance 600 ohm unbalanced.

FSK Output — Open Collector +40 VDC Max. Polarity can be reversed.

Scope Output — 10K ohm output impedance.

PTT Output — Open Collector +40 VDC Max.

Computer Connection — TTL Compatible. Inputs also RS232 level compatible.

Power Requirements — 11 to 15 VDC (12VDC nominal) 75ma

Construction — Precision Extruded Aluminum Alloy Case

Dimensions — 1.9"H x 5.9"W x 7"D

Weight — 1¾ lbs.

Kantronics
1202 E. 23rd Street
Lawrence, Kansas 66044

The eighth bit of the ASCII code has varying uses, depending upon the configuration of the computer system. It may be set to one of four different conditions: (1) always mark, (2) always space, (3) odd parity, or (4) even parity. All four choices are in use in various systems. Simple systems not using parity usually set this pulse to a mark. Parity is used in some systems to detect if a character has been received in error. When parity check is used, the state of the 8th bit transmitted is determined by counting the number of mark pulses used in the first 7 data bits. The 8th bit is then set to make the total number of mark pulses to be either an odd or even number. For example, if odd parity is to be transmitted and the letter to be sent is "A" (first 7 bits = 100 0001), the 8th bit is then set to "1" to make a total of 3 mark pulses in all 8 pulses (1100 0001). Similarly, the letter "C" (100 0011) would have the 8th bit set to "0" in an odd parity system (giving 0100 0011 for the full ASCII character). An even parity system would, of course, have the exact opposite computation of the 8th bit state.

In practice, the parity bit is rarely used in radio service and by only part of the telephone computer services. The receiving station must also then be set up for the correct odd or even parity detection. It computes the number of mark pulses in each character received and assumes an error was received if the parity bit is not set correctly. This parity detection will give an indication of a bit error, but gives no information as to which bit was in error. No parity error will be detected if two bits of the same character are changed. Also, if the parity bit itself was garbled, the character may indeed have been received correctly. Unless a special reverse signaling channel is also used, parity detection offers no way to determine what the garbled character should have been. For radio communications, the error correction techniques of either the ARQ (AMTOR/SITOR) or packet radio systems are much more reliable than simple ASCII parity detection.

ARQ Code (AMTOR/SITOR)

Recognizing that neither the Baudot nor ASCII codes themselves provide error-free communications, a unique code and transmission system was established for marime radio teleprinter use. This code is commonly called AMTOR by radio amateurs, but is the same as that defined by *CCIR Recommendation 476*. It is also called "SITOR" and "TOR" in commercial marine systems. The ARQ code is set up to be very similar to the Baudot code but with *even* parity. However, 7 data bits are used, and each character is encoded so that there are always 4 mark and 3 space pulses. Thus, not all of the 128 possible codes for 7 bits may be used. In fact, the character set of the ARQ code is much the same as that for Baudot, and the *476 Recommendation* is specifically set up for a direct Baudot to ARQ code translation. Because of this limitation, the ARQ code, like Baudot, can only be used for one case of letters (upper or lower) and the number of punctuation symbols is limited. Various features are included in the ARQ system so that it operates automatically in most cases without operator intervention. The ARQ code is shown in Table V.

RTTY Modes

Our normal Baudot and ASCII communications use a one-way continuous mode for exchanging information, much like we do for voice or Morse code. One station makes a complete transmission and then stands by for the other station to make comments. Transmissions tend to be long, and there is no way for the receiving station to interject comments to the transmitting station, nor even to ask for corrections of errors printed. AMTOR, and now packet radio, allows a new interactive mode of communication whereby such an interjection is not only possible, but necessary. This interactive mode exchanges text in bursts (or packets) with frequent listening periods for the receiving station to comment or request repeats.

AMTOR/SITOR

The ARQ mode of AMTOR (also called "Mode A") defines a two-way transmit-receive system in which the receiving station acknowledges correct or incorrect reception of groups of characters. Bursts of three characters are sent by the Information Sending Station (ISS). The Information Receiving Station (IRS) examines each character received and tests for the correct 4/3 mark/space ratio. The IRS then turns on its transmitter and sends a control character to indicate whether or not a repeat burst is required from the ISS. A special sequence of characters (**+?= "OVER"**) may be transmitted to change the direction of transmission (interchange ISS and IRS). Obviously, only two stations at a time may communi-

ARQ Error Correction Code

LTRS Case	FIGS Case	CCITT#2 Code	7-Unit ARQ Code	LTRS Case	FIGS Case	CCITT#2 Code	7-Unit ARQ Code
A	—	ZZAAA	BBBYYYB	Y	6	ZAZAZ	BBYBYBY
B	?	ZAAZZ	YBYYBBB	Z	+ (")	ZAAAZ	BBYYYBB
C	:	AZZZA	BYBBBYY	Carriage Return		AAAZA	YYYBBBB
D	WRU ($)	ZAAZA	BBYYBYB	Line Feed		AZAAA	YYBBYBB
E	3	ZAAAA	YBBYBYB	LTRS Case		ZZZZZ	YBYBBYB
F	! (**)	ZAZZA	BBYBBYY	FIGS Case		ZZAZZ	YBBYBBY
G	& (**)	AZAZZ	BYBYBBY	Space Bar		AAZAA	YYBBBYB
H	# (**)	AAZAZ	BYYBYBB	Null (no tape hole)		AAAAA	YBYBYBB
I	8	AZZAA	BYBBYYB				
J	BELL (')	ZZAZA	BBBYBYY	**ARQ Mode**	**FEC Mode**		**7-Unit ARQ Code**
K	(	ZZZZA	YBBBBYY	Control Signal 1			BYBYYBB
L	)	AZAAZ	BYBYYBB	Control Signal 2			YBYBYBB
M	.	AAZZZ	BYYBBBY	Control Signal 3			BYYBBYB
N	,	AAZZA	BYYBBYB	Idle Signal Beta			BBYYBBY
O	9	AAAZZ	BYYYBBB	Idle Signal Alpha	Phasing Signal 1		BBBBYYY
P	0	AZZAZ	BYBBYBY	Signal Repeat (RQ)	Phasing Signal 2		YBBYYBB
Q	1	ZZZAZ	YBBBYBY				
R	4	AZAZA	BYBYBYB				
S	(BELL)	ZAZAA	BBYBYYB				
T	5	AAAAZ	YYBYBBB				
U	7	ZZZAA	YBBBYYB				
V	= (;)	AZZZZ	YYBBBBY				
W	2	ZZAAZ	BBBYYBY				
X	/	ZAZZZ	YBYBBBY				

(**) = Characters not defined by CCIR 476.
( ) = Equivalent U.S. Baudot FIGS character.
Z = Baudot Mark; A = Baudot Space.
B = ARQ mark (AMTOR) = ARQ space (SITOR).
Bits are shown in reverse bit order to that of Tables III and IV (Baudot "A" = ZZAAA = 00011).

Table V– The ARQ error correction code.

cate with such a system, and their transmitters and receivers must be capable of switching on and off quickly. Also, the ARQ mode requires transmission and reception of the correct *selective call code* before communications may be established.

Another mode provided by *Recommendation 476* for transmission to a group of stations is the **FEC** (Forward Error Correction) or broadcast mode. When FEC mode is used, the ISS transmits text continuously without switching on and off. The same 4/3 mark/space ratio coding is used, and each character is sent twice, spaced in time by 4 characters. The receiving FEC station (IRS) then examines each character for the 4/3 ratio. If the ratio is 4/3, the character is printed. If it is not, the receiving station then examines the repeated character. If it has the 4/3 ratio, it is printed. Otherwise, a space (blank position) is printed to warn the operator of a reception error. The FEC mode is a one-way transmission system that does not require use of a special call code.

A third mode called **Selective Broadcast**, or **SEL-FEC**, is used when a broadcast is to be made to a selected group of stations. This mode is similar to the FEC mode except that it requires reception of a station's selective call sequence before reception can begin. SEL-FEC also sends all text with the polarity reversed so that the mark/space ratio is now 3/4. Thus, stations not meeting the selective call requirement do not print the message.

Another distinction of the ARQ code is that it is transmitted as a *synchronous* rather than *asynchronous* serial code. The difference between these two forms of serial RTTY codes will be discussed in a later section. Because of the special on-off switching, error correction, and synchronous form of the ARQ code, AMTOR/SITOR equipment is considerably more complex than that used for Baudot or ASCII. ARQ equipment usually takes the form of either a special computer-driven code conversion device, or special computer programs designed only for ARQ use. Standard Baudot or ASCII machines, terminals, or computers are not directly compatible with the ARQ code.

Packet Radio

Packet radio is the newest RTTY technique in amateur radio. It combines the advantages of an ARQ-type error correction system with the freedom of the ASCII (or other) code. As currently implemented by radio amateurs, packet radio sends text (information) using the ASCII data code rather than a special error-correction code as used for AMTOR. As in AMTOR ARQ mode, packet radio sends the information in bursts or blocks, but using much larger blocks at a higher speed. Current v.h.f. and h.f packet radio operation uses 1200 baud (sometimes 300 baud on h.f.), and text is formatted in blocks of 128 or 256 characters (compared to 100 baud and three character blocks for AMTOR). Error correction in packet radio does not depend upon a special coding for each character. Rather, a sophisticated sum of the digital value of all characters in a block is computed and transmitted. This number, called the **CRC** (Cyclic Redundancy Check) or **FCS** (Frame Check Sequence), is recomputed at the receiver. If the received calculation agrees with the FCS transmitted, the receive station assumes no error in the received text; if not, the receiving station asks the transmitting station to repeat the entire block of information.

In addition to 128 (or 256) characters of text plus the FCS, several other sections of information are sent in each packet (or burst) by the transmitter. Included in these additional sections are the call signs of both the sending and receiving station (plus repeater stations if used), a control character, and special start and end characters, called **Flags**. The format in which all of these sections are sent and the rules governing automatic transmission are all described by the packet radio *PROTOCOL*, commonly known as the *AX.25 Protocol* for level 2 or the link layer of the system.

Each section of the packet radio format is made up of 8-bit characters ("octets"). The Flag character at the beginning and end of each packet is always (01111110), to allow the receiving station to synchronize with the received data. The information is sent as continuous, synchronous serial 8-bit ASCII groups (no start or stop pulses). To prevent the possibility that a grouping of two ASCII characters could produce the (01111110) end flag code, a technique called **bit stuffing** is used when the data is transmitted. When transmitted, an extra "0" (space) bit is inserted in the code whenever five "1" bits are to be transmitted in sequence. The receive system then automatically removes all "0" bits following five "1" bits, thus restoring the original data format. Because of this bit-stuffing technique, the actual length of each packet will vary, even if all data blocks are of constant length. Therefore, the through-put of a packet-radio system will vary with the text transmitted.

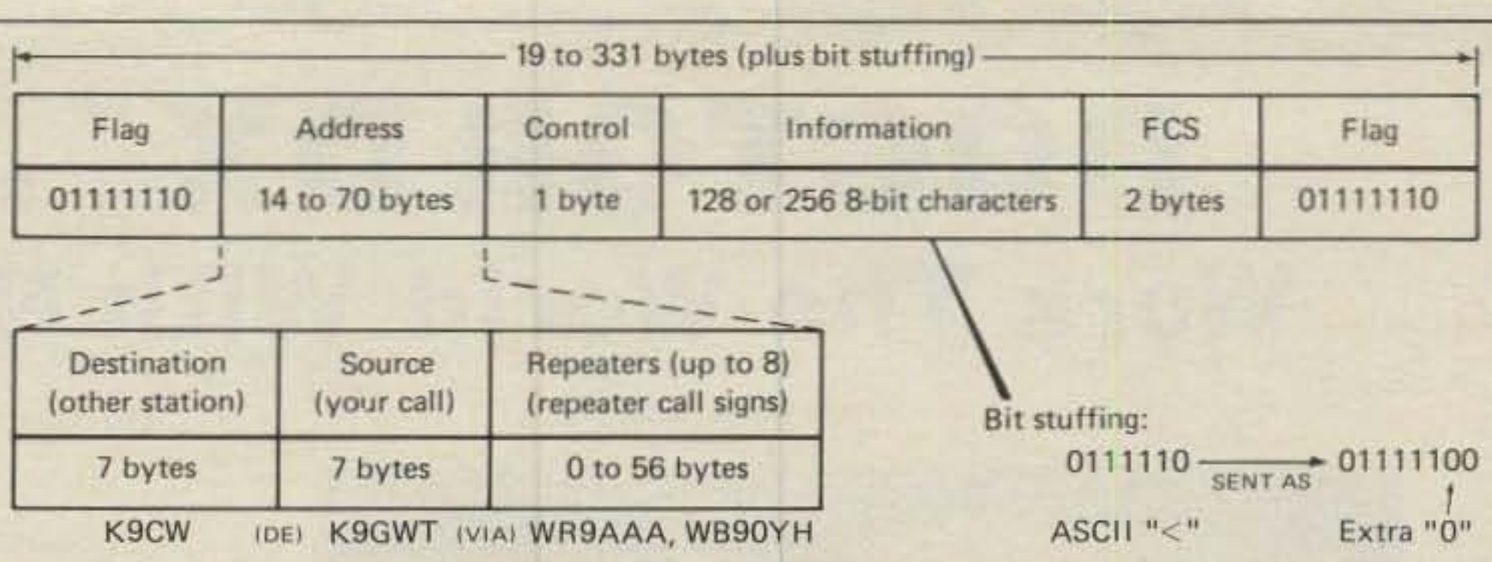

Fig. 2– Format of a packet radio frame.

One of the very convenient features of packet radio as currently implemented in the Tuscon Amateur Packet Radio (TAPR) equipment is the capability for each packet-radio station to serve as a repeater for other stations and also to pass a message through multiple repeater stations. Thus, even if you are using your station to communicate with another packet station, a third station may simultaneously use your equipment to pass traffic to still a fourth station. The current TAPR implementation allows up to eight repeaters in a given link. However, you must specify the address (usually amateur call sign) of the destination station, source station (your station), and all repeater stations you wish to use along the way. This multiple repeater feature may prove to be temporary until a suitable level three (network) protocol can be defined for packet radio. The format of a typical packet is shown in fig. 2.

The format of a packet and the proper response to the protocol are all controlled by a special microprocessor-controlled device called a **Terminal Node Controller**, or **TNC**. The TNC includes specialized parts and programs to do all of the FCS calculations, error correction, and bit-stuffing/stripping required. Much like equipment used for AMTOR, the TNC serves as a code converter device between the RTTY terminal (usually an ASCII terminal or computer) and the radio modem. Several different TNC hardware and software devices have been developed, the most popular being the TAPR TNC kit. The modem currently used for packet radio is the "Bell 202" modem (1200/2200 Hz). Since much of packet radio is still experimental, changes undoubtedly will occur in some technical standards as the mode attracts more users. In particular, the data rate, modem standard, and network communications format (protocol) probably will be changed in the near future. The packet enthusiast therefore should look to new articles in the amateur magazines and activities of packet-radio groups (and their excellent newsletters) to stay abreast of current standards. Several good references of current practice will be listed in the bibliography in Part II of this article. CQ

(To Be Continued)

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Radio propagation (programmed for each band) represents what you would expect to hear on a good propagation day at the peak of the sunspot cycle. The propagation follows the internal real-time clock that you set before beginning operation. All the simulated stations you hear (with proper prefixes) are at distances you would expect to hear for the time of day and band selected.

You can learn and enhance your CW operating skills with Doctor DX. Doctor DX will not reward bad habits. AEA even offers an awards program to owners of Doctor DX that work all zones, 100 countries, 5 band Dr DXCC, or Doctor DX Honor Roll.

The Doctor DX CW trainer is a totally new concept in Amateur Radio. See what all the excitement is about. Send for full details, and see your dealer for a demonstration.

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Parker, Colorado 80134
Or Call Mike, KC0FW at: 303-841-8444

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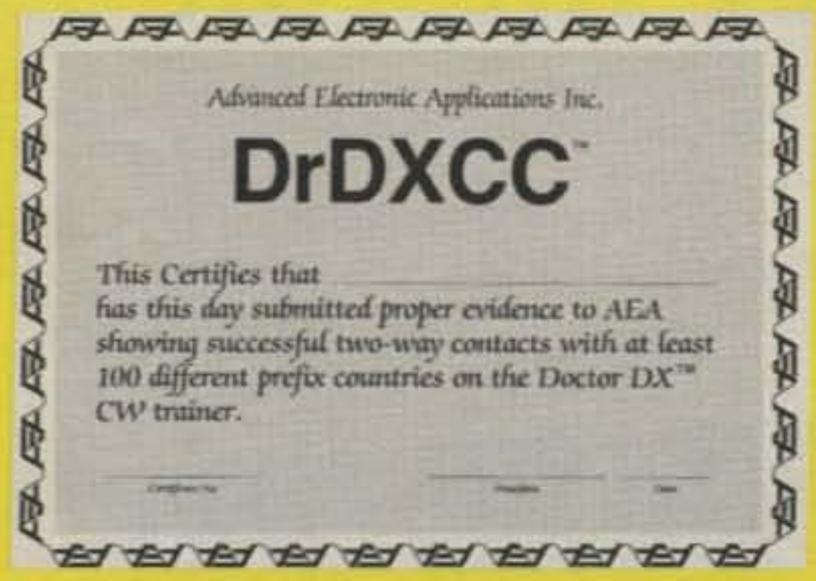
Doctor DX™ Challenge

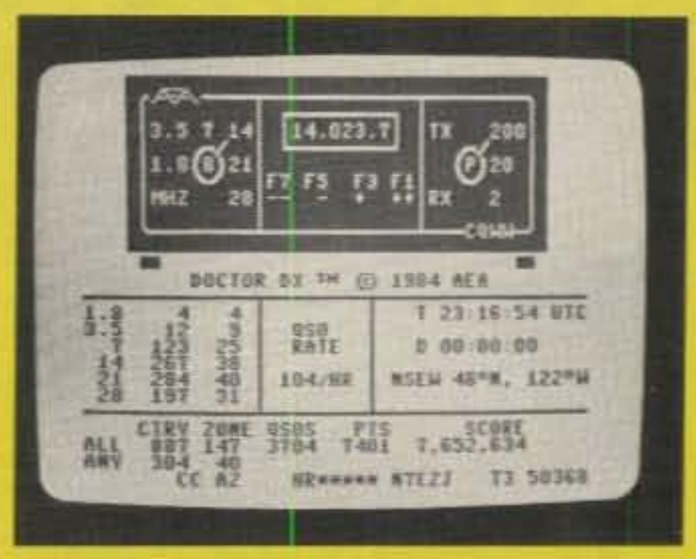
BY AEA



DOCTOR DX CONTEST BOX

TOP SPRINT SCORES	TOP MARATHON SCORES
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

WILL YOUR CALL APPEAR HERE?



For good clean, competitive fun, Doctor DX™ shows your score and QSO rate for continuous monitoring of your improved CW operating skills. The DDX-64 can be a vehicle for fairly settling those club rivalries by competing with your friends under identical operating conditions.

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AEA DrDXCC is achieved when you have worked 100 different countries, regardless of the frequency band or the amount of time operated. DOCTOR DX WAZ can be earned by working all 40 CQWW zones of the world, without regard to the band or duration of operating time. The DOCTOR DX HONOR ROLL is reserved for top notch operators capable of working 250 countries without regard for band or operating time. Additional endorsement awards are available for each additional 10 countries worked up to 300 (out of 304 possible) countries. AEA 5 BAND Dr DXCC is a very difficult award to achieve. It requires working 100 countries on each of five different bands, without regard for the amount of operating time.

Each award can be obtained by filling out a photocopy of the award application form (supplied) along with the score information and qualifying check sum from your screen display. Please enclose $3.00 to cover handling costs for each certificate ($1.00 for Honor Roll endorsements). Awards will only be granted to owners having a Doctor DX warranty card on file.

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AEA **Brings you the Breakthrough!**

CQ REVIEWS:

BY DAVE INGRAM*, K4TWJ

The HAL Communications CRI-200 Computer RTTY Interface

Today's world of RTTY is amidst a period of transition, and resulting developments reflect one of today's hottest areas of amateur radio interest. As the golden age of mechanical teleprinters fades on yon horizon, all-electronic terminals and RTTY-interfaced home computers are becoming star performers in numerous setups around the globe. The home computer aspect of that situation holds particular appeal in several respects: The computer can be used for small business/personal applications, or it can be adapted for various printed-word amateur radio activities within a few minutes.

Commercial equipment manufacturers have recognized the above situation, and are thus producing some very impressive RTTY interfacing units. These "modern day TU's," along with suitable computer software, create a flexible RTTY setup which can be used quite easily. During receive, the interfacing unit converts incoming tones to voltage changes which can be recognized as "1's" and "0's" by a computer. During transmit, the interface unit converts similar computer-output voltage changes to tone differences which can be accepted by an s.s.b. or f.m. transmitter. Since home computers operate with "1's" and "0's" in ASCII rather than Baudot (RTTY) code, software provides "look-up tables" and buffering for interlanguage conversions and internal data manipulations. The two areas, software and interfacing hardware, thus work together to establish a complete system. Although software must coincide with particular computers, RTTY interfacing units can normally be used with a variety of computers and amateur transceivers.

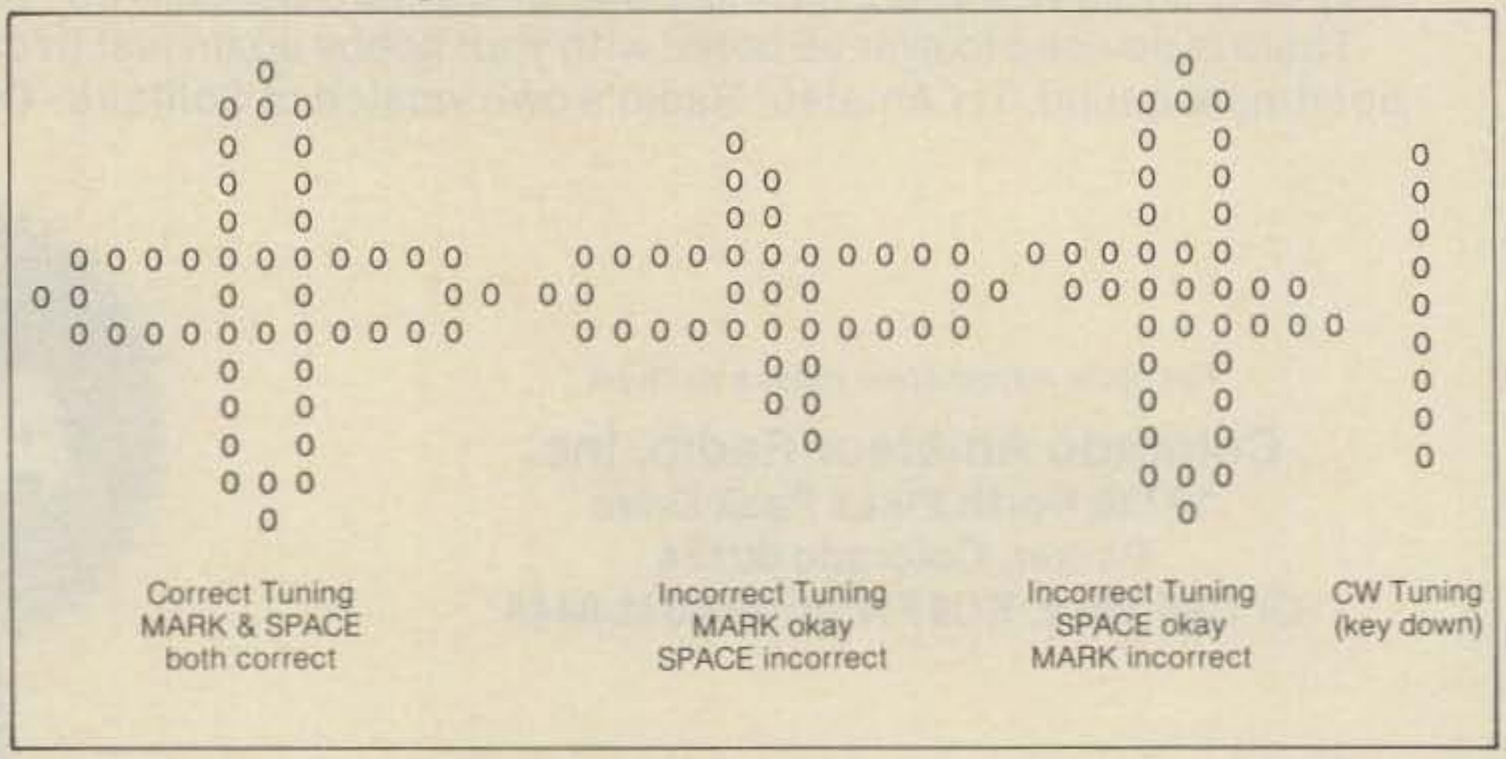
Two recent additions to the area of RTTY/computer interfaces are the model CRI-100 and CRI-200 units from HAL Communications Corporation. The two interfacing units are basically identical in performance and appearance with the exception of their front-panel crosshair (CRI-100) or cross-ellipse (CRI-200) LED displays. This review, however, will highlight the latter unit.

The HAL CRI-200 computer RTTY interface.

The CRI-200

This attractive RTTY interface connects between a transceiver's mike, speaker, and key jacks and a home computer's game or RS232 port (as specified by the particular software). The unit is housed in a smoke-gray enclosure measuring 3"H × 10"W × 7"D. Front-panel controls include pushbuttons for **On/Off**, **CW** or **RTTY** operation, **Manual** or **Automatic** computer keying of a transmitter's push-to-talk line, narrow shift (**170 Hz**) or continuously **Variable** shift demodulation (range is approximately 80 Hz to 975 Hz via a front-panel control), and selection of **Normal** or **Reversed** RTTY tones. The cross-ellipse LED display in the unit's center is used for accurate on-frequency tuning and for evaluating various off-the-air signals. This display functions on both RTTY and c.w. modes (see fig. 1). The unit's

Fig. 1– The CRI-200 RTTY tuning indications.



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

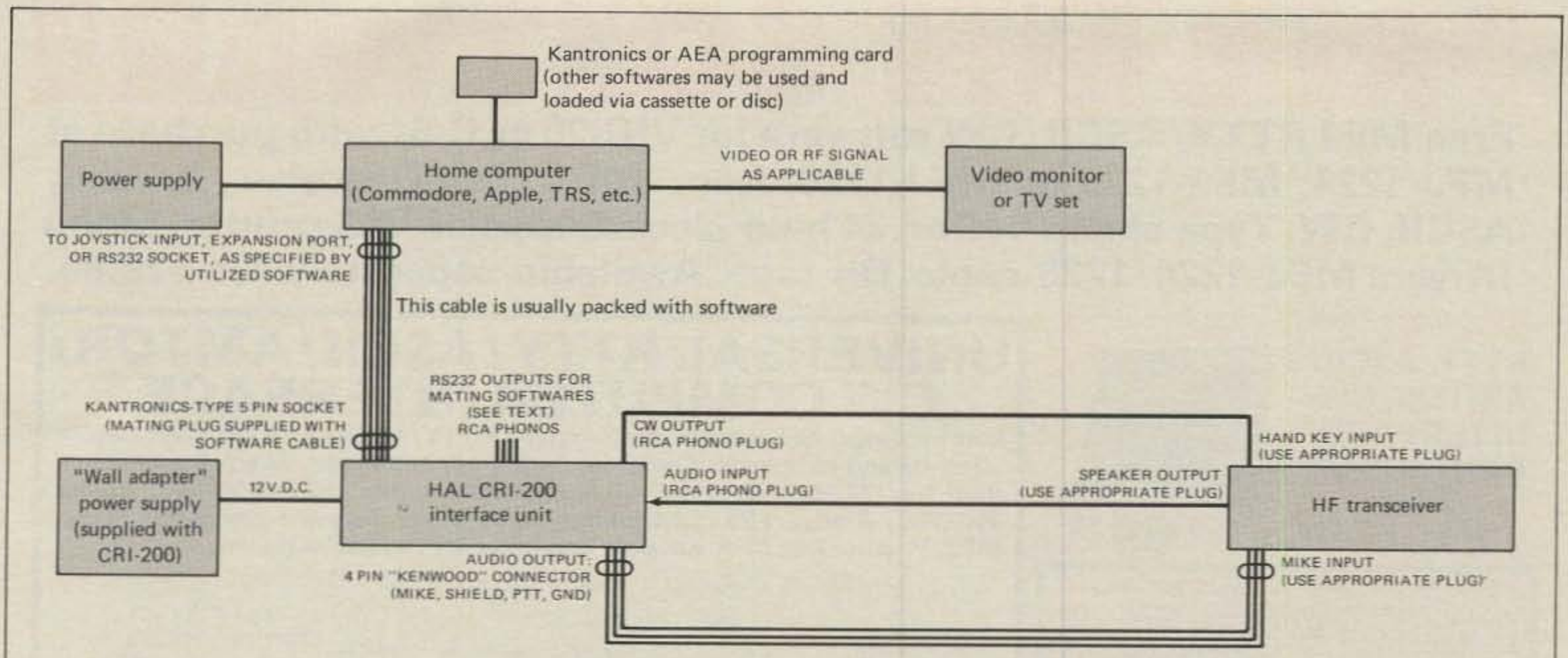


Fig. 2– Station interconnections for the HAL CRI-200 and home computer system.

"front end" is quite selective for QRM reduction, and the cross-ellipse is an extremely useful feature.

Rear-panel connections on the CRI-200 include receiver speaker (an adjacent socket provides audio "normal through" operation for an external speaker), computer-provided Morse input for c.w. operation, c.w. keying to transmitter (positive or negative polarity is internally selectable), AFSK output to transmitter (a 4-pin "Kenwood-type" socket for carrying audio tones, push-to-talk keying, and ground), a computer I/O jack (a popular 5-pin connector directly compatible with Kantronics and AEA interfaces and software), plus four "auxiliary" connectors which can be internally jumpered for various applications to fit one's needs and equipment. Station interconnections generally follow the outline shown in fig. 2, with auxiliary jacks being used for special applications such as FSK pulsing of "RTTY ready" transceivers, RS232C or TTL level computer interfacing, oscilloscope connections, etc. All jacks except the 5-pin computer connector and AFSK output are standard RCA phonos (see fig. 3).

Inside, the CRI-200 boasts *separate* mark (2125 Hz) and space (2295 Hz) filters for RTTY demodulation or a tunable space filter (2200 to 3100 Hz) for wider shifts (the mark filter is fixed tuned at 2125 Hz). C.w. operations activate a separately tuned filter which is internally adjustable from 700 to 1000 Hz and factory set at 700 Hz. That frequency is an optimum selection for c.w. operators using narrow i.f. filters to minimize QRM. An isolated pair of relay contacts is used for transmitter push-to-talk keying, while transistors activate c.w. key and FSK lines. Thanks to a multitude of internal jumpers and adjustments (plus a highly detailed instruction manual), this is the most field-flexible computer interfacing unit I've seen. The unit can be powered via its supplied 12 volt/200 ma wall adapter or any 12 volt d.c. source.

HAL Communications isn't producing interface-related computer programs at this time, but they are referring customers to RTTY software available from Kantronics, AEA, K6AEP, etc. It should also be noted that a computer-to-RTTY interface cable isn't included, as that item is usually supplied in related software packages. Computer-to-RTTY interface wiring information is included in the CRI-200 manual, however, for amateurs using unusual software and/or "rolling their own" cables.

FREE MFJ SOFTWARE

Free MFJ RTTY/ASCII/CW software for VIC-20 or C-64 with purchase of MFJ-1224, MFJ-1225 or MFJ-1228 from MFJ. Send/receive Baudot, ASCII, CW. Type ahead buffer. 24 hour clock. Supports VIC printer. Menu Driven. MFJ-1224/1225 cable. On tape. Available separately for $29.95.

RTTY/ASCII/AMTOR/CW INTERFACE CARTRIDGE FOR VIC-20/C-64

MFJ-1228 $69.95

FREE MFJ RTTY/ASCII/CW Software
INCLUDES MFJ-1228, SOFTWARE ON TAPE. ADD VIC-20 OR C-64 AND RIG TO ENJOY COMPUTERIZED RTTY/ASCII/CW. ORDER MFJ-1228/MFJ-1264 FOR VIC-20, MFJ-1228/MFJ-1265 FOR C-64.

Most versatile RTTY/ ASCII/AMTOR/CW interface cartridge available for VIC-20 and Commodore 64. Gives you more features, more performance, more value for your money than any other interface cartridge available.

Same interface cartridge works for botn VIC-20 and Commodore 64. Plugs into user's port.

Choose from wide variety of RTTY/ASCII/CW, even AMTOR software. Not married to one on-board software package. Use MFJ, Kantronics, AEA plus other software cartridge, tape or disk.

850 Hz and 170 Hz shifts on receive **and** transmit.

Has mark and space outputs for scope tuning.

Normal/Reverse switch eliminates retuning.

True dual channel mark and space active filters and automatic threshold correction gives good copy when one tone is obliterated by QRM or selective fading.

Easy, positive tuning with twin LED indicators.

Narrow 800 Hz active CW filter. Automatic PTT.

Exar 2206 sine generator for AFSK output.

Shielded XCVR AFSK/PTT interface cable provided. Plus or minus CW keyed output. FSK out.

Powered by computer (few ma.), no power adapter to buy or extra wire to dangle or pick up/radiate RFI.

Glass epoxy PCB. Aluminum enclosure. 4½x4½x1".

UNIVERSAL SWL RECEIVE ONLY COMPUTER INTERFACE FOR RTTY/ASCII/AMTOR/CW

MFJ-1225 $69.95

FREE MFJ RTTY/ASCII/CW Software
TAPE AND CABLE FOR VIC-20 OR C-64. ORDER MFJ-1225/MFJ-1264 FOR VIC-20 OR MFJ-1225/MFJ-1265 FOR C-64.

Use your personal computer and communications receiver to receive commercial, military and amateur RTTY/ASCII/AMTOR/CW traffic.

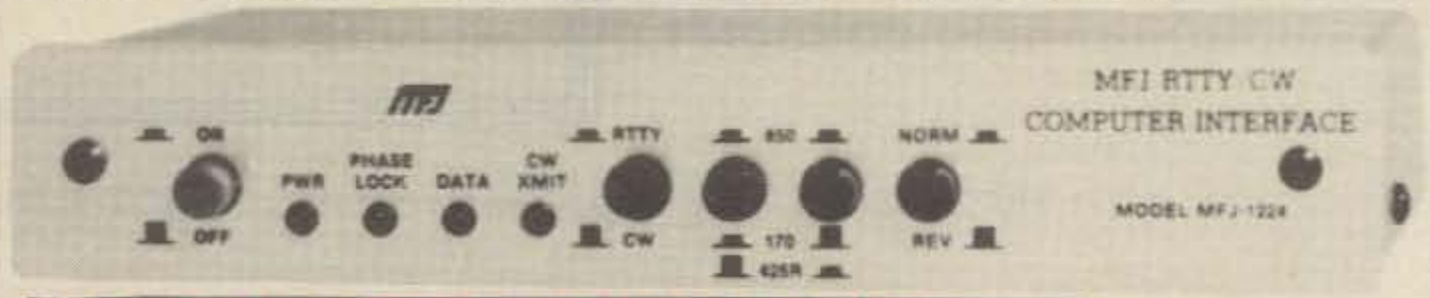
Plugs between receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers. Requires appropriate software.

Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

Copies all shifts and all speeds. Twin LED indicators makes tuning easy, positive. Normal/Reverse switch eliminates tuning for inverted RTTY. Speaker out jack. Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64. 4½x1¼x4¼ inches. 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

UNIVERSAL RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE

Lets you send and receive computerized RTTY/ASCII/AMTOR/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or other personal computers. Uses MFJ, Kantronics, AEA software and other RTTY/CW software.



FREE MFJ RTTY/ASCII/CW Software
COMPLETE PACKAGE INCLUDES MFJ-1224, SOFTWARE ON TAPE, CABLES. YOU NEED ONLY VIC-20 OR C-64 AND RIG TO ENJOY COMPUTERIZED RTTY/ASCII/CW. ORDER MFJ-1224/MFJ-1264 FOR VIC-20. MFJ-1224/MFJ-1265 FOR C-64.

MFJ-1224 $99.95

New MFJ-1224 RTTY/ASCII/AMTOR/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/AMTOR/CW station for sending and receiving. Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most others.

Use MFJ software for VIC-20, Commodore 64 and Kantronics for Apple, TRS-80C, Atari, TI-99 and most other software for RTTY/ASCII/AMTOR/CW.

Easy, positive tuning with twin LED indicators.

Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

Copies on both mark and space, not mark only or space only, to improve copy under adverse conditions.

Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

Normal/Reverse switch eliminates retuning. +250 VDC loop output drives RTTY machine. Speaker jack.

Automatic tracking copies drifting signal.

Exar 2206 sine generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone line: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying output. Plus and minus CW keying. CW transmit LED. External CW key jack.

Kantronics compatible socket.

Exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

Use Galfo software with Apple, RAK with VIC-20, Kantronics with TRS-80C, TI-99, N4EU with TRS-80 III, IV. Some computers with some software may require some external components.

Metal cabinet. Brushed alum. front. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.

SUPER RTTY FILTER

MFJ-725 $39.95

Super RTTY filter greatly improves copy under crowded, fading and weak signal conditions. Improves **any** RTTY receiving system. 8 pole bandpass active filter for 170 Hz shift (2125/2295 Hz mark/space). 200 or 400 Hz bandwidths. Automatic noise limiter. Audio in, speaker out jacks. On/off/bypass switch. "ON" LED. 12 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95. 3x4x1 inch aluminum cabinet.

CW INTERFACE CARTRIDGE FOR VIC-20/C-64

$39.95 MFJ-1226

High performance CW interface cartridge. Gives excellent performance under weak, crowded, noisy conditions. Works for both VIC-20 and Commodore 64. Plugs into user's port.

4 pole 100 Hz bandwidth active filter. 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

Plus and minus CW keying. Audio in, speaker out jacks. Powered by computer.

Includes Basic listing of CW transmit/receive program. Available on cassette tape, MFJ-1252 (VIC-20) or MFJ-1253 (C-64), **$4.95** and on software cartridge, MFJ-1254 (VIC-20) or MFJ-1255 (C-64), $19.95.

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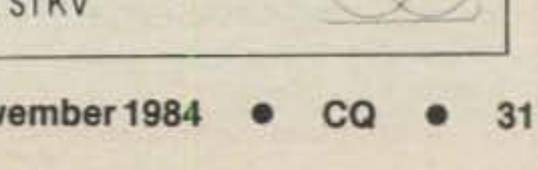

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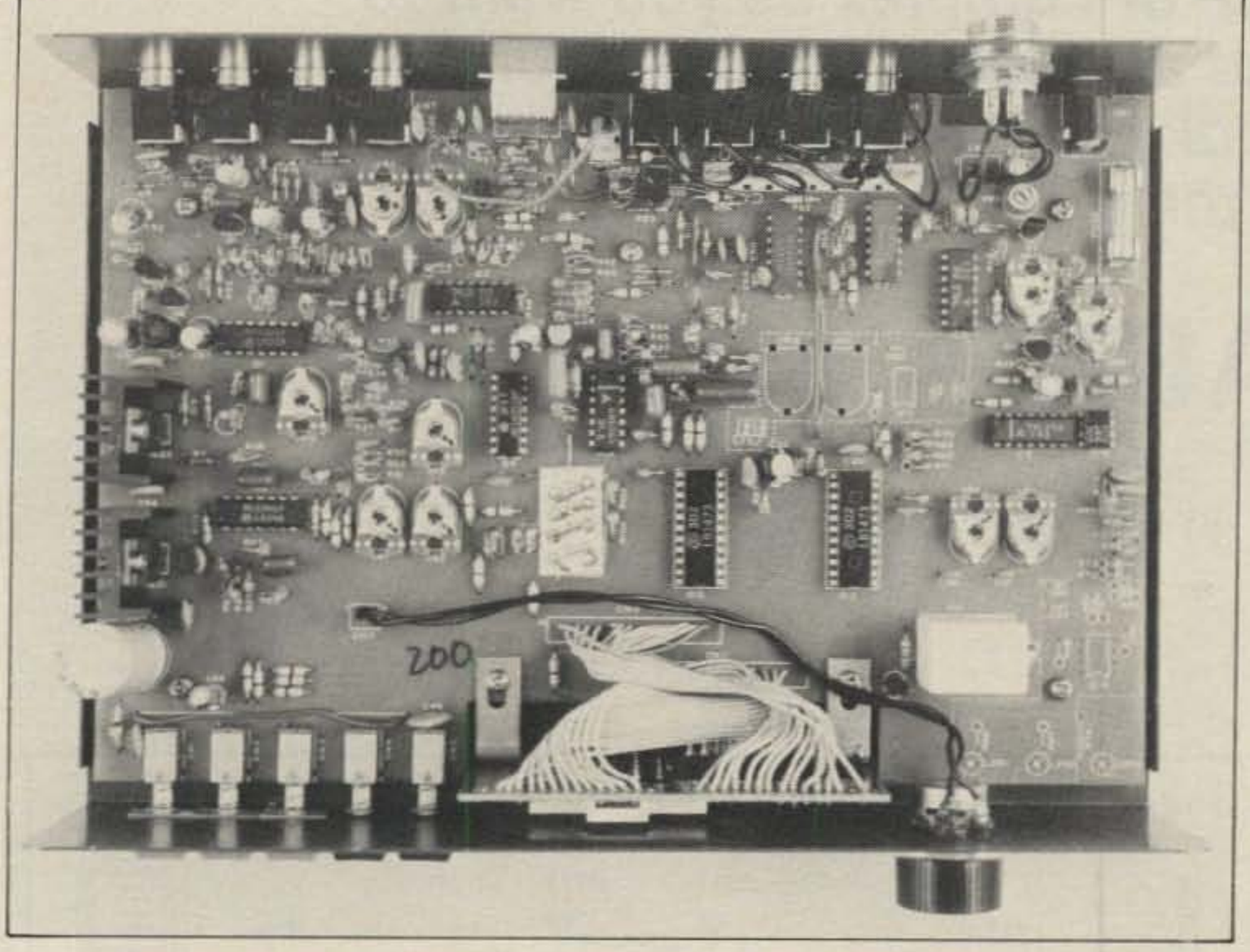

The internal layout of the CRI-200. See fig. 3 for parts identification.

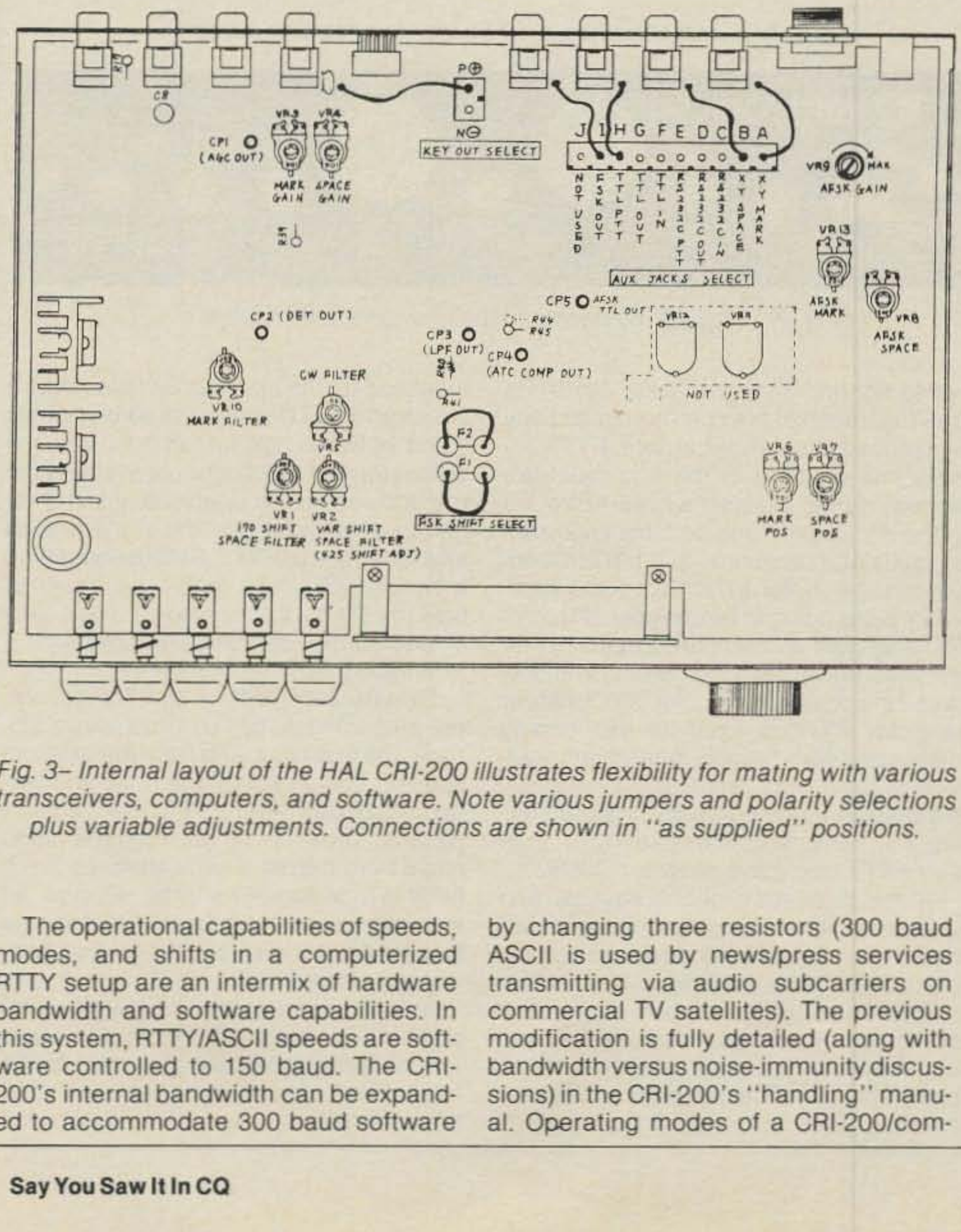

Fig. 3– Internal layout of the HAL CRI-200 illustrates flexibility for mating with various transceivers, computers, and software. Note various jumpers and polarity selections plus variable adjustments. Connections are shown in "as supplied" positions.

The operational capabilities of speeds, modes, and shifts in a computerized RTTY setup are an intermix of hardware bandwidth and software capabilities. In this system, RTTY/ASCII speeds are software controlled to 150 baud. The CRI-200's internal bandwidth can be expanded to accommodate 300 baud software by changing three resistors (300 baud ASCII is used by news/press services transmitting via audio subcarriers on commercial TV satellites). The previous modification is fully detailed (along with bandwidth versus noise-immunity discussions) in the CRI-200's "handling" manual. Operating modes of a CRI-200/computer setup include RTTY, ASCII, and c.w., assuming those three modes are included in utilized software. In other words, the CRI-200 demodulates dual tones or detects a single (c.w.) tone while software interprets resultant TTL/RS232C voltages into computer-handled data. As previously mentioned, the CRI-200 alone demodulates all popular RTTY shifts. Although not mentioned in HAL literature, I suspect the CRI-200 would also make a good "passive" AMTOR interface. That arrangement would use "full function" AMTOR software (includes error checking and automatic ACK/NAK signaling) while the CRI-200 responded to rapid pulsing and keyed its mated transceiver accordingly.

Using The CRI-200

Whether seriously pursuing two-way communications or casually reading the mail on h.f. bands, computerized RTTY and c.w. operations are an enjoyable activity worthy of investigation by all. The CRI-200 is an impressive performer in this area, copying both strong and fairly weak signals in a quiet and reliable manner. The unit's filters are quite narrow-banded/sharp tuned, and the built-in cross-ellipse display is superb for accurate on-frequency signal tuning, especially until you acquire a feel for the unit.

A brief check confirmed the CRI-200 worked equally well with Kantronics or AEA software and plug-in interface cables and their mating home computers. A couple of jumpers were moved to voltage polarity match my transceiver, and the setup was ready for action—a quick, easy, and simple installation.

The CRI-200 performs admirably on both RTTY and c.w. modes, and its front-panel controls are quite handy when tuning the many unusual signals on short-wave bands. Armed with a general-coverage transceiver plus my *RTTY Today* book and Universal Electronics' *World Press Frequencies RTTY* guide, you literally have the world at your fingertips.

Conclusion

The area of computerized RTTY/c.w. is one of today's most popular amateur radio interests (if you question that statement, notice the many ads in recent magazines). Additionally, home computers used with such setups can be flexibly adapted to a variety of personal applications as desired. This is an inexpensive way to get your feet wet in printed-word communications, and it's also a good way to expand your c.w. interest.

The HAL CRI-200 is one of the most impressive interface units I've seen. It copies all popular shifts and speeds, and it can be interfaced with almost any home computer/software combination. The unit is backed with a one-year factory warranty. For more information, contact HAL Communications Corporation, Box 365, Urbana, IL 61801.

RTTY can be as simple or complex as you want to make it. W0XI gives us a capsule approach on how simple it can be to hook up some gear and get your first RTTY CQ out on the air.

The ABC's of RTTY

BY PHIL ANDERSON*, W0XI

What is RTTY, when would you use it, where is it, why use it, who uses it, and how does it work?

RTTY is an abbreviation for radioteletype. The term *teletype*, or *TTY*, refers to a printer and keyboard unit that has been used historically to send teletype and telex messages via telephone lines. In fact, teletype-like messages have been sent across the Atlantic by undersea cable since the turn of the century. Once teletype equipment was adapted for radio transmission, such systems became known as radioteletype units—RTTY.

RTTY systems were used commercially even before 1940. Teleprinter equipment was in use between San Francisco and Honolulu by April 1932. Advanced equipment was also placed in use between New York and San Francisco by 1934. Additional equipment was then adapted for use across the Atlantic after the war. Special equipment, called ARQ RTTY, was in service from New York to Amsterdam by 1947. However, RTTY was not generally found in the amateur service until teleprinter equipment became available on the surplus market. In the 60's and 70's RTTY became a somewhat popular amateur mode, and with the advent of the home computer and new terminal equipment, RTTY is a common and very popular transmission mode.

If you tune the amateur and commercial bands for RTTY, you will find transmissions all over the radio spectrum. Amateur QSOs can be found nearly any time at about 7.075 and 14.075 MHz. In addition, ARRL broadcasts in RTTY occur every day; consult *QST* for time and frequency. Commercial and government transmissions occur at many places in the h.f. spectrum; try the 4, 8, 12, and 16 MHz bands.

Why use RTTY? Obviously, there must be some advantages in using RTTY or we would not find all this activity. While it is true that much of the commercial activity has moved to satellite carriers, RTTY activity has doubled in the h.f. spectrum anyway during the last few years. We are in the information age and any spectrum space is at a premium, so h.f. RTTY continues to be useful. In fact, for some applications it is going to be cheaper to use an RTTY system as compared to a satellite system, particularly for small and low data rate applications. For the amateur operator RTTY is ideal for exchanging messages with friends, particularly outside a local v.h.f. area. RTTY is easily adaptable for computer-to-computer linking, too, even though to date most amateur RTTY links have been for QSOs.

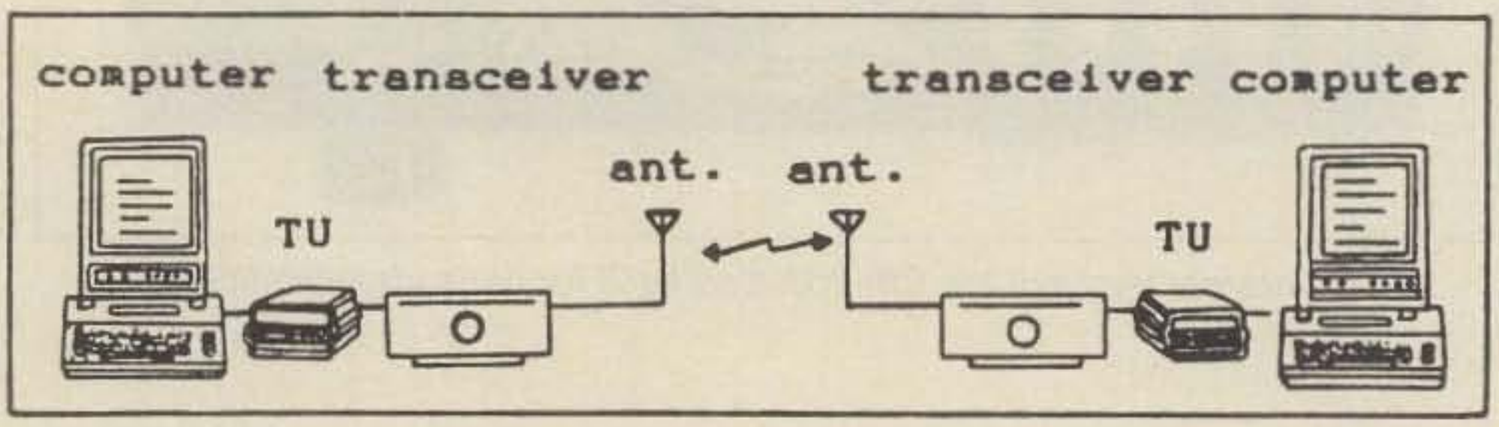

Fig. 1– A computer-based RTTY communications system.

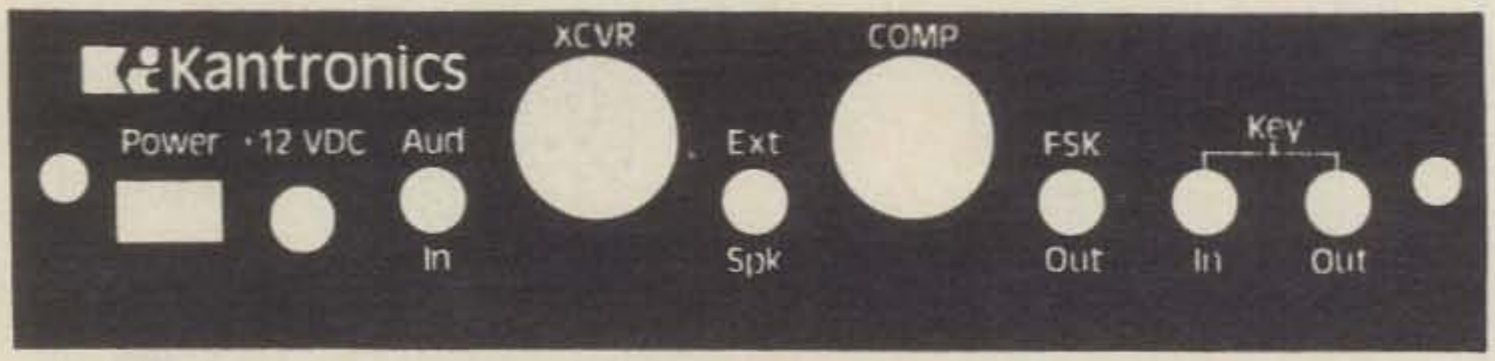

Fig. 2– A typical TU back panel showing various connectors.

At this point you probably have several questions: what kind of equipment do I need, how does it work, and how do I operate it? Let's take a look.

The basic RTTY station requires a computer or teletypewriter, a terminal unit (called a TU), and a transceiver as shown in fig. 1. The computer is used for entering and receiving messages. In most cases, the operator will also desire a printer. The TU is used to adapt signals going between the transceiver and the computer. For most amateur systems the transceiver will be operated in l.s.b., regardless of band, for the transmission and reception of RTTY. Before describing a typical QSO, let's look a bit closer at how the TU is attached to your transceiver and home computer and how such a system works.

Signals received by the transceiver are presented to the TU in audio form. Usually, the audio is taken from the external speaker connection of the radio and presented to the TU input. A typical TU back panel is shown in fig. 2. Here the audio cable from the receiver is attached to the **Audio In** jack shown near the left side. An external speaker is then attached via the **External Speaker** jack so that received audio can also be heard.

In turn, signals generated by the computer are converted by the TU to audio tones. These tones are then sent to the transceiver's microphone input. In fig. 2 the audio tones, called AFSK signals, are

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Fig. 3– A simple RTTY TU using a series of LEDs to indicate mark and space.

cabled via the **XCVR** plug to the transceiver microphone jack. Push-to-talk (PTT) control is cabled here, too.

The tones used for amateur RTTY are similar to those used for computer communication by telephone. In each case a signal is represented by two tones, mark and space. Generally, a mark is a "0" and the space is a "1." Instead of transmitting ones and zeros by phone, which cannot be done really, tones which represent these numbers are sent. For example, to send 1010 we would send a mark, a space, a mark, and a space. Marks and spaces are defined as specific audio frequencies. For example, for amateur RTTY the mark is a 2125 Hz tone and the space is a 2295 Hz tone. For phone-line work a different frequency set is used. Since the two tones for amateur RTTY are spaced 170 Hz apart and a signal sequence is represented by shifting between these tones, the signals are referred to as 170 Hz shift Audio Frequency Shift Keyed RTTY, or 170 shift AFSK.

Now let's consider briefly the connection between the TU, or terminal unit, and your computer. Generally, only two TTL or RS-232 voltage level lines are required —one for data receive and one for data transmission. In addition, a ground reference line is needed. In fig. 2 these connections are made at the **COMP** connector. Often this connector will be the usual RS-232 25-pin type.

With your computer, TU, and transceiver in place how do you go about making a contact or tuning in to listen to RTTY? First, let's set your transceiver in the proper mode and on the right frequency. Let's suppose that you are going to listen and make contacts on 20 meters. Hence, tune to about 14.080 MHz and set your transceiver for l.s.b. Tune around a bit until you hear signals that have two tones alternating; it sounds like do-do-do-do. Second, you will need to properly tune in this signal in order to receive it.

Tuning RTTY can be critical. Remember, the two tones are only 170 Hz apart and the TU filters are generally very sharp. Your transceiver must be stable and able to tune to 10 Hz resolution. Referring to fig. 3, a typical TU front panel is depicted. Note that the unit includes both mark and space LEDs. To tune an RTTY signal, start with the do-do-do-do tones at about 500 Hz and slowly turn your transceiver dial until the tones come up in frequency to 2295 and 2125 Hz, respectively. These tones are high in pitch, so tune slowly and watch the mark and space LEDs; they should blink in sequence with the tones when properly tuned. If you are too low, only the mark LED will light. If you are too high, only the space will light. When your transceiver is turned just right, both LEDs will light. At this point, with your computer operating, you should be receiving RTTY.

What is the procedure for calling CQ or answering a CQ? Contacts essentially should be made in the same manner as with c.w. contacts. If a station calls CQ, he will do so and include his call. Nothing different there. However, he will often send a character string ryryryryry so that the other station can tune to his signal. Remember, it is a bit harder to tune to RTTY than c.w. You'll want to give the other operator a fighting chance. Once his call stops, you would transmit back with his call and yours. Generally, you will want to send this message several times so that any additional tuning can take place. Short identification, as with c.w. contacts, is not appropriate. As an example, I may call CQ as follows:

RYRYRYRYRYRYRY
CQ CQ CQ CQ DE W0XI W0XI W0XI
and repeat this several times

You would then answer with:
RYRYRYRYRYRYRY
W0XI W0XI W0XI DE W0/// W0/// W0///
and repeat once or twice

I would then respond and we would be in contact.

Finally, we hope that you have found this introduction to RTTY interesting. For further information, you might start with the chapters in the *ARRL Handbook* on introduction to RTTY. In addition, several books about RTTY are available from the ARRL and *CQ* magazine. See you on the bands. CQ

CQ REVIEWS:

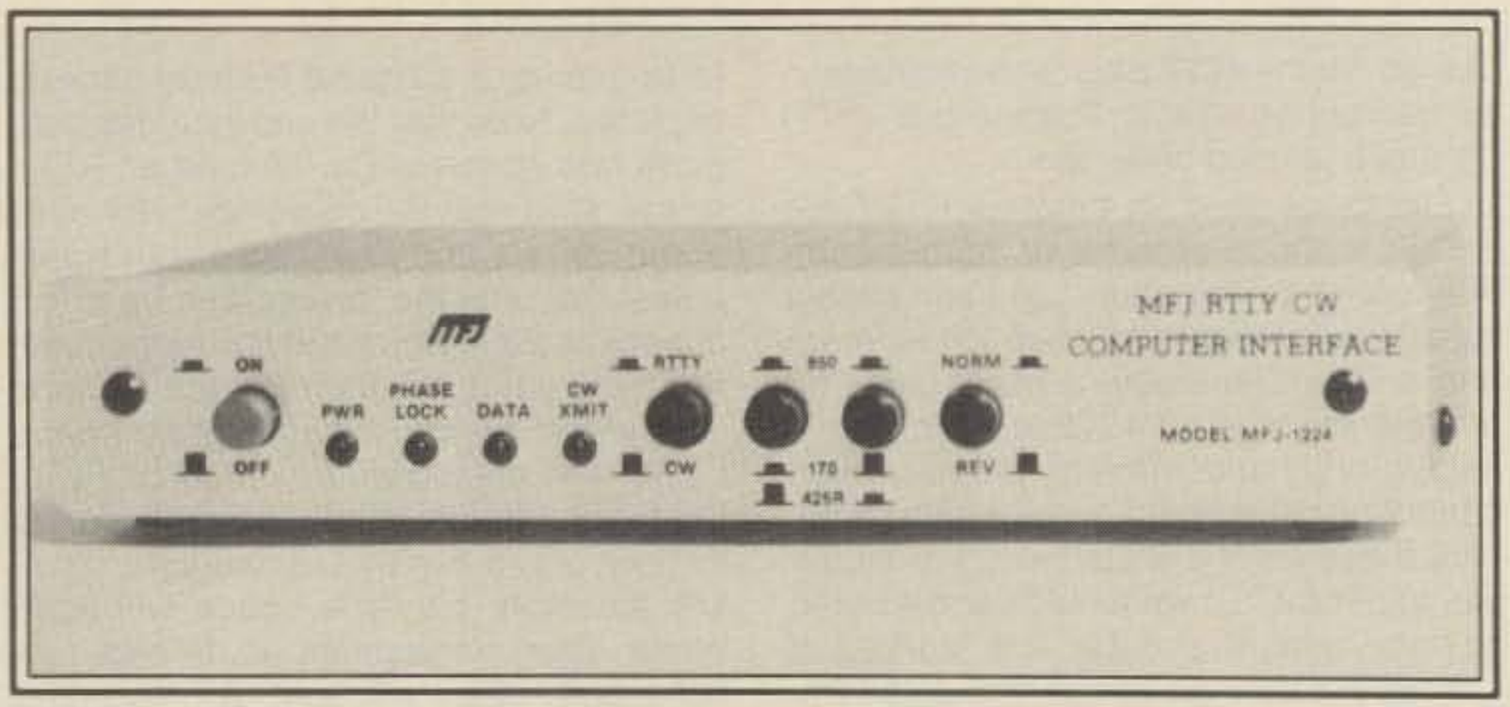
BY DAVE INGRAM*, K4TWJ

The MFJ 1224 RTTY Interface and Mating Software Packages

There are a variety of ways in which one can join the activity of RTTY today: older model mechanical teleprinters interconnected with loop supplies and terminal units, dedicated all-electronic terminals, or home computers used with RTTY interfaces and mating software. Each approach has its particular advantages and disadvantages, and each can provide enjoyable returns for its initial investment. Older teleprinters usually can be acquired very reasonably, but the units are bulky, and mechanical problems can become hair-pulling experiences. Dedicated and super function electronic terminals are grand, but their cost may prove discouraging. Home computers and RTTY interfaces are an inexpensive alternative, however, especially when that unit is employed for other in-home or small-business functions.

Realizing the above situation along with the mass popularity and department-store availability of Commodore 64 and VIC-20 computers, MFJ Enterprises developed their MFJ 1264 and 1265 RTTY/c.w. packages. Each package consists of an MFJ 1224 RTTY/c.w. computer interface unit, a cassette program for RTTY/ASCII/c.w. operation, a prewired computer-to-interface cable, manuals and software documentation, plus unwired cables for interconnecting with an h.f. transceiver. The MFJ 1264 package is used with a VIC-20 computer, and the MFJ 1265 package is used with a Commodore 64 computer.

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



The MFJ 1224 RTTY/c.w. computer interface. The unit combines with MFJ software to provide an inexpensive and effective package.

Each of the previously described MFJ packages provides the basic items for a complete RTTY/ASCII/c.w. setup. One only needs to add an h.f. transceiver, Commodore computer, and video monitor to join today's printed-word activities. The MFJ setup is also ideal for short-wave listeners and news-conscious amateurs following printed broadcasts on international frequencies. Transceivers with multiple memories and general-coverage receivers are great ideas for those pursuits.

The 1224 Interface Unit

This is the popular "small box" unit which introduced many amateurs to computerized RTTY/c.w. during recent times. It's a good per-

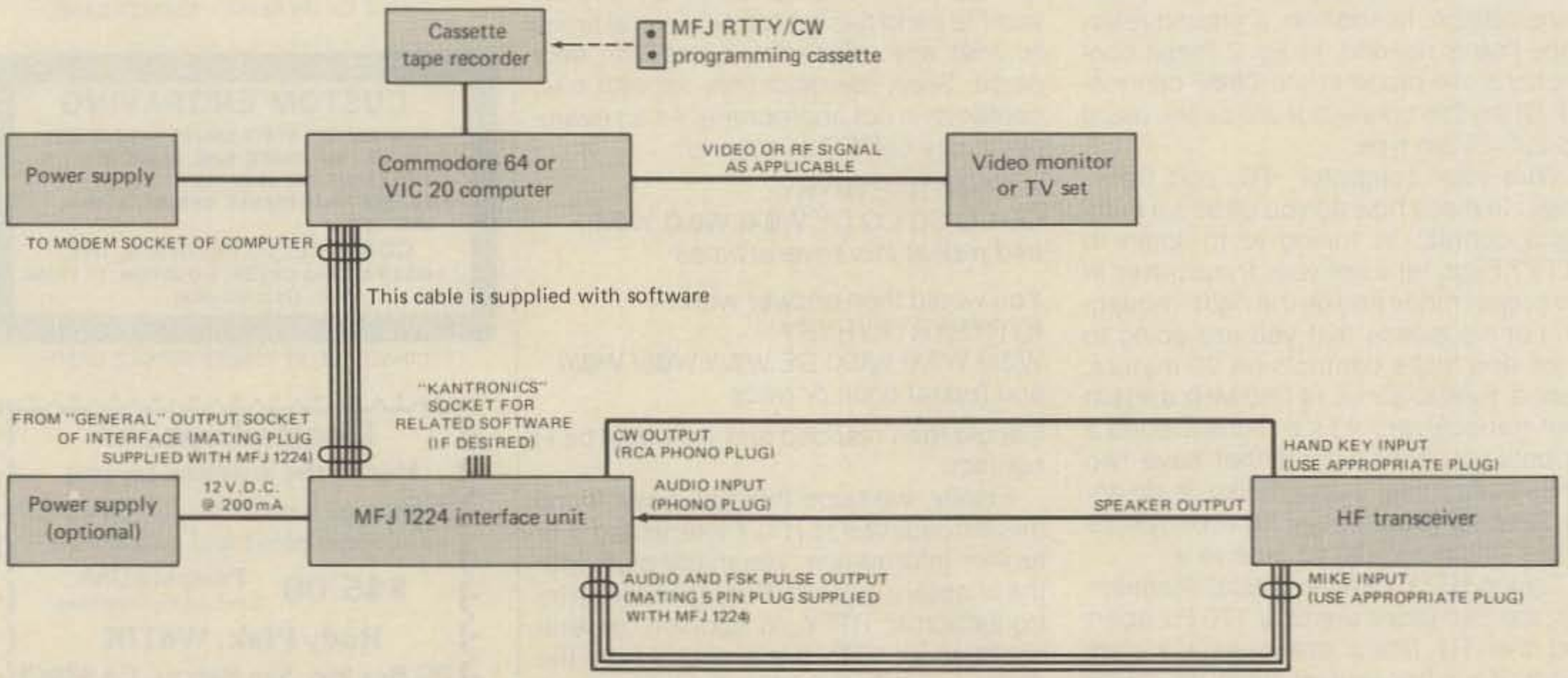


Fig. 1– Interconnection guide for computerized RTTY/c.w. system using the MFJ package.

former at a fair price, and a combination that continues to enjoy significant appreciation by all. The interface measures 1¼ "H × 8 "W × 6 "D. It is flat black in color with a brushed aluminum front panel. Pushbuttons select **On/Off**, **RTTY/CW** operation, **170/425/850 Hz** receive shifts, and **Normal/Reverse** tone polarities. Four LEDs indicate operational status during use. The **CW XMIT** LED flickers with outgoing Morse. During RTTY receive, the **PHASE LOCK** LED illuminates continuously with signal detection, and the **DATA** LED flickers with MARK/SHIFT pulses.

Some of the 1224's significant features are both MARK and SPACE filters, a sharp eight-pole filter for 170 Hz shift and c.w., automatic noise-limiting input, and flexibility to mate with a variety of rigs and software/computers. Rear-panel connections include speaker input and output (for "normal through" use), a 5-pin mike connector (AFSK output, PTT, shield, ground, and FSK pulsing), a Kantronics software-compatible computer connector, hand key input, positive or negative polarity, c.w. rig keying, and a loop output (for keying magnet loop supplies in older teleprinters—a convenient "extra"). An eight-pin "general applications" connector (and mating plug) is also included for customer interfacing with various computers and software as personally desired. The latter feature is supported by an internal eight-lever DIP switch and manual notes on settings for software from Kantronics (all Hamsofts and Hamtexts), RAK, AEA, Galfo, K6AEP, and MFJ (supplied positions mate with MFJ). Let's now clarify the previous statements. The 1224 can be used "as is" with MFJ software. Other software requires a two-minute switch resetting plus connections to either the general or Kantronics port.

The MFJ 1224 decodes RTTY/ASCII tones of 170, 425, or 850 Hz shifts. The unit's AFSK output shift is 170 Hz, 2125 Hz MARK/2295 Hz SPACE, unless front-panel switches are set for 850 Hz operation (both transmit and receive). Speed selections are under software control. C.w. reception requires tuning incoming signals for a 2295 Hz note rather than the semi-customary 500 to 1000 Hz tone (the unit's SPACE filter is used here). "Unshifted" transceiver operation with this setup is accomplished by tuning the rig's RIT and i.f. shift controls for a higher frequency received tone and disabling any narrow c.w. filters in the rig. That procedure is fully explained in the MFJ manual. Finally, the 1224 interface requires 12 volts d.c. operating power. That voltage can be obtained from an in-shack supply or an optional MFJ 1312 "wall adapter."

The MFJ 1264/1265 Software

These full-function cassette programs and mating interface cables are designed for the Commodore 64 or VIC-20 computers and MFJ interface models 1224, 1228, or 1225. The 1228 is a direct plug-in RTTY/ASCII/AMTOR/c.w. unit for *either* computer, and the 1225 is a receive-only unit for s.w.l. enthusiasts.

The MFJ programs operate 60, 67, 75, and 100 w.p.m. Baudot, 110 or 300 baud ASCII, and 5 to 80 w.p.m. Morse. There's also a 24-hour clock, split-screen display, VIC printer compatibility for hard copy, a type-ahead transmit buffer, and four 2K transmit buffers for retaining often-used information. The buffers are readily accessible and provide smooth operation: merely tap the F1, F3, F5, or F7 key and the stored message is transmitted. Other easy-to-use functions include tapping *Control R* for receive, *Control t* for transmit, *Control s* for clock set, *Control w* for writing into the 2K buffers, etc. Two K of information equates to approximately 2½ full screens of text on RTTY, and 80 characters or two lines of text on c.w. The tape programs are also available separately and with or without interfacing cables from MFJ.

Using the Package

Whether seriously pursuing RTTY/c.w. QSOs or casually monitoring various printed-word communications, the MFJ package is a good deal for its reasonable cost. Direct on-the-air comparisons between it and similar computer/RTTY systems indicated "commendable" to "very high average" results—better than some, but not a "super deluxe" performer either. The unit copies stronger signals without strain, and follows weaker signals almost to the noise level. If one of the RTTY tones fades, the 1224 continues copying on the other tone. If the remaining tone gets QRMed, the system prints gibberish (it isn't a miracle worker). The flickering RTTY LEDs aren't a "deluxe" tuning indicator, but they serve their purpose quite sufficiently. I especially like the unit's loop output for occasional connection to older model teleprinters. That's convenient when checking/demonstrating classic collectibles or enjoying Golden Age operating stints.

C.w. reception with the 1224 might be tricky at first, as incoming signals must be tuned for a 2295 Hz tone rather than the familiar 800 Hz note one usually hears. Depending on your particular transceiver's c.w. flexibilities and bandwidth, you may need to bypass or remove any narrow c.w. filters when using the MFJ system. I use a Kenwood 930, however, and its front-panel c.w. *pitch* control can center any audio tone in the c.w. bandpass. Otherwise, I would use a rig's s.s.b. filter and set the i.f. shift for high-frequency response.

Conclusion

All aspects considered, the MFJ 1224 interface and software packages are a good deal for the money. They are also a logical approach to joining printed-word activities from a second QTH or summer home. Technically speaking, I doubt if one could homebrew a similar unit . . . with demodulator, AFSK generator, loop key, cabinet, etc., for less money.

In addition to the previously mentioned 1228 plug-into-computer interface and the 1225 receive-only interface which operates with the MFJ software, a c.w.-only interface and software package is also available at low cost from MFJ. All MFJ products carry a one-year warranty plus a 30-day try it without obligation offer. For more information, contact MFJ Enterprises, Inc., Box 494, Mississippi State, MS 39762. CQ

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11056	28	5.15	4.50	4.05
11057	40	6.81	5.95	5.35
11058	64	12.02	10.50	9.45

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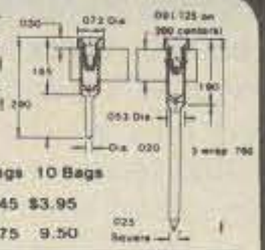
22226	16	.29
22228	18-20	.29

SCREW MACHINED SOCKET PINS,

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



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

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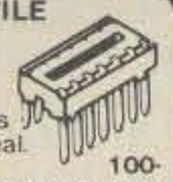
11292	80±40g	1.5±.5mm	3.95	3.60

TI WIRE WRAP SOCKETS

Tin plated phosphor bronze contact – 3 wrap

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

TI LOW PROFILE SOCKETS



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

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

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

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

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

SINGLE ROW SOCKETS

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

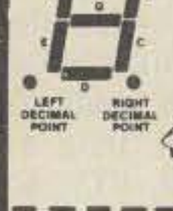
Both styles breakable to any number of contact positions wanted.

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

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

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

OPCOA



Single Digit Displays - Common Cathode

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

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Stock No.	1	100
11010	$1.24	$ .99

OPTEL LCD's with pins

Stock No.	Description	1	10
47005	3½ dig, .5"	$ 5.95	$ 5.50
47006	4 dig, .5"	5.95	5.50
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23010	Z80 CPU	$5.95
23011	8080A/8085A	5.95
23012	6502 (65XX)	5.95
23013	8048 and relatives	5.95
23014	54/7400 TTL Pinouts	5.95
23015	Basic Algorithms	5.95
23016	8086/8080A	5.95
23017	How to generalize from a sample	5.95
23018	Wordstar	5.95

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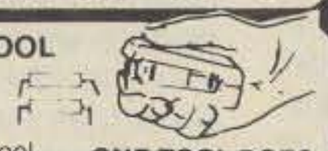

puts IC's on their true row to row spacing. One side is for .300 centers. Flip tool over for devices .600 centers. Put device in tool and squeeze.

ONE TOOL DOES 8 thru 40 PINS!

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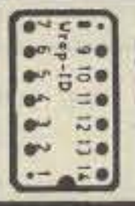
Includes DIP IC extractors and inserters to accommodate all ICs from 14 to 40 pins. Tools that engage conductive surfaces are CMOS safe and include grounding lugs. Stock No. 13309 **$41.34**



SOCKET WRAP ID

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

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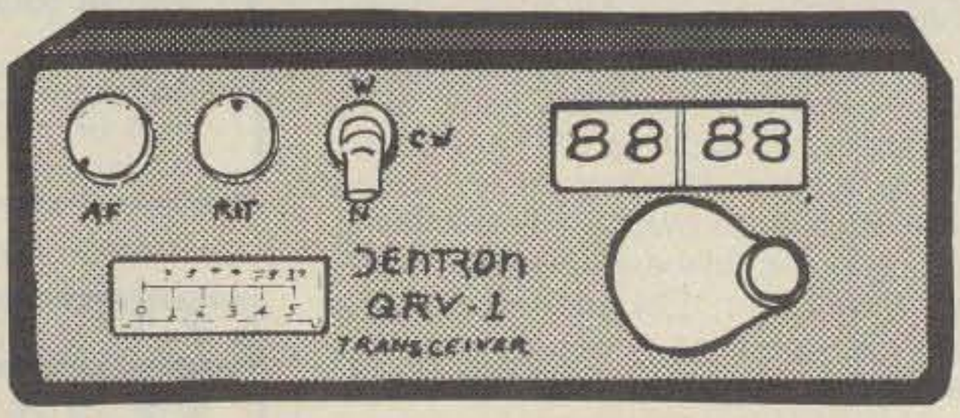

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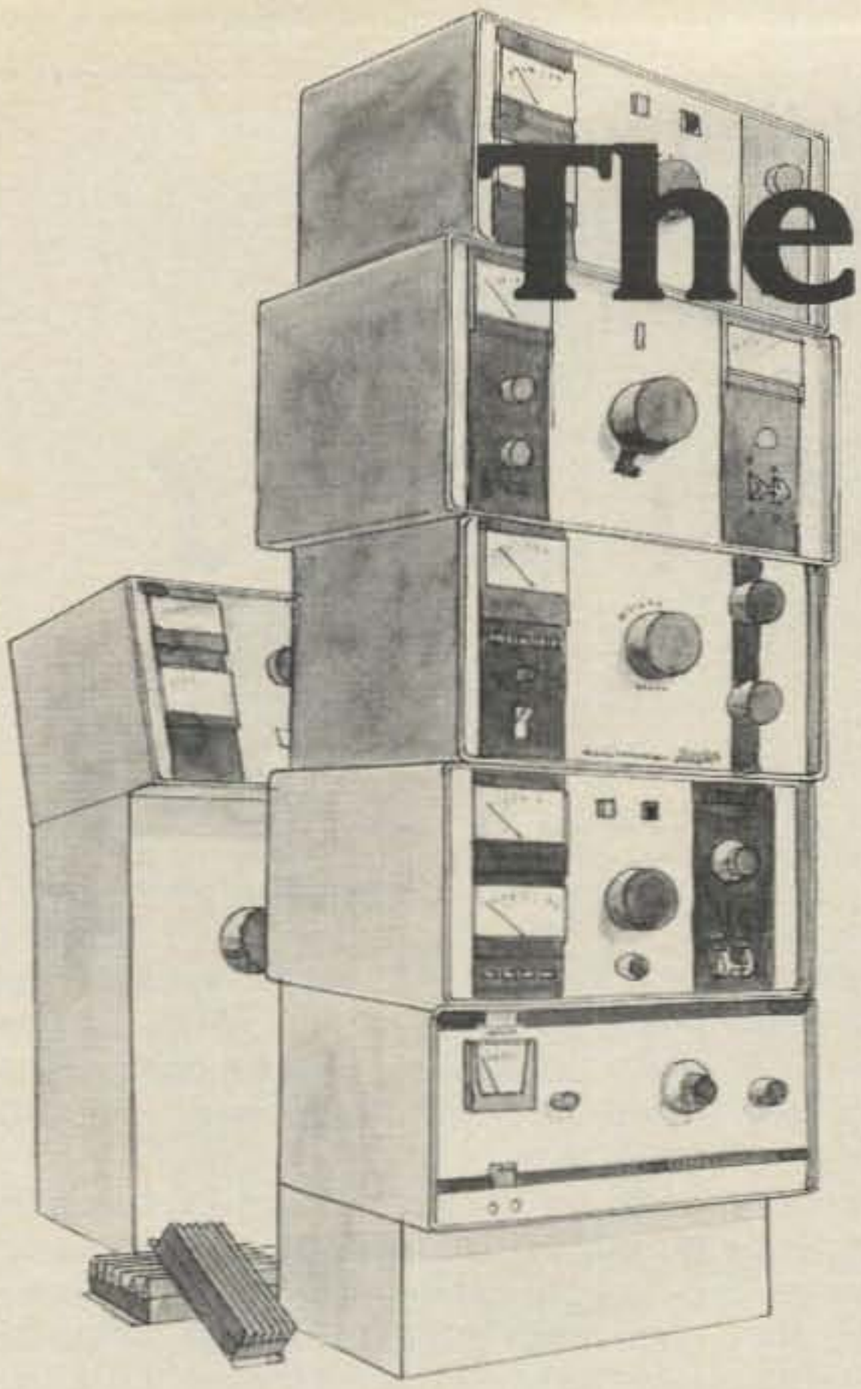

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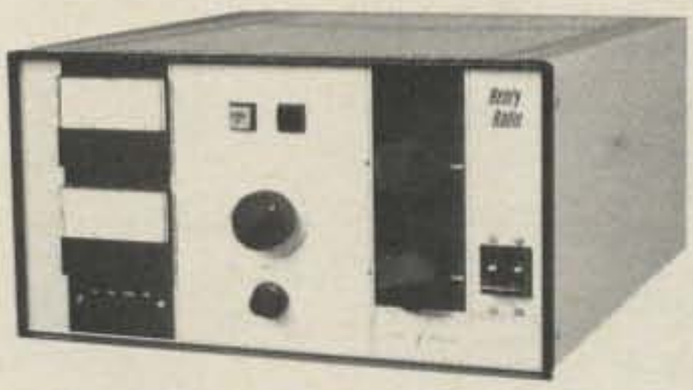

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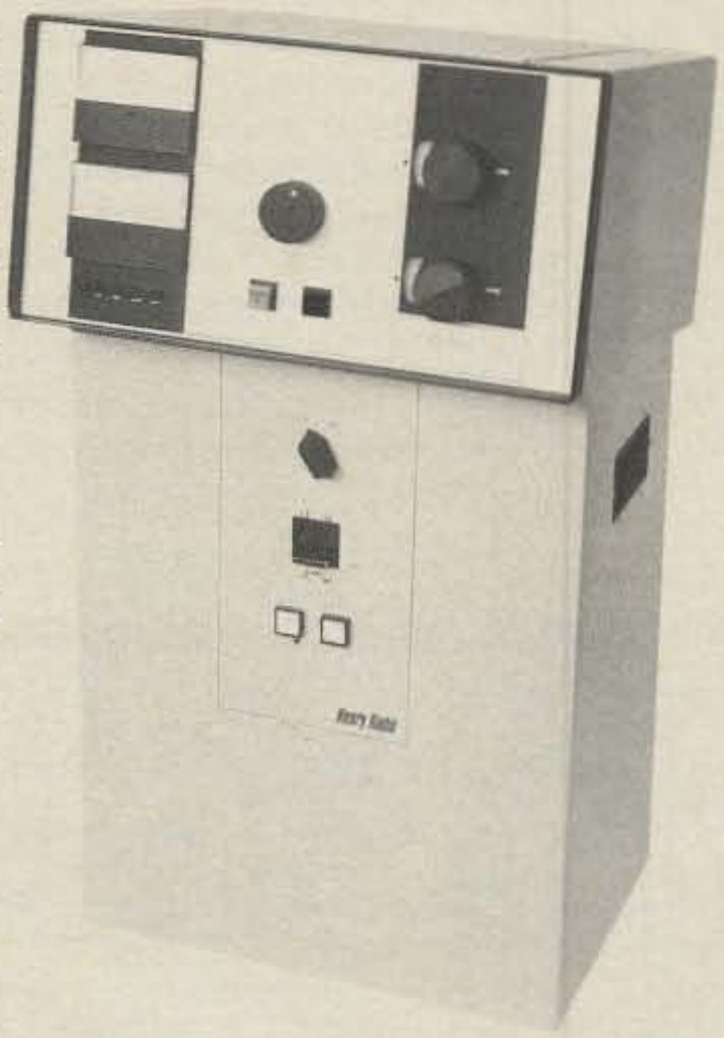

2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a 1/4 wave length strip line design for extreme reliability. It provides 2000 watts input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.

2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier uses a 1/2 wave strip line and offers all of the same specifications as the 2002A.

1002-A A rack mount 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for 1/2 power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

1004-A...a rack mount half-power version of the 2004A. Covers the 430 to 450 MHz band using a 1/2 wave strip line design.

Henry amateur amplifiers are available from select dealers throughout the U.S. and are being exported to amateurs all over the world. In addition to our broad line of commercial FCC type accepted amplifiers we offer special RF power generators for industrial and scientific users. Call or write Ted Shannon or Mary Silva for full information.

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Generally you can save money by building your own equipment, but the big giant plus is the feeling of accomplishment when you can say that you built it.

ROLL YOUR OWN RTTY

BY JOE A. ELLIOT*, K0WVN

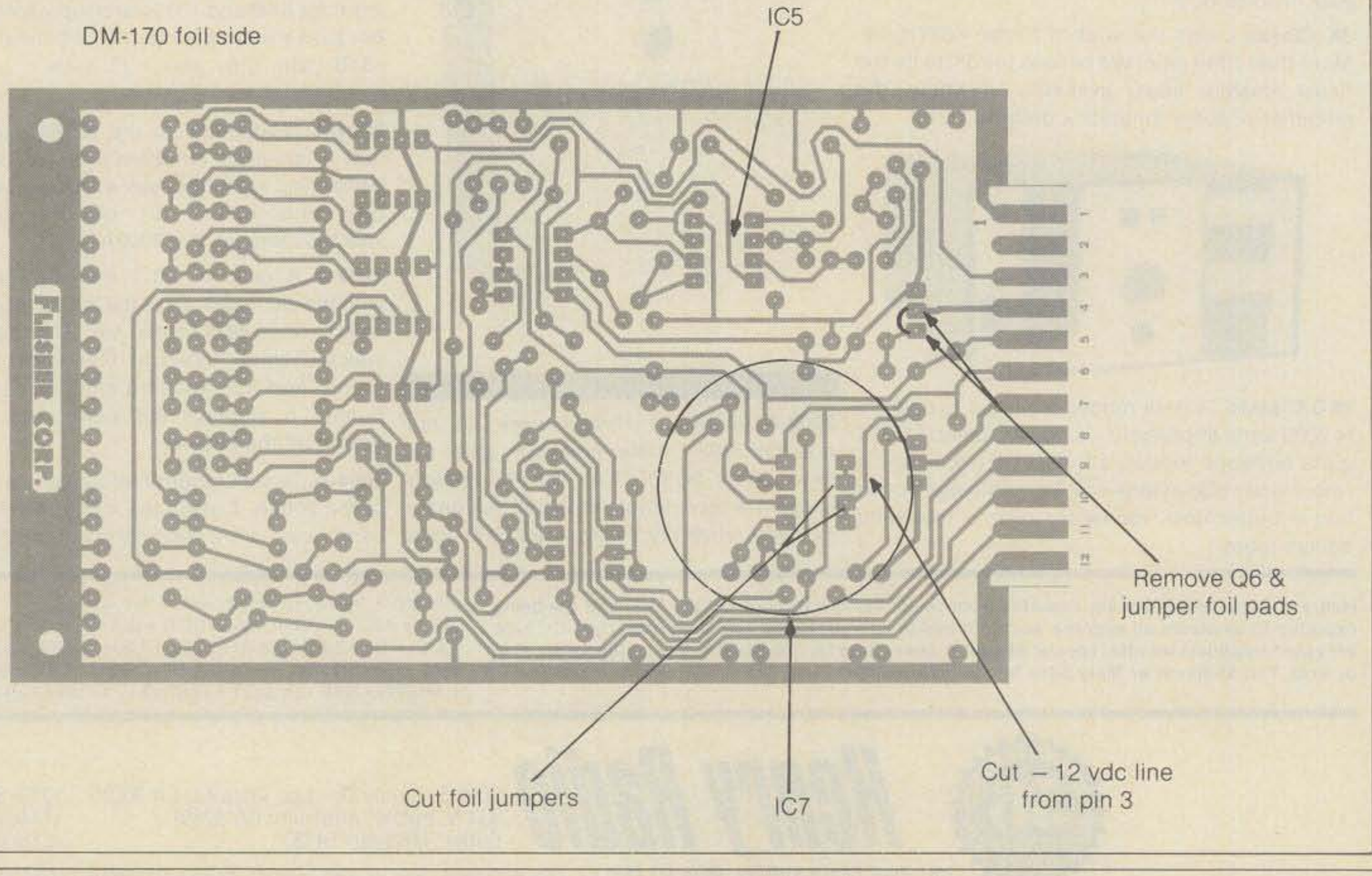
What happened to the builders? Is there anyone out there still building, or do you find it embarrassing to admit you're not using a $300 or $400 factory-made RTTY terminal unit? Nothing takes the wind out of your sails like walking into a 16-year-old's shack and seeing that all of the equipment was built from scratch! This happened to me. I suddenly felt very stupid for not building more and not feeling the same satisfaction of a job well done. Those of you who don't own soldering irons or who take little interest in building may not find the following money-saving information all that interesting. Anyway, there is still a cheap way of getting on RTTY without sacrificing quality and filtering.

The Flesher Corporation still sells a little demodulator board kit called the DM-170. It is the best buy on the market with more features and filtering for the money than anything else available. It has scope outputs, autostart relay driver output, autostart threshold control, tuning meter output, two tone detection using six pole active filters, and if that is not enough, it is pocket size (3″ × 5¼″). The board is silk-screened, solder-masked for easy soldering, and has a 12-pin edge for a connector or hard wiring. As you can see, it does require you to mount it in a box, and buy a meter, a switch, a pot, and a ± 12 v.d.c. power supply. Even so, your investment is still way below any other unit and with many more features, not counting the satisfaction of assembling it all yourself. The filters are 170 Hz shift high tones, and normally this will allow you to go up to 110 baud ASCII. I say normally, because there is a modification to make the DM-170 operate up to 300 baud, too.

At the time this board kit was introduced, TTL and RS-232 compatible outputs were not necessary. All we have to do to make this demodulator compatible for RS-232 is to locate the unused portion of IC7 and notice that pins 1 and 2 are foil jumpered. The same is true for pins 3 and 4. With a razor blade, carefully cut the foil jumpering these pins together. There is a − 12 v.d.c. line running to pin 3; cut this line away from pin 3 and jumper it to pin 4. At this point pins 1, 2, and 3 should be free of any connection, and the − 12 v.d.c.

*607 Wabash St., Topeka, KS 66616

Fig. 1– The DM-170 board as seen from the foil side. The simple modifications as described in the text are shown.



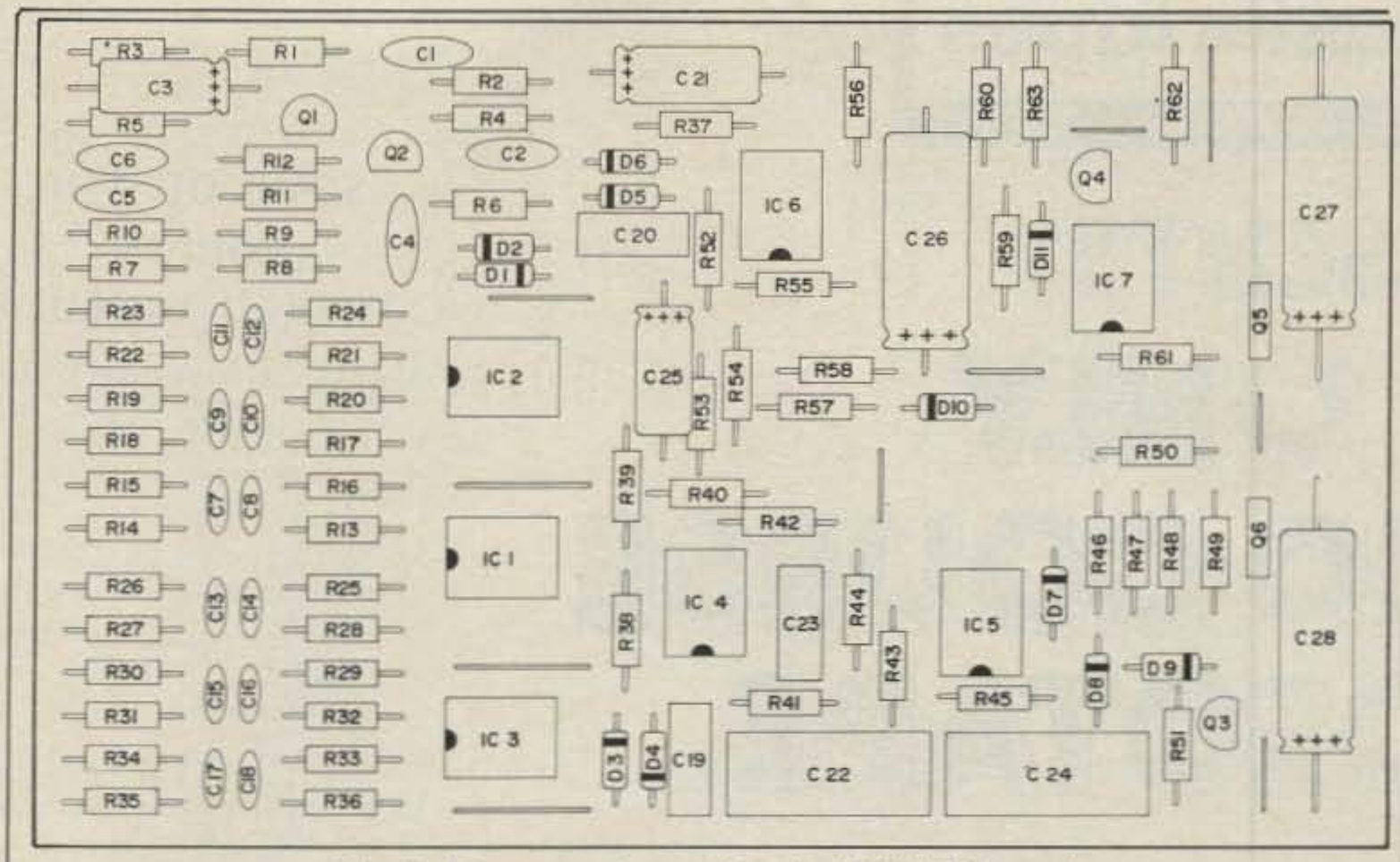


Fig. 2– The parts layout for the DM-170 board.

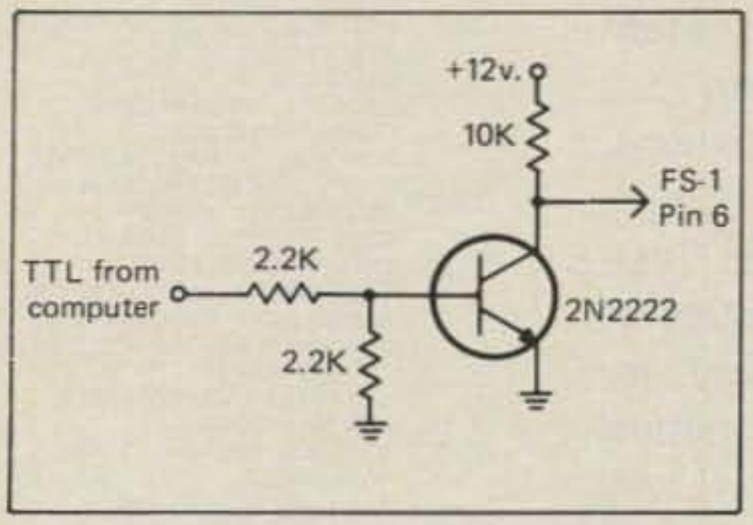


Fig. 3– The simple keying inverter circuit as described in the text.

has been connected to pin 4. Jumper pin 1 of IC5a to pin 2 of IC7. Place another jumper from pin 3 of IC7 to any close ground location. Connect a 1000 ohm, ¼ watt resistor from pin 1 of IC7 to the edge connector pin 2. The RS-232c output will be located on pin 2 of the edge connector to be connected to your computer RS-232c input.

If your require a TTL level for your computer, a resistor change and the removal of Q6 are the only modifications. You first remove Q6 and jump the center solder pad to the outside solder pad that connects with edge connector pin 4. Replace R49 with a 1500 ohm, ¼ watt resistor. Replace R50 with a 1000 ohm, ¼ watt resistor. Pin 4 of the dge connector is now the TTL compatible output you require for your computer.

Okay, for those thousands of people who have already bought this unit, the 300 baud modification has proven to work very well. Change R40 to a 150K ¼ watt 5%, R42 to a 47K ¼ watt 5%, C22 to .022 uF mylar, and C23 to .0022 uF mylar, and add a .022 uF in parallel with R40. That is all there is to the modification—short and sweet.

Okay, there is a bunch of you TU-170 owners jumping up and down, wanting to do the same thing to the TU-170. Well, calm down. I have that one covered, too. Change R33 to 150K ¼ watt 5%, R35 to 47K ¼ 5%, C22 to .022 uF mylar, and C23 to .0022 uF mylar, and add a .022 uF in parallel with R33.

That takes care of the receive side of RTTY, but what about the transmit side, the AFSK (audio frequency shift keying) generator? Because of popular demand, Flesher Corporation has agreed to once again make the FS-1 AFSK available in kit form only. This board kit requires +12 v.d.c. only and will interface directly to RS-232c outputs of computers. Therefore, no further modification is needed to interface to the RS-232c type of I/O. As with the DM-170, the FS-1 is a small board which measures approximately 2⅝" × 2⅞" and draws no more than 30 ma of current. It has a standard 12-pin edge for an edge connector, or it can be hard wired.

For those who require TTL keying of the AFSK, this should not be a major problem (see fig. 3). All we have to do is invert the input keying, and it then is ready to go right side up. Don't worry about connecting a switch for going 850 Hz shift; just jumper the edge for 170 Hz shift. Most amateur RTTY uses 170 Hz shift, and the DM-170 is only for 170 Hz shift anyway. The FS-1 was made to replace an AFSK in another unit that was large and bulky.

For those of you who wish to build AFSK circuits from scratch, there have been several circuits that work equally as well and that have been described in various amateur radio publications.

Of course, all the boards will need a power supply. Most of the parts, if not all, for a well-filtered, regulated, ±12 v.d.c. supply can be bought from Radio Shack. If you want a power supply kit, I imagine that these are available also.

The DM-170 kit is priced at $47.95, and the FS-1 sells for $31.95. These are available from Flesher Corporation, P.O. Box 976, Topeka, KS 66601. CQ

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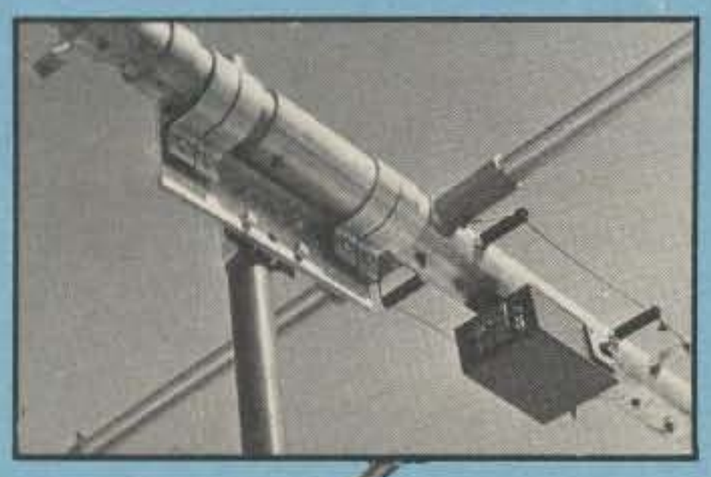

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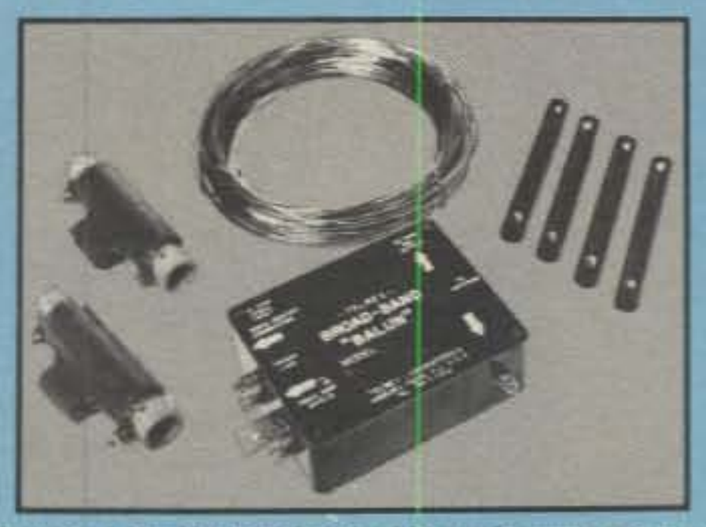

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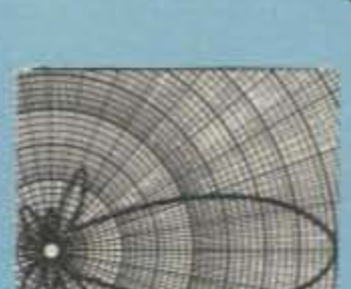

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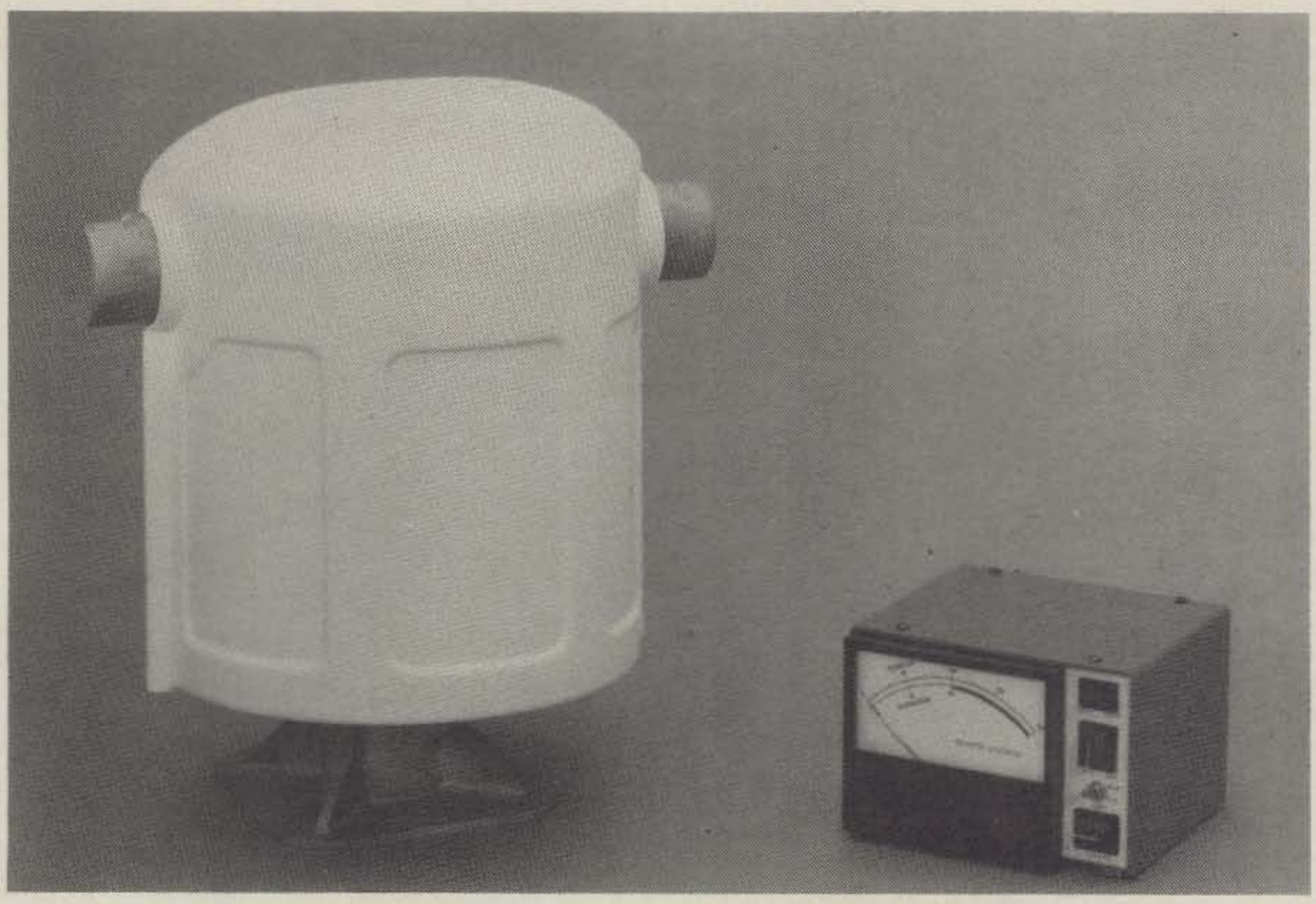

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CQ REVIEWS:

BY LEW MCCOY*, W1ICP

The Microlog AIR-1 RTTY/Morse System

I have been using a TRS-80 Model I, Level II for several years and still do for all my word processing, tax records, etc. However, I never have been happy with the severe r.f.i. the computer generates. I have taken several measures to reduce the interference, but none of them really works 100 percent, particularly when trying to use the computer in conjunction with my amateur radio station. A few years back some of my amateur friends went the Commodore/VIC-20 computer route simply because these units are pretty clean when it comes to radio interference. I finally succumbed and bought a VIC-20 (at a fleamarket) for $50. (They only cost about $70 new at the discount houses.) What does this have to do with a product review? Simple. The amateur radio manufacturers of software/hardware devices have more or less settled on these computers as a means of marketing their products. Several companies make software/hardware combinations as you can quickly see from reading the ads and product reviews.

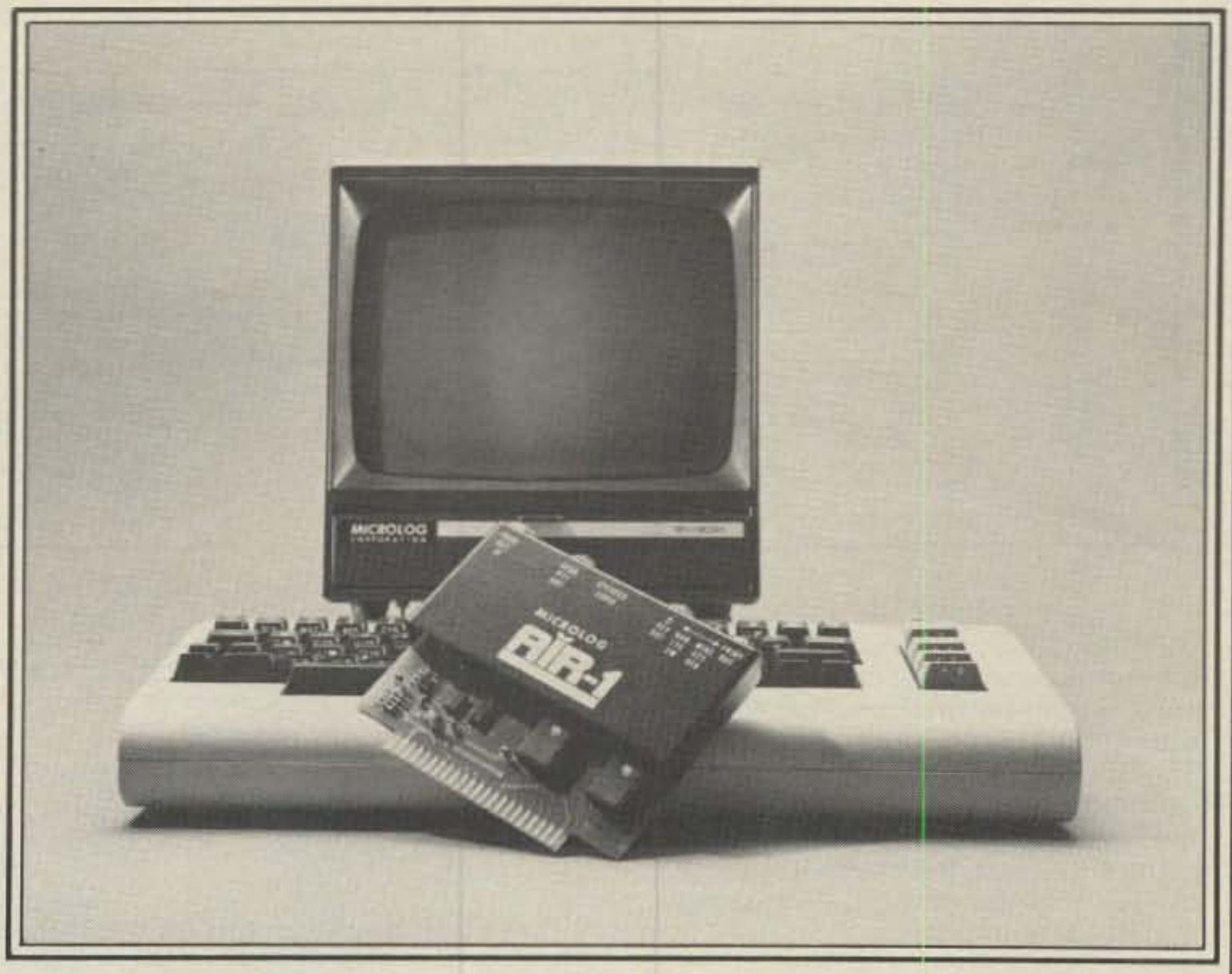
The Microlog AIR-1

The Microlog Corporation has been in the business of making keyboard keyers and RTTY-related items for some years. The AIR-1 is not exactly a new product, having been available for well over a year. However, it certainly warrants describing, because if any single device "turned me on" to RTTY and Morse-generated c.w., the AIR-1 certainly did.

The VIC-20 computer has an expansion port on the back of the unit. The AIR-1 is a stand-alone unit that plugs into the expansion port and from there directly to your transceiver. There is no terminal unit as is normally required. As you read and study this review, please keep in mind that you do not need a terminal unit with the AIR-1; you simply plug the AIR-1 into your computer and connect two leads to your microphone jack on your transceiver and another lead for the audio, and you are in business—and a very good business indeed!

Before going into details, let me first say that the quality of the AIR-1 is outstanding; the circuit-board material and solder work are excellent. The instruction book is complete and detailed, and Microlog is to be complimented. Also, while I have only mentioned the VIC-20, Microlog makes an AIR-1 for the Commodore 64.

One other point I would like to mention is that Dave Ingram, K4TWJ, who is also a member of the *CQ* staff, has written a fine book called *RTTY Today*, which covers the subject of amateur teletype in great detail. If you become interested in the subject I would recommend getting the book (it is available from *CQ*'s Book Shop).



At the left is the AIR-1 for the Commodore C-64, and at the right is the model for the VIC-20.

The AIR-1

As you can see from the photographs, the AIR-1 is a plug-in unit that fits into the back extension port of either a VIC-20 or Commodore C-64. On the back of the AIR-1 are several connection ports in the form of jacks, but more about those in a moment. The unit, in conjunction with the VIC-20, will send and receive Morse code from 5 to 149 w.p.m. For Baudot (RTTY code) you have a choice of 60, 66, 75, 100, and 132 w.p.m. with 110 or 300 baud rate for ASCII. Also, the AMTOR feature is available if desired.

I used a black-and-white display, but the unit is programmed for optimum use of color display, using the computer's full color capabilities. The top line of the display shows all the vital statistics for the particular mode being used. For example, on RTTY the top line shows an **R** (receive mode), then a **B** (Baudot), then the speed (066 **WPM**, for example), then **NOR** (indicating that the built-in dual tone demodulator is selected in the normal mode, with the "Unshift on Space" shown as a **U**. Just below the end of the line is the time shown from a real-time clock in hours and minutes and the abbreviation UTC for universal mean time.

Hitting the control **s** on the computer provides the user with a split-screen option with the received text on the bottom half and the transmitted or typed text on the top half. The system has word wrap-around, which means no splitting of words at the end of a line, which works in receive as well as transmit.

Another feature is the unit will send randomly generated five-letter code groups if you want to practice c.w. or use the system for club code practice (the Morse code groups are sent at any desired speed). There is also a hand-key input available if desired. The input jacks are either standard ¼ inch diameter phone jacks or RCA-type phono jacks (and these are included with the AIR-1). I used an ICOM 745 transceiver in my tests, and the AIR-1 has both an audio input jack (for input from your headphone transceiver jack) and another audio output jack to which I connected an external speaker. It worked like a charm.

For transmitting I connected a three-connection phone jack (included) with the TR lead

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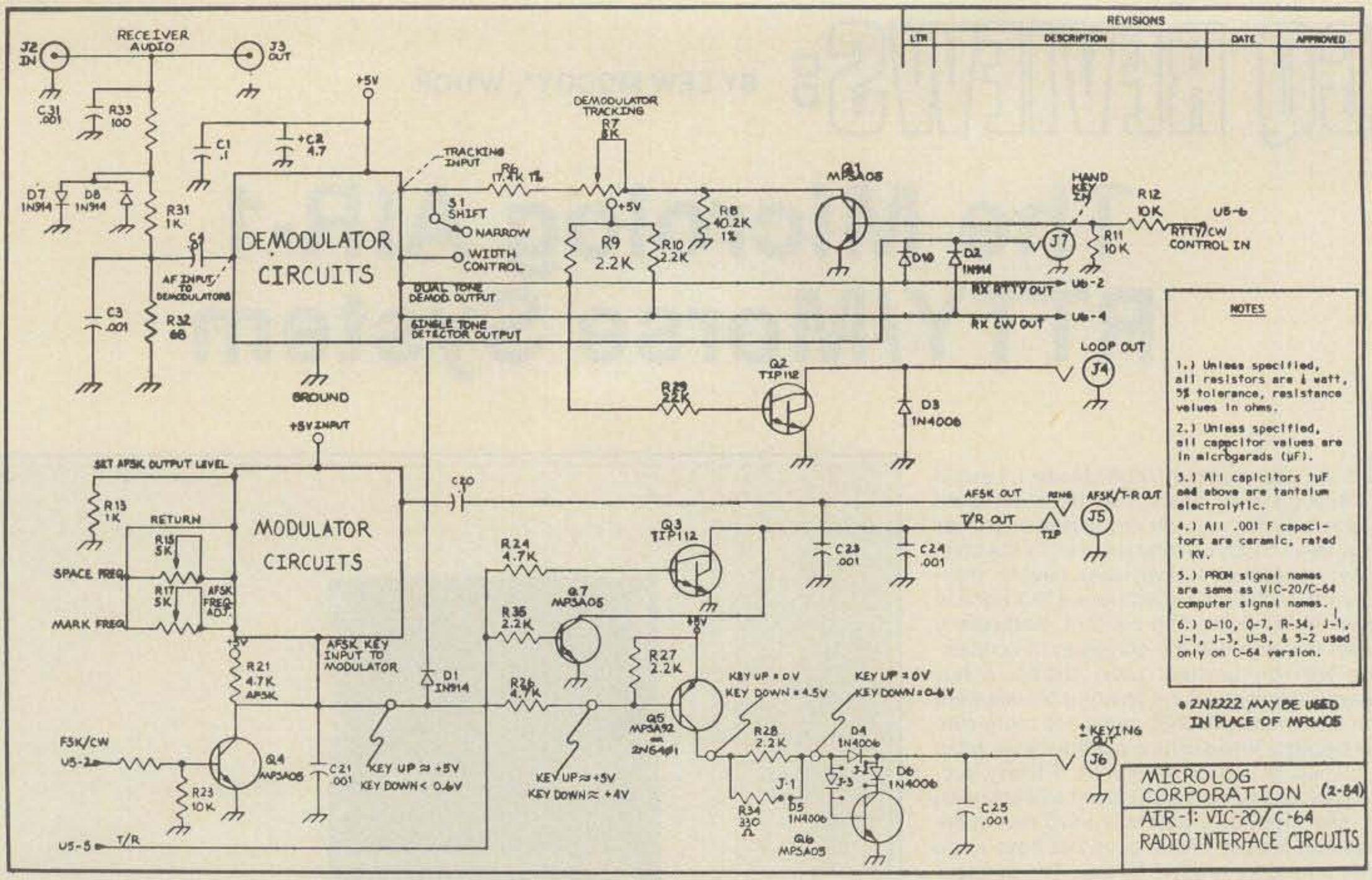


Fig. 1– Here is a circuit diagram of the Microlog AIR-1 RTTY, Morse, and AMTOR unit.

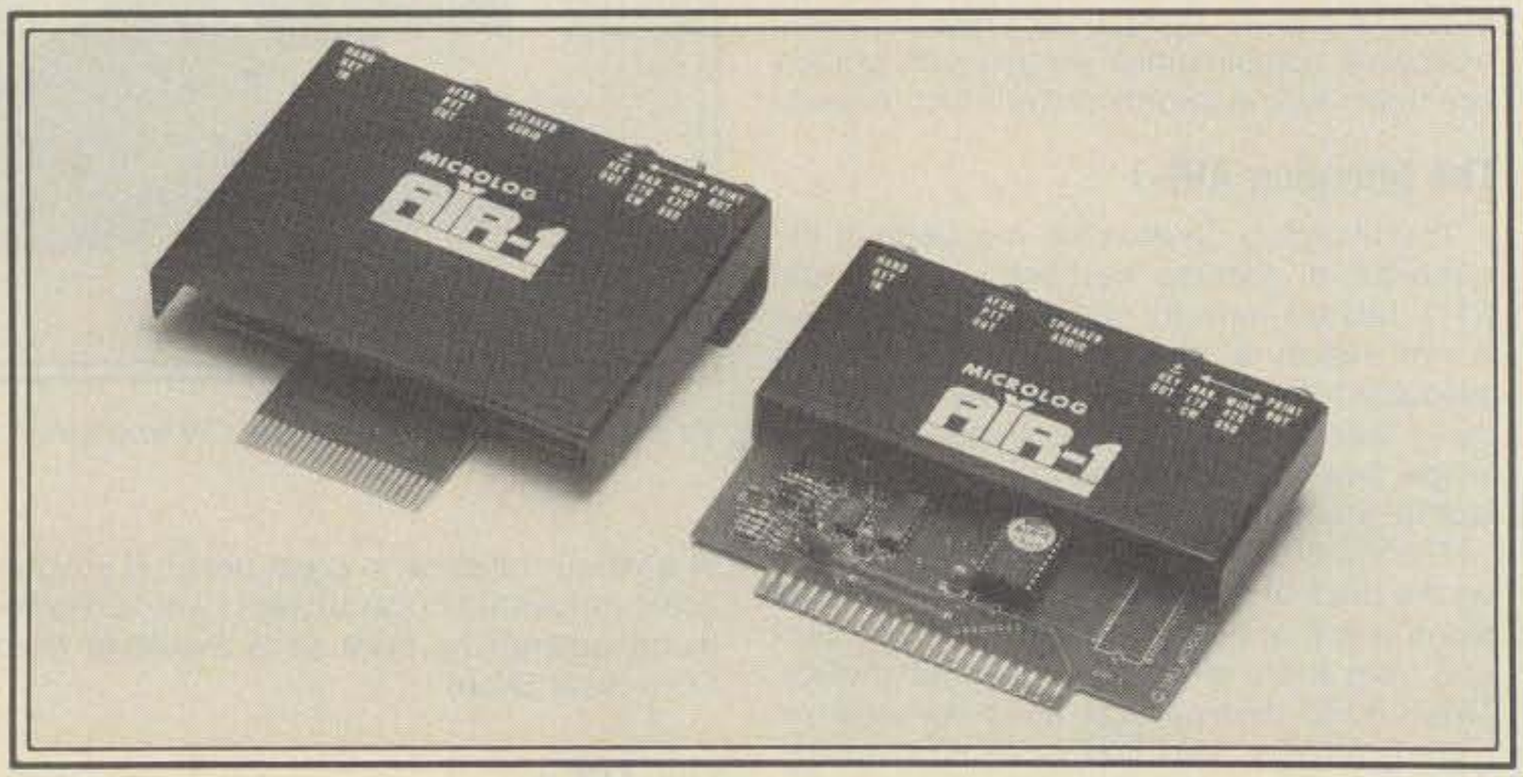
to one jack connection (the other to the jack sleeve ground) and the remaining connection to the AFSK (audio frequency shift keying) jack pin. The other end was plugged into the mic jack of the ICOM 745; it worked the first time I adjusted the VOX on the transceiver.

Also available on the AIR-1 is a keyed output for RTTY or Morse via a key jack to the keying jack of your transceiver.

Receiving Features

Probably the most amazing thing about this unit is the tuning display. There is a round circle or dot shown in the upper left portion of the video screen which is red on a color display, or just the circle that fills in with black on a monochrome display. As you tune in an RTTY signal, the circle become solid, and you get the typical + crossbars when the signal is properly tuned in. You'll know it in a hurry because you'll be reading received copy across the bottom of the screen. With such a tuning indicator it is extremely easy to tune in RTTY signals. My ICOM 745 has an RTTY position, but I used the lower sideband setting because I was using VOX. I found no problems with "inverted" signals using that system.

The AIR-1 has all the usual features (gimmicks, as I call them) for computer-operated RTTY. For example, there is a receive buffer that will handle manual or automatic keyboard-controlled receive data storage for retransmission. Actually, the AIR-1 provides eight message storage memories of 128 characters each, 2 ID memories of 64 characters each, a **WRU** (who are you) memory of 11 characters, and 2 selective print memories of 11 characters each. You can store messages at *any time*—even during a transmission. Gosh, how amateur radio has changed, and I haven't even discussed Morse yet!



The AIR-1 plugs into the back of the computer, and two leads are used to make the connection to your transceiver.

If your are not an RTTY fan and you are reading this review, frankly, take my word for it—you don't know the fun you are missing. So you say, "But that scares me because it sounds like code and I don't know my code that well." Forget about the code. The ASR-1 and the VIC-20 will make a heckuva c.w. operator out of you even if you can't copy your own call! For example, in the good old days you copied a guy on the other end, listening to his c.w. and making notes so you wouldn't look stupid when he stood by. You did all this so you could comment on his rig, his wife, his job, and so on. At least you did that if you were a good amateur. You ended up with piles of notes you really didn't want. Ahhh, but look at RTTY and this system: as the other guy sends to you, you type your comments into the "buffer"—computer memory in this case—and when he gets through, you hit one or two keys on the keyboard and the AIR-1 takes over and sends all your comments. You can go out in the kitchen and make yourself a fresh drink while all this is going on and still be a good amateur—not a lid! And I haven't even started to discuss the Morse code features yet!

All of the above refers pretty much to RTTY, but the same features also apply to Morse code reception. The software in the AIR-1 does an outstanding job of copying Morse. True, one does get imperfect code if sent by an imperfect fist, but on the whole, one can tune across any c.w. band and copy at least 90 percent—at any speed. I have never used a keyboard to send and receive high-speed Morse, but I did do it in testing the AIR-1, and I

might add, I enjoyed it tremendously. All the memory buffers that exist for RTTY are also there for Morse, so when I say the AIR-1 is versatile, I am sure you know what I mean.

Transmitting

The AIR-1 has a number of transmission modes. In the **CHAR** mode, each character is transmitted as it is typed. In the **WORD** mode an entire string of characters is transmitted as soon as the space bar is pressed. In the **LINE** mode the typed characters are transmitted when the **RETURN** key is pressed.

The split-screen option lets you see what you have typed and allows you to correct any errors before they are transmitted. If you happen to be a hunt-and-peck artist, this feature makes you like a hot-shot secretary, hi! There are all kinds of text-editing features available, and as I said earlier, the instruction manual is excellent and takes you through step by step.

The transmitting buffer I just discussed for RTTY also holds true for Morse. You can store your comments in the buffer and transmit them as desired, or even save the information to tape or disk if it is that earth shaking.

I mentioned keyboard-sent c.w. earlier, but you have the option of transmitting c.w. either with the VIC-20 keyboard or with your own key or bug. The AIR-1 handles either.

AMTOR

An option for the AIR-1 is the transmission and reception of AMTOR. For those readers who don't know what that means, it is an acronym for **AM**ateur **T**eleprinting **O**ver **R**adio. This mode of RTTY transmission is basically one of error-free use of RTTY. With the AIR-1 and the option of AMTOR all of the features of AMTOR are available to the user. I didn't actually transmit AMTOR, but I put the AIR-1 through its paces in the listening mode.

When you initialize in the AMTOR mode, all you do is hold down the control key of the VIC-20 and asterisk key, and the top line of the video display changes to an **R**, indicating receive (**T** if transmitting), then the circle and **+** mark for tuning indicators. The next indicator shows either **U**ncommitted, **M** for **M**aster, or **S** for slave. The next indicator shows control signal, and * equals an error, 1 equals CS1, 2 equals CS2, and 3 equals CS3. The next indicator is your **SELCAL** at the top, and just below, the other station's SELCAL. After that is an indicated control command, a letter **K** showing when you have initiated a control command which disappears upon the termination of the control command. The last indicator is either an **I** for Idle Mode, an **A** for ARQ Mode A, an **F** for FEC Broadcast, an **S** for SELFEC (selective broadcast mode), or an **L** for Listen Mode. The instruction manual is quite detailed in the use of AMTOR.

Conclusions

I have been using the Microlog AIR-1 for several months. I am really convinced that it is an easy but completely thorough method of getting into RTTY or computer-generated Morse. It was simple to set up and get working. After I got rid of the first few bugs, I was banging away at RTTY, making lots of contacts.

The AIR-1 measures 5¾ "W × 4½ "D × ¾ "H. As mentioned earlier, it plugs into the expansion port of the VIC-20 (where it also gets its power). The list price is $199 and the AMTOR is $99. The unit is manufactured by Microlog Corporation, 18713 Mooney Drive, Gaithersburg, MD 20879 (301-258-8400). CQ

Here's a practical way of keeping tabs on a DX net while you're out. It's also a simple way to get involved with v.h.f. RTTY traffic handling.

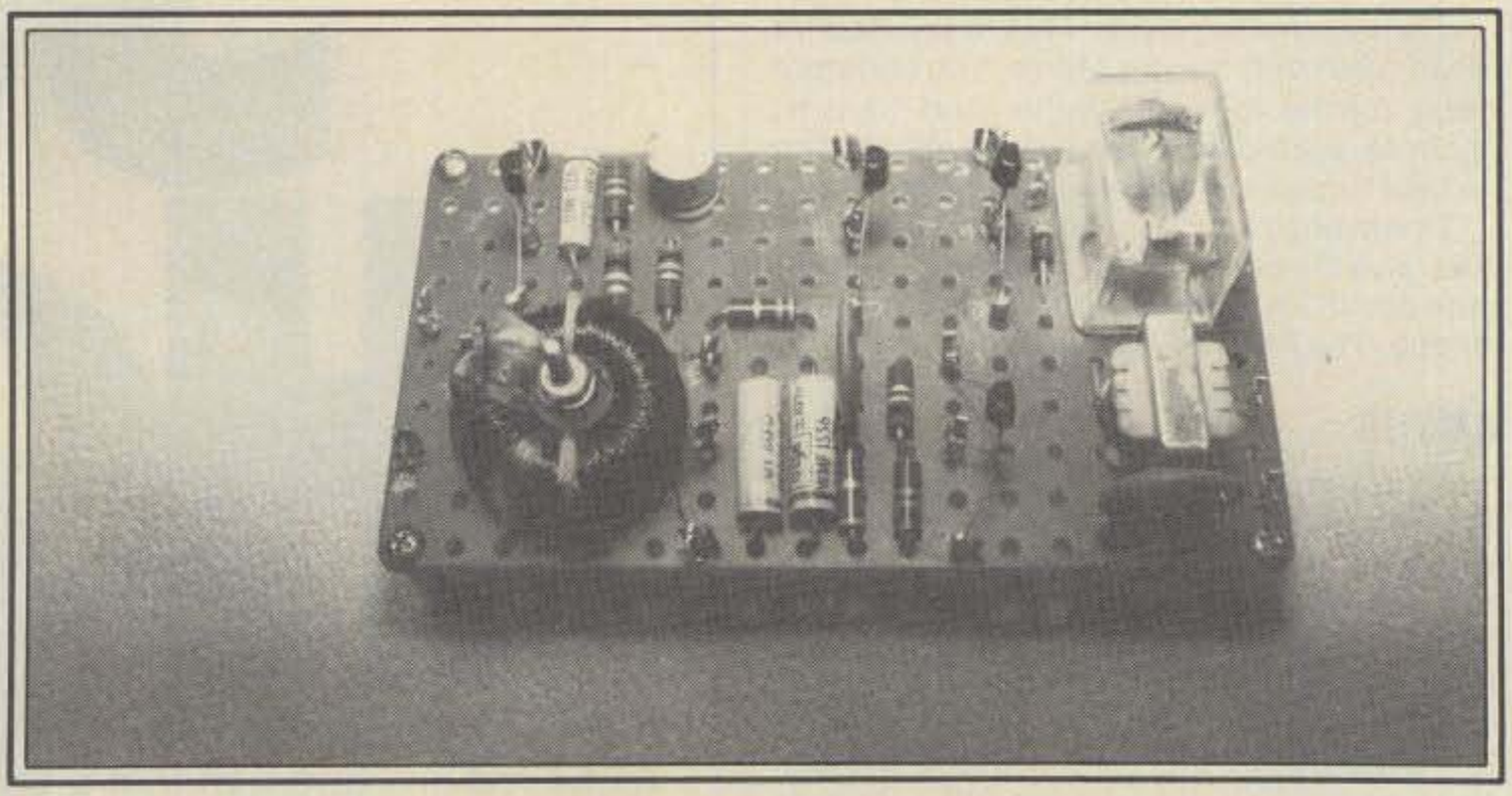
AUTOSTART ON RTTY

BY BYRON H. KRETZMAN*, W2JTP

The casual reader of amateur radio magazines today gets the impression that to operate RTTY (radioteletype) the average amateur needs a microcomputer with a video display to read signals and a complicated, and sometimes expensive, "interface" to connect between a likewise expensive demodulator (terminal unit or TU) and the computer. At first glance RTTY may appear to be a rich amateur's sub-hobby.

Well, it ain't necessarily so! Plenty of old but quite serviceable teleprinter machines can be found at radio club auctions and fleamarkets for $25 to $50.[1] Some can be had merely for the asking, and transportation, from amateurs retiring and/or cleaning out their basements. These are usually Teletype Corporation Model 15 and 28 machines.

While operation on 20 meters might be thought to be attractive, use of the machines on v.h.f. with a simple TU is much easier and actually very practical. (It is also lots of fun!) Many DX-hunter groups use v.h.f. RTTY as a means of advising each other of a "hot one" coming through. Date, time, frequency, band conditions, etc., are all printed out, ready to be read at the convenience of the operator. Traffic handlers, too, find v.h.f. RTTY a very convenient means of passing traffic across town from one net to another. It is "autostart" that is the tool which makes v.h.f. RTTY so very practical.



The tone detector for RTTY autostart. (Photo by Norman Carlstrom)

Fig. 1– Autostart system block diagram.

Autostart Explained

Autostart is the automatic starting and stopping of teleprinter machines at the other end of a radio circuit by the station transmitting. It enables you to leave a message on someone else's machine, even if no one is there. All you need to know is the time that station's RTTY receiving system is turned on. With reasonable care for safety, this can be a completely unattended receiving operation. Crystal-controlled receivers on the RTTY channel are most common, as is operation on 2 meter f.m. Of course, audio frequency shift keying (AFSK) is used. Standards, set through many years of evolution, are 2125 Hz for MARK and 2295 Hz for SPACE for 170 Hz shift. (Older nets may be using 2125 Hz for MARK and 2975 Hz for SPACE for 850 Hz shift.)

Autostart systems are usually controlled by the reception of only the 2125 Hz MARK tone. Random noise, phone signals, and other tones must not be allowed to start the motor of a machine. A steady MARK tone of about 5 seconds minimum should be required to start the motor. General practice suggests 15 seconds to make sure it starts. An absence of MARK or a steady SPACE signal of about 3 seconds or more should shut off the motor.

A highly sophisticated and expensive

*431 Woodbury Road, Huntington, NY 11743

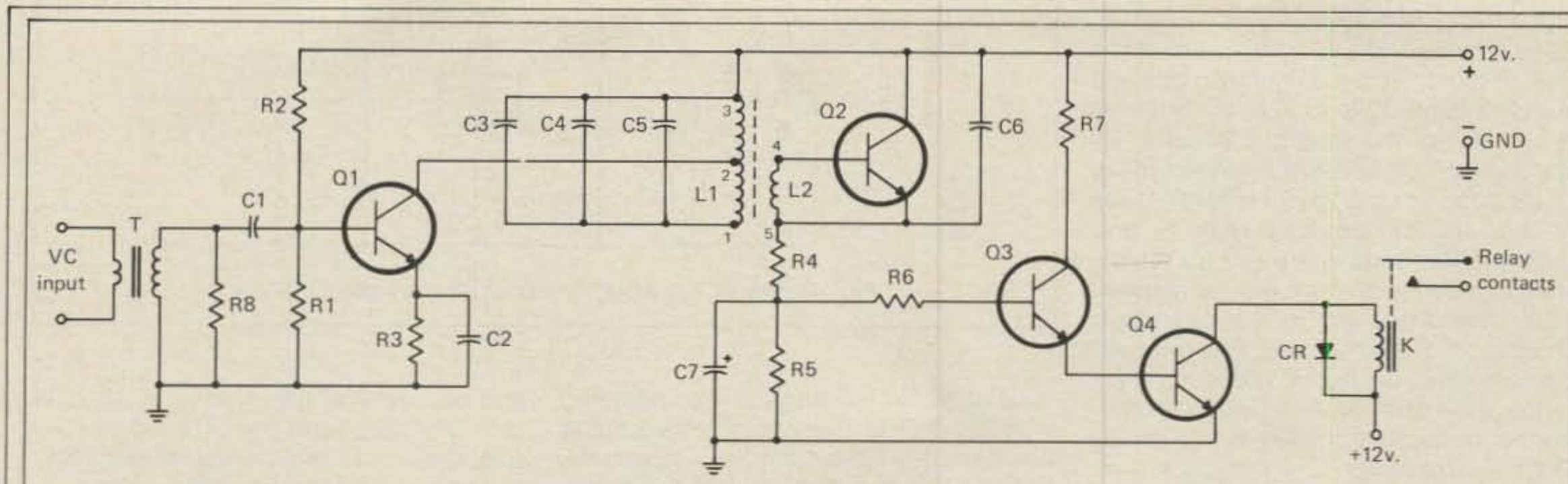


Fig. 2– Tone detector schematic diagram.

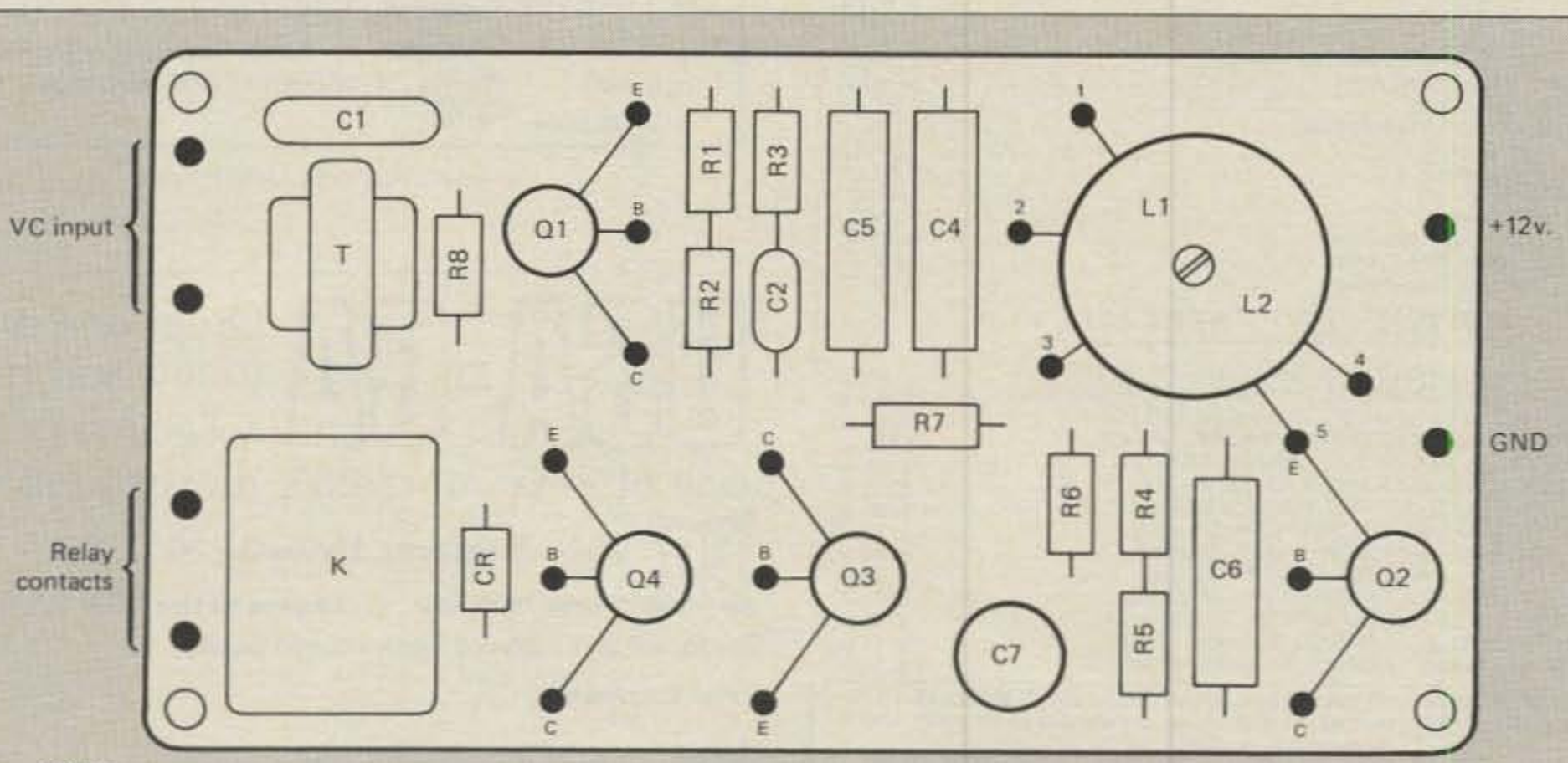
Symbol	Component	Radio Shack Cat. No.	Symbol	Component	Radio Shack Cat. No.
C1	.05 mF, 100V, ceramic	272-134	L1	88 mH Toroid	(see text)
C2	.1 mF, 100V, ceramic	272-135	L2	33 turns #26E wound on L1	(see text)
C3	.0022 mF, 100V	(see text)	Q1, Q2, Q3, Q4	2N2222 NPN Transistor	276-1617
C4	.01 mF, 100V	(see text)	R1, R6	10k, ½ watt	271-034
C5	.056 mF, 100V	(see text)	R2, R4	100k, ½ watt	271-045
C6	.022 mF, 50V	272-1066	R5	22k, ½ watt	271-038
C7	220 mF, 35V, electrolytic	272-1029	R7	3.3k, ½ watt	271-028
CR	1N4001 1 amp 50 PIV Silicon Diode	276-1101	R8	1.0k, ½ watt	271-023
K	SPDT Relay, 12V coil	275-003	T	8 ohms to 1000 ohms CT, Transformer	273-1380

demodulator (TU) is not required, nor is it cost-effective, for v.h.f. AFSK. A simple audiotype TU will suffice. Even if the old standard of 850 Hz shift is used on a net, it most likely will use 2125 Hz for MARK. Therefore, a quite simple autostart tone detector tuned to 2125 Hz can be used to start and stop the machine motor independent of the TU.

The System

There are several options as to how an autostart system can be set up. You can choose continuous monitoring or monitoring only at certain times. Fig. 1 is a block diagram of a suggested autostart system. Many variations are possible, such as leaving the receiver on all the time, and/or eliminating the timer for continuous monitoring. The tone detector relay does not directly control the a.c. to the machine motor, but it is used to actuate a heavy-duty motor control relay such as the Radio Shack #275-217, which has contacts rated at 10 amperes at 125 volts a.c., and a 120 volt a.c. coil. Fuses are strongly recommended in the a.c. leads to the receiver, to the motor control relay, and to the TTY machine.

If it is desired to monitor only at certain times instead of continuously, a multiple programmable timer should be used. Recommended is the Radio Shack #63-864 timer. It can turn on the receiver and make a.c. available to the TTY machine via the motor control relay at preprogrammed times. *Note that if no start tone is detected by the tone detector, the TTY machine motor will not be turned on.* This timer provides, through 24 programming tabs, up to 12 on/off functions per day, through 24 hours. Minimum on time is one hour. For example, if it is desired to monitor for traffic between 6 p.m. and 7 p.m. only, the 6 p.m. tab is set. If it is desired to monitor from 8 p.m. to 11 p.m., as another example, the 8 p.m., 9 p.m., and 10 p.m. tabs are set. Each station on the net therefore can have its own particular autostart time, the time at which the TTY machine is ready to copy.



NOTE:
C3 under board.

Fig. 3– Tone detector circuit board layout.

The Tone Detector

Fig. 2 is the schematic diagram of the tone detector. It is designed to operate from the voice coil circuit of the radio receiver. (Silent monitoring is possible by switching off the speaker as shown in fig. 1.) Detection of the 2125 Hz MARK tone will activate the detector relay *K*, provided that the tone is present for a minimum of 5 seconds. It should not respond if any other frequency, voice, or noise is coming out of the receiver. This relay will then drop out after about 3 seconds of absence of the MARK tone, effectively causing the motor control relay to turn off the TTY machine motor.

The tone detector was built on a Vector[2] 3/32" thick, prepunched insulating board using zip-type push-in terminals. Similar predrilled boards and push-in terminals are available from Radio Shack. We used a board size of 4¾" × 2½". (At W2JTP a board unit size of 4¾" × 1¼" has been standard for solid-state projects for many years.) Fig. 3 is a suggested layout for the board. Point-to-point wiring is used. If it looks a bit crowded, there is no reason why the components couldn't be more spaced out on a larger board. If there is no room to mount the board in your TU, small boxes or cabinets in a wide variety of sizes are available from Radio Shack.

The tuned circuit coil *L1* (1, 2, 3) makes use of the obiquitous 88 mHy telephone loading coil, upon which a secondary winding (4, 5) of 33 turns of #26 enameled wire is scramble wound. These loading coils are available from Ed Wetherhold, W3NQN[3] or possibly from Fred Schmidt of Typetronics.[4] Incidentally, Typetronics is a good source of replacement parts such as gears (in case you get a machine with the wrong speed gears) for Teletype Corporation machines.

Tune-up can be accomplished quickly with the aid of an a.c. vacuum-tube voltmeter, such as the Heathkit IM-21, connected across the secondary terminals (4, 5). Feed in, at the voice-coil input terminals, the output from an audio oscillator. Resonance is indicated by a peak on the v.t.v.m. If this does not occur exactly at 2125 Hz, vary the total value of the effective capacitance provided by *C4* and *C5* (we had to add *C3*). If the peak is slightly low in frequency, a few turns can be removed from *L1* to get right on 2125 Hz.

The power supply for the tone detector can be any available source of 12 volts d.c.[5], perhaps from your TU supply. The total drain is 11 ma maximum, with relay *K* energized. A simple power supply, such as shown in fig. 4, can be built from components readily available from Radio Shack. It can be housed in the same box or cabinet as the tone detector.[6] CQ

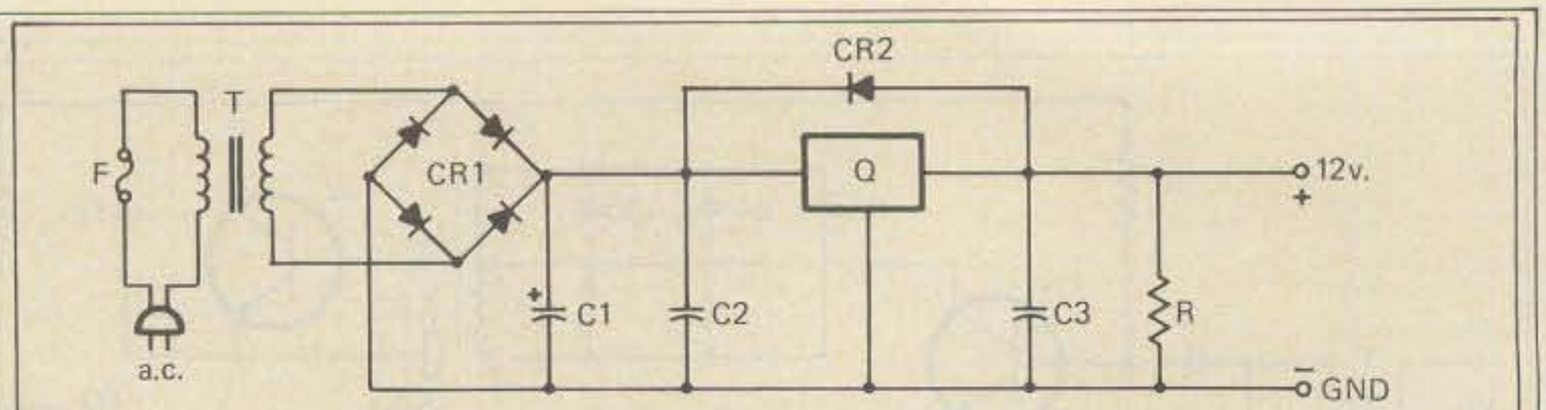


Fig. 4– Power supply schematic for the tone detector.

References

[1]Kretzman, B. H., "The Model 15 Still Lives!" *CQ*, Nov. 1983, p. 75.

[2]Vector Engineering Company, Sylmar, CA 91342.

[3]Wetherhold, E., "Elliptic Lowpass Filter Design," *Ham Radio*, Feb. 1984, p. 26.

[4]Typetronics, Box 8873, Ft. Lauderdale, FL 33310.

[5]Kretzman, B. H., "A Workbench Low Voltage Power Supply," *CQ*, March 1983, p. 40.

[6]O'Hara, T.R., "RTTY Autostart," *73*, Jan. 1969, p. 56.

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Selcal (Selective Calling) System: With this feature, the unit only receives messages following a preset code. Built-in Demodulator for High Performance: Newly designed high speed RTTY demodulator has receiving capability of as fast as 300 Baud. Three-step shifts select either 170Hz, 425Hz or 850Hz shift with manual fine tune control of space channel for odd shifts. HIGH (Mark Frequency 2125Hz)/LOW (Mark Frequency 1275Hz) tone pair select. Mark only or Space only copy capability for selective fading. ARQ/FEC features incorporated.
Crystal Controlled AFSK Modulator: A transceiver without FSK function can transmit in RTTY mode by utilizing the high stability crystal-controlled modulator controlled by the computer.
Photocoupler CW, FSK Keyer built-in: Very high voltage, high current photocoupler keyer is provided for CW, FSK keying.
Convenient ASCII Key Arrangement: The keyboard layout is ASCII arrangement with function keys. Automatic insertion of LTR/FIG code makes operation a breeze.
Battery Back-up Memory: Data in the battery back-up memory, covering 72 characters x 7 channels and 24 characters x 8 channels, is retained even when the external power source is removed. Messages can be recalled from a keyboard instruction and some particular channels can be read out continuously. You can write messages into any channel while receiving.
Large Capacity Display Memory: Covers up to 1,280 characters. Screen Format contains 40 characters x 16 lines x 2 pages.
Screen Display Type-Ahead Buffer Memory: A 160-character buffer memory is displayed on the lower part of the screen. The characters move to the left erasing one by one as soon as they are transmitted. Messages can be written during the receiving state for transmission with battery back-up memory or SEND function.
Function Display System: Each function (mode, channel number, speed, etc.) is displayed on the screen.
Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.
Wide Range of Transmitting and Receiving: Morse Code transmitting speed can be set from the keyboard at any rate between 5-100 WPM (every word per minute). AUTOTRACK on receive. For communication in Baudot and ASCII Codes, rate is variable by a keyboard instruction between 12-300 Baud when using RTTY Modem and between 12-600 Baud when using TTL level. The variable speed feature makes the unit ideal for amateur, business and commercial use.
Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.
"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.
Automatic CR/LF: While transmitting. CR/LF automatically sent every 64, 72 or 80 characters.
WORD MODE operation: Characters can be transmitted by word groupings, not every character, from the buffer memory with keyboard instruction.
LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.
WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.
"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.
Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.
MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.
Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.
Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.

CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.
CW Random Generator: Output of CW random signal can be used as CW reading practice. **Bargraph LED Meter for Tuning:** Tuning of CW and RTTY is very easy with the bargraph LED meter. In addition, provision has been made for attachment of an oscilloscope to aid tuning.
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CIRCLE 52 ON READER SERVICE CARD

This article outlines the author's efforts to construct a simple receive-only interface unit for c.w., RTTY, and ASCII signals with the use of a microcomputer.

The TU] [Revisited

A Simple But Effective Computer Interface For Reception of C.W., RTTY, and ASCII

BY LAWRENCE W. STARK*, K9ARZ

Throughout my 24 years of amateur radio operation I've had a fascination for radio-teleprinting. The exotic sounds of mark and space tones have had a mysterious ring to them, especially when I was a shortwave listener prior to my being licensed as an amateur. Somehow, however, the thought of having one of those noisy, clanking boat anchors (Model 15's, etc.) taking up space in the hamshack was never really appealing to me. With the advent of micro-computers and dedicated CRT terminals, it is now possible to enjoy RTTY and keyboard c.w. without all the noise and mess of the old "clacker boxes."

About the time I purchased my first computer, a Commodore VIC-20, my knowledge of RTTY, keyboard c.w., and digital electronics was sadly lacking. Incentive licensing required that I know a smattering of RTTY theory, but then it doesn't take that much beyond the block diagram stage in order to pass the Advanced or Extra class license exam.

I therefore began to dig out every available issue of *CQ*, *QST*, and *73* magazines to see what has been written on the subject. After about two weeks of intensive reading, I happened upon several construction articles related to interfacing an amateur station to a computer (see notes). All of the circuits I tried worked well, but each had some minor quirks that needed to be addressed.

Discussing the matter with other local amateurs resulted in arguments over single or dual tone detection and phased-locked loops versus traditional discriminator detection. At this point, being thoroughly confused, I decided to do a little "empirical" study of my own at the test bench.

The author's complete RTTY station, including VIC-20, monitor, Gemini 10X printer, c.w.-RTTY active filter, home-brew modem, receive-only demodulator, TS-530S transceiver, and R600 receiver.

The first circuit I tried was WA5WPQ's receive-only demodulator, which he called "A Tightwad's FSK Demodulator" (see notes). The circuit used a 567 tone decoder chip following a bandpass filter which utilized an operational amplifier chip. The circuit would decode the RTTY signal, but the bandpass filter created so much noise that the output to the computer (TTL) would generate nonsense on the screen when no input signal was present.

Comparing the circuit to the c.w. detector in the TU] [, I found that most of the 567 chip's associated components were identical, with the exception of the input circuitry. The TU] [used a simple diode limiter and series resistor on the input, and to my surprise the circuit outperformed the earlier circuit.

The circuit I settled on most closely resembles the WA7HRA TU] [c.w. demodulator (see notes) with the exception of

*1320 Fox Glade Court, St. Charles, IL 60174

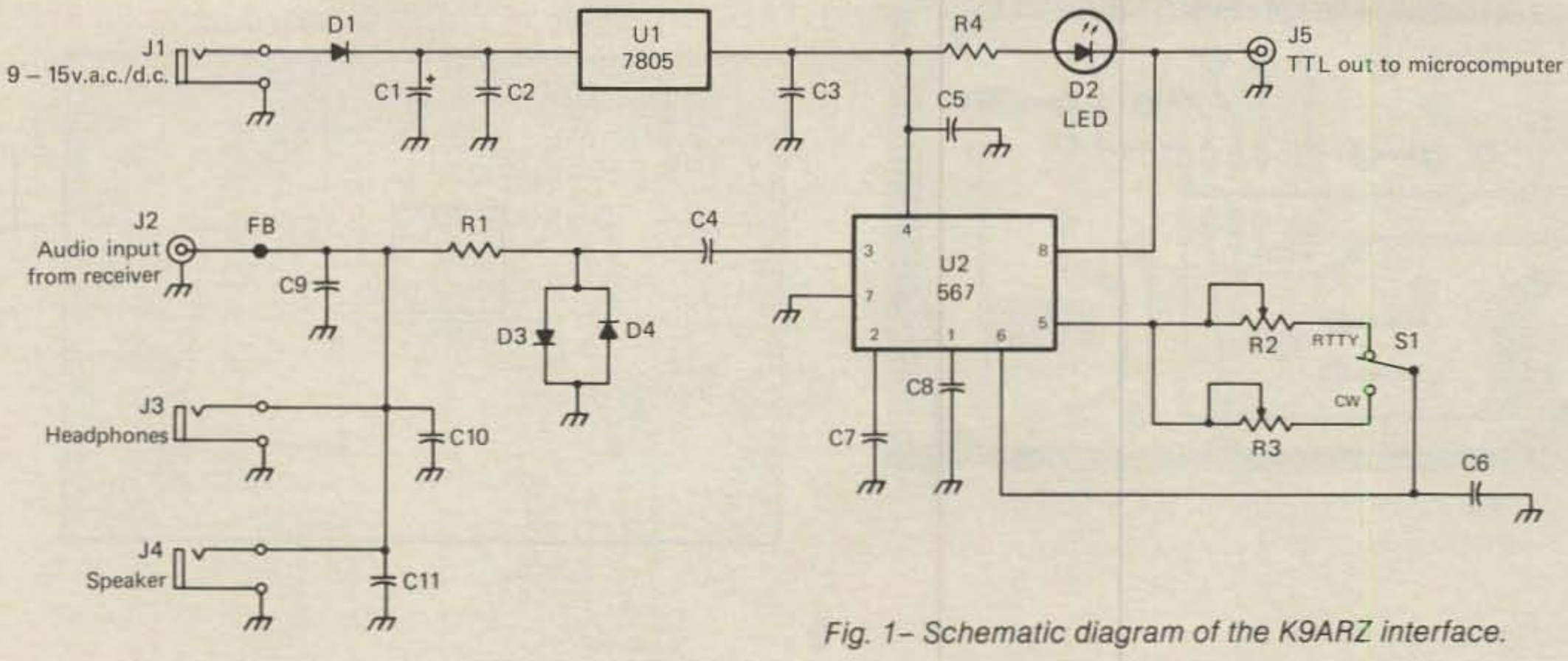

Fig. 1– Schematic diagram of the K9ARZ interface.

Photo of receive-only demodulator for c.w., RTTY, and ASCII atop the author's R600 general-coverage receiver.

Parts List

C1: 470 mFd @ 25 w.v.d.c. (Radio Shack #272-1018)
C2, C3, C5, C6: .1 mFd disc, polyester, or epoxy type capacitor (Radio Shack #272-1069, 272-1053, or 271-111)
C4, C7: .047 mFd mylar or epoxy cap (Radio Shack #272-1068 or 272-1052)
C8: 1.0 mFd tantalum (Radio Shack #272-1434)
C9, C10, C11: .001 mFd (102) disc ceramic cap.
FB: ferrite bead (not critical) or 10 uH r.f. choke
R1: approx. 100 ohms (not critical)
R2, R3: 20K, 10–15 turn trimpot (Radio Shack #271-340)
R4: 220 ohm, ¼ watt resistor
D1: 1N4001 silicon diode (Radio Shack #276-1653)
D2: light emitting diode—2.2 v, 12–20 ma (Radio Shack #276-033)
D3, D4: 1N34 or equivalent germanium diode (Radio Shack #276-1123)
S1: SPDT toggle switch (Radio Shack #275-625)
J1: micro-mini phone jack (power input) 3/32 inch (Radio Shack #274-292)
J2, J5: dual RCA jacks—a.f. input and TTL output, respectively (Radio Shack #274-332)
J3: standard ¼ inch headphone jack (headphones) monaural type (Radio Shack #274-252)
J4: miniature phone jack ⅛ inch (speaker output (Radio Shack #274-251)
U1: 7805 (LM340-05) 5 volt regulator chip (Radio Shack #276-1770)
U2: 567 tone decoder PLL chip (Radio Shack #276-1721)
Miscellaneous: a box in which to mount the unit (metal) (Radio Shack #270-271 or 270-251)

the dual resistors, which are selectable from the front panel, to control the time constant for frequency control on the 567. This control allows you to set the frequency of tone detection for either 2125 Hz for RTTY or 850 Hz for c.w. detection. I also added a simple but effective power-supply circuit which would allow for operation of the circuit from any of the common wall transformers from 8–15 volts a.c. or d.c.

Circuit Description

The circuit centers around a 567 phase-locked loop tone decoder. A simple diode limiter is used on the input (pin #3), and when the appropriate tone (either c.w. tone at approximately 850 Hz or RTTY tone at 2125 Hz) is fed to the input, the output (pin #8) is shunted to ground potential. The shunting of pin #8 affects the TTL "low" condition when an appropriate audio tone is received. The TTL "high" condition exists when there is no tone present. At this time pin #8 is brought up to 5 v.d.c. with resistor R4 (see fig. 1) through LED D2. At the time a tone is received (TTL low), pin #8 is shunted to ground, D2 will light and serve as a tuning indicator for the c.w., RTTY, and ASCII modes.

In my VIC-20 the TTL output is fed into the light pen input on the joystick port as per the instructions included with the Kantronics "Hamsoft," the software I've chosen for the programming.

The power-supply circuit is a simple yet versatile circuit that allows for a vareity of voltage sources. Diode D1 serves as a half-wave rectifier if an a.c. source is used, or as a series polarity protection diode if d.c. is used. The unit I built uses a 9 volt, 100 ma wall transformer for power. If you are currently using a receiver or transceiver that runs off of 12–13.8 v.d.c., this can also be used without any problem. Once the input voltage is rectified (in the case of a.c. input) and filtered by C1, the d.c. is then regulated with a 7805 (or LM340-05) regulator chip. With the small current draw of the total circuit, half-wave rectification, a relatively small amount of capacity for filtering is needed, and the regulator chip seems to work quite well to provide an adequate yet low-cost power source for the interface.

Construction

Although the circuit can easily be constructed on a "perf-board," I elected to etch a printed circuit board for neatness sake. Fig. 2 represents a 1:1 scale foil pattern for etching your own board. For mine I simply used some single-sided board, a resist pen, and etchant I purchased at a local Radio Shack store. Fig. 3 shows the layout of parts on the opposite side of the board.

All of the electrical components are readily available at Radio Shack and other radio parts stores. I've included Radio Shack parts numbers in the parts list in case your "junk box" is not well lined with the appropriate components. Do not be afraid to substitute disc capacitors with

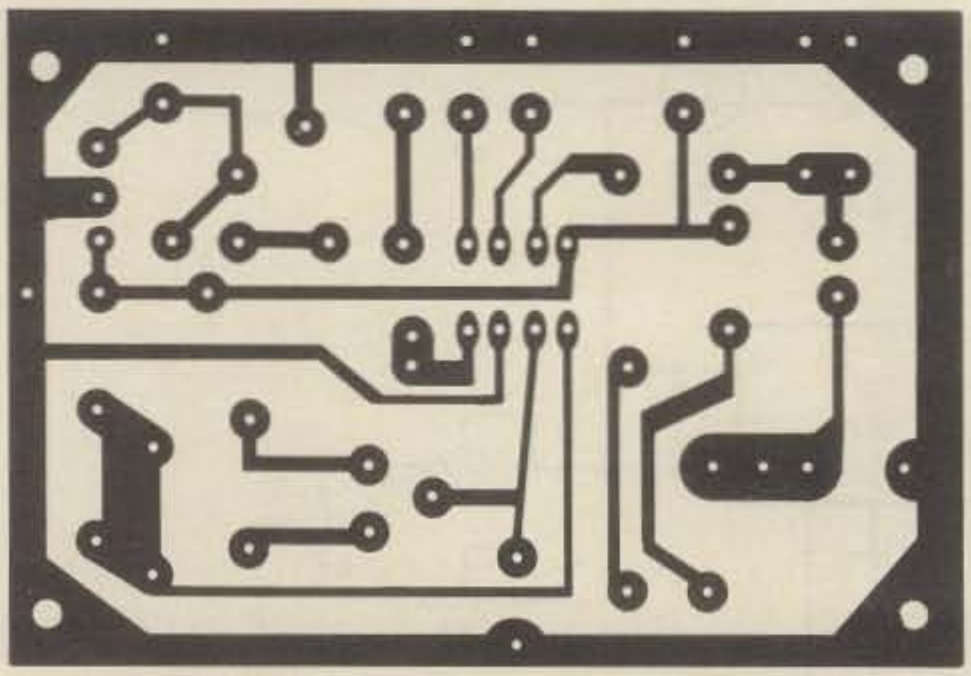

Fig. 2– Foil pattern (actual size).

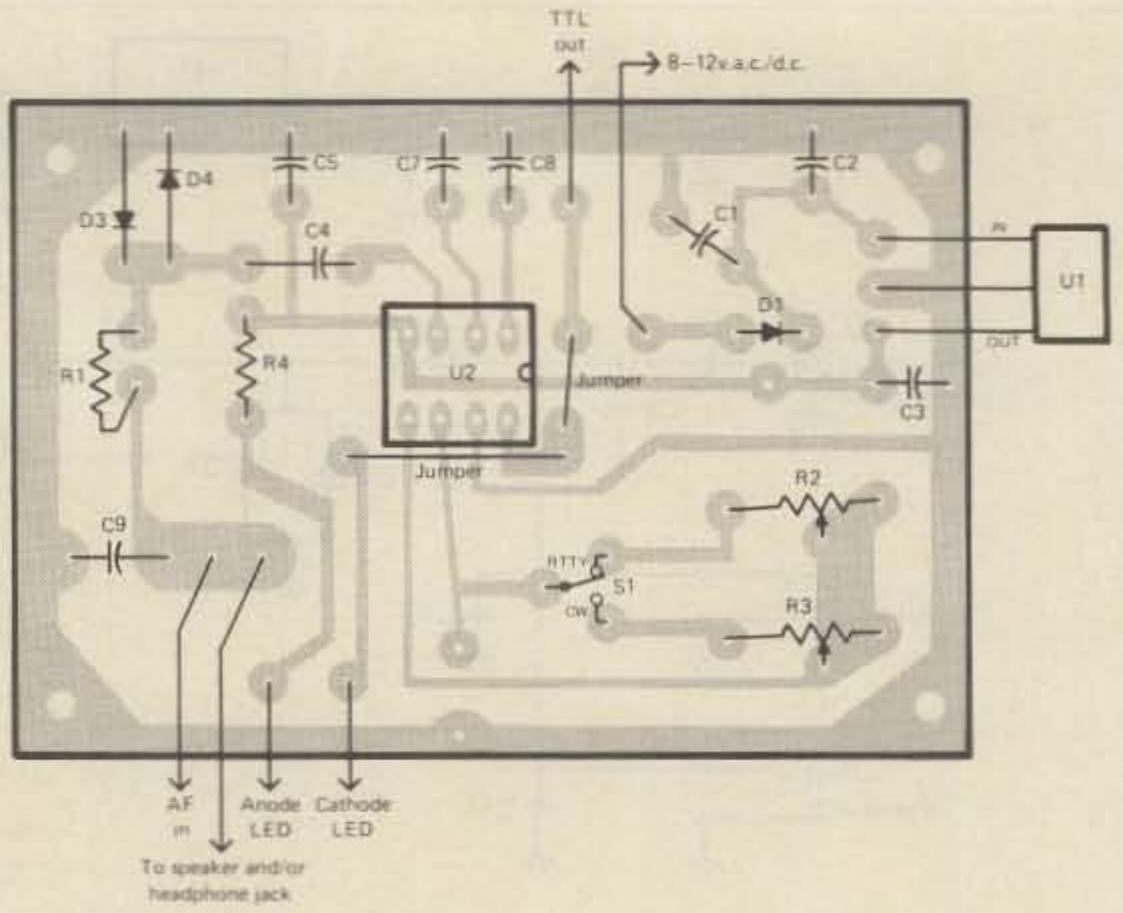

Fig. 3– Parts layout diagram, non-foil side of board.

tubulars or tantalums if they are available, and vice versa. I've tried many combinations of available parts on at least six different interface units, and they all performed well in operation.

The entire circuit including the power supply (less transformer) is housed in a small aluminum cabinet also available at Radio Shack.

For good EMI/RFI suppression, the cabinet should be all metal, and leads from the receiver or transceiver should be shielded.

Alignment

The alignment is very simple and requires only a receiver with a calibration oscillator, a frequency counter, and a VOM or VTVM. The procedure is as follows:

1. Unplug the 567 chip from its socket and make sure nothing else is connected to the interface. Place the leads to your ohm meter across pins #5 and #6 of the IC socket. With the mode switch in the RTTY/ASCII position, adjust R2 (RTTY trim pot) for a value of 5600 ohms. Switch over to the c.w. mode and adjust R3 for a rough setting of 12,500 ohms (12.5K).

2. With the 567 still out of the circuit, plug in the wall transformer and insert the plug into the socket on the rear of the interface. The tuning indicator, D2, should light when you short the center of the TTL output jack (J5) to ground.

3. Unplug the wall transformer and replace the 567 in its socket.

4. Connect a shielded cable to the a.f. input (J4) of the interface from the speaker output of a communications receiver or transceiver. Also connect a speaker to the interface unit or plug in a set of headphones.

5. Connect a VOM or VTVM to the TTL output (J5). The VOM should be set for d.c. volts; the 10 volt position is ideal (not less than 5 volts).

6. Connect a frequency counter across the a.f. input jack (in parallel with the receiver audio output), with the demodulator in the RTTY position and the receiver in the l.s.b. (lower sideband) mode.

7. Plug in the interface unit and turn on the receiver. Allow for receiver warm up if necessary to stabilize the oscillator.

8. Switch on the crystal calibrator of the receiver (or marker oscillator). Find the oscillator signal on any band or frequency. Carefully tune the receiver off the marker oscillator until the frequency counter is reading an audio frequency of 2125 Hz. At this point adjust the RTTY trimpot (R2) until the TTL output as measured on the VOM goes low (drops from about 5 volts to near 0 volts). If this condition cannot be obtained, check the wiring of the circuit and make sure you have made all the correct connections.

9. For c.w. alignment switch the demodulator mode switch to c.w. and the

receiver or transceiver to the u.s.b./c.w. position. Retune the receiver off the calibrate signal until the counter reads an audio frequency of 850 Hz. Then adjust the c.w. trimpot (R3) until the TTL output drops from its approximate 5 volt reading to 0 volts. This completes the normal alignment if you intend to use the interface on the h.f. frequencies with a v.f.o.-type receiver.

Operation

Once the unit is aligned, it will be necessary to connect the TTL output of the interface unit to the appropriate I/O (input or output) port on your computer. This information is usually provided with your software package. With the Kantronics "Hamsoft" package for the VIC-20, the connection is made to pin #6 (light pen input) and pin #8 (ground) of the joystick port. A joystick replacement cord can be used for the connection. These cords are available at almost any computer store. It might also be advisable to place a 5 volt MOV (metal oxide varistor) across the TTL output connector of your interface unit to prevent damage of the computer's CMOS circuitry should the 7805 regulator chip ever fail.

It is also important that all units in your system be tied to a good common ground. This should include the antenna, receiver, interface, computer, and any other computer peripheral.

Operation is not difficult, but be sure that the last unit you turn on and first unit you turn off is the computer. With all units turned on, tune in an RTTY station and tune until you notice a flashing of the tune indicator (D2) on the interface. If you carefully tune back and forth across the signal with the receiver in the l.s.b. mode, you will begin to see characters appear on your computer CRT monitor. The LED will flicker just above and below the carrier frequency. If the system does decode on one side, tune the other or switch to the other sideband. This may be necessary due to the different shift modes employed (normal or reverse). Most amateur radio RTTY is sent at either 60 w.p.m. or 100 w.p.m., so try these speeds first. Commercial RTTY is sent at either 67 w.p.m. or 100 w.p.m. in case you begin tuning on those frequencies.

In order to tune c.w., you will have to switch the receiver over to u.s.b./c.w. mode and change the mode switch on the interface to c.w. If your receiver has a c.w. filter (either i.f. or a.f. type), it would be advisable to switch the filter "in." Tuning in c.w. is more critical in the c.w. mode than on RTTY. The tune indicator (D2) should light on the dits and dahs received. Be sure to keep the a.f. gain on the receiver as low as possible in order to prevent detection of noise pulses. Noise pulses are of little consequence when decoding RTTY. ASCII operation is performed in the RTTY position on the interface and is tuned the same way. The ASCII mode is software selected on the computer.

If you intend to use the interface to decode AFSK on v.h.f. with a synthesized receiver, you may find it necessary to carefully "tweak" R2 while listening to an RTTY signal in order to get good print.

Acknowledgements

I would like to thank all of the authors cited below for the excellent articles that provided the foundation for this work, and especially Bob Hart, WA7HRA, for his initial TU][.

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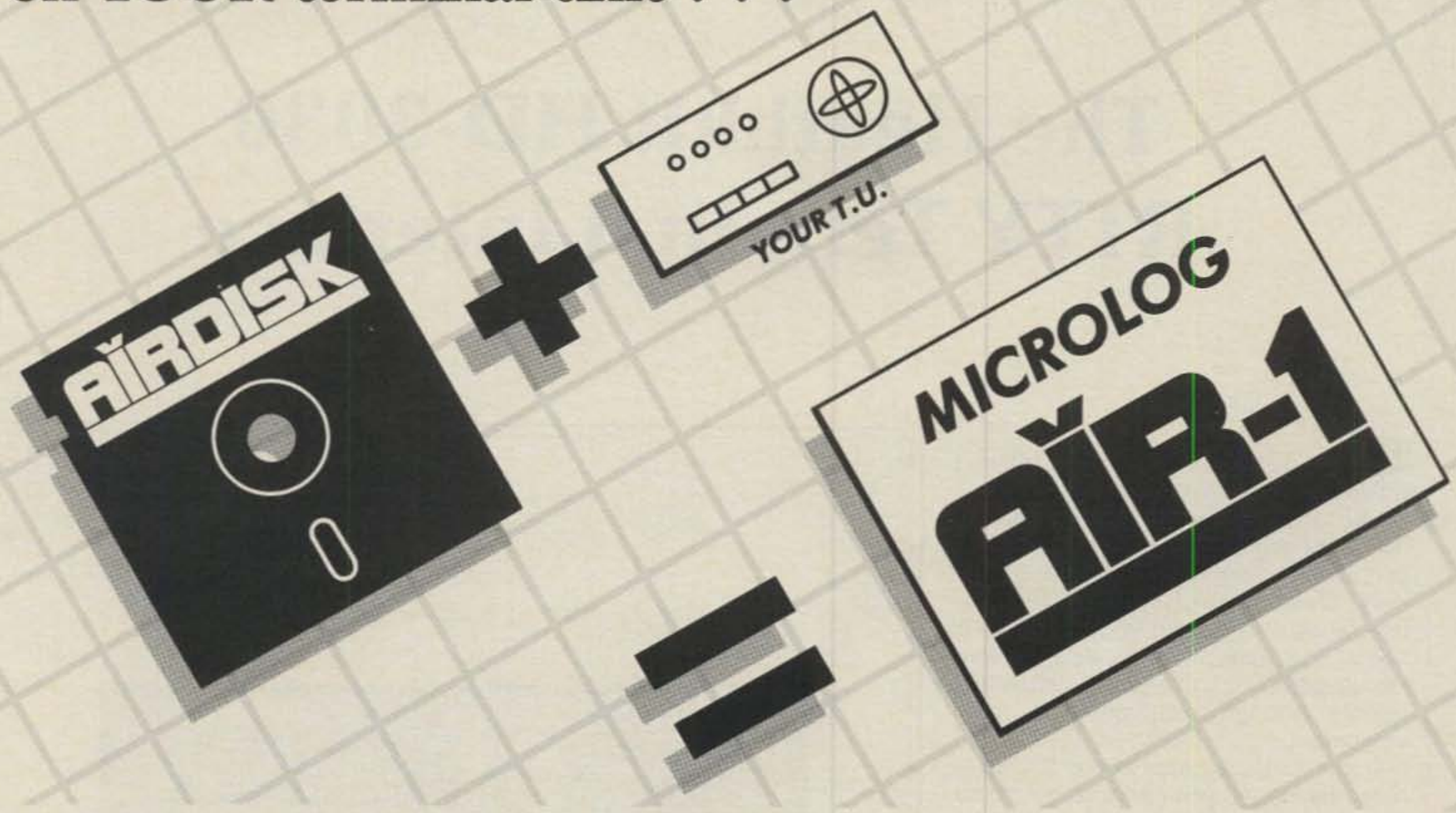

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CIRCLE 55 ON READER SERVICE CARD

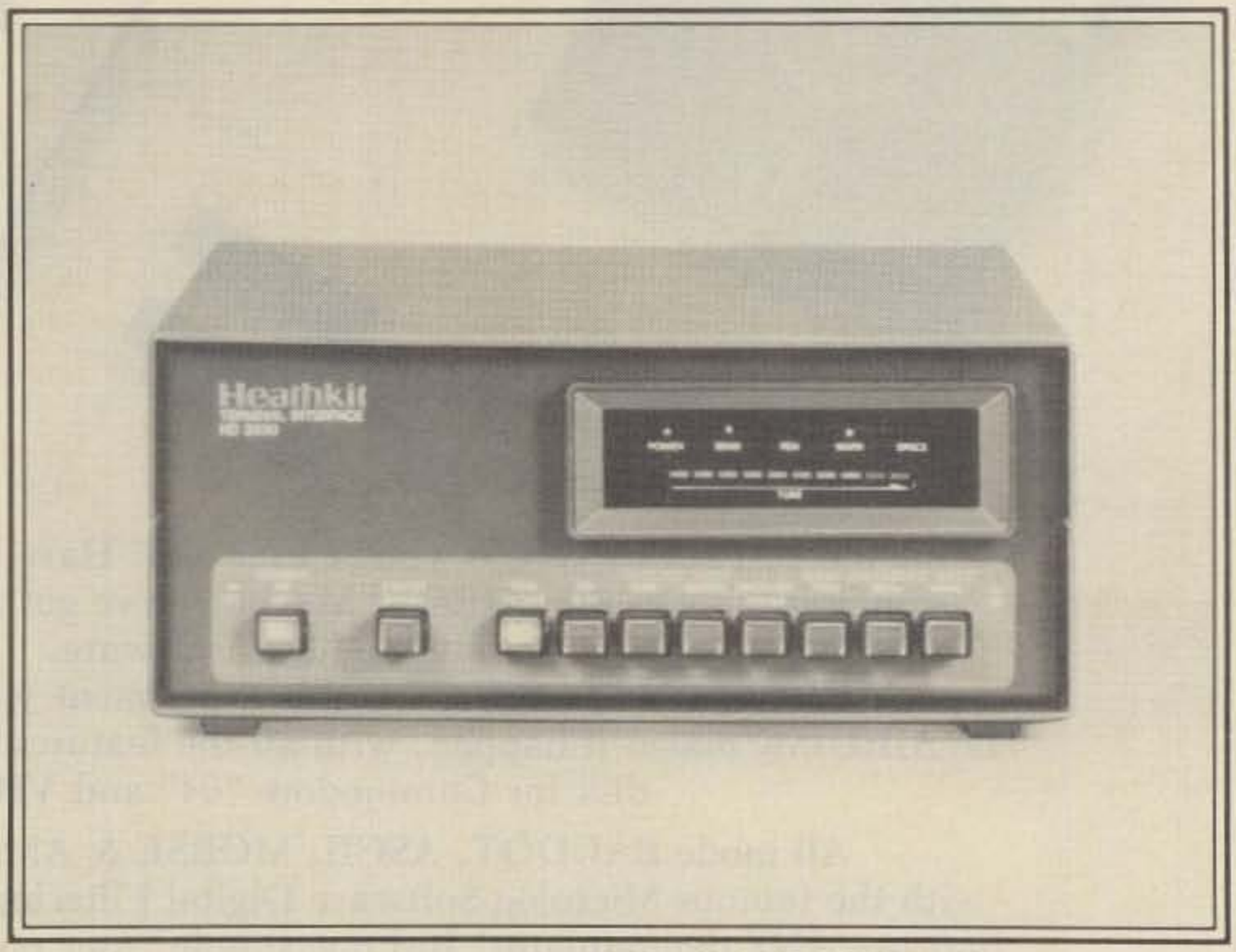
CQ REVIEWS:

BY WAYNE RASH, JR.*, N4HCR

The Heathkit HD-3030 RTTY Terminal Interface

Sometimes it's really hard to come up with the proper answer. Your spouse or a friend takes a look at your new home computer and asks, "So . . . what are you gonna use it for?" Now you have an answer. With the HD-3030 Radio Terminal Interface from Heathkit, you can use your home computer to send and receive Morse code, radio teletype, and ASCII signals through your amateur radio equipment.

If the computer you happen to own is made by Heath, you can also get some excellent software that you can use with the HD-3030. Once you get the combination of hardware and software up and running, you can tune in most decent c.w. signals and watch as the computer does the work while you watch the words march across the screen of the monitor. You are not limited to using a Heath computer with the HD-3030. Heath has included instructions for using the machine with nearly any computer and transceiver.



Front view of the completed Heathkit HD-3030 interface.

Building the HD-3030

The kits starts off easily. You begin by soldering resistors to the circuit board that holds the LED display, followed by the LEDs for that board. From there you proceed to the amplifiers and filters that process the signals that you feed through the HD-3030. Each of these small circuit boards is completed in order.

The only tricky part of building these boards has to do with the large number of very small diodes, and the fairly high component density of the circuit boards. Most of the diodes in the kit are made of glass and marked with a ring around one end. In a few cases the ring that marks the diode was so faint that it was nearly invisible. The 1N4149 diodes used by Heath are very small, so kit builders with aging eyes may find a magnifying glass very useful.

Despite their small size and high density, the eight plug-in boards were assembled quickly. I was able to average about one per hour. A soldering iron designed for microcircuitry will make construction much easier. There just isn't room for most 25 watt irons to work on these boards.

One reason for the quick assembly is careful planning by the Heathkit people. Most of the construction stages require only a limited number of components, so you no longer have to steal egg cartons from the kitchen in order to sort parts. To make matters even easier, many of the components, resistors, and diodes, for example, are attached to strips of tape in the order of their assembly. These strips of tape are accompanied by full-size charts showing where each part is located on the tape. When you get ready to assemble a section of the kit, you get out the proper chart and attach the pre-taped components to it, and you're ready to go. No longer do you have to search in the bottom of a brown paper bag for that elusive 47 ohm resistor.

The Motherboard

The main circuit board, or "motherboard" as computer types call it, is much more complex than the boards you started building in this kit. The project is made easier by dividing the board into regions and treating each region separately. As a result, the kit is still built in manageable pieces.

This was the only portion of the project in which I ran into any difficulty. Many of the capacitors used by Heath are tantalum capacitors and must be polarized properly if they are to work. Heath goes to a great deal of trouble to illustrate these

*c/o CQ magazine

items and show how polarization is determined. Unfortunately, some of the tantalum capacitors that came with the kit were not of the types in the illustrations, and they were not marked obviously, either. I took a chance that the tapered end of the capacitors was the positive end and installed them accordingly. As it turned out, the guess was correct, but even Heath's technical staff was at a loss as to the correct orientation of the component.

The main circuit board also contains the power supply, and this was the location of the only defective part in the kit. One of the secondary taps on the power transformer had a low resistance short that did not show up in the initial testing. As a result, the voltage checks on the main circuit board did not give the proper readings. I noticed that the transformer would get hot very quickly, but that there was no evidence of overheating components on the circuit board. Heath's technicians suggested that I check the resistance between pins on the transformer, and that revealed the problem. The faulty part was replaced within two days.

Construction and Design

Overall, construction of the HD-3030 is quite sound. Everything fits in its assigned place as it should, and there do not appear to be any compromises in the design of the HD-3030. The only weak spot is the DB-25 connector on the rear of the unit. This is the connection point for the RS-232 cable from the computer, and it is held in place only by the solder attaching it to the circuit board. There is room for this to be attached with screws, and the connector itself has provision for them, but they are not provided. Also not provided are mounting bosses for the screws on the RS-232 cable.

The DB-25 connector has provisions for all of the input and output from the HD-3030. This means that the cable to your computer connects here, and so does the cable that connects to your transceiver's audio and control circuits. That's a lot of cable to run out of a DB-25 connector, and you may have to be creative when you make the hook-up. I solved the problem by running two cables out of the DB-25 plug, requiring a tight squeeze when I screwed the shell together.

Alignment

As you would expect with equipment of this type, there is a considerable amount of alignment to be done after construction is complete. As has been the case with previous Heathkits, this can also be done with simple test equipment. If you have access to a signal generator you are given instructions on the ways to align the HD-3030 using this equipment. Those whose test equipment is limited to a volt/ohm meter can still perform the alignment, however. Heath provides the necessary signals for alignment from within the HD-3030 itself, although you do have to make a few jumpers and attach them to one of the circuit boards.

The alignment process is not difficult. Each of the filter cards you built earlier has three trimmer potentiometers. All you have to do is connect your voltmeter to the test point on the proper board, set the front-panel switches as indicated, and adjust each of the trimmers to their peak reading. The test points for each of the circuit boards are clearly marked, and you should encounter no problems with alignment as long as you *carefully read the directions in the manual.* It's easy to overlook a switch setting and as a result do the alignment improperly.

Making the Connections

Now that the construction of the HD-3030 is complete, the time has come to see those teletype messages appear on your computer's screen. Before you can do that, however, you have to decide what software you're going to use, and how you're going to connect the HD-3030 to your computer. If you have a Heathkit H-8 or H-89, a Zenith Z-89, or a computer that is 100% compatible with these, most of your work is done. Heath sells software for this series of computers and gives complete information for connecting the HD-3030 with the computer. If you have another type of computer that can use an RS-232 interface or a TTL interface, or one which can make use of a current loop, the HD-3030 can provide the signals you need. The details of the installation are left to you in this case, but Heath provides sufficient information about the signals provided by the HD-3030 so that nearly any computer should be usable. The existence of the current loop means that you can even run an older machine with the HD-3030.

The connections to your transceiver are well described and are expressed in a sufficiently generic manner so that they can be used with nearly any amateur's rig. I operated mine with my Yaesu FT-707 without a problem. All that is required is an audio output from the receiver to feed the HD-3030, and another audio line to the transmitter from the HD-3030. If you require a push-to-talk line, that is available as well, as is a line to your c.w. key.

Using the HD-3030

Operation of the HD-3030 is controlled by a series of pushbuttons located on the front. You can use these buttons to turn on the power, select the mode of communication you wish to use, and control some of the parameters of the teletype mode. Each of the buttons has an internal flag that shows when it has been pushed.

You tune signals with your receiver, just as you always would. When you get to a signal you want to decode, you watch the LED bargraph indicator on the front of the HD-3030. As the bargraph indicator reaches its peak, you need to shift your attention to the MARK and SPACE LEDs just above. A properly tuned teletype signal will cause these LEDs to flash alternately. With a properly tuned c.w. signal the MARK LED will light in time with the received code.

With RTTY signals you have the option of changing the frequency difference between MARK and SPACE so that you can receive commercial teletype, and you can change to an inverted mode if necessary. How your computer handles the resulting signal will depend on the software you are using.

The most difficult part about using the HD-3030 is properly tuning in an RTTY signal. Depending on your receiver, this may require a careful touch. If you prefer to use an oscilloscope as a tuning aid, the HD-3030 has the outputs necessary to run one.

Tuning without a scope is not really difficult, although it does require some care. The tuning bar will show three peaks for an RTTY signal, but only one of these will be the proper one. You can tell the proper one because that's when both the MARK and SPACE lights flash. A similar situation exists for tuning c.w. signals. There are only two peaks for these signals, and the proper one is where the MARK light flashes in time with the code you're receiving.

Using Heath's C.W. and RTTY Software

An interface such as the HD-3030 can only do part of the job of reading Morse code or RTTY. Most of the work, including the actual translation, is done by your computer's software. Heath supplies two programs for these functions, both of which run under the company's proprietary HDOS operating system. These programs, *Super CW* and *Super RTTY,* are produced by Quantum Communications Systems of Harvard, Massachusetts.

While they perform different functions, both programs appear to be remarkably similar to the user. If you have both programs, the readjustment when you change between them will be minimal. Both programs operate with a split screen. The text you are receiving is displayed on the top half of the screen, while the bottom half is reserved for commands and for the text you are preparing to send out.

Both programs use the same commands where possible. There are differences in items relating to c.w. or RTTY, of course, but otherwise the use of the function keys and the commands is identical. In each case the numbered function keys send or modify the transmit buffer, while the colored function keys handle additional buffers.

Reading manually sent c.w. is one of the tougher challenges for c.w. readers

and programs. The spacing is often uneven, the characters are sent with varying speeds, and the weighting of the characters can change from letter to letter. While the quality of sending on the 40 meter Novice bands was probably an unfair test, the *Super CW* program was able to make sense out of most of it. The program was not able to copy this code perfectly, but the results were usually understandable. With conditions that were less severe, the quality of the received text was quite good. There was a tendency to skip spaces between letters, but that was due to poor sending habits. An operator with an excellent fist was able to generate nearly perfect copy. Code that was sent with electronic keyers or using other computers was usually received perfectly. The program was able to handle individual characteristics such as changes in weighting.

I was pleased to see that the program also tolerated interference quite well. Most atmospheric noise and off-frequency c.w. was ignored, even when it sounded louder than the signal being copied. According to Quantum Communications' Ron Jackson, this good performance is due to a feature that he calls "software filtering."

Very weak signals did cause difficulty, as did signals that were very erratic. In either case these signals would cause the program's automatic speed tracking system to become confused. You'll never be able to use *Super CW* to drag that last station you need for DXCC out of the mud, but for routine use it works just fine.

Super RTTY works just fine, too. With the exception of a couple of very weak stations, the copy was perfect. The only thing I missed was the c.w. program's ability to determine the speed automatically. With *Super RTTY* you must set the speed manually. Since most amateurs run at either 60 or 100 w.p.m., this is not a serious problem. Listening to commercial stations, however, will require more trial and error.

Both of these programs are full-featured and require some study to be used effectively. Fortunately, the documentation is adequate for the experienced amateur, although new operators may want to get some help understanding RTTY before trying to use this program. Most basic functions run themselves, incidentally. All you have to do is have everything hooked up and turned on, and the proper program loaded, and the reception will take place if you are tuned in to a signal. You can transmit nearly as easily. There all you do is save text to the transmit buffer, and then send it when ready.

The customer support provided by Quantum Communications is quite good. Inexperienced users will find willing and detailed help, both for running the program and for using it with the HD-3030. More advanced users can be accommodated as well, and for them Quantum has included the complete assembly language source code for the programs so that modifications can be made easily.

Conclusions

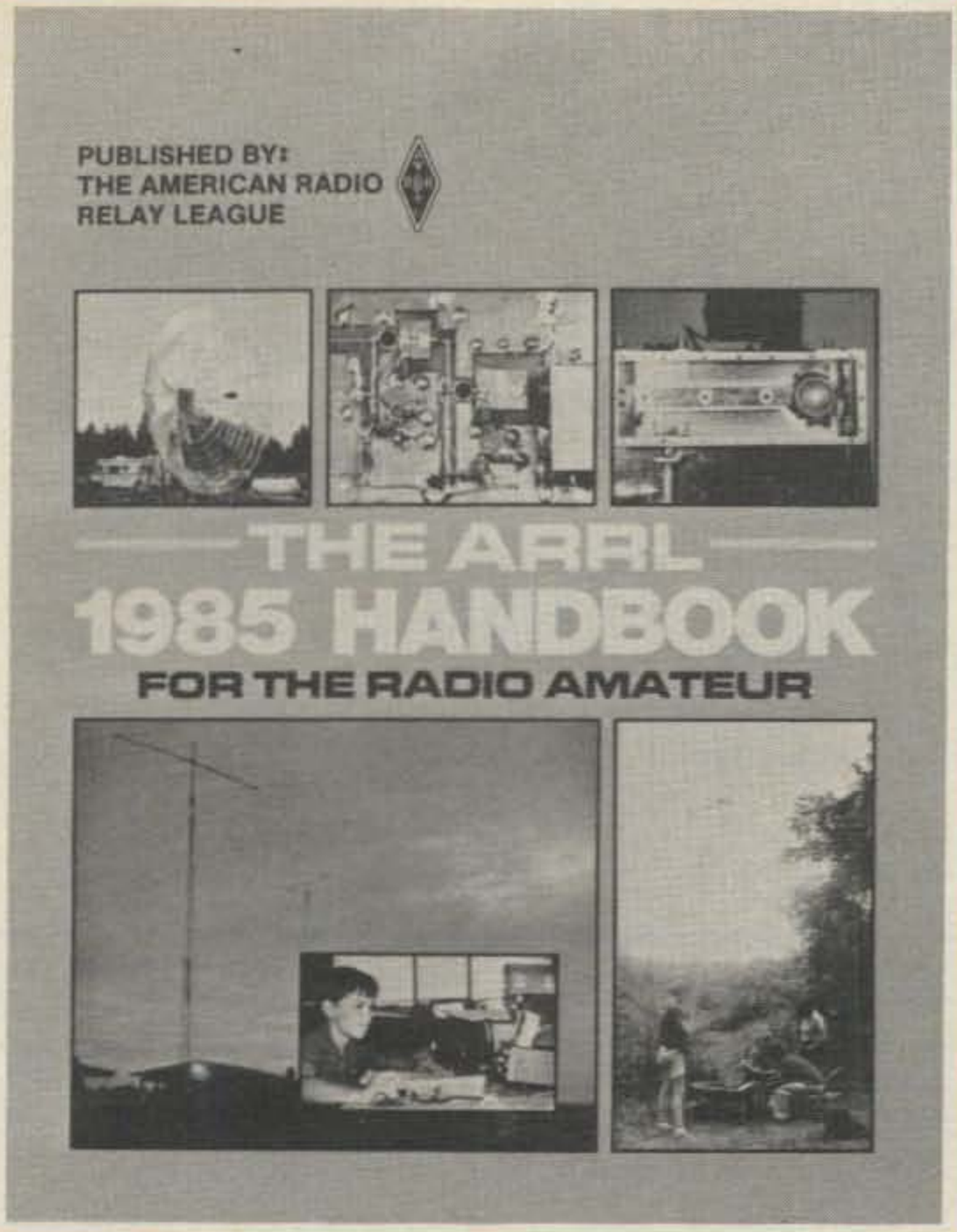
The Heathkit HD-3030 is a valuable addition to the well-equipped shack. Its $249.95 price tag is reasonable in light of the cost of units with similar capabilities, and it has capabilities beyond those of less expensive units. Its ability to work with Heath and Zenith computers is a plus for owners of these machines, since they pretty well have been ignored by manufacturers of other c.w. and RTTY interfaces. Another plus is that the parts of the package are useful individually. The HD-3030 will work with nearly any computer and transceiver, and you are given enough information about the unit to make such wide use possible.

The two programs, *Super CW* and *Super RTTY*, are also very flexible. You are given explicit instructions for use with the HD-3030, but you are given enough information to be able to use the software with most other interfaces as well. Currently these programs are only available for the Heath/Zenith H-8 or H/Z-89. Owners of the H/Z-100 will have to wait a little while, but a version is in the works for those computers as well.

I found operating with the HD-3030 to be a pleasure. The program performs nearly any function related to c.w. and RTTY communications that I could want. It received both types of communications accurately, kept my station log, allowed me to send prepared text from a disk file (a great help for traffic handlers) and saved the text I received to disk if that's what I wanted. The HD-3030 has become a useful and heavily used accessory for my station.

Options

The two programs mentioned—*Super CW* (Heath HDP-1010) and *Super RTTY* (Heath HDP-1020)—are available as options at $49.95 each. There are also two filter options available: a universal 425/850 Hz filter board (Heath HDA-3030-2, $14.95) and a 170 Hz preselector board (Heath HDA-3030-4, $19.95). CQ



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CONTENTS

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K0WVN describes a piece of equipment that does double-duty at the shack.

The Switchit

How To Use One RTTY Terminal Unit With Two Rigs

BY JOE A. ELLIOT*, K0WVN

As computers come down in price, many amateurs are purchasing them, and the shack seems to be becoming a bit tighter. You have the computer, the video monitor, a cassette or disk drive, a printer, perhaps a telephone modem, and a dozen or so books to instruct you on how to use these things. Hopefully, you didn't sacrifice a piece of amateur gear to make room for all of this equipment, but then again, elbow room is hard to find. Now that the computer has shown up in the shack, we have to find a way to compact the shack operation, too.

Computers are not only designed to fill mental hospitals, but they are also the new disease for the amateur's shack and his pocketbook. In my shack I found my-

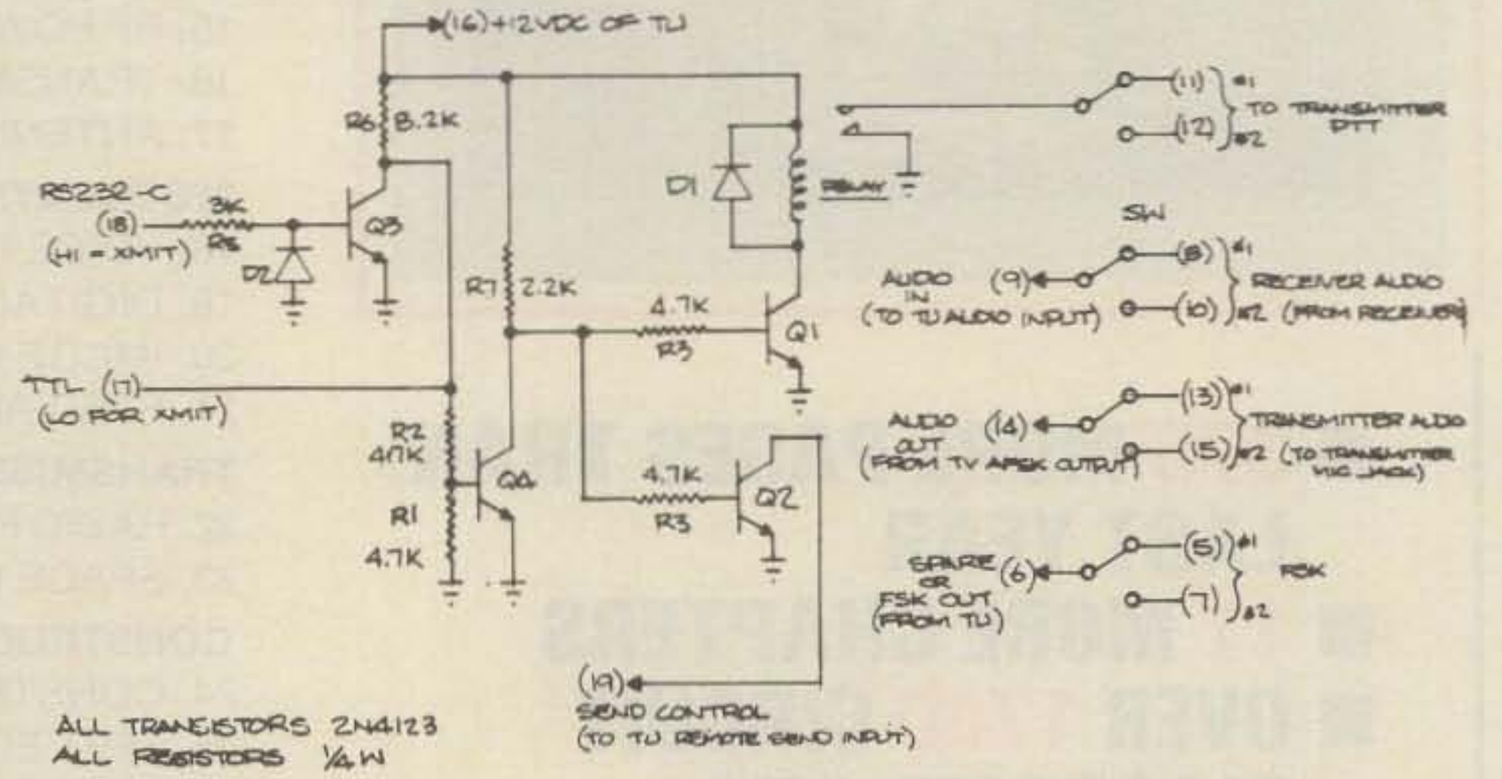

Fig. 1– The schematic diagram of the Switchit.

*607 Wabash St., Topeka, KS 66616

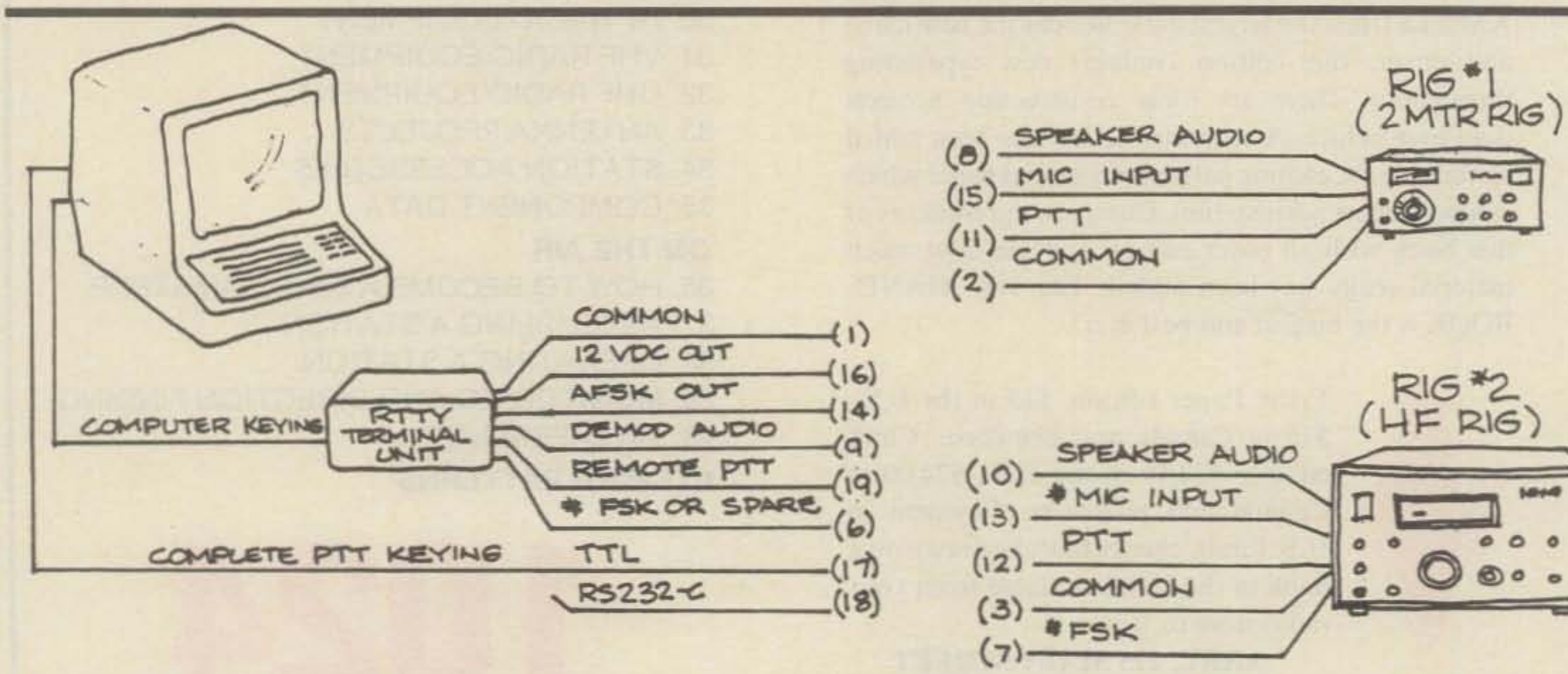

Fig. 2– Wiring example for the Switchit's typical use. The asterisk (*) denotes that if AFSK is to be used, the FSK connection is to be disregarded. If the FSK is to be used, then the AFSK connection is to be disregarded.

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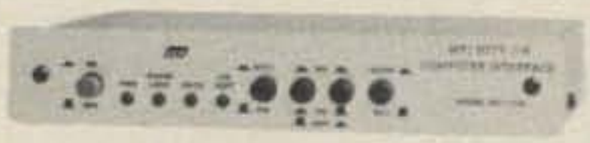

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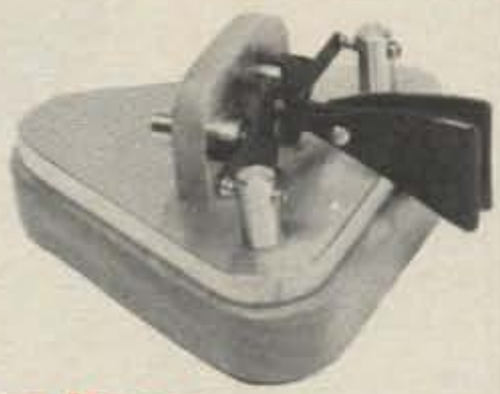

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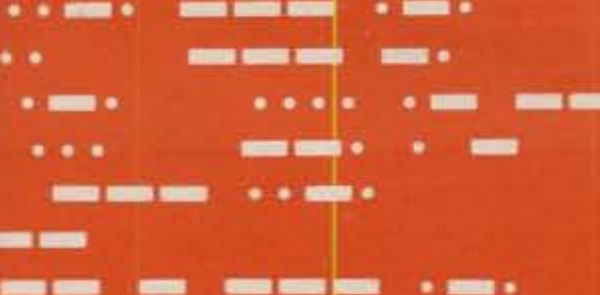

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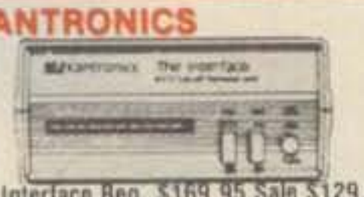

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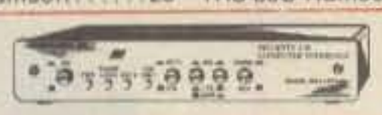

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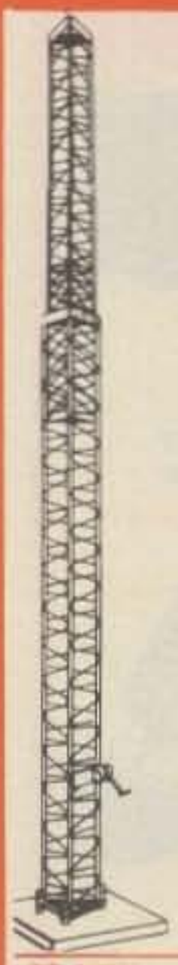

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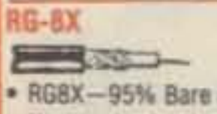

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½" Heliax	50	.2	.4	.9	1.6
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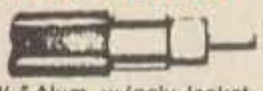

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TA-33JR 3-el Triband Beam	$189
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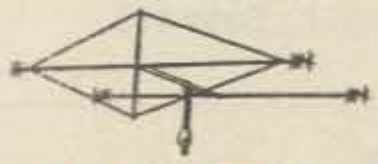

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Alliance HD73 (10.7 sq ft rating)	$99
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.18 in Wall	$39	$69	$99	$129
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self selling all of my spare gear to get more gadgets for the computer. My wife used to say, "Where did that come from?" and now she is saying, "What happened to the thing that used to be here?!" Before I had everything I needed for the computer, my ham shack inventory was greatly reduced.

One of the primary reasons for my getting this computer was to be able to get on RTTY. Now I had to make room for an RTTY terminal unit. Only one problem came up, and that was that I wanted to use it on both h.f. and v.h.f. rigs! Two RTTY terminal units were out of the question, so I had to figure out a way to switch one RTTY terminal to two different rigs.

In 1983 Flesher Corporation brought out a 22-pin board kit called the Switchit. It was designed to answer the problem that was bothering alot of RTTY enthusiasts. The Switchit schematic (fig. 1) shows both RS-232c and TTL compatible inputs for PTT. This is very handy for those terminal units that have a remote keying input to put them into transmit, but have no circuitry to in turn key the PTT circuit of the transmitter. Terminal units such as the ST5, ST6, TU-170, TU-170A, and others didn't isolate the computer keying from the transmitter PTT circuit. The Switchit eliminates this problem and does not care whether the PTT is a positive or a negative input, since it is a relay contact to ground. You simply connect the PTT output of the computer to the appropriate Switchit input. It will then key the relay that keys the transmitter PTT, and at the same time Q2 will key the remote keying of the RTTY terminal unit into transmit. The four-pole switch will determine which rig is to be selected, and power can be taken from any +12 v.d.c. source at the RTTY terminal unit. Since it only draws approximately 15 ma of current, it shouldn't be a problem for just about any supply available.

The wiring example gives you a general idea of how to hook up the Switchit to various rigs. I hope that this is as handy for you as it has been for me.

The Switchit board kit is still available for $19.95 plus $1.75 shipping from Flesher Corporation, P.O. Box 976, Topeka, KS 66601. CQ

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CIRCLE 23 ON READER SERVICE CARD

Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Product Peek

This month in CQ columnist W8FX takes a look at some new antenna products and sources. He also highlights some simple antennas for the experimenter, discusses "gray line" signal propagation, and focuses on some interesting new software for the hamshack computerist.

In last month's Antennas column, we discussed a number of subjects. These included sharing of reader comments regarding the coaxial dipole and vertical antenna grounding and feeding. We also presented another version of the "Reflected Power Program," which we now have presented in several versions for the Commodore 64 computer, and now the Vic-20. We also assembled a partial listing of antenna-construction parts sources, and highlighted several new antenna and software products.

This month we will "peak into" a number of new and interesting product offerings from a variety of manufacturers. We'll also share a few DITY (do-it-yourself) antennas submitted by readers, piggyback on a previous discussion of so-called "gray line" propagation, and touch on a few software topics. Let's begin with a look at a simple but useful new tool.

Product Peek

Coax Stripper. Doing a great deal of wire stripping for coaxial cable connectors can be a real pain. For the most part, there is no easy way around the task. However, we recently came across an interesting automatic coax stripper from Vaco Products.

The Vaco stripper is a compact tool that strips most sizes of small-diameter coaxial cable quickly, easily, and efficiently. It is intended primarily for cable TV applications, and is particularly suited for BNC-connected cables, including RG-6, RG-58, RG-59, RG-174, and RG-182. However, the device can be used to strip cables ranging in diameter from 0.14 inch to 0.30 inch. A strip length of 6 mm (0.236 inch) is standard, although this can be changed using interchangeable cassettes. Either so-called "two-level" or "three-level" cable stripping can be accomplished with the Vaco unit.

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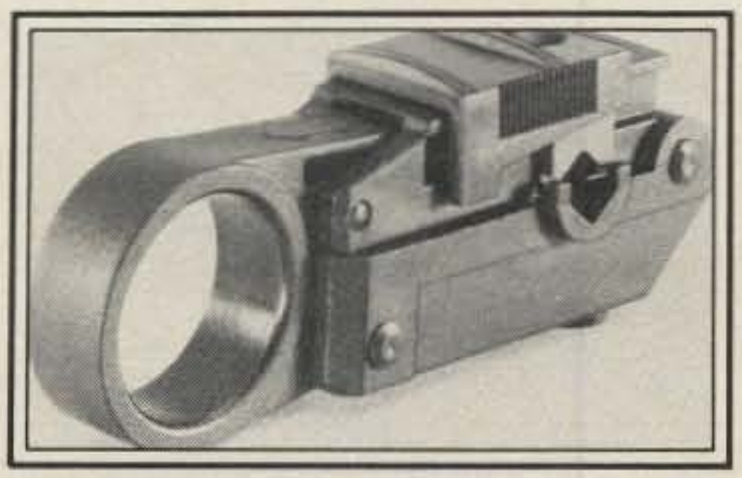


An interesting tool that's come to our attention should be of interest to those who do a great deal of work with coaxial cables. The Vaco coax stripper No. 70374, shown here, is a compact tool that cleanly strips most popular sizes of coax cable quickly, easily, and efficiently. While the device is designed primarily for cable TV applications, the stripping blades can be adjusted for different cutting depths to handle a variety of cables. (Photo courtesy Vaco Products Company)

Priced at about $46, the Vaco stripper is not inexpensive, and it is not suitable for stripping large-diameter cables. However, for many applications it has the potential of being a real timesaver, and some clubs and active antenna experimenters may be able to justify the cost. For more information and a product catalog, contact Vaco Products Company, 1510 Skokie Blvd., Northbrook, IL 60062.

ColAtchCo Antenna Products. Specialty verticals are the "name of the game" with this Massachusetts firm. Heavy-duty 160, 40, and 80 meter verticals and multielement vertical arrays are their stock in trade. Interestingly, the firm was founded in early 1983 by an enthusiastic group of amateurs (including W1CF, W1FC, WA1ZPA, and K1PEK), with the objective of providing specialty antenna systems and key components other than Yagis . . . meaning an emphasis on the lower three h.f. bands.

The firm's products include a series of single-band, quarter-wave verticals for 80 (adaptable to 160) and 40 meter operation. The antennas feature rugged construction; for example, the 57 foot, 80 meter vertical uses several sections of 6061-T6 alloy-drawn aluminum tubing tapering from a diameter of 2 inches down to ⅞ inch, and two sets of insulating guy wires are furnished. All of the verticals are also furnished with a section of galvanized pipe for base support. A weatherproof 160 meter loading coil is available for the 80 meter model, and several new models (42 foot and 61 foot) are stocked for 80/ 160 meter operation.

A family of vertical directional arrays, known as "Instantarrays," is also available from ColAtchCo. These are electronically steerable, phased vertical arrays for 80 and 40 meters, configured in 2- and 4-element versions. According to the manufacturer, the 2-element Instantarray has an approximate 3.0 dB gain over that of a single vertical, while the 4-element array has a 5.5 dB gain. Beamwidth (at the 3 dB down point) for the former is 180 degrees, and for the latter, 90 degrees. Typical front-to-back ratio is 20 dB, with a stated power-handling capability of 2 kw PEP nominal.

The "heart" of the system is the "lobe selector box," which is used to select the lobe for best reception of the desired signal; four LEDs indicate the approximate direction of the selected lobe. A relay box is mounted at the center of the array, and it contains the necessary relays to switch the phases of the two or four radiators to form the desired patterns.

A primary design goal for the Instantarray has been the delivery of equal currents with the desired phasing at the radiator bases over the whole band. A special potted ferrite core, 90-degree phasing device (which, incidentally, looks like a hockey puck) is used in the relay box, and all of the phasing and feed cables are precut to help meet this design objective.

Additional information on these verticals is available from the manufacturer, ColAtchCo., P.O. Box 230, Carlisle, MA 01741. A drawing of the 80 meter vertical is shown in fig. 1, while horizontal polar patterns for the Instantarrays are shown in fig. 2.

Austin Custom Antenna Product Line. A variety of specialized v.h.f. antennas are offered by Richard A. Austin's firm, operating out of Sandown, New Hampshire. Included in the product line is an unusual set of multiband v.h.f. verticals available either in quarter-wave mobile or half-wave fixed station versions. These antennas are available for any multiple bands with 25% or greater separation—for example, 144/220/450 MHz, as well as similar 2-way or 3-way combinations for marine or public-service frequencies.

A novel mobile antenna (the "Omni") features easily changed vertical or horizontal polarization for use with 2 meter multimode rigs: vertical polarization for f.m. work, horizontal for s.s.b. This anten-

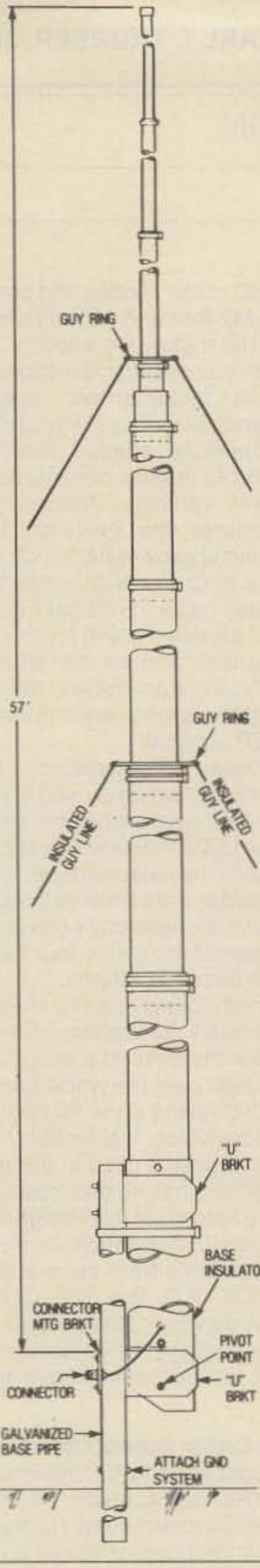
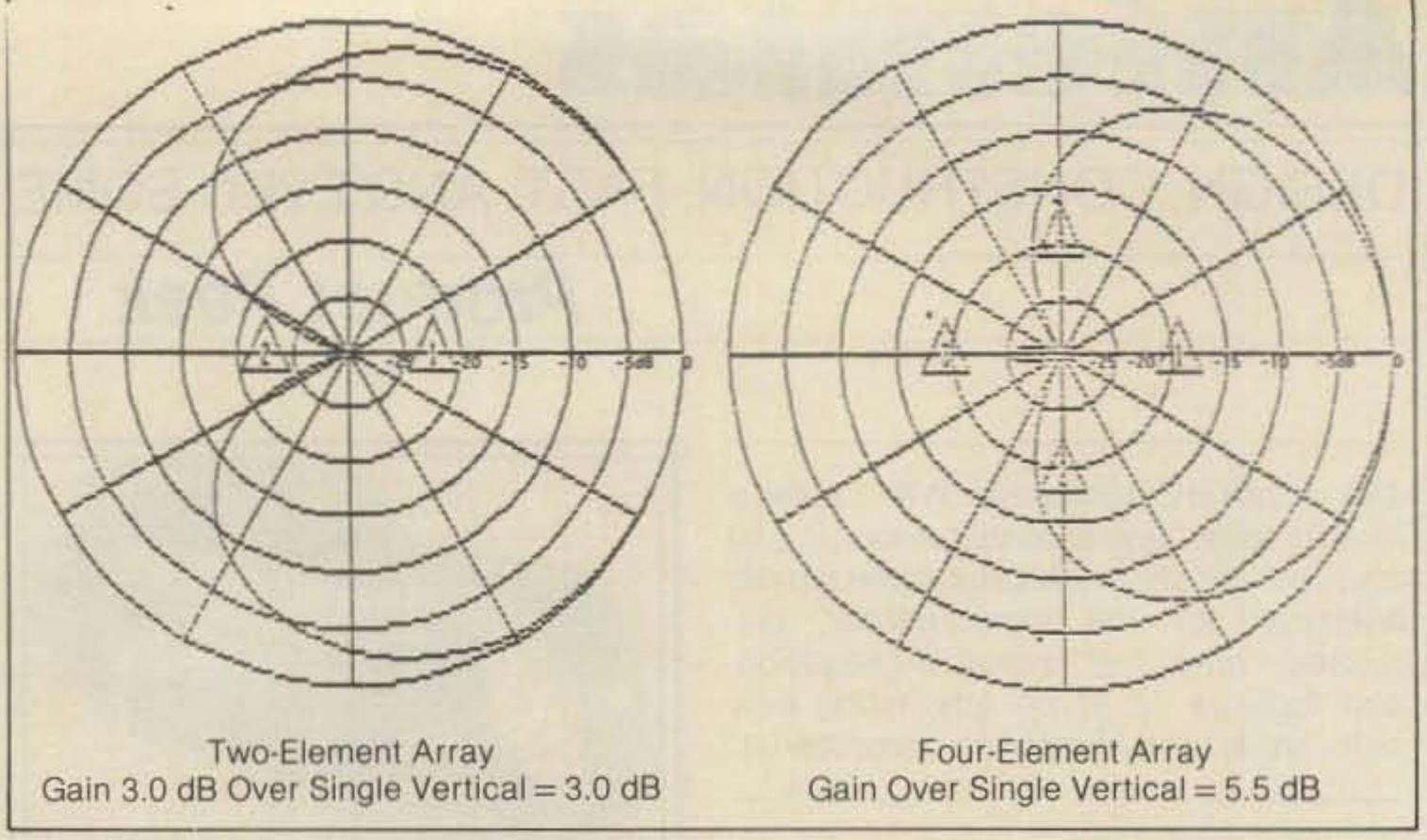


Fig. 1– ColAtchCo 80-meter vertical. According to Dana Atchley, W1CF, the ColAtchCo product line is under constant revision and improvement. While a 57 foot version of the firm's 80 meter vertical is shown here, a newer 61 foot version, very similar in mechanical design, is now available. Another variant is a 42 foot dual-band 80/160 meter vertical with no switching required when changing bands. A 32 foot vertical for 40 meters is also offered. (Source: ColAtchCo product literature.)



Two-Element Array
Gain 3.0 dB Over Single Vertical = 3.0 dB

Four-Element Array
Gain Over Single Vertical = 5.5 dB

Fig. 2– Instantarray horizontal polar patterns of two- and four-element arrays with dB gain shown over a single vertical antenna. In addition to the 80 and 40 meter Instantarrays described in the text, 160 meter arrays are also available in two- and four-element configurations. (Note: Taken from ColAtchCo product literature and instruction manuals. Patterns are theoretical and will vary in practice due to installation conditions.)

The overall utility of many "all-mode" v.h.f. transceivers is reduced by lack of an antenna system enabling dual or switchable polarization tailored to the particular transmission mode in use at a given time—for example, vertical polarization on f.m. and horizontal on s.s.b. Antennas such as Austin's "Omni," with quickly changed polarization, represent a step in the right direction. (Photo courtesy Trio-Kenwood Communications)

na is configured as two half-waves in phase, center-fed through a matching stub and a 4:1 balun to allow 50 ohm coax feed. The matching stub and the balun are contained within the slimline fiberglass mounting shaft, which attaches to most ⅜-24 bumper mounts via a lift-off quick-disconnect adapter, which is furnished. The swiveling half-wave elements are replaceable stainless steel whips. The elements can be folded down and the antenna slipped off the mount and stored in the car's trunk when not in use. Fig. 3 shows a sketch of the Omni mobile antenna.

Several other unusual antennas are offered by Austin, including a double extended Zepp v.h.f. antenna; half-wave, end-fed mobile/maritime verticals; a half-wave, trap-decoupled hand-talkie antenna; and several scanner and maritime antennas. For information on Austin's offerings, contact the firm at P.O. Box 357, Sandown, NH 03873.

"Now Try This"

With tongue only partly in cheek, a note from Cliff Francis, W0MBP, brings word of a handy, compromise field day antenna for the 40, 20, and 15 meter bands. He calls it the "ABBBC Field Day Antenna," the strange name "ABBBC" translating to "Ambidextrous Bobtailed Bi-directional Broadside Curtain"!

While Cliff's name may be on the far-out side, the antenna itself, shown in fig.

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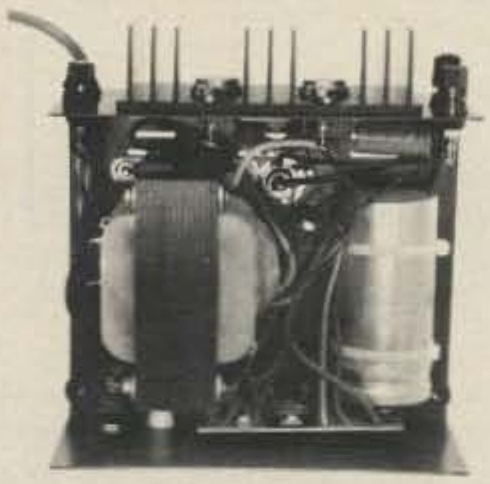

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- RIPPLE: Less than 5mv peak to peak (full load & low line)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

- Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

MODEL VS-20M

- Separate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

MODEL RS-7B

- Matches EF Johnson PPL Radios Available as models.

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7B	5	7	4 x 7½ x 10¾	9
RS-10A	7.5	10	4 x 7½ x 10¾	11

*ICS—Intermittent Communication Service (50% Duty Cycle 5 min. on 5 min. off)

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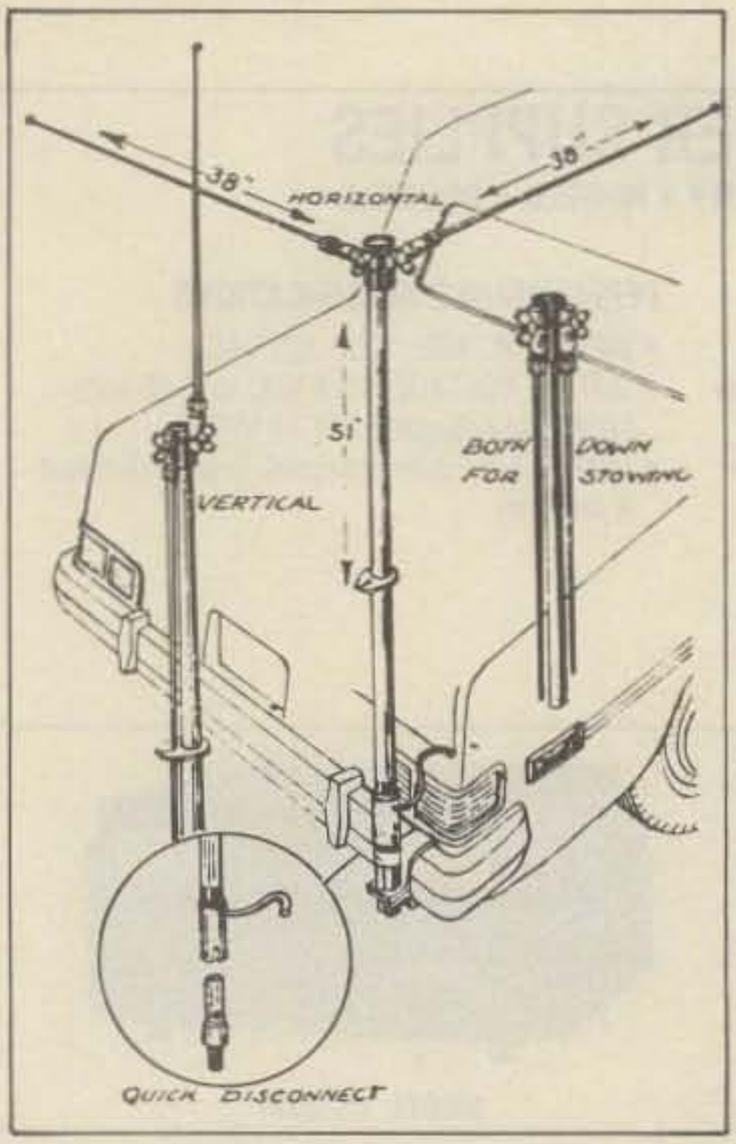

Fig. 3– Austin Omni mobile antenna.

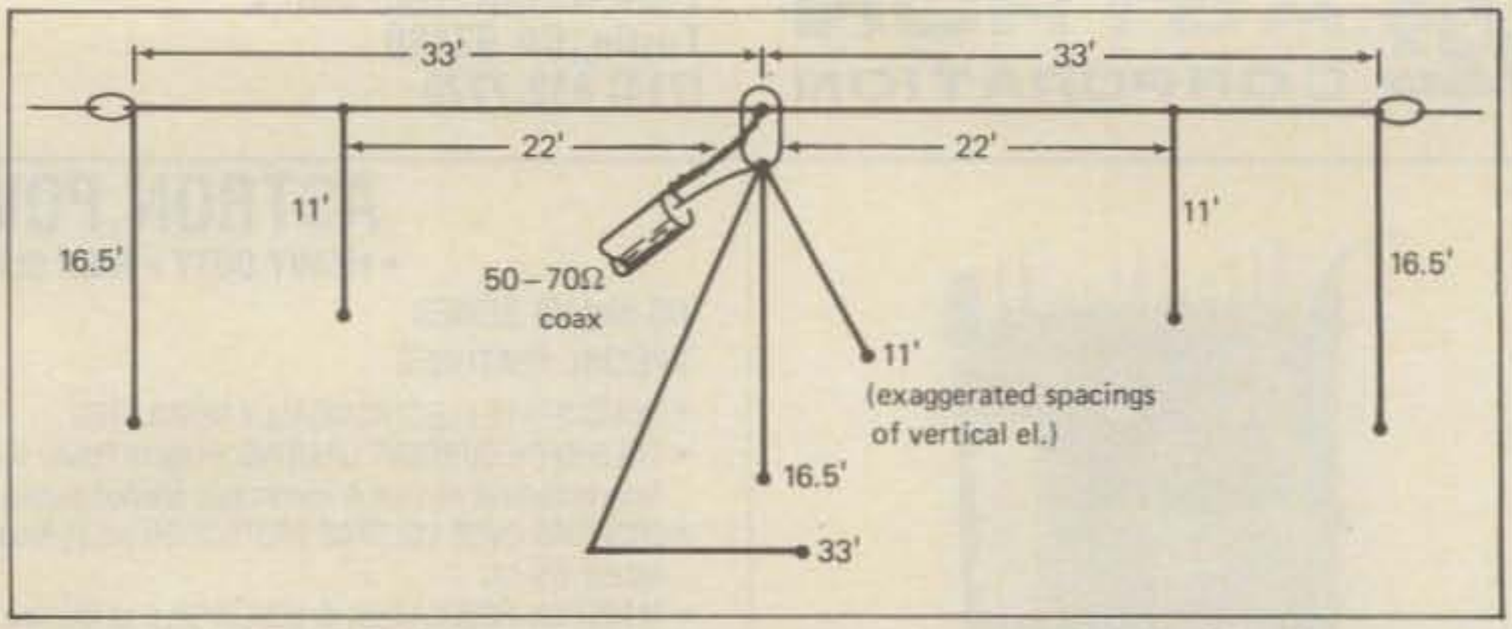

Fig. 4– W0MBP ABBBC Field-Day antenna (experimental) for 40, 20, 15 meters. If beams and towers are "a bit much" for Field Day, here is a simple, compromise antenna for 40, 20, 15 meters, as suggested by Cliff Francis, W0MBP. Cliff points out that the 40 meter vertical portion will resonate on 15 meters, to avoid adding another center radiator of 11 feet to the group, but he doesn't trust the characteristics of the 33 foot radiator if it must be folded due to the low height of the flattop. He adds that stakes are the easiest way to separate the center radiators, although he prefers to keep the flattop as "flat" as possible and the center wires almost vertical. Pruning can easily bring the s.w.r. below 2:1 on 20 and 15 meters, but 40 meters requires some effort if the antenna is below a quarter-wavelength or so on that band such that the 33 foot radiator must be folded. If folded, it is best kept well clear of the ground. Generally, the center radiator can be pruned roughly before Field Day commences, if pole heights are a known factor. Note that in the W0MBP antenna the center conductor of the coax is connected to the vertical radiators and the shield to the flattop. The antenna's name: the "Ambidextrous Bobtailed Bidirectional Broadside Curtain" antenna! So, does the ABBBC work? Cliff stresses that he is an antenna tinkerer, not an engineer, and thus his designs are experimental. With that in mind, cut it long, prune a lot, and see!

4, is not. Requiring only 20–25 feet of height, Cliff points out that even jointed dowel rods will support it. Coax-fed at the center, the ABBBC may or may not require an antenna tuner, depending on installation conditions. The antenna is easily rotated, too, because of the short support poles required. Thus, changing the antenna's directional characteristics should present little difficulty. The 40 meter radiator, representing the longest section, may be folded. However, if this is done, considerable adjustment might be required to achieve matching to coax.

John D. Tuchscherer, an avid tropical band s.w.l.'er and author of articles for various s.w.l. publications, wrote in with some nice words. John advises that "... you would be delighted and surprised to learn how many shortwave listeners and DXers read your column. Any articles on antennas for SW-DXers in future issues of *CQ* will be greatly appreciated." The s.w.l. who tunes the 49, 41, 31, 25, 21, 19, 16, and 13 meter bands has no antenna problems in hearing the big international broadcasters. The problem comes when the listener becomes a DXer and the DX is on 60, 90, and 120 meters, and he doesn't have the 100 to 200 feet needed to put up a half-wave dipole. It's akin to the problem of the amateur who wants to work DX on 75 and 80 meters.

John is apparently space-limited for antennas for low-band DX, and he sent along a sketch of a loaded attic antenna especially for reception of the so-called "tropical" bands. It is shown in fig. 5.

On another quite interesting subject, John also enclosed a copy of an article

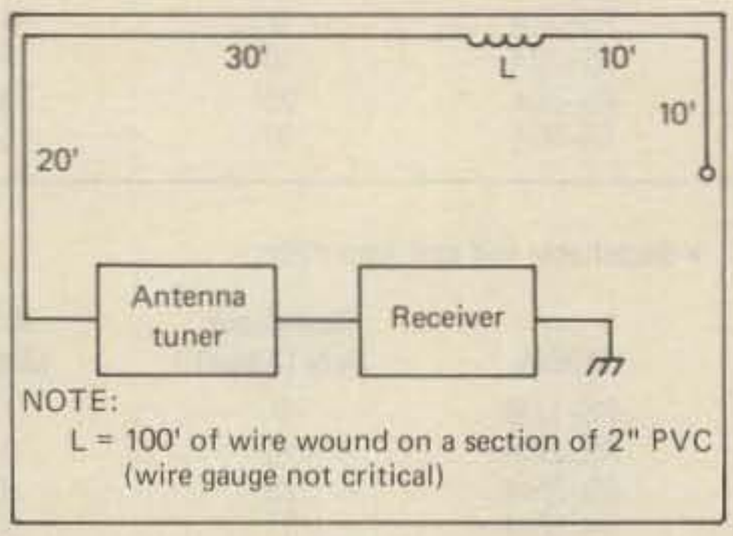

Fig. 5– The Tushscherer attic s.w.l. antenna. Shown above is a simple s.w.l. antenna for cramped-space users, as submitted by John D. Tuchscherer. A "tropical band" specialist, he finds that the antenna is a good performer on the 60, 90, and 120 meter bands.

which he had written, "Gray Line DXing the Tropical Bands," which appeared in the March 1984 issue of *FRENDX*, the monthly bulletin of the North American Shortwave Association (NASWA). This article presents a very practical and simple approach to gray-line DXing that requires only a set of sunset/sunrise tables for the calculations. John advises that an adaptation of the *FRENDX* article will also appear as a chapter of the *DX Listener's Handbook*, published by Universal Electronics, 4555 Groves Rd., Suite 3, Columbus, OH 43232.

For those readers who missed our coverage of gray-line propagation in a previous column (including discussion of the "DX Edge" calculator in the May issue) and are unfamiliar with this specialized aspect of propagation, following is a mini-review.

Observation has shown that enhanced conditions for working DX often occur at sunrise and sunset. The line between day and night is known as the circle of illumination, or terminator; it forms a great-circle path. In reality this path is a band rather than a narrow line, which is known as the "gray line" among s.w.l.'s and amateurs. For practical purposes, the width of the gray line can be a variable that is determined by the user, often arbitrarily set at 15 degrees, which is of sufficient width to determine which countries can be found along this great-circle path. For any location on earth, the gray line is in effect twice each day: once in the morning and once in the evening, each plus or minus "x" minutes from sunrise to sunset. For most applications, a time window of ± ½ hour is adequate to determine which countries can be found, and this window corresponds to the gray-line width of 15 degrees described above.

That signal enhancement frequently occurs along the gray line is primarily caused by the fact that the atmospheric D-layer (which absorbs high-frequency signals) is disappearing at the station which lies on the sunset side of the gray line, while the layer hasn't fully built up on the sunrise side. Note that the condition of approximate sunrise at your location and sunset at the other location (or vice versa) must occur for true gray-line propagation.

Various methods to calculate the gray line have been developed. These include the Dalton method, which involves the

use of a world globe, some tabular information, and several cardboard devices: specially designed slide-rule overlay devices, such as the "DX Edge" described in a previous column; John Tuchscherer's simplified charting method, described in his *FRENDX* article; and by computer (more on computer-assisted gray-line techniques in the next section, Software Notes, below).

Software Notes

Readers of the column may wonder if I realize that there are computers out there other than the Commodore 64! This month we hope to set the record straight with several items of interest to a variety of PC users.

From Cynwyn comes word of "HF Antenna Design," a program for the TRS-80C Color or MC-10 Micro Color Computer. According to the manufacturer, the program provides the required calculations for building three popular h.f. antenna types (dipoles, Yagis, and quads) and displaying the calculations in tabular format. Yagi and quad dimensions are optimized for maximum gain.

The "HF Antenna Design" program requires a TRS-80C Color Computer with 16K RAM and Extended Color Basic, or an MC-10 Micro Color Computer with 4K RAM. The program is available for $10 plus $1 shipping and handling from Cynwyn, 4791 Broadway, Suite 2F, New York, NY 10034.

Also of interest to the Color Computer user is "COCOINDX," the Color Computer Article Index, offered by Dean Norris of COCOINDX, P.O. Box 23654, Tempe, AZ 85282. The $19.95 index is a comprehensive listing of articles, stories, equipment reviews, and other items of interest to the "COCO" owner. The book is sectioned by year and sorted in two ways. The first sort is by date, with secondary field sorts of date and magazine name and page number; this is essentially an "index of indices." The second sort is by article type, with secondary field sorts of date and magazine. Using this sort makes it easy to find an article referencing a particular idea you might have in mind. Coverage of amateur radio magazine articles is provided, including those from *CQ*.

For the Apple-equipped hamshack comes word from Van Brollini, NS6N, of a set of DXer and contester-oriented propagation programs, DX-1 and DX-2. These disk-based programs, priced at $39.95 and $19.95, respectively, are for either the Apple II or Apple IIe computers with 64K; a printer is optional but desirable. (The only difference between the DX-1 and DX-2 programs is that the latter does not calculate the gray line, so we'll discuss the former program from here on.)

The DX-1 is a comprehensive propagation program that has a variety of possible "outputs." These include the display of the user's sunrise/sunset times, as well as that of the target's (distant

```
SEP 15

                                        PATH
      LAT     LONG                   SHORT  LONG
BASE  32:29   086:19    DIST          6833 14767
                        HEAD           169   349
TARGET NAME  :GENERAL BELGRANO STATION
TARGET PREFIX: LU

          SUNRISE  SUNSET
BASE      11:28    23:54    GEO-MAG   12
TGT-AVE   09:01    19:30    10.7cm    128
TGT-MIN   09:01    19:30    SUNSPOT   80
TGT-MAX   09:01    19:30    Q-FACT    5.5

      MAXIMUM USEABLE FREQUENCY
00   9.3 05  7.6 10 10.8 15 18.3 20 17.2
01   8.8 06  7.4 11 11.2 16 18.4 21 16.4
02   8.4 07  7.3 12 14.3 17 18.4 22 15.2
03   8.1 08  7.2 13 16.6 18 18.2 23 13.4
04   7.8 09 11.4 14 18.1 19 17.8 24  9.3

   FREQUENCY OF OPTIMUM TRANSMISSION
00   7.9 05  6.5 10  9.2 15 15.6 20 14.6
01   7.5 06  6.3 11  9.5 16 15.7 21 13.9
02   7.2 07  6.2 12 12.1 17 15.6 22 12.9
03   6.9 08  6.1 13 14.1 18 15.5 23 11.4
04   6.6 09  9.7 14 15.4 19 15.1 24  7.9
```

Fig. 6– Sample DX-1 program screen printout. See accompanying text for description of various factors provided by the DX-1 program. This computer program is designed for use with the Apple II and IIe computers.

```
JUN, 23 SUNSET GREY COUNTRIES

Base latitude is  032:29.  Sunset is at   00:56.
The longitude is  086:19.  Greyline Headings are 208/28.
Sunrise is at    10:38.    Greyline width of  0.00 degrees.

 COUNTRY                  PREFIX    SS/SR  DISTANCE  HEADING
ALABAMA                    W5-AL     SS         29      180
DENMARK                    OZ        SR      17621      217
ESTONIA                    UR2       SR      17231      210
EUROPEAN R.S.F.S.R.        UA2       SR      16303      212
FINLAND                    OH        SR      17421      206
GEORGIA                    W4-GA     SS        121       75
GREENLAND                  OX-XP     SS       2789       18
ICELAND                    TF        SS       3095       30
IRAN                       EP        SR      15333      214
KENTUCKY                   W4-KY     SS        275       10
LABRADOR                   VO2       SS       1647       31
MEXICO                     XE        SS       1085      234
MISSISSIPPI                W5-MS     SS        140      259
NEW YORK                   W2-NY     SS        842       38
NORTH CAROLINA             W4-NC     SS        432       59
NORWAY                     LA        SR      17784      212
OHIO                       W8-OH     SS        478       19
ONTARIO                    VE3       SS        994        4
PAKISTAN                   AP        SR      14826      204
PENNSYLVANIA               W3-PA     SS        663       37
QUEBEC                     VE2       SS       1288       21
SWEDEN                     SK        SR      17557      210
TENNESEE                   W4-TN     SS        211        0
TURKOMAN                   UH8       SR      15542      208
VIRGINIA                   W4-VA     SS        421       37
```

Fig. 7– Sample DX-1 gray-line printout. This chart shows a sample sunset gray-line data printout for June 23, based on the author's QTH, generated by the DX Enterprises DX-1 computer program for the Apple computer. Many locations that cannot readily be identified by mechanical means can easily be found using computer-assisted techniques.

Crumtronics Contender's "Operational Menu" offers several functional choices, all described in detail in the software package's user's manual. Menu-driven program offers extensive capabilities and can be used with a variety of printers and either one or two disk drives. (W8FX photo)

Initial screen display and main menu of the Contender Plus II, described in the text, is shown here. Program makes extensive use of the Commodore 64's function keys. (W8FX photo)

station's) sunrise/sunset times. Other program outputs include display of the long- and short-path beam headings and great-circle distances; sunspot number; Maximum Usable Frequency (MUF); Frequency of Optimum Transmission (or Traffic, FOT); and the sunrise and sunset gray-line data. In conjunction with the sunspot number display, the program also provides a "quality factor" estimate for the QSO path, which is an empirical means to describe the projected quality of a QSO—for example, 0.9 being "poor" and 9.0 being "good." The user inputs the various information the program requires, such as date; base (user) location; name or location of target country, state, or province; 10.7 cm solar flux; and desired gray-line width to be calculated. Gray-line and screen information can be directed to a printer, if one is available.

Since we're not equipped with an Ap-

ple computer, we were not able to put NS6N's programs through their paces in our hamshack. However, we were impressed with the professionally prepared instructional and tutorial material which was contained in the owner's manual, and with the detailed kinds of output data that the program provides to serious DX-ers and contesters. More information is available from Van Brollini, NS6N, DX Enterprises, 5861 Bridle Way, San Jose, CA 95123.

A sample DX-1 screen printout for an assumed Sept. 15 path from my QTH to Argentina is shown in fig. 6. A sample June 23 sunset gray-line printout based on the W8FX QTH is depicted in fig. 7 for a gray-line heading of 208/28 degrees and a gray-line width of 0 degrees.

Postscript: Before we leave the subject of gray-line propagation, a tip o'the hat is in order for Van Brollini and John D. Tuchscherer for the background information on the gray-line phenomenon which they provided in preparing this month's column.

Over the past year or so that we have been including notes on hamshack software in the column, we have had the opportunity to review several dozen amateur radio programs, mostly those for Commodore computers (PET, Commodore 64, and Vic-20). As one might expect, hamshack software is largely the product of a "cottage industry" of enterprising and enthusiastic amateurs and as might be expected, the quality of software varies all over the lot. It's a pleasure to try out good amateur software, especially for the 64. Several excellent, professionally written offerings are provided by George W. Crummie, KA9DAH, of Crumtronics, P.O. Box 6187, Ft. Wayne, IN 46896.

KA9DAH's "Contender" series of logging programs for the Commodore 64 makes use of fast-access disk "relative files"; most logging programs use fairly slow-access sequential file data storage. The Contender series is available in three menu-driven versions: the Contender, Contender Plus, and Contender Plus II. Features of all programs of the series include 2000 log entries per single-sided disk; several automatic logging features; editing/update; forward/reverse scan; and log review and printout. The programs also include dupe sheet, QSL card, and QSL label printout features. The Contender Plus II, for example, also offers additional features such as Worked All States (WAS) and DX Century Club (DXCC) summaries and reports, as well as a dual disk drive option. All versions are provided with a comprehensive and well-written user's manual which includes a large number of simulated screen printouts.

The Contender series is priced at $34.95 for the Contender Plus II, $29.95 for the Contender Plus, and $19.95 for the Contender. According to KA9DAH, the latter two programs produce data which is compatible with the Contender Plus II, and upgrades are available.

In a previous column we mentioned two very useful Commodore 64 programs by Eugene Morgan, WB7RLX: "Antenna Design" and "Prefix Locator and MUF Forecaster," both distributed by RAK Electronics, P.O. Box 1585, Orange Park, FL 32067. We noted the high quality of Eugene's programs in the column, and recently we were advised by him that new versions of both programs are now available which correct minor errors and bugs and which incorporate suggestions from readers. Eugene also sent me an updated version of the latter program which now features a very useful sunrise/sunset calculation routine helpful in gray-line DXing, which we discussed earlier.

WB7RLX also sent us a review copy of his newest creation, "Ham Log for the Commodore 64." The program includes a number of "real time" features, including two clocks (UTC and local) and a user alarm; automatic time logging; user-definable preset values (date, mode, RST, etc.); various log search functions; log updating; hardcopy printout; and saving to disk or tape. A professionally prepared, 16-page user's manual is provided. In addition, a nice machine-language "boot" loader for the "Ham Log" program is provided on the disk, which can be used independently as a handy disk menu generator and utility program loader. For more information, contact Eugene Morgan, WB7RLX, 1311 Cross Street, Ogden, UT 84404.

Wrap-Up

More "product peek" next month. This time we surveyed some new and interesting products from ColAtchCo, Austin Custom Antenna, and Vaco Products. We've shared two simple antenna ideas submitted by readers, and presented some notes on gray-line propagation and computer software for the Apple, Color Computer, and Commodore 64. Join us next month. See you then.

73, Karl, W8FX

Ticket Talk

BY DICK BASH*, KL7IHP

Welcome to the November installment of "Ticket Talk," a column devoted to answering questions you may have about the amateur radio licensing structure. If you still have questions, please write to me *c/o CQ* or at the address shown below. A reply will be sent to those enclosing a self-addressed, stamped envelope. If you can't wait for an answer, call me at (415) 278-8275 between 10 a.m. and 6 p.m. California time Monday through Friday, or call your local FCC Field Office.

So Long, FCC!

November is upon us, and with the fall of the year we witness the demise of the FCC as far as amateur radio examinations are concerned. From December on, until something significant changes, *all* amateur tests above Novice will be conducted by a volunteer examining team consisting primarily of three Extra class licensees. The exception to the three Extras rule occurs when the examining team is giving a 5 w.p.m. code test and/or written test for the Technician class license level. Then up to two of the three examiners may hold an Advanced class license. Since the majority of the exams will be for the 13 or 20 w.p.m. code test or the Advanced or Extra class written tests, the teams will have to be made up of three Extras. Whether the volunteer program will work or not is something only time will tell. Hopefully, the volunteer examiner coordinators (VEC's) who are in charge of the exam teams will have the problems with the existing program cleared up soon so that amateurs can expect a reasonable frequency of exams.

Testing By Appointment

At this time the exam schedules by the VEC's are not good, but hopefully they will get better. Should you ever meet the VEC for your area, ask him/her to have the exams conducted at least every two weeks in those towns with a population greater than, say, 500,000 people. The exams are usually by appointment. Tell your VEC that you would prefer that he/she set up the program so that you could just walk in and take an exam and not have to make an appointment 30–45 days in advance. Also, ask the VEC to allow for "standby" status during the exams if an appointment *must* be made. The airlines have it! That way if someone who scheduled doesn't show up, then a standby can take the test. Better yet, remove this aspect of having to make an appointment ahead of time.

What To Study?

At the time of this writing (September 4, 1984) no publisher (including our company) has a manual out that will get you by the Advanced or Extra written test. Ameco does have a little guide to help with the General/Technician written, but the ARRL and our company do not yet.

Getting the Actual Questions

You may obtain a copy of the 500 questions being asked on the General (PR Bulletin 1035 B) or Advanced (PR Bulletin 1035 C) exam or the 400 questions being asked on the Extra (PR Bulletin 1035 D) by writing to the FCC in Washington and requesting the appropriate PR Bulletin. The FCC will *not* furnish you with the correct answers, however. They are leaving that work to the publishers to come up with (which is why it's taking everyone so long to publish their test guides). Request the PR Bulletins from the FCC (FCC, Private Radio Bureau, Washington, D.C. 20554).

The new ARRL License Manual (colored green) is *not* designed for helping pass the volunteer exams, although it *has* to help a little. One book that does help is *Amateur Radio—Theory & Practice* by Robert L. Shrader, W6BNB (McGraw-Hill). The ARRL's *Handbook* will also help. A current copy of Part 97 is a *must!* Because of the lack of materials designed to help pass the new volunteer exams, you should probably wait until the various publishers have something ready.

Will the New Manuals Work?

Ah, that's the real question, isn't it? I'm not sure, for a couple of reasons. For example, if you studied one company's manual and then ended up taking an ARRL sponsored exam, it might hurt you because there are *no standardized* answers to the FCC's questions available. Conversely, if you studied the ARRL materials and took a volunteer exam with a team who was not operating under the ARRL as VEC, the same thing could occur. I blame the FCC for this. What one company feels the right answer should be may not be the answer that the person who wrote the actual test (meaning the VEC) had in mind. More important, there already have been numerous cases of

*Bash Educational Services, Inc., P.O. Box 2115, San Leandro, CA 94577

wrong answers showing up as the "programmed" right answer. The FCC appears to have just approved the questions they received, and it seems as if no one at the FCC read them. Many of the questions are technically incorrect or based on a misunderstanding of Part 97 of the FCC Rules.

Everyone wants to be studying the right stuff before taking the test. All the publishers want you to buy their products. Also, all of the major publishers want their materials to be up to date. We have a problem there. The FCC has published a schedule of dates they are going to follow to *change* the questions in the various PR Bulletins. That's part of the reason why there aren't materials out there now. What publisher in his right mind would want to publish something and immediately have to do a revision? No one who is in amateur radio publishing! So, if you can, wait until the various publishers get their material ready.

What Tests Do I Take NOW?

The tests to take *now* with a volunteer examining team are the various Morse code tests! From what I personally have seen, the volunteers are giving reasonable code tests, and they all seem to be a simple, ordinary QSO at the prescribed speed. Watch out for abbreviations such as *FER* for *for*, *ES* for *and*, *RCVR* for *receiver*, *WX* for *weather*, *GUD* for *good*, etc. Copy the test character for character. Don't read what you're writing. Be sure to ask the examiners if their code test tape complies with FCC Recommendation R. 140. If it does not, politely suggest to them that they meet these standards. They may not even know about the standards!

When the code is finished, you are asked 10 questions about the material. If you get 7 or more correct, you pass. If you miss more than 3, you fail.

We're All Growing Older

An interesting statistic: every year that goes by results in the average age of the amateur radio operator in the U.S. going up by about one year. Why? We aren't getting young folks (12–19) interested in this hobby. Why? They're out there playing with computers, etc. If you know of a youngster, get him/her interested in the Novice program. All the publishers have material out for the Novice class license. A person who gets into amateur radio at a young age is very likely to end up in a technical or engineering field, and the U.S. and all the rest of the world can use all those engineers to build a better world (besides possibly designing some neat amateur gear!).

That's it for this month. Thanks for reading the column! Hope you have a great Thanksgiving, but don't overeat! See you in December.

73 de KL7IHP

CQ REVIEWS:

BY LEW MCCOY*, W1ICP

The Kantronics Interface II and Hamsoft

Here is the Interface II. The controls are explained in the text.

Many years ago I was given the assignment of building a terminal unit for RTTY for use in the *Radio Amateur's Handbook*. I knew little, if anything (and not much more now), about RTTY. I do remember the problems I had with filters, display devices, power supplies, the tubes used, and so on. The unit was built primarily for the *Handbook*, but it also put in years of service at W1AW. Looking back at that project and what is available these days with solid-state, computers, and software, it is like comparing the stone age to modern times. Kantronics with their Interface II and its marriage to computers is what I call modern times.

The Interface II is a terminal unit that is used to interface between a transceiver and a computer. It can be used in the reception and transmission of c.w., RTTY, ASCII, and AMTOR. In my tests for this review I used an ICOM 745 transceiver and a Commodore VIC-20 computer. The software/firmware is a plug-in module. The one I tested fits into the VIC-20. The module is called *Hamsoft*.

The Interface II measures 2½ inches high, 6 inches wide, and 6 inches deep, so it is small enough to fit anywhere in your station. There are a series of pushbutton switches across the bottom front. The **Shift** switch puts you in either the **CW** mode, **170 Hz** RTTY shift, **425 Hz** shift, or **850 Hz** shift. The next switch is the **FM/AM** switch, which alters the sensitivity of the unit, the **FM** position being more sensitive, as an audio input of only 2 mV RMS is required. The **AM** position requires 7 mV RMS, and this position permits you to ignore low-level noise when monitoring a signal. Next, there is a channel-selector switch which permits you to use Channel **A** or **B**. The Interface II is designed to be used with two different transceivers at the same time, if desired, and hence the two channels.

Above the switches is a bar/graph tuning indicator incorporating a green, 10-segment LED. The **MARK** indicator is on the far left, and the **SPACE** is at the far right. I found this indicator to be an excellent tuning device, plus it is really needed when tuning in either a c.w. or RTTY signal.

It takes a little getting use to tuning in c.w. signals. The filter for c.w. operation is 765 Hz with only an 85 Hz bandwidth, so that means "tight" tuning. It takes a little time in the cockpit to master the tuning technique for c.w. However, tuning in RTTY signals is very easy. All you have to do is get the bar segment on the far left lit solid and then the one on the right—bingo! You are copying RTTY.

The unit I had came with a cable made to plug directly into the VIC-20. Another cable provided goes from a jack on the rear of the interface to the microphone jack of your transceiver. One line is the **AFSK OUT**, which carries the AFSK tones generated by the Interface II to the audio in-line of the transceiver. The other important line is the **PUSH-TO-TALK** line, which also goes to the microphone jack, and this allows the computer to control the transceiver between transmit and receive. There are also oscilloscope MARK and SPACE connections if a scope is desired.

In addition, there are connections on the back of the Interface II for an external speaker. **KEY IN** and **KEY OUT** jacks are also available for a key input, and the KEY OUT carries the keyed signal to the transmitter.

Circuit Description

Fig. 1 is a block diagram of the Interface II, and fig. 2 is the circuit diagram. The heavier lines in fig. 1 denote the signal path through the Interface II. The received signal is fed to a gain stage and thence to two prelimiter filters. The 170 Hz shift filter is used for all 170 Hz shift activity plus c.w. signal filtering. The 850 Hz shift filter is used for both 450 Hz and 850 Hz shift RTTY inputs. Both filters are derived from switched-capacitance devices and are stagger-tuned Butterworth circuit configurations. The 170 Hz unit has a bandwidth of 260 Hz, while the 850 Hz unit is set for 100 Hz. These switched-capacitance filters are controlled by a crystal-derived clock, giving them superior stability and precision.

Two-pole switched-capacitance filters are used for the detection of the MARK and SPACE tones. In the RTTY mode the MARK filter center frequency is fixed, and the SPACE filter center frequency is set by the shift-select circuitry. The filters, just as the prelimiter filters, are driven by a crystal-based clock, giving them excellent stability. The output is available for driving the X-Y display on a scope.

The Automatic Threshold Correcting (ATC)

*200 Idaho St., Silver City, NM 88061

ICOM

HF Equipment	Regular	SALE
IC-740* 9-band 200w PEP xcvr w/mic	$1099.00	899.95

***FREE PS-740 Internal Power Supply &**
$50 Factory Rebate - until gone!

PS-740 Internal power supply	159.00	149.95
*EX-241 Marker unit	20.00	
*EX-242 FM unit	39.00	
*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	
Options also for IC-745 listed below		
IC-730 8-band 200w PEP xcvr w/mic	$829.00	569.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	$1349.00	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	$999.00	769.95
PS-35 Internal power supply	160.00	144.95
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

**See IC-740 list above for other options (*)*

IC-751 9-band xcvr/.1-30 MHz rcvr	$1399.00	1199
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
Options: 720/730/740/745/751	Regular	SALE
PS-15 20A external power supply	$149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	233.95
OPC Optional cord, specify 2 or 4-pin	5.50	
GC-4 World clock	99.95	94.95
HF linear amplifier	Regular	SALE
IC-2KL w/ps 160-15m solid state amp	1795.00	1299
VHF/UHF base multi-modes	Regular	SALE
IC-251A* 2m FM/SSB/CW transceiver	$749.00	549.95

***$50 Factory Rebate - until gone!**

IC-551D 80 Watt 6m transceiver	$699.00	599.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	799.95
PS-35 Internal power supply	160.00	144.95
PS-15 external power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 PS-15/CF-1 fan adaptor	6.50	
AG-25 Mast mtd. GaSFET preamp	84.95	
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	989.95
PS-35 Internal power supply	160.00	144.95
PS-15 20A power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 PS-15/CF-1 fan adaptor	6.50	
AG-35 Mast mounted preamp	TBA	
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	619.95
PS-25 Internal power supply	99.00	89.95
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted 15dB preamp	89.00	
PS-25 Internal power supply	99.00	89.95
Common accessories for 271A/H and 471A/H		
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	
VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	489.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-22U 10w 2m FM non-digital xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-27A Compact 25w 2m FM w/TTP mic	369.00	329.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	369.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	399.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
ML-12 10w amplifier	TBA	
6m portable	Regular	SALE
IC-505 3/10w 6m port. SSB/CW xcvr	$449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
SP-4 Remote speaker	24.95	

Hand-held Transceivers		
Deluxe models	**Regular**	**SALE**
IC-02AT for 2m	349.00	299.95
IC-04AT for 440 MHz	379.00	339.95
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 800mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-60 Six position gang charger - all batts	TBA
BC-16U Wall charger - BP7/BP8	10.00
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 ⅝-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-02AT Leather case for deluxe models	39.95
LC-2AT Leather case for standard models	34.95
LC-11 Vinyl case for standard models	17.95
LC-14 Vinyl case for Deluxe models	17.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 (dlx only)	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE 79.95
ML-25 2m 2.3w in 20w out amplifier	SALE 179.95
SS-32M Commspec 32-tone encoder	29.95

Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	689.95
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	599.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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CIRCLE 143 ON READER SERVICE CARD

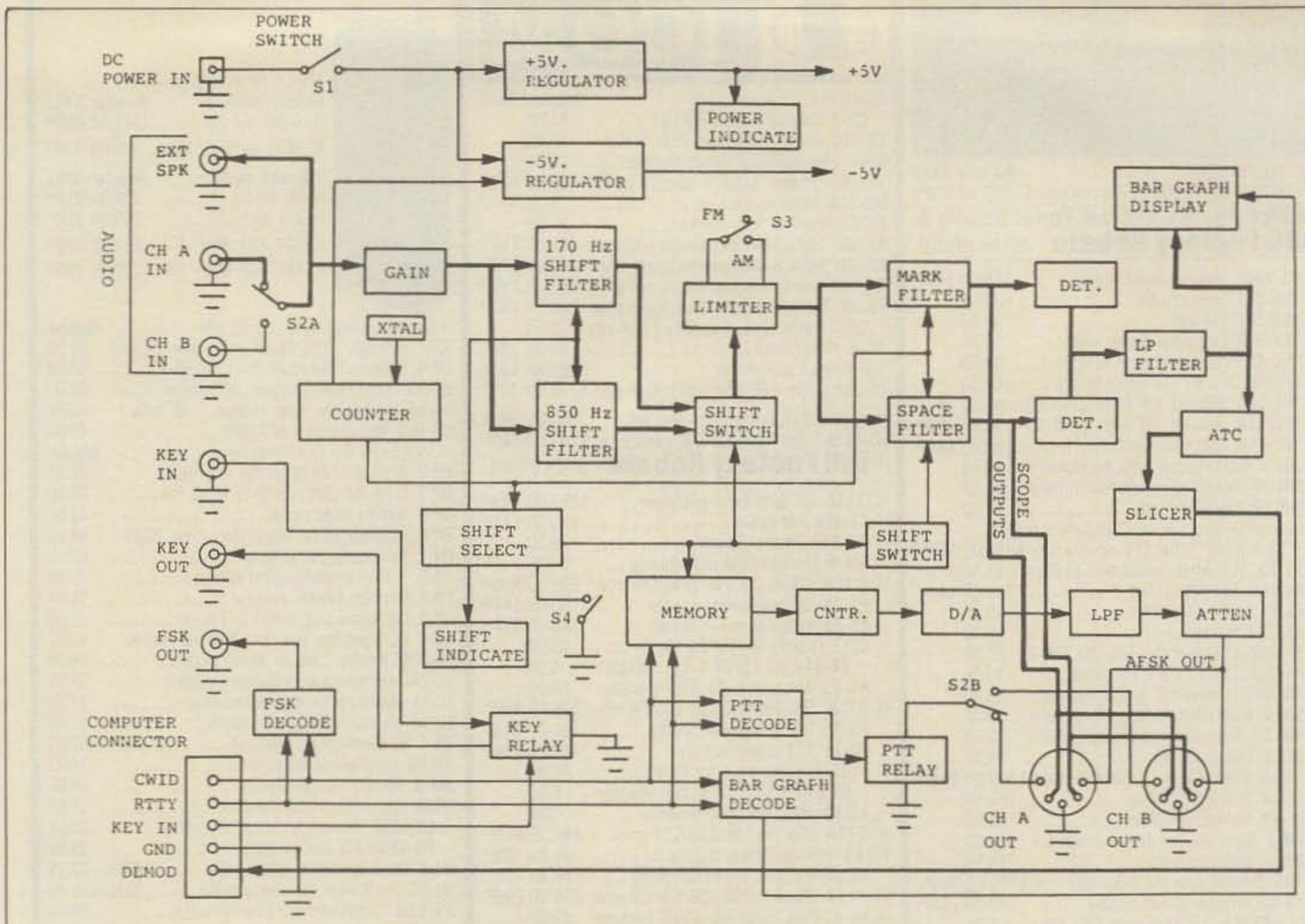


Fig. 1– This is a block diagram of the Interface II showing signal paths.

circuit acts as a d.c. restorer to correct imbalance originating in signals coming from the detectors. Such imbalance can result from selective fading, loss of MARK or SPACE, and interfering signals. By rebalancing the signal, proper symmetry of the MARK and SPACE voltages can be maintained for the next circuit, the slicer. The ATC output is fed to the slicer, a high-gain limiting amplifier or comparator, to convert the signal to digital (TTL).

The AFSK generator—shown in fig. 1 as D/A, LPF, and ATTEN—produces all the MARK and SPACE tones for RTTY or ASCII transmissions. An EPROM memory is used to catalog the necessary count-down sequences for a large number of transmit frequencies.

The generator produces tones by running the counter at specific rates. The counter is preset to a specific count by the contents from the EPROM for each tone set. Output of the counter drives a ring counter D/A converter combination, which in turn generates a five-level synthesized sine wave. The sine wave is then processed by a two-pole filter to smooth it, creating a low-distortion tone. Filter gain is attenuated to present a sine wave of 35 mV RMS to the transmitter.

Hamsoft, The Software

Hamsoft is available for several different computers, and I used the version designed for the VIC-20. The software has many features. It enables the computer to send and receive Morse code from 5 to 99 words per minute and radioteletype at 60, 67, 75, and 100 words per minute. ASCII send and receive at 110 and 300 baud is provided. A split-video screen display can be used. The software provides for a 1024-character transmit buffer. Automatic Morse speed tracking is used. Also, the software has CW-ID during RTTY/ASCII transmissions. There are 10 programmable message ports. And last, the software has printer compatibility for the Centronics parallel or VIC serial.

Kantronics has Hamsoft available for the VIC-20, TRS-80 color computer, several models of the Atari, some of the Apple units, and the TI-94. Hamsoft for the VIC-20 is $49.95 list.

Once you bring up your computer system with Hamsoft, the video display will show a choice of **M** (Morse), **R** (RTTY), **A** (ASCII), **T** (Time), and **P** (Message ports). Press the appropriate letter and you are then in that mode. The message ports allow you to program up to ten different messages which can be transmitted at a single command.

Selecting one of the modes, such as **M** for Morse, will bring up a split screen. The lower portion of the screen prints the received signal, and the upper shows your type-ahead buffer. At the top portion of the screen is a status display giving the time of day and the send/receive speeds. The various functions can be changed by pressing appropriate keyboard keys.

Using the System

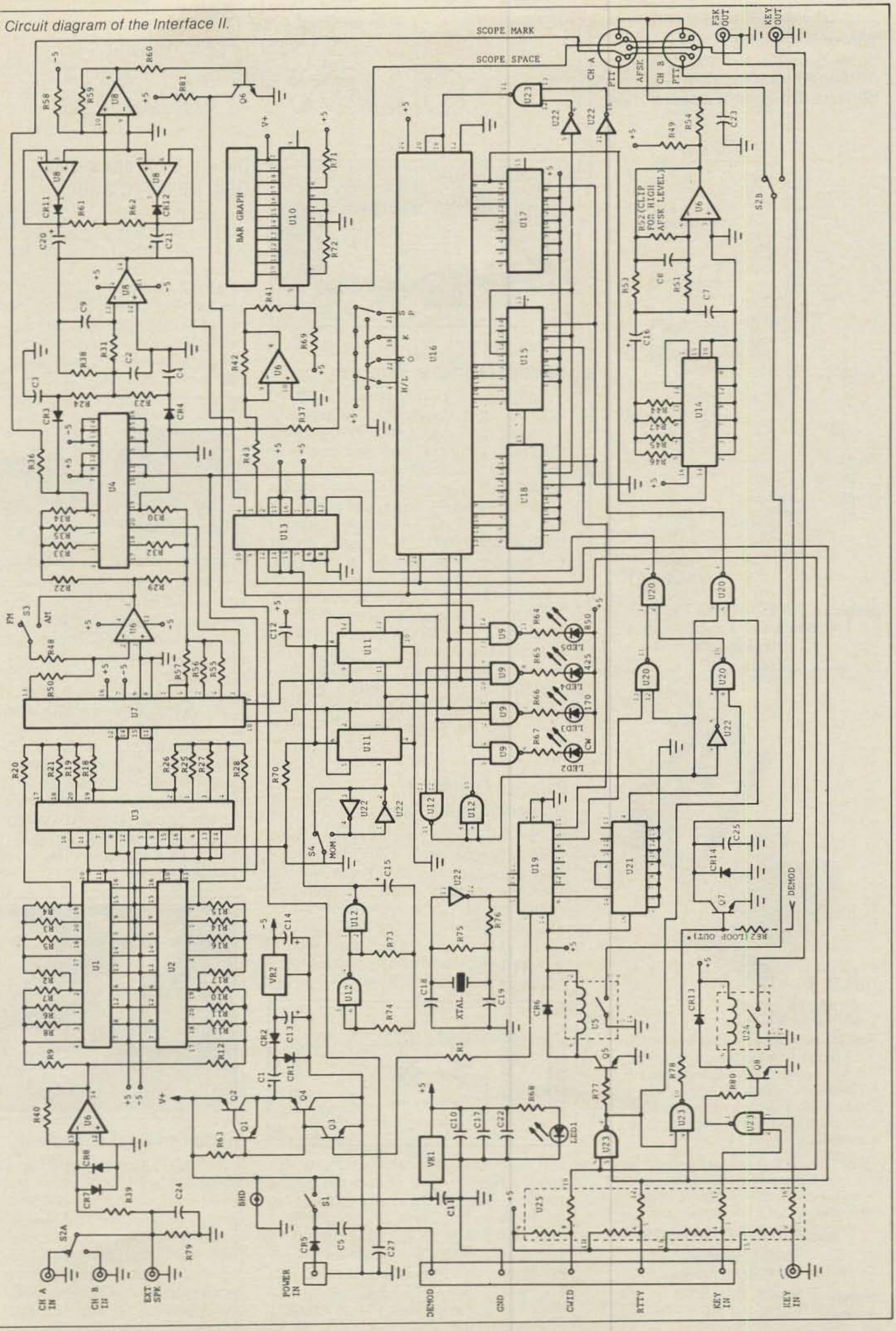
Anyone who does much c.w. work knows that there are plenty of arguments going on about computer-generated c.w. versus older methods. Of course, amateurs like to argue, just as they did over spark versus c.w. and single-sideband versus a.m. For myself, I am a "modern" dinosaur. I went from a straight key to a bug and stopped there until keyboards and computer-generated code came along. Many amateurs swear by electronic keyers, and many of those same people blast computer users. In such a case, I think the pot is calling the kettle black, because if you use a keyer that makes exact spacing and self-completing dots and dashes, what's the difference between that and a computer doing the job? To me it is just another step on the road called *progress.*

With this setup I found it very easy to tune in c.w. signals, including both good and bad fists. The computer and software do an excellent job of translating the code to readable text. I have another computer that I use for word processing, and with that system I also have VOTRAX, which reads the video display and then speaks out what it reads via a speaker. It would be no problem at all to use such a system along with Hamsoft to have code translated to voice! I guess we have come full circle in amateur radio when we can transmit with c.w. and have it received by voice. Where are the phone-c.w. wars of yesteryear?

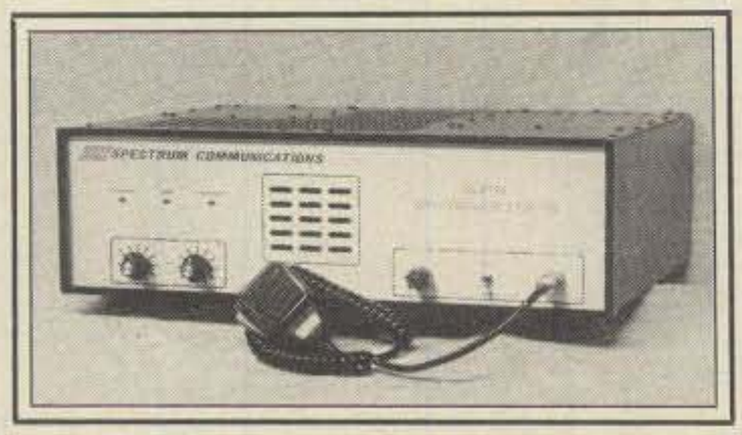
Copying RTTY and the other modes is also extremely easy using the Interface II and Hamsoft. I made many contacts with the system and would rate it as being very good. The instruction manual is adequate, but I feel it could be a little more detailed, particularly for one who is a newcomer to RTTY. I would suggest studying other literature on operating techniques, use of the different modes, and explanations of terms.

The Interface II is priced at $269 list and is manufactured by Kantronics, 1202 East 23rd St., Lawrence, KS 66044 (phone 913-842-7745). CQ

Fig. 2– Circuit diagram of the Interface II.



CQ SHOWCASE

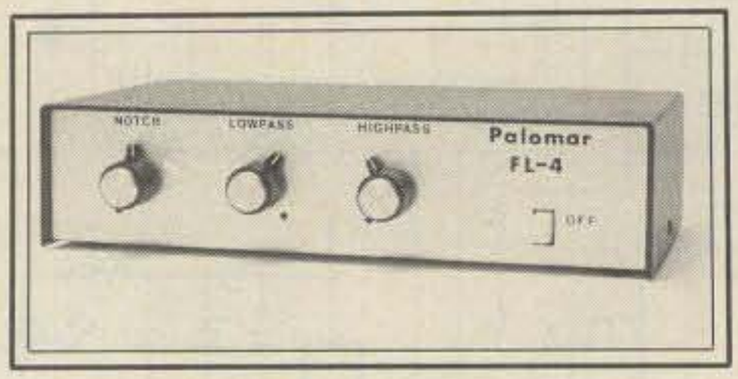


Spectrum SCR77D Desktop/Portable Repeater

Spectrum Communications' SCR77D is a new "desktop/portable" repeater. Its compact, low-power configuration makes it suited for "local" use (within a 0–20 mile radius, depending on antenna and terrain). It may be used at a fixed location, or portable/mobile. Autopatch and PL are available "built in." AC power supply is built in, plus jacks for 12 v.d.c. power. Full-duplex base-station applications, such as computer data links or export "rural telephone," are also possible with the SCR77D. Standard models include 10 watt u.h.f. unit with built-in duplexer and a 15 watt v.h.f. unit with external duplexer. For more information, contact Spectrum Communications Corp., 1055 W. Germantown Pk., Norristown, PA 19401-9616, or circle number 104 on the reader service card.

Palomar Engineers Universal Audio Filter

Palomar Engineers has announced a new universal audio filter. The Model FL-4 is for s.s.b./c.w./RTTY and features switched capacitor filters. A 10-pole low-pass and an 8-pole high-pass can be moved anywhere in the 200–3500 Hz range to form a sharp bandpass filter at any frequency and of any bandwidth. A notch filter is also included.

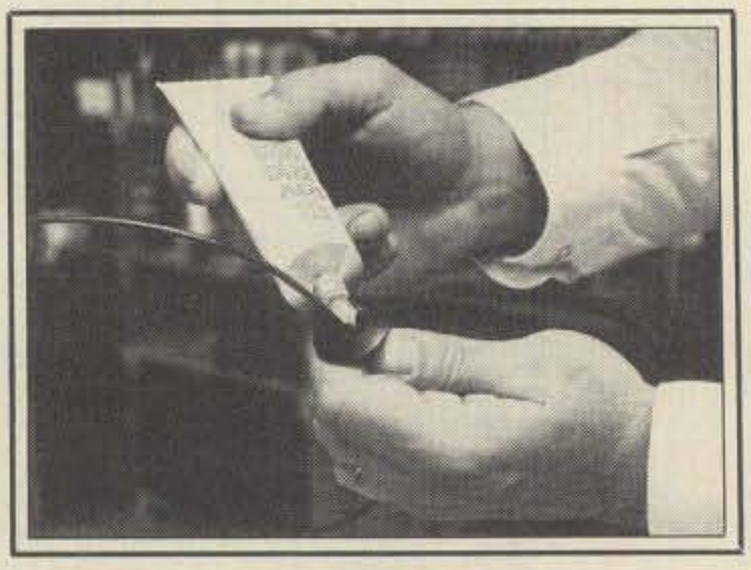


It connects to the receiver phone jack and provides 2 watts of audio to drive a speaker. The on-off switch bypasses the filter when not in use. It operates from 15 v.d.c. Price is $139.95 plus $4 shipping. The optional 115 v.a.c. adapter is $9.95. For further information, contact Palomar Engineers, Box 455, Escondido, CA 92025, or circle number 101 on the reader service card.

Design Electronics Ohio QSK 1500 T/R Switch

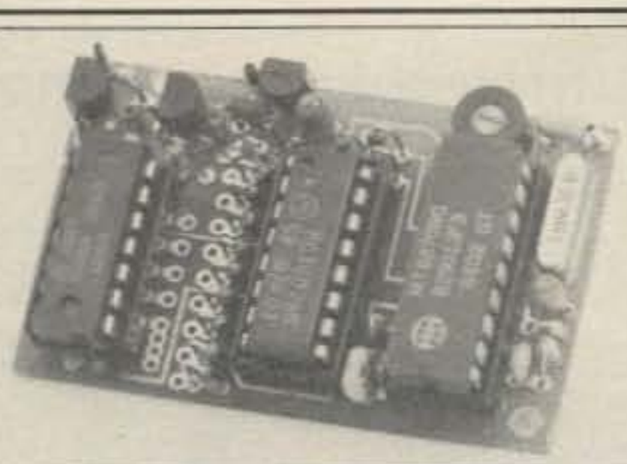
Design Electronics Ohio has introduced the QSK 1500, an all solid state, American-made, T/R switch which uses "state of the art" high-power pin diodes for switching. The installation of the QSK 1500 between a QSK (full break-in) transceiver and any linear amplifier (including homebrew) allows full break-in QSK c.w. operation at the 1500 watt power level. In addition to allowing full QSK c.w., the

QSK 1500 allows the operation of high-power AMTOR with any amplifier. Since the QSK 1500 uses pin diodes instead of vacuum relays, its operation is totally silent. Installation of the unit requires no modifications to either your QSK transceiver or amplifier. The QSK 1500 will operate from 1.8 MHz to 30 MHz without any additional switches or controls to adjust. Typical insertion loss is 0.25 dB. The unit also includes a custom-designed power supply and control panel, plus a receiver line protect circuit. For more information, contact Design Electronics Ohio, 4925 South Hamilton Road, Groveport, OH 43125, or circle number 106 on the reader service card.



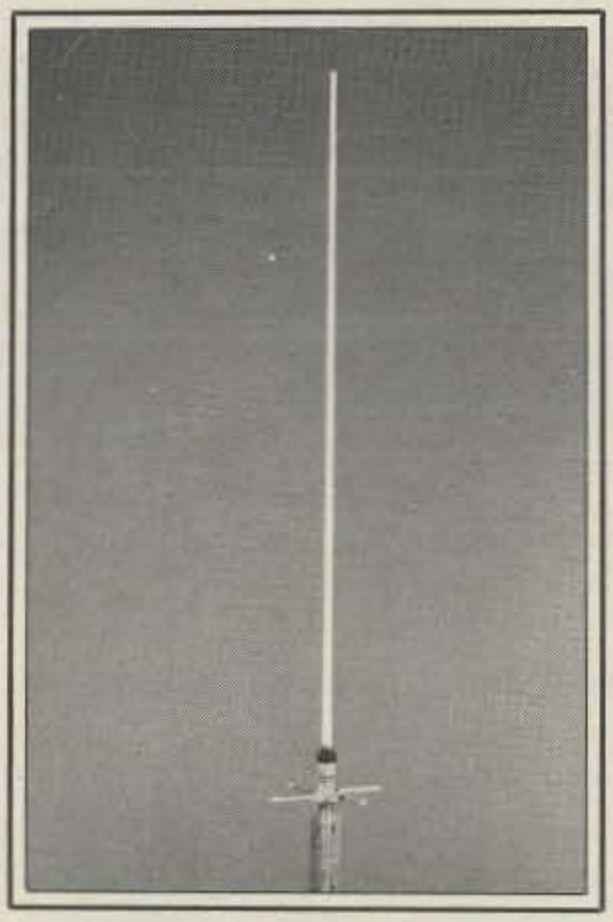
GE Silicon Rubber Sealant

RTV-108 silicone rubber sealant from General Electric Company pours over connectors, taps, and other CATV components, curing to a flexible silicone rubber that protects components from the corrosive effects of the elements. For more information, contact General Electric Company, Silicone Products Division, Waterford, NY 12188, or circle number 107 on the reader service card.



Communications Specialists DTMF Decoder

Communications Specialists has introduced the DTD-1 DTMF decoder, a dual-tone multi-frequency decoder which will provide a latched or momentary open collector output for single function operations. It is capable of decoding any one of 5,040 four-digit codes. The DTD-1 measures 1.25"×2.0"×.4" and sells for $59.95. For more information, contact Communications Specialists, Inc., 426 West Taft Avenue, Orange, CA 92665, or circle number 103 on the reader service card.



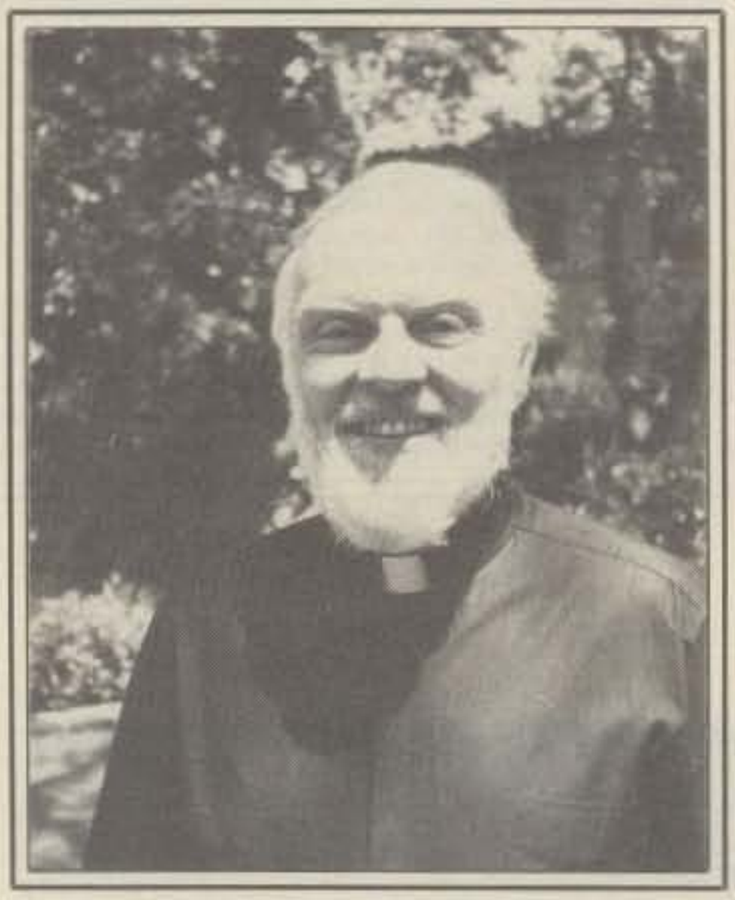
Hustler U.H.F. Antenna

The G6-440 u.h.f. antenna for amateur fixed station or repeater use has been announced by Hustler. Based on the G7-144 v.h.f. antenna, the u.h.f. antenna delivers 6 dBd gain through the use of stacked ⅝-wave brass radiator sections, series phased, and sealed in an ultralight, tapered fiberglass radome. Aluminum and stainless steel components are used throughout. Coaxial cable termination is accomplished through the use of a hub-mounted, moisture-resistant, "N"-type connector. The antenna is factory tuned at 440 MHz with a typical v.s.w.r. of 1.15:1, and it exhibits an 18 MHz bandwidth under 2:1. Overall height is 88 inches with a wind survival rating of 120 mph. For further information, contact Hustler Inc., 3275 North B Avenue, Kissimmee, FL 32758, or circle number 102 on the reader service card.

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING



Father Terry Koch, K6HZI, All Counties #471, 4-2-84.

The story of the month for November as told by Father Terry is:

Father Terry Koch, K6HZI
All Counties #471, 4-2-84

"Some may think that I showed up on the County Hunters' Net in August of 1983 and then suddenly had All Counties #471 six months later. Actually, it all started in 1962 when I was trustee for the Loyola High School Amateur Radio Club in Los Angeles. After working for ten years we finally qualified for All Counties #74. *(See the Awards column in the March 1973 issue of CQ magazine for that story.—ed.)*

"In 1977, with only 30 counties to go, I undertook a job that simply did not allow time for County Hunting. I was off the air for five years. Last August I resumed a life that could include chasing those 30 counties again. I found out that what I'd always heard was true—the counties will always be there *(except for poor Nansmond, Virginia!—ed.)*. In all, it took me only 12 years to earn #471.

"I still have the old Swan 240 that I used in the 60's, but it is resting now. Jack Striker, W6MOV, has furnished me with newer ICOM equipment to use. Thanks, Jack! You can still hear me chasing counties and running counties from the mobile station. Well, it agrees with me, so why not? If I keep up my past frantic pace, I'll finish again around the year 2000, and I'll be 70!—73, Terry"

333 South Lincoln Ave., Mundelein, IL 60060

Special Honor Roll
All Counties
#479 Sandie Miller, KC0VA 7-1-84
#480 Michael J. Eilers, K8OOK 7-3-84

Awards Issued

Sandie Miller, KC0VA, took time to finish all her paperwork and sent for All Counties #479, 7-1-84, Mixed. Sandie's OM, Bill, KC0VB, has All Counties #440. Sandie and Bill can often be heard from their mobile station in Colorado.

Michael J. Eilers, K8OOK, qualified for them all and now has All Counties #480, 7-3-84, Mixed.

Daniel R. Broadbooks, KB0YU, All Counties #347, 7-27-84, added a new endorsement to his Award—All C.W.

Mike Mutnick, KV0E, sent for USA-CA 500 through USA-CA 2500, all C.W.

USA-CA 500 certificates went to:

Kraig D. Pritts, KA2LHO, #1956, 6-29-84, Mixed.

Sandie Miller, KC0VA, #1957, 7-1-84, Mixed.

Carlos Albuquerque, PY7OD, #1958, 7-2-84, Mixed.

Thiery Robert, F6CRT, #1959, 7-2-84, All C.W.

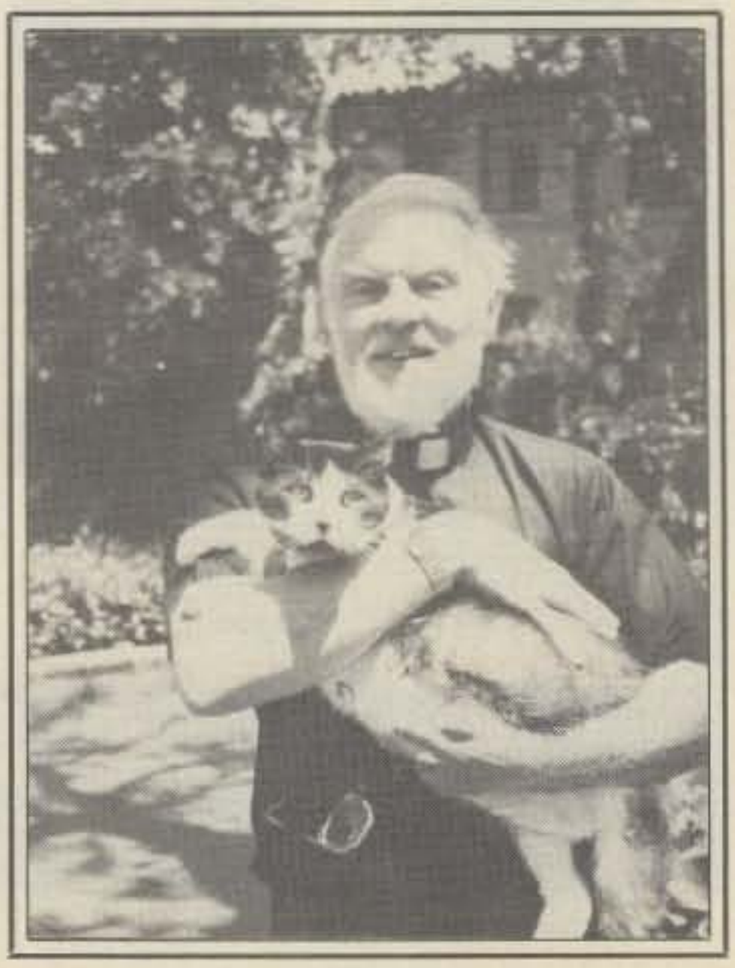
Tetsuya Sanada, JA8CFR/7, #1960, 7-2-84, All C.W.

Ronald J. Polityka, WB3AAL, #1961, 7-16-84, Mixed.

Mike Mutnick, KV0E, #1962, 7-17-84, All C.W.

Jerzy Stopa, 9U5WR, #1963, 7-18-84, Mixed, first USA-CA Award issued to Burundi.

Father Terry with his friend "Fat Cat."



Bob, ON4QX, founder of Antwerp MMC and custodian for the OSA/MM Award, at his station in Antwerp.

Bob, N5QQ, holding the traveling trophy awarded to him for the year by MARAC. (Photo by N0CKC)

New Awards

Maritime Mobile Award. The Antwerp Maritime Mobile Club is offering an attractive award for working MM and ex Radio Officers. The award is designed by our late ON7DI; the port is Antwerp. The rules are as follows:

(a) Work 5 MM and one ON/MM (list follows).

(b) Work one ON/MM or an ex R/O of the club.

(c) No QSL's. Log data as follows: La, Lo, or region, frequency, UTC, name of ship, A1 or A3.

(d) Send log data and $3.00 U.S. or equivalent IRC's to: Antwerp CW/MM Club to ON4QX, P.O. Box 331, Antwerp 2000, Belgium.

USA-CA Honor Roll

3000		2500		2000		1500		1000		500	
KC0VA	510	KC0VA	568	KC0VA	623	KC0VA	691	KC0VA	850	KA2LHO	1956
		KV0E	569	KV0E	624	KV0E	692	KV0E	851	KC0VA	1957
										PY7OD	1958
										F6CRT	1959
										JA8CFR/7	1960
										WB3AAL	1961
										KV0E	1962
										9U5WR	1963

C.W. County Hunters (U.S. and Canada)
Confirmed C.W. Contacts
Jan. 1, 1984
Honor Roll

#1 W8RSW, #2 W2MEI, #3 KA5A, #4 W1JTD, #5 W3HQU, #6 W3ARK, #7 WB0ODS, #8 KB0YU

	Jan. 84	Jan. 83		Jan. 84	Jan. 83		Jan. 84	Jan. 83
W1AQE	3075	3001	K7EQ	2030	1501	KV0E	2385	1375
N2RT	3067	3047	KA1HB	2015	*	W2EMW	2370	1773
W9VEN	3059	3050	N9AG	*	1879	N9DR	2326	2253
N5QQ	3005	2765	KD6PP	1871	1485	KQ3S	1702	1559
K9BG	*	2993	WA2EYA	*	1843	W4ILE	1573	315
W0FBB	2940	2876	W1GNR	*	1831	W7IEU	*	1569
W7GHT	2898	2766	N9TN	1755	*	VE3KZE	1547	*
WA4EBE	*	2872	W4POA	2700	2521	N7TT	1502	1133
W1SBU	2870	2742	W2EZ	2670	2265	W6NNV	1407	*
N6QA	2822	2613	K3ZMI	*	2636	W9MYY	1350	*
K3LK	2786	2116	W8YL	2630	2566	VE3DAP	*	1305
K3DEJ	*	2741	W8WVU	2611	2562	WB6IYS	*	1260
K9WA	2735	2665	W2NCG	2604	*	W0QWS	*	1115
WD4SIG	2321	1696	K8KIR	2555	2046	N6UH	985	*
W5VGF/6	*	2296	W1TEE	2501	2373	KU9G	*	963
W8RYP	2286	1811	W3PYZ	*	2462	KG3P	*	556
K8MW	*	2271	KA4IFF	2430	1621	NU4L	*	509
KN4Y	2135	*	N0CKC	2429	2033	KA8MSU	389	237
N2CWG	*	2105						

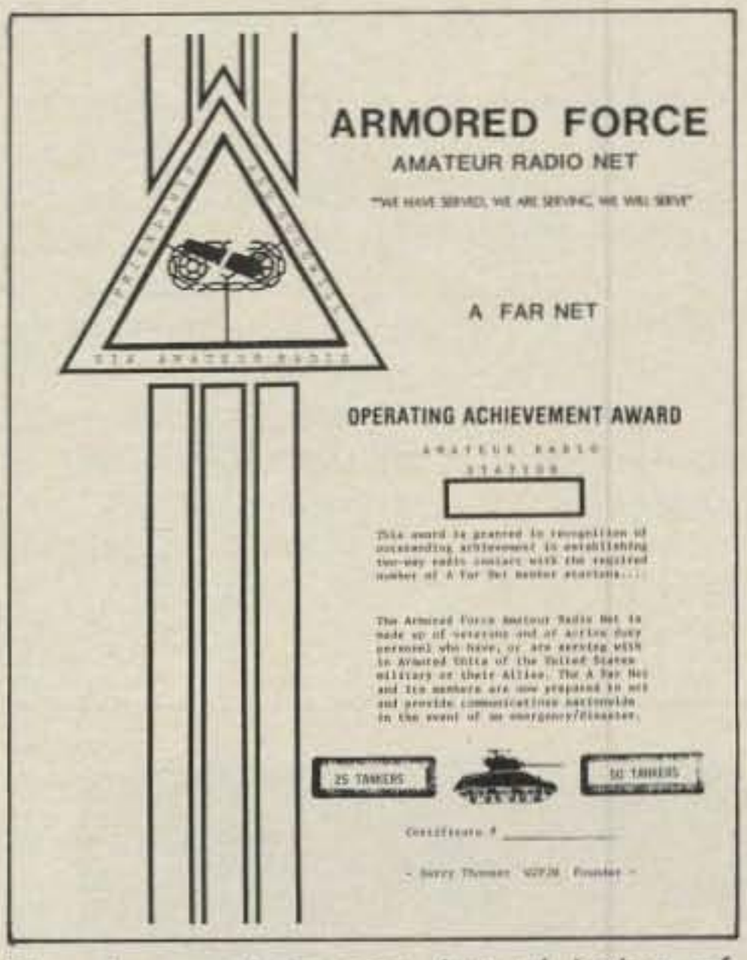
**No information.*
(Thanks to George, WB0ODS, and Buster, N0CKC, for the foregoing information.)

The Maritime Mobile Award offered by the Antwerp MM Radio Officers and Antwerp C.W. DX Clubs.

When in QSO with a member of the club, he will sign EX/MM. Members presently at sea are ON4US, ON4QY, ON5GT, ON5JD. Members of the Antwerp (OSA) Maritime Mobile Club are: ON4EX (ex-ZM/FN), ON4GK (MN), ON4IT (ex-RN), ON4US (MN), ON4WD (ex-ZM/FN), ON4QX (ex-RNVR), ON4QY (MN), ON4ZX (RMT), ON5GT (MN), ON5JD (MN), ON7DI ex-MN), ON5IA (ZM/FN), ON7SF (MN), ON4HR (FN/ZM), ON5OJ (FN/ZM), ON5OE (FN/ZM), ON6OG (FN/ZM), ON6QX (yacht), ON4NW (FN/ZM).

A Far Net Award Certificate. The Armored Force Amateur Radio Net offers its "A Far Net Award" certificate to amateur radio operators of any nation. The 8½" × 11" certificate is printed in four colors on white, heavy stock and is intended for framing.

Endorsements are available for making additional contacts and for making contacts in one mode or on one band. Applications may be made for any award level, mode, or band operation at any time.



The Armored Forces Award being offered by "A Far Net."

Qualification Requirements (non-member stations):

1. To qualify for the basic award, non-member stations must establish two-way contact with a minimum of 15 different "A Far Net" member stations.

2. To qualify for endorsements, non-member stations must make contact with 10 or 35 members on any band or in any mode.

3. Confirmation of the required contacts must be through a copy of the non-member's log that has been certified by two other amateur radio operators.

Fee: Applicants for the basic award

C.W. County Hunters at the Kansas City convention in July. Top row: KV0E, KD9Q, K9DZG, KA0MQS, W0RSR, KY0E. Stairway, top to bottom: WA2TJL, W3PYZ, WD9GSU, W3XE, KB0YU. Front row: N9TN, W1DIT, AD5F, WA6VJP, N0CYB, WD9GMA, N0CLV. (Photo by N0CKC)

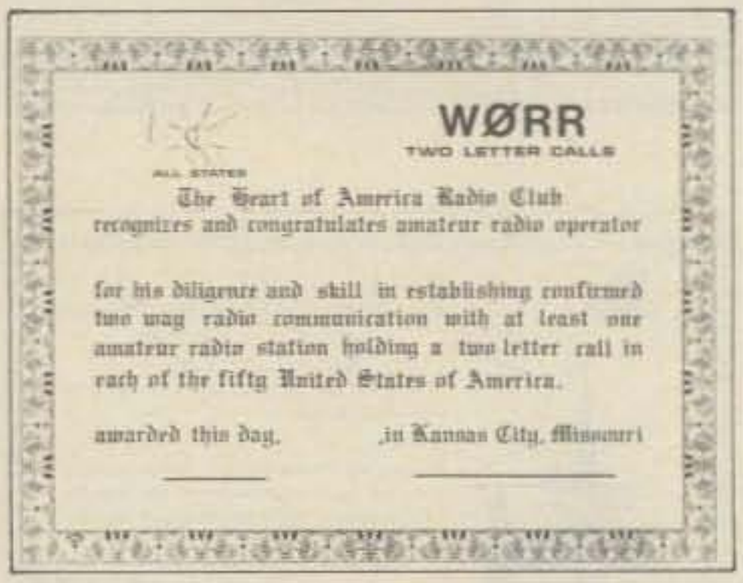
Some holders of USA-CA All Counties Award. You have met many of them in the "Story of the Month" in CQ magazine. (Photo courtesy K0AYO)

K5OUK Award of Merit.

certificate must submit a minimum of 50¢ along with their application to cover postage, envelopes, etc. Endorsements not mailed along with the basic certificate will require only a normal 4½" × 6" s.a.s.e.

Applications for the basic award or endorsements should be sent to the A Far Net Certificate Manager, Alfred G. Beutler, K2DWI, 36 Manchester Road, East Aurora, NY 14052. Please allow from two to four weeks for mailing of the certificate or endorsements.

The K5OUK Merit Award. Establish radio contact with K5OUK from 50 counties, or contact K5OUK/M in 50 counties, or a combination of 25/25. Send log data (no fee) to: L. M. "Mike" Gray, Box 284, Howe, TX 75059.



The Heart of America Radio Club Worked All States, Two-Letter Calls Award.

Worked All States Two-Letter Award. Work any 2-letter call in each of the 50 states of the U.S.A., 1 × 2, 2 × 2, 2 × 1. Have log data certified, and send data along with fee of $2.00 U.S. or equivalent IRCs to Heart of America Radio Club, c/o A. Hoogenraad, WB0RAF, 4316 Ditzler, Kansas City, MO 64133.

New Traveling Trophy for County Hunters. Thanks largely to the efforts of a group of County Hunters in Kansas City headed by Skip, WA0WOB, and Bob, K0AYO, there is a new traveling trophy for County Hunter of the Year. The family of Cliff Corne, Jr., K9EAB (SK), has given the large trophy which was awarded to Cliff for USA-CA All Counties #1 to the Mobile Amateur Radio Awards Club to be used as a traveling trophy for County Hunter of the Year. This award is given each year by MARAC members in recognition of outstanding contributions to County Hunting and mobile operating.

Notes

In Northern Illinois we are preparing for another winter and looking forward to our national holiday of Thanksgiving. I hope things are going well where you are.

73, Dorothy, WB9RCY

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No 91-92

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

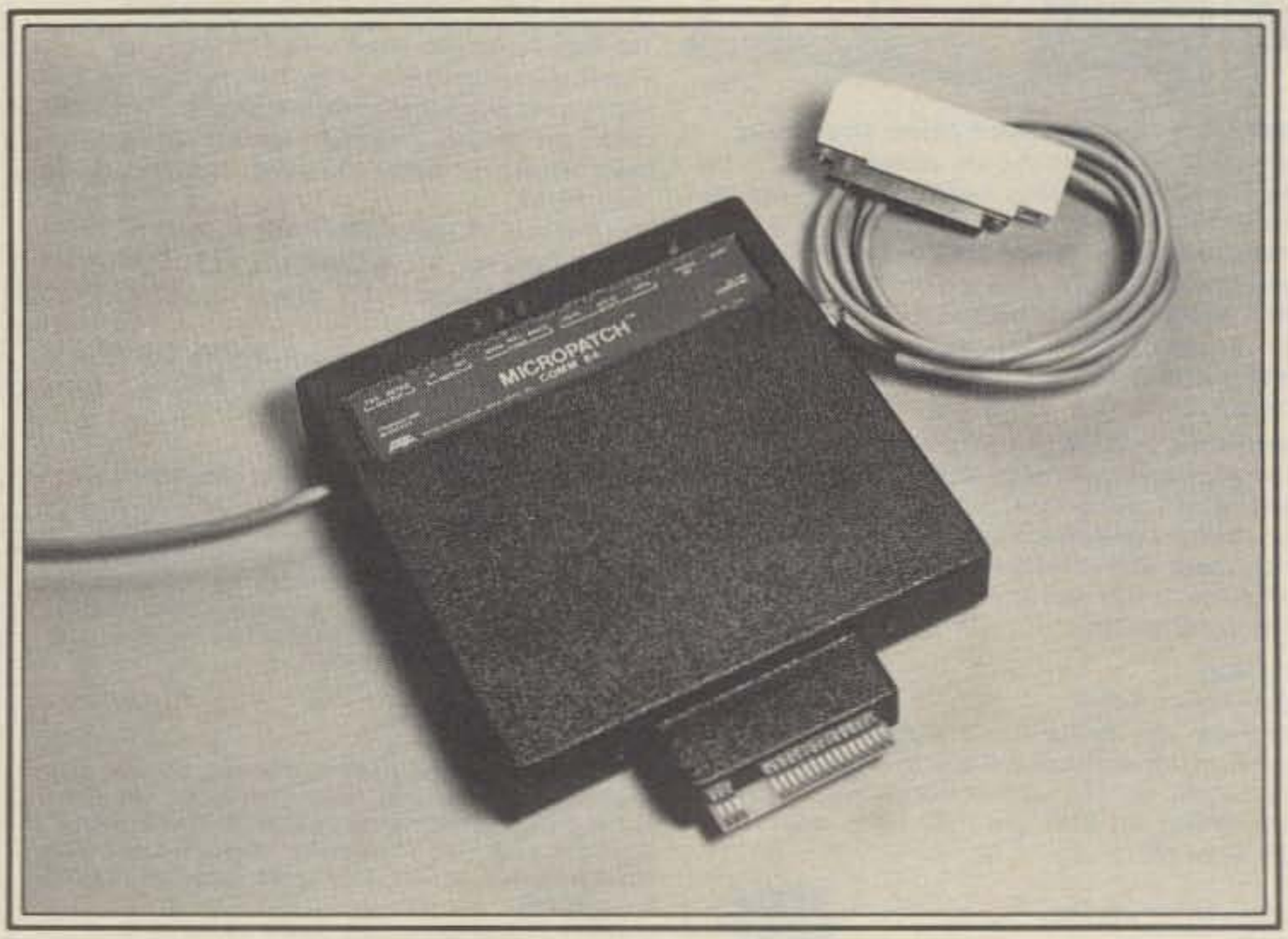
A LOOK AT THE WORLD AROUND US

Expansions In Printed Word Communications

As you can judge by this month's special RTTY features, printed-word communications has become an amateur radio craze of worldwide proportions. RTTY itself has mushroomed in popularity primarily due to the introduction of inexpensive home computers and transceiver interfacing packages. That "easy way in" is also being complemented with a fantastic variety of hardware expansions and dedicated systems of superb performance. Similar innovations are also affecting teleprinting mediums proper, and the future of this era almost staggers the imagination.

The ball of technology was boosted somewhat when the FCC authorized ASCII transmissions on h.f. bands. Those operations added inspiration for computer-type bulletin-board setups and shed an interesting light on "unattended" station operations. Then during early 1983 error-free AMTOR operations were authorized for h.f. communications and printed words again expanded our horizons. During that time packet radio systems were being developed on our v.h.f. bands. Various stations within a system provided digital repeating for multi-mile network expansions. Today plans are being formulated for gateway interlinking packet networks in various world areas via OSCAR satellites (the PACSAT concept). JAS-1, an amateur satellite form of flying mailbox with store-and-forward capabilities, is being constructed by Japanese amateurs and JAMSAT. The satellite is scheduled for launch during February 1986 from the Tanegashima Space Flight Center. The satellite will host one megabyte of on-board memory, and input channel protocols will be based on amateur radio's AX.25 packet concepts.

With all these innovations either happening or in the works, it's quite possible for today's amateur to become confused about what each system will or will not do, which system works with which peripherals, and which system/concept would be of most use for a particular setup. Realizing that situation, this month's column will overview the popular areas of printed-word communications in a straightforward and plain-language manner. The resulting views thus should provide "Helping Elmer" guidance for understanding various printed modes and comparing each with your particular areas of interest.



A recent approach to printed-word interfacing between transceivers and home computers consists of plug-in multi-mode adapters such as AEA's Micropatch. This compact unit fits directly into the Commodore 64 and provides RTTY, c.w., and AMTOR operations. Language conversions and data checking are under software control.

RTTY Today

Seems like I've seen that title somewhere before. Hmmmm . . . This is the highly popular teletype® mode enjoyed for many years on our h.f. bands. Original concepts employed commercial teleprinters adapted for amateur use with external loop supplies and transmitter/receiver-interfacing terminal units. Usual speeds were 60 words per minute, with *wide* frequency *shifts* (850 Hz) between *mark* and *space* tones during early times, and *narrow* frequency *shifts* (170 Hz) with present (and more frequency-stable) transceivers. A popular "frill" used with a number of those setups was *autostart*: an "automatic start-up" for hammering out any (and all!) on-frequency RTTY activity received during operator absence.

The mass introduction to RTTY of home computers, equipment interfacings, and all-electronic terminals has opened a complete new world of printed-word interest and enjoyment. The warm chatter of older style mechanical printers (may their clunking be remembered forever!) has now given way to silent computer keyboards, CRT screens, preprogrammable message buffers, etc. The traditional standards of Baudot code, wide/ narrow shifts, etc., have been retained for full compatibility between both old and new style systems.

Along with the introduction of "electronic RTTY" and "intelligent terminals" came several exciting new capabilities: *computerized CW, ASCII, selcal,* and *electronic mailboxing.*

Selcal differs from autostart in that only messages containing a pre-established/ preprogrammed code are printed or saved on tape during operator absence. This feature permits continuous monitoring of an active RTTY frequency while responding only to specific station-intended messages (similar to tone-squelch systems monitoring busy 2 meter repeaters: nothing is heard until a designated station is "toned").

Electronic mailboxing, or *E-mail,* is a concept which allows one to type a message for a particular station, designate its access according to a specific password, then leave it with the electronic terminal for "unattended operations." The other station can later call the "unattended station," give an accessing sequence

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and password, and the stored message will be transmitted. The E-mail concepts can also be expanded in several ways. If I wanted to send a message to a VK friend via RTTY, but neither of us had E-mail capability for late-night communications, for example, I might use a close friend's system when available. I would first access the friend's E-mail system, and then leave my VK-addressed message. During the night's wee hours the VK would exchange E-mail notes which I would later retrieve from the friend's system. Naturally, close and congenial agreements are keynotes to all E-mail activities.

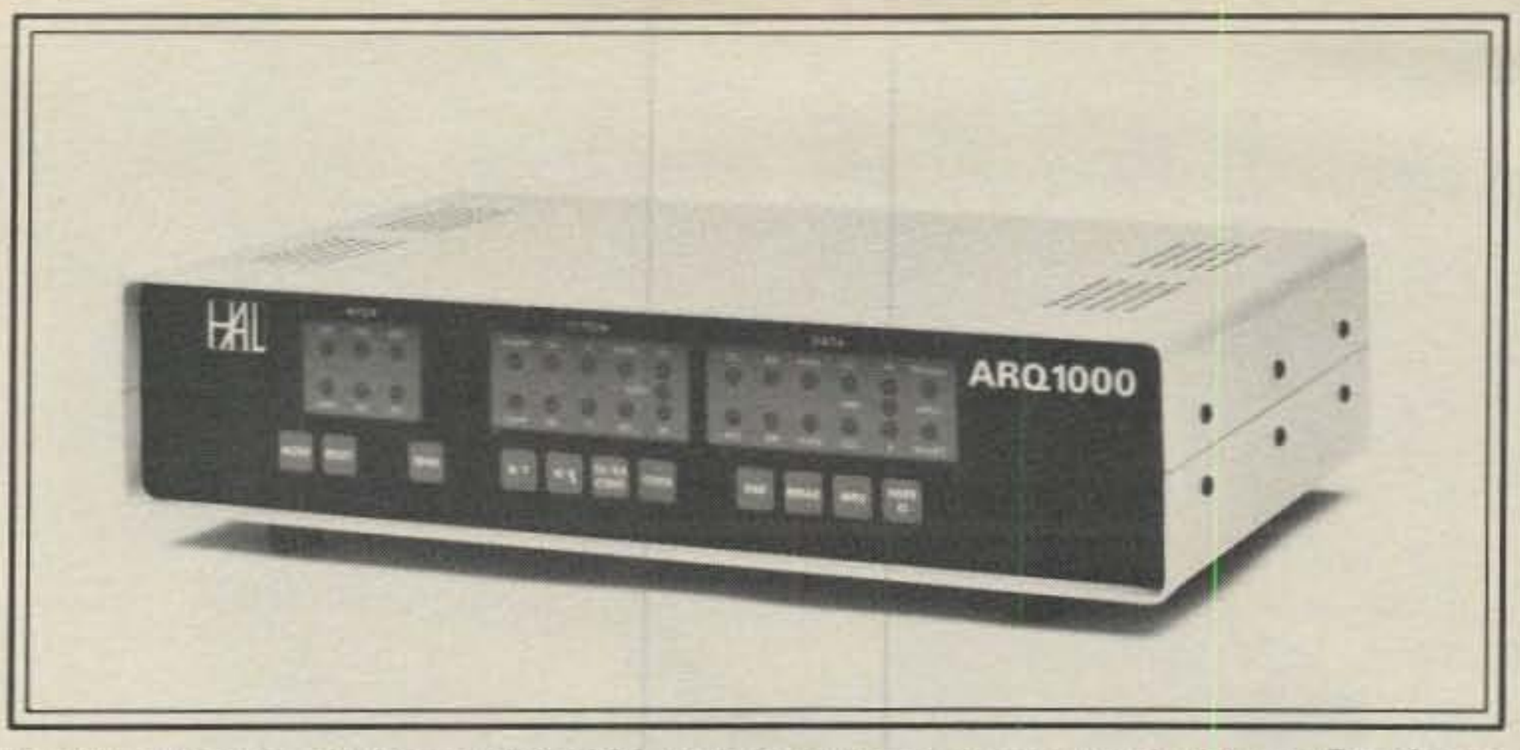
Computerized CW is a direct spinoff of "Electronic RTTY," and is usually an included feature of those commercial systems. Some amateurs operate CCW at normal QSO speeds of 10 to 20 w.p.m., reading messages directly from CRT screens and replying via hand key or keyboard. Others operate CCW at 40 to 80 w.p.m. as a sort of "RTTY alternative." The attractive points of CCW are *direct compatibility with any and all amateur stations* (software manufacturers: notice the market potential here) and an easier duty cycle compared to RTTY. Unfortunately, there's a shortage of CCW software with E-mail and programmable passwording. Assuming that vacancy was filled, an "unattended" CW rig could call CQ DX, insert received call in memory, reply with QSO information and contact serial number, etc. A true "unattended" setup would use "secret codes" for remote station enabling/disabling, etc. Far out idea? Hardly. The Russian amateur satellites did that a couple of years ago (is American technology slipping?).

ASCII is the data language normally used between computers communicating via phone lines (and the "natural" language employed in computers themselves). When this mode is used for on-the-air amateur h.f. operations, normal RTTY mark/space tones of narrow shift (170 Hz) are employed, and information is in direct computer language (less "Headers," etc., as in packet systems) rather than in Baudot, as used in RTTY.

AMTOR

This recent innovation in printed-word communications can provide almost error-free copy of typed messages between stations using low power levels or experiencing conditions of marginal propagation. That capability is possible because AMTOR's code has a built-in 4 "on"/3 "off" bit error checking format for each alphabetic character, and because "intelligent" terminals are used at each AMTOR station.

There are two popular methods of AMTOR operation: Automatic Request for Corrections and Forward Error Correction modes (ARQ and FEC, respectively). *FEC* is primarily used during broadcasts to a group of stations (such as



The HAL Communications ARQ1000 code converter can be used with any Baudot or ASCII full-duplex terminal at data rates from 45 to 300 baud.

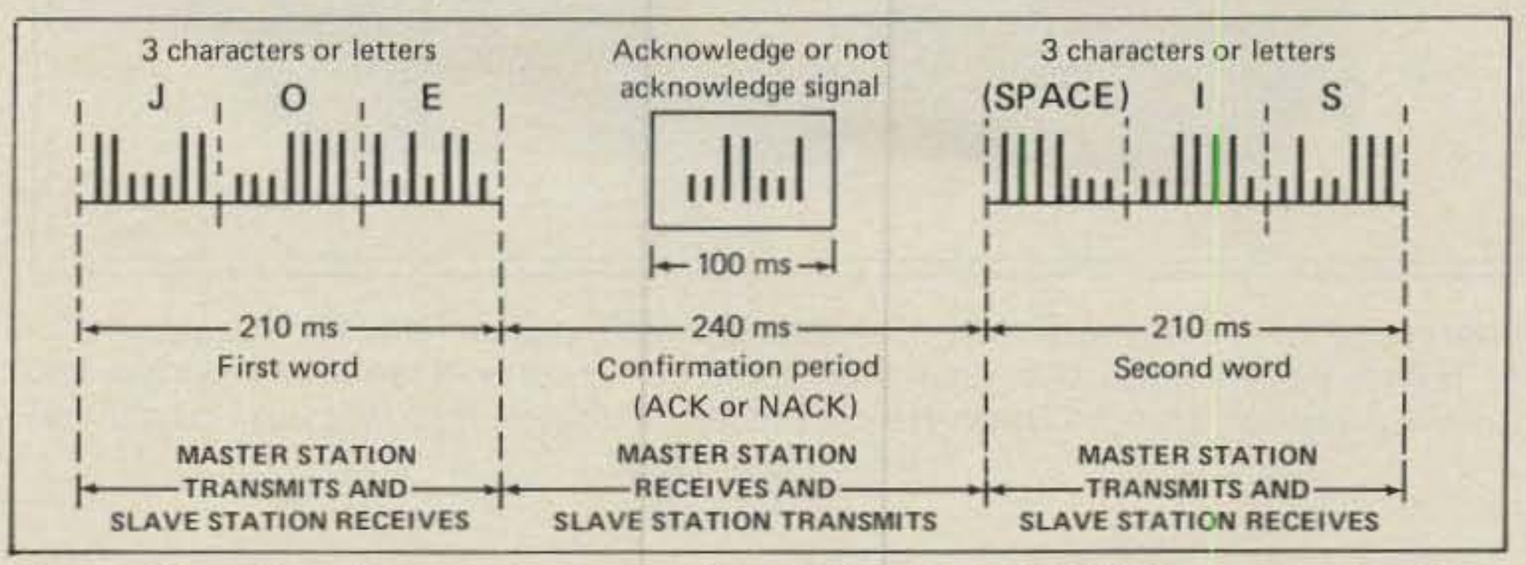


Fig. 1– Operational concept employed in ARQ mode of AMTOR communications. Large messages are transmitted in three-character bursts, each being acknowledged as "good" or "bad" before the following three characters are transmitted.

Items used for joining the activity of an amateur radio packet network. Setup consists of AEA (or equivalent) packet controller, home computer with terminal program, and v.h.f. transceiver. Multiple QSOs are conducted on a single frequency using time multiplexing techniques.

W1AW bulletins to all amateurs). Text is transmitted in three-character "bursts," and each burst is transmitted twice. The receiving terminal uses the dual bursts and 4:3 ratio characters to assemble and print a single correct message. *ARQ* is primarily used between amateurs communicating on a one-to-one basis and might be visualized as a form of "RTTY break-in" operation. A transmitting station sends typed messages in three-character bursts which are checked and acknowledged as "good" or "bad" (*ACK* or *NAK*) by the receiving station, and then three more characters are transmitted (see fig. 1). If propagation is lost, the two terminals "chirp at each other" to re-establish the link while the receiving screen waits for new information. Error checking and automatic acknowledging may be a function of the rig interfacing unit or part of the terminal/computer program, depending on particular system designs. In other words, "basic" RTTY interfacing units for home computers may be used for AMTOR *provided* error checking and ACK/NAK responses are software controlled. Otherwise, those functions must be handled by circuitry in a dedicated AMTOR interface unit. The continuous and rapid transmit/receive switching generally requires using newer type gear with either full break-in capability or quiet and fast-acting T/R relays (reed relays are grand). This stipulation usually rules out using vacuum tube rigs and regular high-power amplifiers. Applying a bit of math to fig. 1 also reveals that long propagation paths can't be used with AMTOR ARQ. If long-path or amateur satellite communications were pursued using this mode, the "transmitting" station would be caught sending a second "chirp" (did you hear my first?) while the "receiving" station's acknowledgement was completing its journey and arriving at the "transmitting" station. AMTOR's prime function is obviously *reliable h.f. communications.*

AMTOR operations usually congregate around 3,637 and/or 14,075 kHz and can be recognized by their back and forth data chirps. The usual communication speed is 100 baud/132 w.p.m., with RTTY 2125 and 2295 Hz mark/space tones being used. Due to data bit makeup of characters, however, Baudot and AMTOR codes themselves are totally different and completely incompatible. *Selcal* and *E-mail* are also popular special features used in AMTOR, and they follow the same general techniques used in RTTY.

Packet Radio

This printed-word medium is an amateur radio form of computer terminal to computer terminal communications similar in concept to those used in schools, business or home computers, and Compuserve setups. "Commercial" networks usually consist of a remotely located "host" computer modem-connected via phone lines to each modem-equipped terminal. Amateur packet radio is comprised of various stations interconnected and interlinked with the network via a home computer/terminal, an interfacing unit known as a packet controller, and (usually) a v.h.f./f.m. transceiver. Any station within a packet radio network can exchange messages with any other network station, and any station within the network might also act as a simplex repeater (called a digipeter). An interesting aspect of packet radio is its ability to flourish within metropolitan areas while also expanding rural amateur by rural amateur and community by community until linked with other metropolitan areas. Judging by the massive growth of packet radio, one might logically expect nationwide linking within the not too distant future.

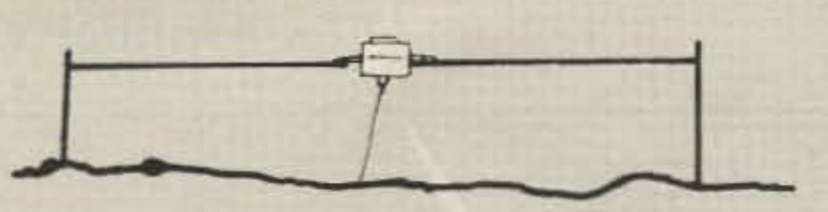
Packet radio differs from h.f.-type RTTY and AMTOR communications in several respects. First, Time Division Multiplexing (TDM) is used rather than frequency diversity. That is, a multitude of packet activities are conducted on a single frequency using time-sharing/"round robin" techniques rather than each station using a separate frequency (as on h.f.). Second, packet data codes are not Baudot or AMTOR, but are ASCII with special protocols and "headers" specifying their destinations.

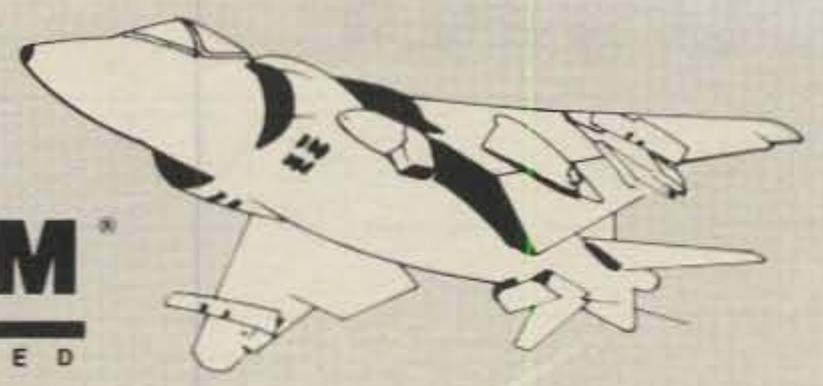
Although packet communications are error free with ACK/NAK signals, E-mail, etc., they are not directly compatible with h.f. AMTOR or ASCII. Using packet, for example, one's typed messages are broken into 128-character blocks and transmitted in sections (AMTOR, you recall, uses three-character blocks). If you visualize packet as straight home computer operations with special protocols, you'll be "almost right" and understand its general concepts. If you presently have a home computer setup, only a couple of additional items are required to join packet activities: a packet controller such as AEA's PKT-1 or the Tucson Amateur Radio Packet Group's kit unit, a standard computer terminal program (such as you load for modem communications via telephone), and a v.h.f./f.m. setup. Naturally, there also should be packet radio activity within your v.h.f. range.

Summary

Looking back at our original purpose of overviewing various areas of printed-word communications, we should emphasize that our discussions were necessarily brief. Full descriptions of individual areas obviously would fill three publications, each of this magazine's size. H.f. RTTY communications continues to be the most popular format with smooth 60 w.p.m./Baudot code compatibility between mechanical and electronic systems. AMTOR is rising in h.f. popularity, while packet is rising in v.h.f. popularity. Only time itself will prove which modes grow and which fade. Meanwhile, we all can enjoy this electronics fantasyland to our hearts' content.

73, Dave, K4TWJ





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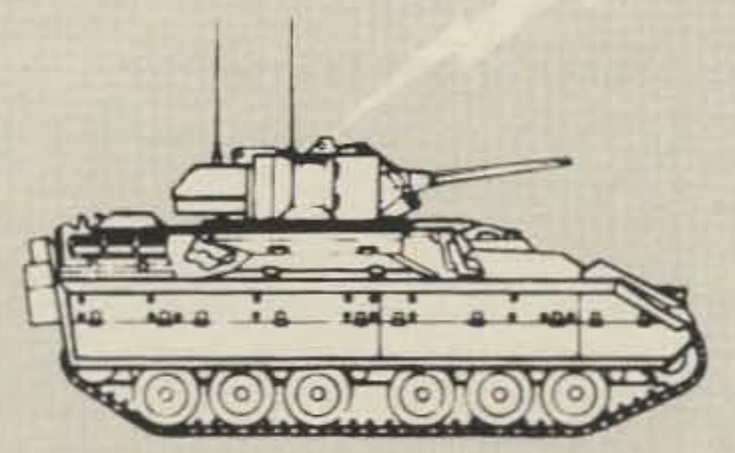

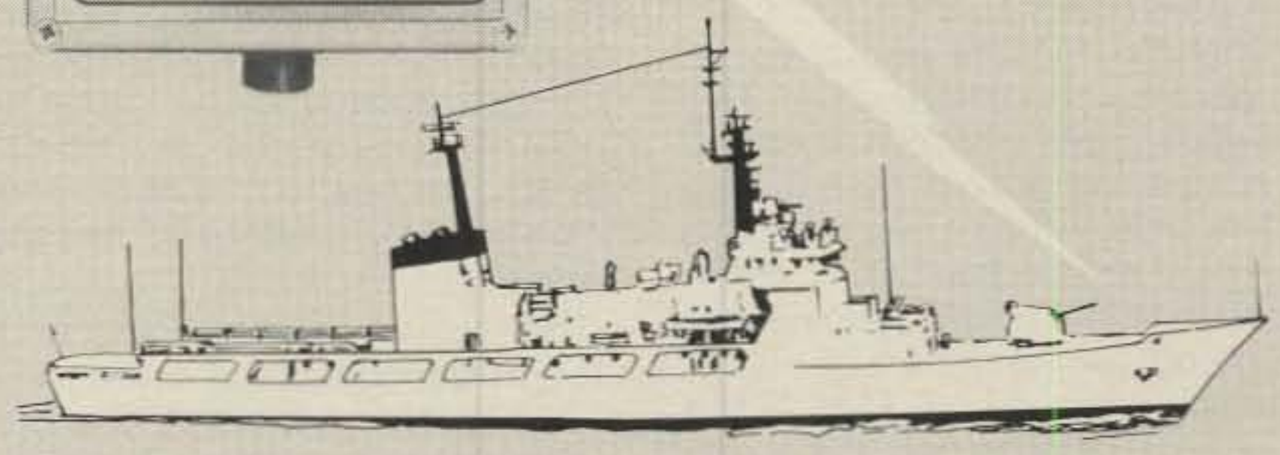

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"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Zero Beat

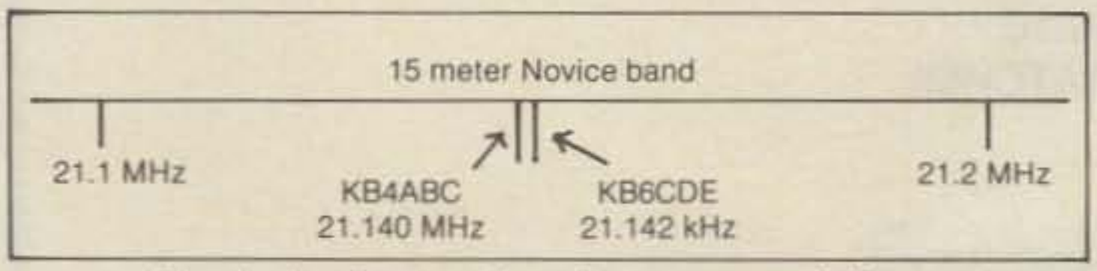

Fig. 1– Inadvertent interference possibility.

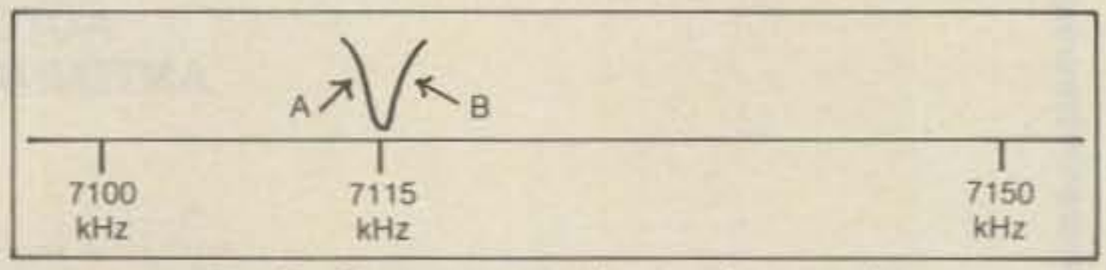

Fig. 2– Separate receiver and transmitter.

The dictionary of electronics I use defines *zero beat* as the complete absence of a beat note (silence), a condition occurring when the frequencies of the beating (comparison) signals are equal. This is a good starting point, but one must also know the meaning of beat note to fully understand what will be covered in this article. A beat note is the sum or difference frequency that results from heterodyning (mixing) two (or more) signals. As an example, if signals at 7125.2 and 7125.9 kHz are heterodyned, the resultant beat notes are 0.7 kHz (difference) and 14,251.1 kHz (sum). The sum frequency of 14,251.1 kHz is beyond the human hearing range, whereas the difference frequency of 700 Hz (0.7 kHz) is within the human hearing range. This relationship exists throughout this article, and we will just refer to the difference frequency beat note because it is the one we can hear.

Advantages

Proper understanding of zero beat enables one to operate one's station correctly, providing more contacts with less possibility of inadvertent interference. When two stations are in contact with each other, it is important that they be on the same frequency or very close to the same frequency. In the first place, the use of two frequencies for a single contact ties up twice as much spectrum, which is undesirable on a crowded band. Second, there is a greatly increased possibility that the contact will be bothered by inadvertent interference. Fig. 1 can be used to help you understand how this unintentional interference can occur. Assuming that KB4ABC made a general call to all stations (CQ) on 21,140 kHz, and that KB6CDE answered on 21,142 kHz, we have a situation that invites interference. When KB4ABC is transmitting on 21,140 kHz, the 21,142 kHz KB6CDE frequency is not in use and a third station may use it to make a CQ call. If this third station receives a reply, or simply continues to make CQ calls, KB4ABC will suffer interference when he listens for the KB6CDE transmission on 21,142 kHz; KB4ABC will hear both KB6CDE and the third station transmitting on the same frequency.

This problem could be compounded by a fourth station hearing no transmission on 21,140 kHz while KB4ABC is listening to KB6CDE on 21,142 kHz. The fourth station may make it difficult to impossible for KB6CDE to copy KB4ABC's subsequent transmissions through this additional unintentional interference. If this dual interference condition develops, the contact between KB4ABC and KB6CDE is at least made less enjoyable, and it is probably ruined. At the same time the contacts between the third and fourth stations, plus their responding stations, also suffer needless interference. In this case, as many as six operators can be subjected to interference just because KB6CDE failed to answer KB4ABC on 21,140 kHz.

This type of interference is very common, and it is not limited to Novices or the Novice bands. I tracked this problem in more than 100 contacts during a recent week. I noted that two-thirds of the responding stations answered my CQ calls more than 1 kHz off my transmission frequency. Most of these amateurs called me 1 to 2 kHz above or below the frequency I was using. Some answered 4 or 5 kHz away from my transmit frequency. I did not listen more than 5 kHz away from my transmit frequency because this is the limit of the receiver offset tuning in the transceiver I was using. It is bad that only one-third of the amateurs involved in this little survey were competent enough as operators to answer me within 1 kHz of my transmission frequency. I hope this article impresses you with the desirability of answering on frequency and teaches you how to do this.

I am convinced that almost all interference among code contacts is unintentional, and I believe that failure to answer on frequency leads to most of this interference.

Receiver and Transmitter

If you operate a receiver and transmitter (as opposed to a transceiver), it is likely that experience has taught you to zero beat your transmitter frequency against your receiver frequency. Fig. 2 should help one understand the following explanation. Assume that one hears a station calling CQ on 7115 kHz and wants to contact that amateur. The chance of having a satisfactory and complete contact is increased if one answers on the same frequency. It is necessary to understand what we do as we tune across a band. One does not listen to the center frequency of a code signal, because there is no beat note sound to listen to at that point. We listen above or below the center frequency of the received signal, and we listen to a tone that suits us. Most people prefer a tone of about 700 Hz to copy code. If we want to listen to a 700 Hz tone, we tune 700 Hz below (A, 7114.3 kHz) or 700 Hz above (B, 7115.7 kHz) the center of the received signal. The preceding example applies to double-sideband reception, which is common to most of the older receivers. If one is using a single-sideband receiver, one simply tunes about 700 Hz away from the center (no tune) point, but the desired beat note will just be heard in one direction.

One does not tune the transmitter to the comfortable listening frequency where the incoming code signal is to be copied, because that frequency is about 700 Hz away from the actual center frequency of the received signal. One tunes the receiver dial to the point where the beat note of the received signals becomes zero, where one no longer hears a tone from the received signal. This is the zero-beat point to which you should set your transmitter to have both stations' transmissions on (or very close to) the same frequency. Most transmitters have an oscillator-only (no output power) or a low-power tune position that can be used

2814 Empire Ave., Burbank, CA 91504

Russ, KA9POQ, and Rich, KA9POR, England who live in Danville, Illinois, are 11-year-old twins and the sons of Terry England, KA9DGS, someone I have been fortunate enough to contact on the air. The boys were operating in the June 1983 ARRL Field Day contest when this photograph was snapped. Their home station includes a Heath HW-101 transceiver, a 2-element 40 meter Yagi-Uda, and a Hy-Gain TH6DXX triband (10, 15, and 20 meters) Yagi-Uda. Most of their operation is on 40 and 15 meters, but they work 10 meters when it is open. Russ and Rich have worked 25 and 18 DX (foreign) countries, respectively. They have each worked 30 states. The twins are studying to upgrade to General.

when zeroing the transmitter frequency to the zero-beat frequency of the receiver. Simply move the v.f.o. (variable frequency oscillator) dial to the point where the transmitter zero-beat note coincides with the receiver zero-beat note. You will hear a high-pitched note as you move the transmitter frequency close to the receiver frequency. As you continue to move closer to the receiver frequency, the beat tone of the v.f.o. will decrease. When the v.f.o. is set to the receiver frequency, there is no difference between the receiver and transmitter frequencies, and the audio beat note becomes zero (silence). If one continues to tune the v.f.o. past this point (using a double-sideband receiver), the resultant beat note will be heard as a low tone that rises as the v.f.o. continues to be tuned away from the zero-beat point. Obviously, one should return the v.f.o. setting to the desired zero-beat point before answering a station calling CQ.

The preceding procedure results in both stations being essentially on the same frequency. With the transmitter set to the received signal center frequency, move your receiver fine-tuning or b.f.o. (beat frequency oscillator) control about 700 Hz above or below the other station's transmission (center) frequency to listen to the incoming code at a suitable tone.

The preceding steps sound a lot harder and more time consuming than they are. Try this procedure a few times, and you soon will develop the ability to zero beat correctly in less than 5 seconds.

Transceivers

It is now unusual for a new Novice to use a station including a separate receiver and transmitter. I know that most of my ex-students use a transceiver in their initial stations. The basic idea of zero beating, which has already been covered for a station containing a separate receiver and transmitter, also applies when a transceiver is used. However, transceivers include unique features which merit additional explanation.

Transceivers usually include two frequency offsets. The transmitter has an offset that automatically shifts the transmit frequency about 700 Hz away from the receive frequency to put the code transmit frequency at (or very close to) the zero-beat point. As stated, this transmit frequency offset is designed into transceivers, and it does not require any special tuning on the part of an operator; however, it is important to know that automatic transmit offset does exist, and one should not also manually offset the transmit frequency. Operators who are accustomed to manually zero beating the transmitter to the receiver center frequency are most likely to make this mistake when they switch to using transceivers.

It is the manual offset frequency tuning of the receiver section which causes most of the off-frequency replies by operators using transceivers. This control has varying front-panel nomenclature on different transceivers, but it serves the same function no matter what it is called. Typical terms for this control are *RIT* (receiver incremental tuning), *OT* (offset tuning), and *clarifier*. Its function was accomplished by the b.f.o. (beat frequency oscillator) control on older receivers. I will use the term *RIT* when referring to this transceiver function, because it seems to be the most popular term.

RIT is both a blessing and a curse. It is good because it allows us to listen above and below our transmit frequency (after calling CQ) to hear any station answering off our transmit frequency. If we were to use the transceiver's main tuning control to locate someone off our original transmission frequency, the other operator might not hear us when we respond on his frequency, since she/he is still listening on our signal transmit frequency. Use of RIT enables us to move just our receiving frequency about 5 kHz above and below our transmit frequency as we search for stations answering us off (above or below) our transmit frequency. RIT use does not shift the transmit frequency selected with the transceiver's main tuning dial. Consequently, we can shift our receiving

frequency to tune in a responding station without moving our transmit frequency. When we subsequently transmit to an off-frequency station, the operator hears us on the same frequency and does not have to tune us in on a different frequency. Simply stated, RIT enables us to leave our transmit frequency where it is while we tune our receive frequency up and down to hear any station(s) answering us above or below our transmit frequency. It sounds like RIT is a great feature, doesn't it? Well it is useful, but if no one had RIT capability, we would all automatically answer each other on frequency.

Some amateur radio equipment manufacturers have built their transceivers with no RIT capability. I used to think that they were dumb, but I now realize that they are smarter than I am. RIT appears to have been designed into early transceivers to enable transceiver users to tune in replies from off-frequency replies from operators using separate receivers and transmitters who did not properly zero beat their transmitter frequency to their receiver frequency. Now that transceivers are used in most amateur radio stations, interference possibilities would be reduced greatly if the RIT features were to be eliminated. However, this is not likely to happen, since transceiver users are accustomed to having RIT.

The single most common problem associated with RIT is that operators frequently forget to return this control to the zero (on frequency) point after they have used it to work a station that answered them off frequency. When this happens, one's transmit frequency is not properly offset (about 700 Hz) from the frequency being received. In this situation any resultant QSO (contact) results in two different frequencies being used by the two stations. It requires effort, but one can get in the habit of returning the RIT control to the zero offset point, which is usually with the knob pointer positioned straight up at the 12 o'clock setting. If you are not sure where the exact zero offset position is located, you can determine this point by tuning in a signal. Listen very carefully to the tone of the received signal. If the RIT is set to the zero offset point (positioned properly to obtain correct automatic transmit frequency offset), there is no difference in the signal tone as RIT is turned on and off. If a tone difference exists, adjust the RIT control (with RIT turned on) until no difference exists when RIT is turned on and off.

Albert Plaza, KA7OQG, of Klamath Falls, Oregon, is a 65-year-old retired U.S. Air Force welder who previously lived in San Francisco. Most of his operating is on the 15 meter Novice code band, where he recently contacted Donald Simmonds operating as VP2MFL on Montserrat Island. Albert's station includes a Yaesu FT-901-DM transceiver, Hustler 5-band trap vertical, frequency counter, and s.w.r./power meter. He has the First Contact Award and a Rag Chewer's Certificate.

One way to avoid inadvertent use of two frequencies during a contact is to leave the RIT turned off when answering another station's CQ call. If you do, you will be very close to being on the same frequency as the station you answer.

Look in your transceiver's instruction manual to see if it states what automatic transmit frequency offset is designed into your rig for various emission modes. If you have a digital frequency meter in/with your transceiver, note the exact difference between the frequency (tone) you prefer and the exact frequency (zero beat, no tone) of the received signal. In other words, if the digital dial reading is 21,107.9 kHz at the point (tone) you prefer, and the tone drops to the point where it disappears at a digital dial reading of 21,108.6 kHz, you prefer a 700 Hz (0.7 kHz) tone. Try this on your transceiver if you have digital readout capability.

When using a standard s.s.b./code transceiver, it is interesting to note which (upper or lower) sideband is used on each band you operate. When operating code, a lot of transceivers use the sideband opposite that normally used on a band for s.s.b. voice operation. Upper sideband (u.s.b.) is normally used for s.s.b. voice transmissions on the upper frequency bands of 10, 15, and 20 meters. This means that the s.s.b. voice signal extends upward from the "center"/base frequency. Lower sideband (l.s.b.) is commonly used for code reception on these upper frequency bands, resulting in the code signal seeming to extend downward from the "center"/base frequency. Similarly, l.s.b. is normally used for s.s.b. voice signals on the lower frequency 80 and 40 meter bands, with code received in the u.s.b. mode on these bands. Pay close attention to how your rig functions. The more you know about your gear, the better you are able to operate it.

Conclusion

I hope this article has been of interest to you. It was suggested by one of my students, who told me that zero beating was something he had not understood despite his having been an active operator for several years. He said my class coverage gave him a good understanding of the subject, and he recommended sharing this information through a column. CQ

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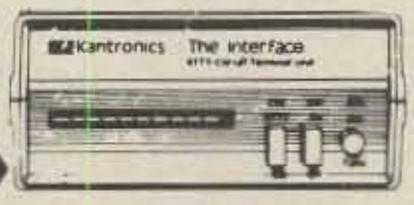

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Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Reading the results of the 1983 World-Wide Phone Contest in the September issue, I discovered a few omissions and errors in the awards list. A preliminary review of the C.W. results also showed some omissions and errors. Limited time makes it impossible to report them in this month's issue. A more thorough check will be reported next month.

In looking over the list of single operator trophy winners, I could not help but notice that many of the winning stations were manned by guest operators. (I like to refer to them as "Hired Guns.") I recall one contest that specifically stated in the rules that the station must be operated only by the station owner. We don't have anything like that in our rules, but we do indicate that awards are issued to the licensee of the station being used. That at least is a step in the right direction.

Rules for the 1985 160 Meter Contest are being drawn up and will be announced in the December issue. No drastic changes are anticipated at this time. However, we are running short of trophy sponsors. The West Gulf ARC will no longer be sponsoring the awards for the U.S., and the C.W. and S.S.B. World Champion Memorial awards have also been vacated. Therefore, there are four spots now available—six if you include the multi-operator division, which has never had a trophy award.

This is an open invitation to all you faithful top-band contesters to come forward and follow the example set by Don Busick, K5AAD, who has been donating the European awards for many years.

There's plenty of contest action this month, especially with the addition of a couple of new ones, so the missing regulars for the month of November whom I have not heard from will not be missed.

A reminder: the deadline for the February issue is November 15th, and December 15th for the March issue. And by the way, have you checked the expiration date of your license lately?

73 for this time, Frank, W1WY

HA QRP C.W. Contest

0000Z Thurs. to 2400Z Wed., Nov. 1–7

This is a new one organized by the Radiotechnika Journal of Hungary, and it should be a challenge to QRPers, since activity is confined to 80 meters (3500 to 3600 kHz) only. Power input must not exceed 5 watts input, and both single operators and multi-operators can participate.

Exchange: RST, QTH, and name.

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

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

Send your log with a description of your station and your transmitter to: Radiotechnika, Budapest PF 603, H-1374, Hungary, before the November 21st deadline.

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Calendar of Events

	Nov.	1-7	HA QRP Contest
	Nov.	3	DARC "Corona" 10M RTTY
	Nov.	3-4	Inter. Police Assn. Contest
	Nov.	3-5	ARRL CW Sweepstakes
	Nov.	4	High Speed Club CW Contest
	Nov.	10-11	DARC Euro. RTTY Contest
	Nov.	10-11	Delaware QSO Party
	Nov.	10-11	Montana QSO Party
†	Nov.	11	Czech. DX Contest
	Nov.	17-18	QRP Club CW Contest
	Nov.	17-18	Missouri QSO Party
	Nov.	17-19	ARRL Phone Sweepstakes
	Nov.	**24-25**	**CQ WW DX CW Contest**
	Nv.30	-De.2	ARRL 160 Meter CW Contest
	Dec.	1-2	TOPS 3.5 MHz CW Contest
	Dec.	1-3	Telco. Pioneers QSO Party
	Dec.	8-9	ARRL 10 Meter Contest
	Dec.	30	Canada Contest
	Jan.	**25-27**	**CQ WW DX 160M CW Contest**

†*Not official.*

High Speed Club CW Contest

Two Periods (UTC)
0900–1100 & 1500–1700 Sun., Nov. 4

The High Speed Club, founded in 1951 by members of the DARC, holds two contests each year. The object is to promote c.w. operating and club activity. There is a power limitation in the contest of 150 watts output. Both members and non-members, as well as s.w.l.'s, are invited to participate.

Exchange: RST and a QSO number starting with 001. Members will also include their membership number.

Scoring: One point per QSO multiplied by the number of DXCC countries worked on each band.

Frequencies: All five bands, 3.5–28 MHz, using the lower 10 to 20 kHz of each band. *(What about the U.S. stations who do not hold an Extra class license?—ed.)*

Awards: Awards will be given to first-, second-, and third-place winners in each country and continent.

Logs go to Detlef Reineke, DK9OY, Katenser Hauptstr. 2, D 3162 Uetze -Katensen, West Germany, and must be postmarked no later than 4 weeks after the end of the contest. Include an s.a.s.e. or IRC to DK9OY for a list of the results.

(The High Speed Club now has over 1200 members in 50 countries all over the world. Besides this contest they also have other on-the-air activities and awards. You don't have to be a high-speed code artist to join the club; accuracy and a smooth "fist" are more important. For more details send one IRC and a self-addressed envelope to the club's secretary, Ernst Manske, DL1PM, Ansgarstr. 14, D 2105 Seevetal 11, West Germany.)

"Corona" 10 Meter RTTY

1100Z to 1700Z Sun., Nov. 3

This is the fourth of a series of 10 meter RTTY contests sponsored by the DARC. As the title identifies, activity will be on 10 meters only in that portion of the band used for RTTY. Complete rules were given in the August column.

Entries go to: Klaus K. Zielski, DF7FB, P.O. Box 11 47, D-6455 Erlensee, West Germany. They must be received within 30 days after the end of the contest.

DARC WAE RTTY Contest

0000Z Sat. to 2400Z Sun., Nov. 10–11

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

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

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

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

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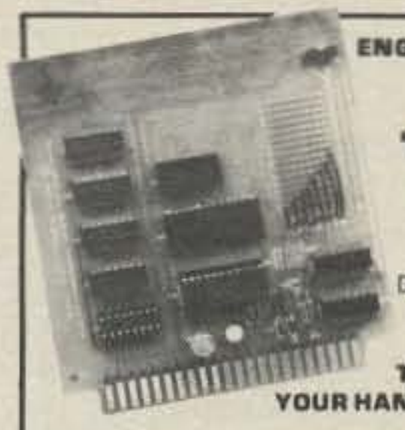

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Mailing deadline for logs is December 15th and they go to: WAEDC Contest Committee, P.O. Box 1328, D-8950 Kaufbeuren, West Germany.

ARRL Sweepstakes

C.W.: Nov. 3–5 Phone: Nov. 17–19
Starts: 2100Z Sat. Ends: 0300Z Mon.

This is the 51st running of the Sweepstakes, making it the oldest domestic competition going, and it really stirs up a lot of activity.

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

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

There are several other regulations, including a cross-check sheet if you make 200 or more contacts. A large s.a.s.e. (37¢ in postage) will get you the "SS Package" and Operating Aid #6 with enough log and summary sheets for an average outing.

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

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

Scoring: Each completed QSO is worth 2 points. The multiplier is derived from the number of ARRL sections, plus VE8, worked (maximum of 74).

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

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

Int. Police Assn. Contest

C.W.: Sat., Nov. 3 S.S.B: Sun., Nov. 4
0600Z–1000Z & 1400Z–1800Z

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

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

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

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

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

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

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

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

Delaware QSO Party

1700Z Sat. to 2300Z Sun., Nov. 10–11

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

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

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

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

Frequencies: C.W.—1805, 3570, 7070, 14070, 21070, 28070. S.S.B.—1815, 3975, 7275, 14325, 21425, 28650. Novice—3720, 7120, 21120, 28120.

Awards: Appropriate awards will be given to the top scorers. In addition, certificates will be awarded to all stations working all three Delaware counties. Include two 20¢ stamps and an address label with your application for the "WDEL" award.

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

Czechoslovakian Contest

0000 to 2400Z Sun., Nov. 11

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 stateside 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, 11327 Prague 1, Czechoslovakia.

Montana QSO Party

1700Z Sat. to 0400Z Sun., Nov. 10–11
1700Z Sun. to 0100Z Mon., Nov. 11–12

The Yellowstone Radio Club of Billings, MT is conducting this one. *(I don't recall having listed this one before. Good luck.—ed.)*

The same station can be contacted on each band and mode; MT to MT QSOs are permitted for QSO and multiplier credit, and mobiles can be worked in each county change.

Exchange: RS(T), QSO no., and QTH. County for MT stations; state, province, or DX country for others.

Scoring: One point for phone contacts; 2 points for c.w. MT stations multiply total QSO points by number of states, VE provinces, DX countries, and MT counties worked. Others use MT counties for their multiplier (maximum of 56).

Frequencies: C.W.—1810, 3540, 7035, 14035, 21035, 28035. Phone—1835, 3905, 7285, 14285, 21385, 28585.

Awards: None were mentioned, but I'm sure top scorers will be acknowledged.

Mailing deadline is December 15th to: Yellowstone Radio Club, 2626 Burlington, Billings, MT 59102.

QRP Club C.W. Contest

0000Z Sat. to 2400Z Sun., Nov. 17–18

Sponsored by the CW Operators QRP Club, contesters may work DX and their own country. QRO stations are invited to participate, but they are limited to working QRP stations only.

Power for QRP stations must not exceed 5 watts output, 10–160 meters, for both single and multi-operator, single or all band.

Exchange: RST plus three-figure QSO number (001, etc.). QRP stations will ID in the exchange.

Scoring: Each QSO on each band using

1 watt or less	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: Each different IARU Zone worked on each band. *(Suggest stations give their zone in the exchange.—ed.)*

There is a bonus of 1.5 for field stations using battery, solar, wind, or hand generated power (no motor generator).

Final Score: Total QSO points × IARU zones from each band × bonus if any.

Awards: Certificates to the highest scoring single and multi-operator stations in each country, in each section, for both QRP and QRO, and to the top-scoring QRP Club member.

Stations can compete for any 24 hour consecutive period or for the full 48 hours.

Include a summary sheet showing the scoring, station description, and a signed declaration with your entry. Logs must be received no later than February 26, 1985 by the Contest Manager, P.O. Box 109, Mt. Druitt, N.S.W. 2770 Australia.

Missouri QSO Party

0001Z Sat. to 1800Z Sun. Nov. 17–18

The Northland ARA is again sponsoring this party, but unfortunately they moved it to a week later, right on the same weekend as the ARRL Phone Sweepstakes.

The same station can be worked on each band and mode (no 30 meters), mobiles in each county change, and MO to MO contacts are permitted for QSO and multiplier credit.

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

Scoring: Two points for phone QSOs; 5 points if on c.w. MO stations multiply total by states, provinces, DX countries, and MO counties worked. All others use MO counties for their multiplier (maximum of 115).

Frequencies: C.W.—1805 and 10 kHz up from band edges. *(Only looking for Extra class?—ed.)* Novice—25 kHz up in Novice bands. Phone—1835, 3963, 7230, 14280, 21380, 28570, 145.43 (no repeaters).

Awards: Certificates to top scorers—phone, c.w., and Novice—in each state, VE province, and DX country. A plaque to the "Top Banana" in Missouri.

Mailing deadline for logs is December 1st to: Northland ARA, P.O. Box 6710, Kansas City, MO 64123.

ARRL 160 Meter C.W. Contest

2200Z Fri. to 1600Z Sun
Nov. 30 to Dec. 2

This is the 15th year for this top-band activity. Exchanges will be between stateside and VE and DX stations. DX to DX contacts, however, are not permitted.

Classes: Single operator and multi-operator.

Exchange: RST and your ARRL section; country for DX and ITU region for maritime mobiles.

Scoring: Contacts between stations in ARRL sections count 2 points, with DX stations 5 points.

Multiplier: Determined by the number of ARRL sections plus VE8/VY1 (maximum of 74) and DX countries worked (for W/VE participants). (DX use ARRL sections only.)

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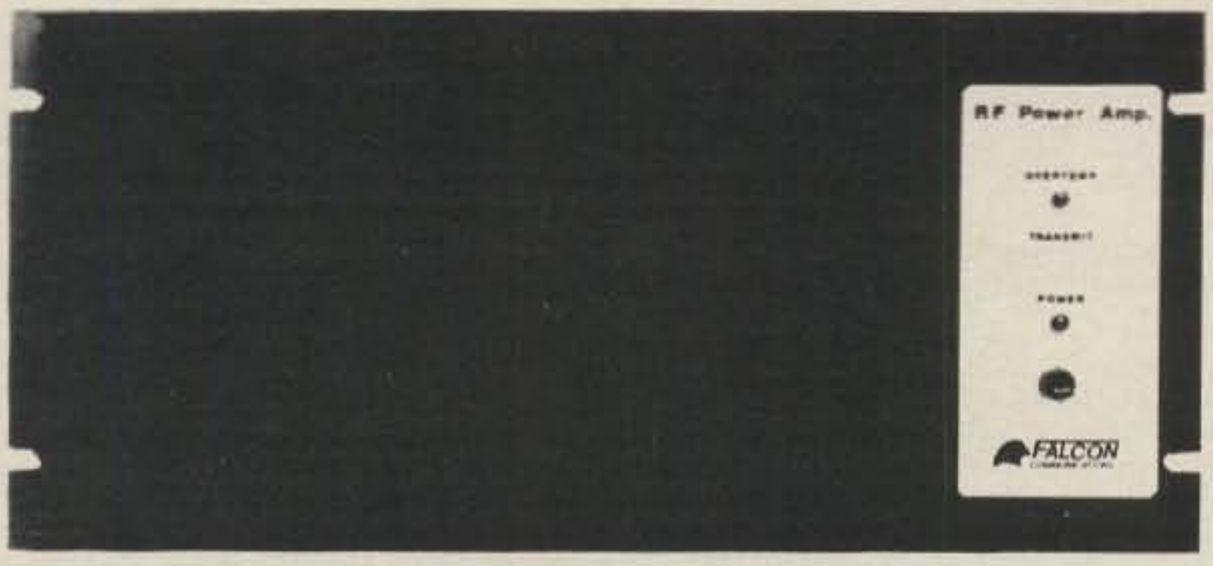

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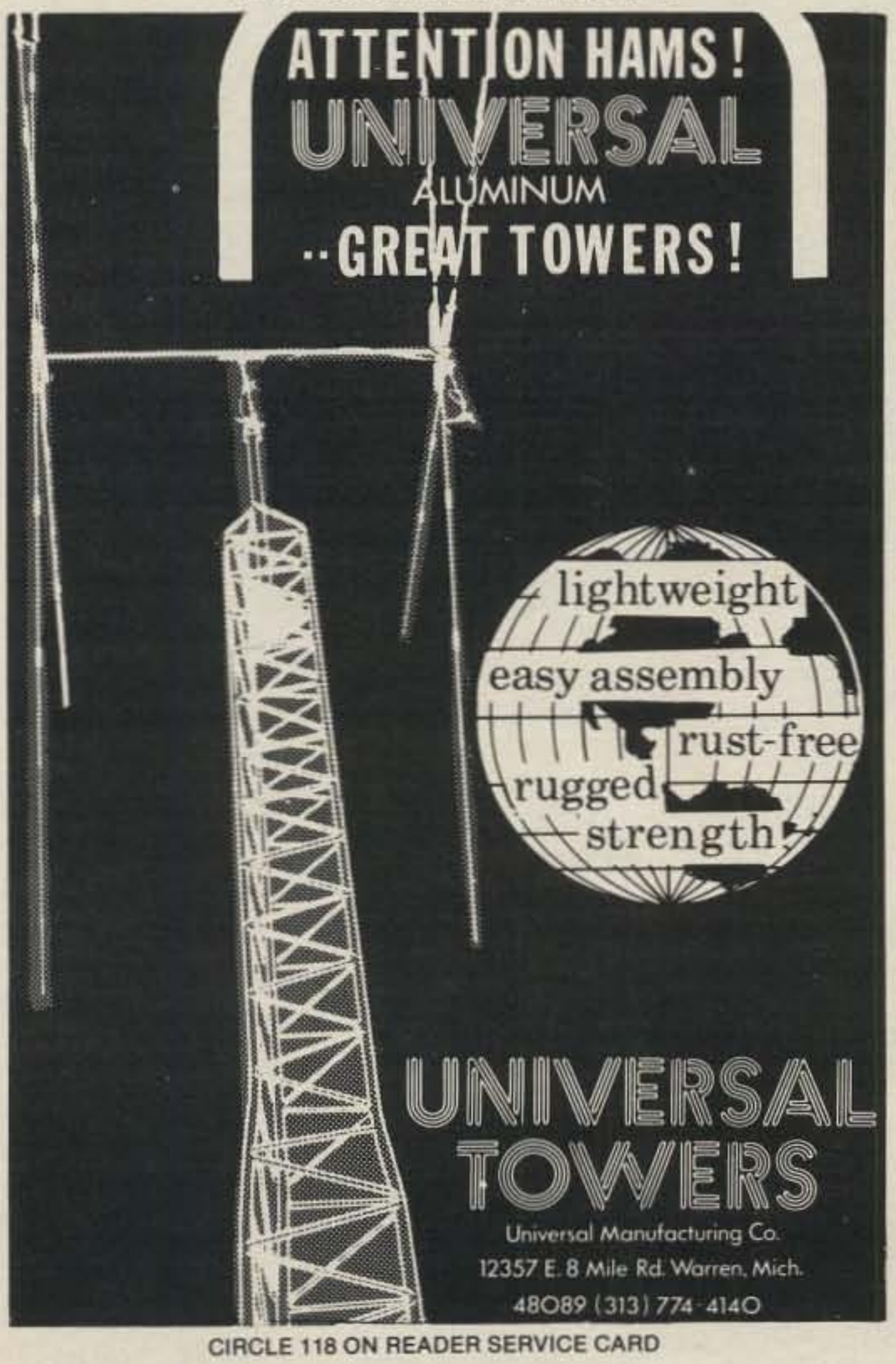

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CIRCLE 136 ON READER SERVICE CARD

Final Score: Total QSO points times the ARRL section and DX multiplier.

Awards: Certificates to the top-scoring single operator station in each section and DX country, and to the top-scoring multi-operator station in each ARRL division and continent.

The ARRL 160 band plan requires that W/VE stations transmit only in the 1800–1825 and 1830–1850 kHz segments, keeping the "DX Window" (1825–1830 kHz) clear for DX stations. They will indicate where they will be listening for cross-frequency contacts.

The usual grounds for disqualification—violation of rules, excessive duplicate contacts, etc.—will prevail.

Logs with more than 200 QSOs must include dupe sheets. A large s.a.s.e. to the ARRL will get you the necessary forms to make log keeping easier.

All entries must be postmarked no later than January 4th and go to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

Telco. Pioneers QSO Party

1900Z Sat. to 0500Z Mon., Dec. 1–3

This is the 20th annual party organized by the Telephone Pioneers of the U.S. and Canada. This year's party is again being sponsored by the John D. Burlie Chapter #89 of Columbus, Ohio.

Members may be contacted on each band and each mode if they are in different chapters, but only one contact is permitted between stations in the same chapter.

Exchange: QSO no. and chapter number (ITPA chapters, name only).

Scoring: One point per QSO on each band and mode, and one multiplier for each different chapter worked. Chapters are counted once only. There are 98 TPA and 10 ITPA chapters.

Frequencies: Phone—3915, 7275, 14285, 21375, 28705. C.W.—3575, 7075, 14075, 21075, 28075. Plus or minus 20 kHz. Also u.h.f. 50–54, and Novice/Tech., and RTTY bands.

Awards: None were mentioned, but there probably are awards for high-scoring individual stations and clubs. Log sheets may be obtained from your Radio Club Coordinator or Administrator. Mailing deadline for all entries is January 15th, and they go to: John D. Burlie Chapter #89, Att: Ted Phelps, W8TP, 6200 East Broad Street, Columbus, OH 43213.

TOPS Activity Contest 3.5 MHz C.W.

1800Z Sat. to 1800Z Sun., Dec. 1–2

TOPS is an international club for c.w. enthusiasts founded in Great Britain in 1946. Their objective is to encourage c.w. operation on the top bands.

Classes: Single operator, multi-operator, and QRP (5 watts or less input).

Single operator stations must take one break of 7 hours during the contest period; multi-operators can operate the full 24 hours.

Exchange: RST plus a three-figure QSO number starting with 001. TOPS members will also include their membership number.

Scoring: QSO's within own country, 1 point, in own continent 2 points, with other continents 6 points. Work a TOPS member and get 2 bonus points (members get 3 points).

Each call area in W, VE, VK, PY, U, and JA will count as a separate country for scoring. The multiplier is determined by prefixes worked (same as *CQ* WPX Contest).

Final Score: Total QSO points times the total number of prefixes worked.

Frequencies: Operation will be between 3500–3585 MHz, with the lowest 12 kHz reserved for out-of-continent DX contacts only. (When sending CQ send TAC, not Test.)

Awards: At least 15 certificates will be awarded based on the top scores in each class.

Logs must be received no later than January 31st and go to: Bertil Arting, SM3VE, Bergesvegen 26, S-823 00 Kilafors, Sweden.

(Last year out of 175 single operator entries W0ZV #154 was the only U.S. entry. To encourage more entries, an award will be sent to all who include $1.00 to cover expenses, regardless of score. The final results will be sent to all entries via bureaus, or direct if you include one IRC with your entry.)

CQ WW DX C.W. Contest

0000Z Sat. to 2400Z Sun., Nov. 24–25

Just a reminder, as if you needed one, that the c.w. section of the contest is coming up at the end of this month. The phone section is already past history.

I'm not going to bore you and repeat what has already been written and rewritten over the past couple of months. Complete rules were published in the September issue, and a reminder of a few minor modifications and additions was printed in last month's column.

The main thing to remember is that all logs, both phone and c.w., go directly to the *CQ* office this year: *CQ* World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801. The phone deadline is December 1st, and the c.w. deadline is January 15th. Be sure to indicate phone or c.w. on the envelope to avoid your logs being entered into the wrong section by mistake!

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THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

Commercial Interests Pose Threat To 220 MHz Band

As we go to press, two petitions before the Commission seek to grab portions of the 220 MHz band for Land Mobile operations. The first, RM-4829, was initiated by the Land Mobile Communications Council and suggests that portions of the 220–225 MHz band could satisfy requirements of Land Mobile users. The Council does note, however, that this band, because of its small size, has limited use in the near term, though it "may prove to be valuable for future Land Mobile operations." For the most part, the Council seeks frequencies in the 800 MHz region of the spectrum as well as portions of the spectrum allocated to television broadcasting and the Federal government.

The second petition, RM-4831, was filed by Sideband Technology, Inc. This corporation manufactures amplitude compandered single-sideband equipment for use by the Land Mobile service, and it, too, seeks frequencies in the 220 MHz band (specifically, 216–222 MHz). In its petition Sideband Technology argues that 220–222 MHz is "lightly loaded," and accordingly, should be reallocated for narrowband (5 kHz) systems.

Pressure on the 220 MHz band results primarily from the continued growth of the Land Mobile service. That the pressure seems to be increasing of late, however, may reflect the fact that the Commission rejected the creation of a no-code amateur license. (In its filing regarding the Implementation of the Final Acts of WARC-79 (General Docket 80-739), the ARRL claimed that the 220–225 MHz band was needed by the amateur community, especially if Commission action in Docket 83-28 established a codeless class of amateur license. This point was given recognition by the Commission in its Second Report and Order in the matter of General Docket 80-739, although the Commission did not comment on the League's argument).

In spite of the petitions before the Commission regarding the 220–225 MHz band, Footnote US 243 in the Table of Allocations indicates that "stations in the radiolocation service have priority until 1 January 1990. Footnote 627 puts it more directly: "In Region 2 (the Americas), the band 216–225 MHz is . . . allocated to the radiolocation service on a *primary* basis until 1 January 1990. All this suggests that the Commission may delay taking any action *vis-a-vis* the 220–225 MHz band in the near term.

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R.F.I. Complaints Shrink Probably Due To CB-Use Decline

According to Jeffrey Young, Field Operations Bureau, FCC, r.f.i. complaints to the Commission in the period April–June 1984 inclusive totaled 15,934. This is down from the 18,051 complaints reported during the same period a year earlier, due largely to the drop in complaints involving CB operations.

As always, so-called television interference (t.v.i.) accounted for the majority of the complaints, with 11,518 cases citing a television receiver as the victim device. This represents 72% of the r.f.i. cases reported, suggesting again that television manufacturers still have a long way to go before their products exhibit good immunity to strong r.f. signals. Of the 11,518 t.v.i. complaints, 6,604 involved CB operations, while only 690 cited amateur operations for the "alleged" interference ("alleged" because most cases of amateur-related t.v.i. have been shown to result from front-end overload of the television receiver).

In all, CB operations accounted for 7794 r.f.i. complaints, while amateurs were cited in 968 cases. Unfortunately, complaints by one amateur against another amateur totaled 253. Thus, roughly one out of every four amateur-related complaints was an intra-service complaint!

Willful Interference Being Considered As Possible Offense Under Section 323 of Communications Act

Amateur-to-amateur interference accounts for one out of every four r.f.i. complaints involving the Amateur service (see above). And nowhere are the problems greater than in California, where continued attempts by violators to disrupt amateur repeater operations keep both amateurs and FCC personnel hopping. To date, a number of scofflaws have been identified and have had their licenses revoked. But despite the revocations and fines imposed by the Commission, some violators continue to operate.

So great has the problem become that west coast amateurs have now enlisted the support of Congressman Jim Bates to introduce legislation that would add willful or malicious interference to the list of offenses included in Section 323 of the Communications Act of 1934 (as amended). The inclusion of such legislation would significantly shorten the time required before the Justice Department could become involved in interference cases . . . cases which, in the past, have sometimes taken years to settle.

A draft of the proposed legislation is now making the rounds within both the Commission and the ARRL.

Commission Orders Second Uncoordinated Repeater Off The Air

In the second action of its kind this year, the FCC has ordered the Hall of Science Amateur Radio Club to cease operation of its repeater, WB2JSM/R, on 145.30 MHz. The repeater has been the subject of numerous interference complaints from operators of coordinated repeaters in the New York area, and was the subject of a study by the Commission's New York field office.

Earlier this year a similar directive resulted in a San Diego, CA, repeater being removed from the air. In both cases the Commission was invoking the provisions of an April 1983 letter from then-Chief of the Private Radio Bureau (PRB) James McKinney, who stated:

"The Commission is persuaded by . . . observation that . . . national frequency planning and coordination by amateur radio operators themselves can result in the best spectrum utilization appropriate to the service." McKinney also noted that amateurs who persist in operating an uncoordinated repeater that causes interference to the operations of coordinated

repeaters may be cited for not observing "good amateur practices." In determining whether or not a repeater is coordinated, concluded McKinney, the FCC intends to take into consideration documents such as nationally promulgated bandplans, and coordination records and correspondence.

While WB2JSM/R has been ordered to discontinue operations, the Commission did give the trustee of the club's station, John Powers, KA2AHJ, the option of continuing repeater operations *provided* he obtained coordination or took steps to eliminate interference to coordinated repeaters.

What's the bottom line, then? Just this: In any confrontation between a coordinated and uncoordinated repeater, it is the uncoordinated repeater that the Commission will order off the air!

Amateur Auxiliary Formed To Assist Field Operations Bureau

According to the FCC, the Field Operations Bureau (FOB), FCC, and the ARRL have agreed to develop and implement an amateur auxiliary to the FOB.

The auxiliary, made up of a cadre of volunteers, will be trained to independently handle many of the amateur-radio-related requests for assistance received by the field facilities. Among other things, the volunteers will devise and implement means to foster wider knowledge of the rules, conduct maintenance monitoring of the amateur frequencies, develop solutions to problems arising from the operation of these radio stations, and undertake other specific projects identified as the need arises.

Creation of the amateur auxiliary was made possible by Congressional enactment of Public Law 97-259 (47 U.S.C. 154 [f]). This is the same law that mandated the creation of the Volunteer Examination Program. Both the VEP and the amateur auxiliary are intended to provide budgetary relief for the FOB.

Operation of the amateur auxiliary began in September 1984. For more information as to how your organization can qualify to participate, contact Mr. W. Elliott Ours, Federal Communications Commission, Field Operations Bureau, 1919 M Street NW, Room 744, Washington, DC 20554 (202-632-7090).

John Silberman, KB4CRT Scores "First" With AO-10

According to *Amateur Satellite Report (ASR)*, a newsletter of the Radio Amateur Satellite Corporation (AMSAT), honors for the development and successful use of the first man-portable amateur satellite station go to John Silberman, KB4CRT. Silberman, said *ASR*, "carried pieces of the station on his back, strapped to his waist, lashed to his arms, (and) stuck in his pockets" when on 23 June 1984 he contacted ON7HP for an historic QSO. The contact was achieved without gateways, commercial power, car batteries, or anything else that would have limited Silberman's mobility. And just to prove that the first contact was not a fluke, Silberman went on to work DB8KJ, DJØPQ, and G6CHP!

By the way, congratulations may also be in order for ON7HP. While it is yet to be verified, that station now claims to be the first to work 100 countries on AO-1Ø.

Amateurs Receive STA For Spread-Spectrum Operations

According to *QEX*, the FCC has issued a second Special Temporary Authority (STA) to the Amateur Radio Research and Development Corporation (AMRAD) for continued tests of spread-spectrum modulation techniques. All of the tests proposed under this STA involve frequency-hopped transmissions. Using this technique, a conventional, narrowband signal is moved in a random pattern over a set of frequencies within a specified band, with the signal only allowed to dwell momentarily on any given frequency.

In the tests proposed, the bands to be used are: 3675–3995, 7050–7295, 14,100–14,345, 21,100–21,345, and 28,100–29,300 kHz. Service frequencies are 3725, 7100, 14,150, 21,150, and 28,350 kHz, plus or minus 10 kHz for establishing communications and technical coordination. Announcements of upcoming tests on all bands (except 10 meters) will be made using W1AW bulletins.

Additional frequency-hopping tests under the STA will be conducted in the 144, 220, and 420 MHz bands. For more information on these and other AMRAD activities, contact Amateur Radio Research and Development Corporation, P.O. Drawer 6148, McLean, VA 22106-6148.

Kantronics Warns Exhibitors/ Amateurs Re Software Piracy

In a letter to *CQ*, Mike Forsyth, Marketing Director, Kantronics, Inc., warned exhibitors and users of its software not to steal its copyrighted programs. Underscoring the message was Kantronics' assertion that it plans to prosecute two exhibitors who were selling illegal copies of Kantronics' programs earlier this year at a hamfest.

Forsyth noted, however, that legal action alone would not stop the problem. He called upon the entire amateur community to assist his corporation and others facing similar problems, and outlined a simple, three-point program to eliminate the problem:

1. Never buy copied software.
2. Report pirates to the software manufacturer.
3. Don't allow illegal sales at your local hamfest.

Why the concern relative to pirated software? Just this, says Forsyth: "If manufacturers are not able to sell

enough product to make a profit, other new and improved programs will not be written."

League Introduces New Edition Of The R.F.I. Handbook

An updated version of the ARRL's handbook on interference, *Radio Frequency Interference: How to Identify and Cure It,* is now available from the League. Opening with a general review of r.f.i.—its history and causes—the book takes the reader through eight chapters that deal with everything from Citizens Band interference (for which we often take the blame!) to interference from electrical devices and power lines, and from transmitter interference to the identification and resolution of radio and television interference (t.v.i.) problems. One very welcome chapter addresses cable-television interference (CATVI), while the updated consumer products r.f.i. assistance list assembled by Hal Richman, W4CIZ, is a "must" for solving problems involving electronic home-entertainment.

While material dealing with video cassette recorders (VCRs) and devices such as touch-control lamps is yet to be included in the book, the latest edition of the League's radio-frequency interference handbook remains one of the best references available on a subject that, at one time or another, affects all amateurs.

Amateurs Move To Implement ACSB

According to *QEX*, the Radio Amateur Satellite Corporation (AMSAT), Project OSCAR, and the ARRL have been exploring the possibility of transmitting amplitude-compandored single sideband (ACSB) through OSCAR 10. Use of this modulation technique will provide two benefits: (1) it will improve the signal-to-noise ratio compared to that obtained using conventional s.s.b., and (2) it will automatically keep the s.s.b. signal tuned in despite any Doppler shift encountered.

Amateurs wishing to participate in ACSB tests are encouraged to contact AMSAT (Vern Riportella, WA2LQQ), Project OSCAR (John Browning, W6SP), and the ARRL (Paul Rinaldo, W4RI).

ARRL Signs MOU With FEMA

After more than three years of negotiation, the ARRL has signed a Memorandum of Understanding (MOU) with the Federal Emergency Management Agency (FEMA). Signing for the League was President Larry Price, W4RA; FEMA Director Louis O. Giuffrida signed for his agency.

According to the terms of the MOU, FEMA "recognizes that the ARRL is the principal organization representing the interests of more than 400,000 U.S. radio amateurs, and because of its organized emergency communications capability, (it) can be of valuable assistance in providing critical and essential communications during emergencies and disasters when normal lines of communications are disrupted."

The League, in turn, recognized FEMA "as the Agency chartered as the central point of contact with the Federal Government for a wide range of emergency management activities in both peace and war time."

Commission Denys HP Petition For Part 18 Exemption

In an Order released earlier this year, the FCC has denied a petition from Hewlett-Packard Co. to exempt medical ultrasonic diagnostic and monitoring equipment from Part 18 of the Commission's Rules. Part 18 of the Rules is designed to control radio frequency interference that can be caused by ultrasonic equipment and other industrial, scientific, and medical (ISM) equipment. This type of equipment uses r.f. energy to perform a specific task, and radiation incidental to its operation must be kept to minimal levels in order to minimize the likelihood of radio frequency interference.

In its argument before the Commission, HP alleged that neither it nor most other manufacturers of medical ultrasonic diagnostic and monitoring equipment previously thought that Part 18 applied to such equipment. The company further asserted that this type of equipment used considerably less power than industrial or medical therapeutic equipment, and that the r.f. energy is coupled by use of techniques less prone to radiation. Joining HP in its argument were the Health Industry Manufacturers Association and the National Electrical Manufacturers Association.

The Commission, however, was not persuaded by the information presented. It stated that its basic concern remained with the fact that this equipment intentionally generates r.f. energy that, unless given proper attention, can cause radio interference. Further, it noted that while it is certainly true that the type of equipment under consideration generally employs lower levels of r.f. energy than most industrial machines, it does not appear that the levels are as low as that employed by the digital electronic medical equipment that had previously been exempted. Accordingly, the FCC *denied* the Hewlett-Packard petition.

At the same time that it acted to *deny* the HP petition, the Commission reminded the communications/electronics community that it had previously proposed a complete revision of Part 18 of the Rules (FCC Docket 20718). Further action in that proceeding has been held in abeyance pending deliberations within the International Radio Consultative Committee (CCIR) regarding international limits on radio noise generated by ISM equipment.

Quello Sworn in for Full Seven-Year Term

Your Washington Editor and the staff of *CQ* congratulate James H. Quello on being sworn in for a full seven-year term on the Federal Communications Commission. Quello is a veteran Detroit-area broadcaster, and was initially appointed to the Commission in 1974. His new term will end in June 1991. The official swearing-in ceremony was conducted by the Honorable Damon J. Keith, Circuit Judge for the U.S. Court of Appeals for the Sixth Circuit.

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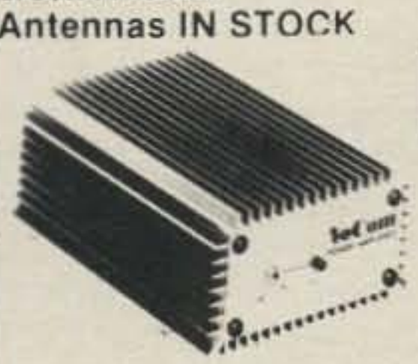

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DX

a monthly feature by

HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

"Oh stay," the maiden said, "and rest
Thy weary head upon this breast!"
A tear stood in his bright blue eye,
But still he answered with a sigh,
"DX, DX . . . ."

Some may tend to believe that all the DX questions have already been asked and answered. However, each generation makes it own good days, and each generation of DXers has to question anew. Last week one of the Newcomers came up the hill to pose some of his questions. "It was at the W9DXCC convention a month or so back," he started right in by saying. "This old DXer was down from Wisconsin, and he told some of us at the banquet table that until you learn the R.E.L. effect, you'll mostly be an amateur working some DX and hardly be a candidate for true-blue status." The Newcomer paused and held our attention with a quizzical glance. "Just what is the R.E.L. effect," he asked, "and just what does R.E.L. mean? One fellow I talked to thought it might have something to do with relativity. Do you know?"

Of course we knew, though we must admit that sometimes we stop to wonder about just what do we know, and the older we get the more we wonder. When one has doubts, one should see a DX consultant, and we headed right on up the hill to the Old Timer, who is one who hardly ever doubts anything. We knew that he would have the answers. Old Timers usually do, and they are usually willing to let you know they do.

The Old Timer had something to say to help us. "Years back," the Old Timer began, "there was a rather well-known DXer called Red-Eyed Louie. He always claimed that the redness in his eyes came from staring at the dials on his rig through many lonely nights. Anyhow, along the way Red-Eyed started talking up his beliefs on how one might find needed DX, and especially the rare or semi-rare countries. Possibly much of what he expounded upon had been heard before, but Louie was always ready to talk if someone would listen. Other DXers came to refer to it as the Red-Eyed-Louie effect, or for short, just R.E.L. Get it?"

At this point we were getting everything the Old Timer was saying, but it was not enough for the Newcomer. "All of what you are saying is pretty much what the Old Timer from Wisconsin told us. I remember his name as Bob. But what about the theory? Just what was it anyhow? There has to be more to it."

77 Coleman Dr., San Rafael, CA 94901

Here is Ed Ross at his 5B4OG QTH. Ed has been known as G3CYC, VP2AV, and A9XCE, to name a few, and is much interested in 160 and 80 meter activity. (Photo via Jack, W2LZX)

In DXing one learns that there is always more expected, and the Old Timer was the one to give it. "Old Red-Eyed," he continued, "believed that new countries come in several packages, one being the well-advertised DXpedition, and the other being the home-grown variety. Many fairly rare countries do have resident DX types, some possibly more active than others. A DXpedition may bring a concentrated effort over a short span of time, while the home-grown type goes on for months, and sometimes years. Louie's argument was that if a low-total and needy DXer was going to work all the available DX, he first had better spend some time studying the home-grown habits of operating. The argument frequently was made that DXers with just over 100 countries are the ones who need the most help, those over 200 a bit less help, and if you have over 300 countries you should know most everything about DXing and should need no help at all." The Old Timer paused to put a question to the Newcomer: "Do you believe that those with over 300 countries will agree that they don't need any help working DX?"

The Newcomer was of the opinion that logically they could hardly think otherwise. The Old Timer stopped for a moment to shake his head, possibly to sort things out, and then continued.

"At least you are learning," he said somewhat sadly. "But the point that Red-Eyed always made was that most DXers are creatures of habit in their operating, and that DXers tend to operate about the same time on the same day of the week, week after week, and often are found around the same frequencies. To anyone who was willing to listen, Louie urged a compiling of reports, claiming that once you establish operating habits you are well along the way to working them. Red-Eyed Louie used to compile lists of large numbers of stations on all the continents. Those who have tried it are usually after a handful of specific countries, so all they do is list every report they have of activity in that country. More than once it has been a surprise to note how quickly a pattern can be detected. Red-Eyed made up his lists a couple of times a month, always with recent activity. You would pick the ones you need, keep your own needed list, and more than one elusive DX country was caught by a needy DXer." The Old Timer was telling this as though it was already common knowledge, but it was obvious that as yet the Newcomer's font of knowledge was not overflowing.

At times we get the feeling that the difference between the Local Newcomers and the Old Timer is that one comes asking questions, the other has all the answers. Then we remember that every DXer has to come asking questions, although it is also possible to move upscale just a bit faster if some of the DX answers come from one's own thinking.

"I hear what you are saying," the Newcomer said, an edge of doubt noticeable in his words, "but how do you get DX information? Where did Red-Eyed Louie get it? That's what I'd like to know."

The Old-Timer was quick to answer. "Louie collected reports, especially recent reports. Many DX bulletins list the rare and semi-rare recent activity, usually giving time and frequency as well as the date. When you see the listing of a country you need, there can be no doubt in your mind that there is current activity going on. The bands may not always be open between your QTH and the DX station, but they will be at times, and if you are primed on the operating times and habits of what you need, your chances of catching a needed one will be improved. Isn't this rather obvious?"

Even the Newcomer had to agree with the obvious. "Someone also mentioned listening for QSL managers at the meeting. Actually, I wondered why a QSL manager would be of any help, but then he

The WPX Program

Mixed

1117	W9NUF	1119	NB2T
1118	DF6EX	1120	KR9F

S.S.B.

1675	W9NUF	1677	ISØKNG
1676	JA9GXY	1678	EA5CIT

C.W.

2280	W9NUF	2284	EA5AIO
2281	KA9GZM	2285	I7PXV
2282	G4MMY	2286	HA8GJ
2283	EA3DSC		

WPNX

221	WP4BJC	222	N2EAW

Endorsements

Mixed: 450 W9NUF, K1SF, DF6EX. 500 W9NUF, DF6EX. 550 W9NUF, DF6EX, I2EAY. 600 W9NUF, DF6EX, AKØG, N3KR. 650 W9NUF, DF6EX. 700 W9NUF, DF6EX. 750 W9NUF. 800 W9NUF. 850 W9NUF. 900 W9NUF. 950 W9NUF, W6YMH. 1000 W9NUF, OK3IF. 1050 W9NUF, LA7JO. 1100 W9NUF, LA7JO. 1150 W9NUF, LA7JO, KF2O. 1200 W9NUF, KF2O. 1250 W9NUF, KF2O. 1300 W9NUF. 1350 I2DMK, SP9AI. 1400 SP9AI. 1550 K9BG. 1600 K9BG. 2400 W2NC.

S.S.B.: 350 W9NUF, ISØKNG, VE4AT. 400 W9NUF, ISØKNG, VE4AT. 450 W9NUF, ISØKNG, W3IJT. 500 W9NUF, NB5C, ISØKNG. 550 W9NUF, ISØKNG. 600 W9NUF, SV1MO, ISØKNG, WI4K. 650 W9NUF, SV1MO, ISØKNG. 700 W9NUF, ISØKNG. 750 W9NUF, ISØKNG. 800 W9NUF, ISØKNG, WAØDCQ, KC8YM. 850 W9NUF, KC8YM. 900 W9NUF, I2DMQ, KC8YM. 950 W9NUF. 1000 W9NUF. 1100 I6SF. 1150 K4CKS. 1200 K4CKS. 1700 WØYDB. 2000 K2POA.

C.W.: 350 W9NUF, JA9GXY, AL5K, YC2BDJ, KA9GZM, I7PXV. 400 W9NUF, JAØGXY, AL5K, I7PXV. 450 W9NUF, JA9GXY, I7PXV, KA8EBG. 500 W9NUF, JA9GXY, I7PXV. 550 W9NUF, I7PXV, N3KR. 600 W9NUF, I7PXV. 650 W9NUF, W1WAI, AK2Y, I7PXV. 700 W9NUF, W1WAI, AK2H, I7PXV. 750 W9NUF, W1WAI, I7PXV. 800 W9NUF, AG5C, I7PXV. 850 W9NUF, W9NO. 900 W9NUF, 950 W9NUF, OK1KYS. 1000 W9NUF, OK1KYS. 1050 DL7MQ. 1100 I2DMK.

10 meters:	W9NUF, CT4UW, LA7JO.
15 meters:	W9NUF, WO4L, CT4UW, JA9GXY, LA7JO, AK2H, SP6FER, JJ1EEA.
20 meters:	W9NUF, CT4UW, W9PWM, LA7JO, AK2H.
40 meters:	W9NUF, LA7JO, AK2H.
80 meters:	W9NUF, LA7JO, AK2H.
160 meters:	W9NUF.
Asia:	W9NUF, W1WAI, CT4UW, JA9GXY, DF6EX, LA7JO, JA2KVD, JJ1EEA.
Africa:	W9NUF, W1WAI, DF6EX, LA7JO.
No. America:	W9NUF, W1WAI, LA7JO, KY9P, SP6FER.
So. America:	W9NUF, LA7JO.
Europe:	W9NUF, WA2WAI, JA9GXY, W9PWM, DF6EX, LA7JO, HA8BJ, JJ1EEA.
Oceania:	W9NUF, LA7JO, JA2KVD, JJ1EEA.

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pointed out that when a DX station passes log information to his QSL manager, that is the time to be waiting. When I thought about it the idea did seem good. So I guess you should watch for schedules with QSL managers, right?"

This Newcomer was thinking for himself. We had to think of the old bureaucratic truism "Knowledge is Power!" and how in DXing it is just as true; the Newcomer who gathers information before long will grandly be advising others seeking DX in a random search pattern. By this time we were leaning to the belief that this Newcomer was acquiring some of the tools of DXing, and before long he would be listing his needed countries on 3 × 5 cards with time, date, and frequency notations when stations were reported from those countries. He would be there at the right times. But he was not yet through talking, unfortunately.

Here stands a total of 2975 DXCC countries worked, and possibly a few more by the time you read this. This was a gathering of the Chiltern DX Club at the home of G4DYO in June. From the left, with their totals, are G3GIQ 336, W6SN/G4WDB 350, G3DOG 329, G3ZAY 321, G3MCS 325, G3LQP 330, G4DYO 313, G2DMR 328, and G3KMA 343. Bill Lippman, W6SN, a past-president of the U.S. Swimming Foundation, was quick to note that his total was tops. In short order it was quickly rebutted by noting that Bill has been DXing for 62 years. There is reason for some DXers being noted as Old Timers, and perhaps more than one reason.

"All this is very informative," the Newcomer gravely commented, "but at that DX meeting there were a couple of fellows who were not in agreement. Admittedly, they did not have any high DXCC totals, but they argued that the best way to work DX is to get on the band and call CQ DX. They argued that this way the DX comes to you and all you have to do is sit there and pick them off. One fellow was very adamant, saying that in a contest with his low power he could not get through and work anything unless he sat on a frequency and called 'CQ DX Contest.' Apparently he is not alone, because in the World-Wide Phone Test a couple of weeks back it did seem at times that they were shoulder to shoulder on the lower portion of 20 calling CQ DX. Is that another procedure that low-total DXers are supposed to know about?"

We were stepping back a step or two because we knew if there was anything to bring the Old Timer to a boiling point it was to advocate calling CQ DX on the DX bands. He was quick to disillusion the Newcomer. "You will find," he said, and there was a grating edge to his voice, "that these will be noted more for their enduring hopes than for their high DXCC achievements. They talk better than they perform." That was all he would say. We did recall that once he told us that newly minted DXers have many roads to follow, but if they insist on turning down the wrong road, they should not bother signaling him for either help or sympathy. We did get the impression that he would give neither to anyone on the DX bands calling CQ DX.

Later on the way down the hill we asked the Newcomer what he had learned. "All that talk about the R.E.L. effect was interesting," he said, "and I do think that it will help make me an effective DXer. But why does the Old Timer object to calling CQ DX?"

We knew why, but we also were not going to even try to tell him. Long ago we began to suspect that what is hard to understand about DX at 100 countries is a model of crystal clarity at the 300 mark. We thought we would let this one learn this himself. Most DXers become wiser as their totals grow, we believe, though some skeptics say it is only that they have grown older. One eventually learns to recognize those things which are proof of no one's skill, but everyone's folly. The Newcomer would learn.

As for working indigenous DXers, think of Father Moran and how tough it would be to catch 9N1 if he were not around. Besides, what DXer has not felt a bit better to sign off with 9N1MM and have Father Moran say, "73, and God bless you."

DXPO '85

Carl Henson, WB4ZNH, passes along some information on the upcoming DXPO '85 which will be held September 27–29 at the Lanier Plaza in downtown Atlanta. Early in 1984 the

The WAZ Program

15 Meter Phone

201	JAØORM	203	WA6DTG
202	SM5BMB	204	W8MLK

15 Meter C.W.

110	N4RR

20 Meter C.W.

220	JA4LXY

All Band WAZ

S.S.B.

2872	W4DOU	2881	JE6JRY
2873	KA1ND	2882	KC7XB
2874	N4JF	2883	JF1IRW
2875	JA2GHW	2884	W7HKI
2876	DK2WH	2885	G3NDC
2877	DJ2PU	2886	DF3BL
2878	W1BH	2887	CT1VY
2879	KB8CU	2888	JA4JBZ
2880	WB2WEO		

C.W. and Phone

5786	YU3ZY	5796	YU8CF
5787	JA8RII	5797	WD9EJE
5788	KA6IYE	5798	EA8ZS
5789	TN8AJ	5799	EA3CRU
5790	W1WAI	5800	AE3S
5791	JA5SPQ	5801	KC2X
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5793	DF5FP	5803	W7MCU
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5795	NS6P	5805	YU1SZ

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the WAZ Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application.

5 Band WAZ

Standings as of August 1, 1984

All 200 zones worked:

1. ON4UN	27. SM3EVR	53. OK1ADM
2. K4MQG	28. LA5YJ	54. CT1FL
3. SM4CAN	29. DL3RK	55. WA1AER
4. AA6AA	30. N4WJ	56. N4RR
5. W8AH	31. G3MCS	57. UW0MF
6. W6KUT	32. SM5AQD	58. W4DR
7. EA8AK	33. W0MLY	59. OK1MP
8. LA7JO	34. I0RIZ	60. W1NW
9. EA3SF	35. ON5NT	61. OE1ZJ
10. OH1XX	36. OH6JW	62. HB9AHL
11. EA8OZ	37. OK1AWZ	63. HB9AMO
12. W0SD	38. IV3PRK	64. LA6OT
13. K0ZZ	39. DJ6RX	65. UR2QD
14. ON6OS	40. OH3YI	66. UK2RDX
15. OK3TCA	41. I4RYC	67. ZS5LB
16. K6SSS	42. ZL1BIL	68. F6DZU
17. ZL3GQ	43. I4EAT	69. DL4YAH
18. OK3CGP	44. ZL1BQD	70. LA7ZO
19. SM0AJU	45. TG9NX	71. W9ZR
20. OZ3PZ	46. XE1J	72. W1NG
21. I3MAU	47. F5VU	73. VK9NS
22. I2ZGC	48. W3AP	74. N4KG
23. 4Z4DX	49. YO3AC	75. YU7DX
24. N4KE	50. K3TW	76. DL8MAG
25. K5UR	51. XE1OX	77. OK3DG
26. K9AJ	52. VE7IG	78. ZL1BOQ
		79. EA9IE

The top 10 contenders for 5 Band WAZ:

1. DK5AD, 199	6. LA9GV, 198
2. JA3EMU, 199	7. W6GO, 198
3. N4WW, 199	8. K4CEB, 198
4. K6YRA, 199	9. OK1MG, 198
5. W8VUZ, 198	10. W2YY, 198

271 Stations have attained the 150 zone level

date was tentatively set as May 3–5, possibly to give some of the international DXers at Dayton a chance to catch another DX gathering in this country. However, after a bit more planning, it was decided that the September date has some advantages.

Look for more to come on this 1985 gathering. Atlanta has steadily increased its stature as a DX center. Carl is the current president of the Southeastern DX Club. Those who may have seen Carl's presentations of his DXpeditions might be surprised to see the *new* Carl—tall and skinny! If for no other reason, this might be what brings the curious DXer to Atlanta for DXPO '85.

St. Martin

A note came scrawled on a stained cocktail napkin to advise that Ron Chiappari, N6AUV, will be on St. Martin for the *CQ* World-Wide C.W. Test the last weekend in November. Ron will be operating on most bands, signing N6AUV/FS7, and QSLs go to him at P.O. Box 9007, Stanford, CA 94305 (s.a.s.e. needed).

Northern California DX Foundation

This foundation is nearing the end of its first decade of helping bring DX to the deserving, and many DXers are mentioning the fine quality of and the information in the Foundation newsletter which is published a couple of times a year. If the NCDXF has not yet come to your attention, a query to them at P.O. Box 2368, Stanford, CA 94305 will bring you what you need plus a copy of the latest newsletter.

Here is Bob Truhlar, W9LNQ, and his XYL Dorothy, N9ALC, working hard in the last Field Day action. Bob does the operating—most times—while Dorothy does the logging, checking, and spotting and lights Bob's cigar when it goes out. She also boosts him out of the chair when something good shows. Bob's contributions often are noted in our QSL information section.

A year or so back we mentioned the desire of the Foundation to acquire the files from DX efforts—logs, correspondence, and various papers. Though no great quantity of material has been gathered, the Foundation is still collecting anything directed its way to save in their DX archives for reference in future years. There is a need to preserve the DX past, and this will help those needing information in the future. Almost anything linked with DX has some value, and if you want to clean out things, drop a line to Josephine Clarke, WB6ZUC, 207 Evergreen Drive, Kentfield, CA 94904.

4U1VIC

Though the request for country status for the UN International Agency in Vienna has been somewhat stalled, those supporting the idea have not relaxed and have been writing to the DXAC with suggestions on various ways of handling such 4U matters.

Later this month you will have another chance to work 4U1VIC, as they will be on in the *CQ* WW DX Test Thanksgiving weekend. They expect to be most active on 15 and 20 meters, plus some activity possible on 40 and 80. They were also making plans for for the *CQ* WW S.S.B. test this past October, as well as the WAE Test earlier this year. The 4U1VIC club on Wagramerstrasse in downtown Vienna will be active in upcoming tests and will continue to work for country status. It might well be a good idea to watch for them. The possibilities for DXCC status are not finished.

Rodriguez Island

This Indian Ocean island will be heard during the *CQ* WW C.W. Test the end of this month. Rudi Klos, DK7PE, will be on from this 3B9 spot working mostly the lower bands.

Rudi may be heard a day or so before the test, but during the test he plans to concentrate on 160, 80, 40 meters c.w. He will be looking for stateside stations, and when propagation is best from your QTH to 3B9, you can look for Rudi. Last year during the contests Rudi was in Senegal signing DK7PE/6W8. This year it is DK7PE/3B9. QSLs go to his home QTH: Kleine Untergasse 25, D-6501 Nieder-01M, Federal Republic of Germany (s.a.e./IRC needed). You can also go via the DARC QSL bureau.

Cook Islands

Victor Rivera, ZK1CG, passes along information on the Cook Islands and the various islands available with regular air service. All this is for anyone wondering, now that winter is here, where there are places with warm sun and soft breezes, and where snow is never found.

Between Samoa and Tahiti, the Cooks are available by air from Samoa, the Fijis, and Tahiti. ZK1CG has been on from the North Cooks, the South Cooks, and Pendrhyn Island. From Rarotonga there is inter-island service to Aitutaki, Atiu, Mauke, Mangaia, and Mitiaro.

If you are wondering what the costs might be, Tiare Village in Rarotonga runs NZ $28.00 per day for two. Back in the summer the NZ dollar was being exchanged at about $.50 if we remember the tables right. Anyhow, if you are looking for some ideas for the coming *CQ* WPX Tests, you might drop a line to Victor at Box 489, Rarotonga, Cook Islands, and ZK1CG will get you the information you need.

Saba

Mike Manafo, K3UOC and various other prefixes, will be in Saba for the coming *CQ* WW C.W. Test signing P46S working in the single operator, all-band category. This is not the first time that Mike has operated from Saba, and if you can hold on until spring comes again, you will note that it will not be the last.

Mike, whose home base is in Pennsylvania, is "Professor de Historia" at the Colegio Internacional de Carabobo in Valencia, Venezuela. He returned to Venezuela in August for his sixth year at the college. During semester breaks and other happy occasions Mike has operated from many of the Dutch Caribbean islands; last year he was heard from Saba, St.

CQ DX Awards Program

S.S.B.

1350	W8MLK	1352	VE7EOA
1351	KM1I	1353	KA4CIZ

C.W.

617	KB1FK	618	WD0DMN

S.S.B. Endorsements

310	K9MM/313	275	W6NLG/295
310	OK1MP/313	275	W6BCQ/286
310	K8LJG/312	275	EA6DE/279
310	YV5DFI/312	275	K3LUE/278
310	4Z4DX/312	275	I8XTX/277
300	N6OC/308	250	IT9TGO/265
300	YU1DZ/307	250	WD0DMN/250
300	KV2S/302	200	KD4RH/221
300	W6SN/301	200	I8HZT/200
300	K9QVB/300	200	G3NDC/200
300	I5EFO/300	150	W8MLK/151
300	WB4UBD/29	150	KC4MJ/151
275	KR9O/297	150	HI8LC/150
275	W4UNP/296	28 MHz	W8MLK
275	KK0C/295		

C.W. Endorsements

310	K6LEB/311	300	OK1MP/306
300	K9QVB/306	275	K8LJG/284

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

Ron Wright, ZL1AMO (left), is shown here with Jerry Hagen, N6AV/4, who a few years back was part of the Southern California DX scene. ZL1AMO was at the Carolina DX Club meeting in the Charlotte area and presented a slide show of his DX operations at ZL8AMO, VR6HI, and ZK1MB.

Eustatius, Sint Maarten, Curacao, Aruba, and Bonaire. He calls this his "Dutch Island Tour" and will again be out, rigs under each arm, next spring. We will have the itinerary before long. All QSLs for any of Mike's operations go to his home CBA, 2419 Willow Street, Wesleyville, PA 16510. He notes that he does not look for cards via the bureaus, direct only.

Don Riebhoff

Once out of W7-land in Washington state, it does seem that in the last decade Don has been in most of the exotic DX spots, including Vietnam, Laos, Cambodia, Iraq, and downtown Lisbon. His last assignment was in Baghdad, but Don is back in the states now going to school, and he expects to be back on the air from Lisbon sometime next year. In between Don may show on some guest spots from some DX shacks in central California.

Don was part of the 1S1A Spratly crew back in 1971, but just prior to the trip a shortcut over the fence to the local watering spot found Don with insufficient clearance, and he ended up with a cracked ankle and no Spratly trip. DXing is always filled with pitfalls.

Another DXer who years back cut a wide swath was John Van Lear, VE7IR. Don says that John is currently in Hong Kong and recently was issued the VS6IR callsign and should have been heard by now. Phil Wight, VS6DR, another big figure from those days, was reported as living close to the San Jose area.

Mellish Reef

Last month we ran up the signal flag on this one. The Down Under DXers Contest Club was last heard headed out to the reef for the Phone Test the last weekend in October. If *CQ* came early this month, you can be watching for VK9MR; that was the callsign requested for the effort.

The Down Under Contest Club was planning for a two-week stay on Mellish. Among the operators were VK2WU, Les Cullen, Tony Gilbert, VK3CE, and Jim Powell, VK2CK, who was there in 1978. Last year this group ran up a score of over five million from Lord Howe with VK2LHI, the total contacts during the stay going over 7000. There are some high-speed c.w. operators in the crew in case you might want to try copying high-speed code from a DX spot you need. Others include Rob McKibbin, VK5ARO, Janek Wakulicz, VK2CIA and one of the high-speed c.w. operators, and Sandy Smith, VK2AD, Sandy being the Australian sales manager for Kenwood. Guess what make of rigs you'll hear! QSLs go to Box 31, Winmalee, NSW 2777, Australia (s.a.s.e. or s.a.e./IRC, naturally).

Phone Band Expansion

A couple of months back the FCC reported its actions on PR #82-83, which contained the proposal for expansion of the h.f. phone bands and also comment on expanding the 40 meter phone band in Hawaii and points west, including Alaska.

The h.f. bands of 75, 15, and 10 meters have changed effective September 1st as follows: 3750–3775 kHz Extra class, 3775–3850 Advanced/Extra class, 3850–4000 General and up, 21,200–21,225 Extra class, 21,225–21,300 Advanced/Extra class, 21,300–21,450 General and up, and 28,300–29,700 General and up.

There were also proposals to enlarge the 40 meter phone band, but it was felt that this would be detrimental to the c.w. sub-band as generally observed. However, the FCC recently authorized use of 7100–7200 kHz for commercial broadcasting in Guam, which is in ITU Region 2. This segment of the ITU allocations is given to broadcasting in Regions 1 and 3, to the amateur service in Region 2. The FCC rules were amended to allow broadcast use of this portion of the band with the stipulation that signals were not to be beamed at Region

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 315. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00.

C.W.

W6PT	315	W6ID	311	N4MM	303	N5DX	291	I5XIM	280
K4CEB	315	K6LEB	310	WA8DXA	302	I3OBO	290	W2LZX	280
DL7AA	314	K4XO	309	SM3EVR	300	W1WLW	289	WD9IIC	280
ON4QX	314	W4BQY	309	W0IZ	300	W4BV	289	N8MC	277
W3GRS	314	DL3RK	308	K3FN	298	SM6CST	286	WB4RUA	277
N4PN	314	W4OEL	307	W6SN	299	WD9IIX	284	K1VHS	277
W9DWO	314	AA6AA	307	DJ7CX	297	K8LJG	284	W6YQ	277
W8KPL	314	W1NG	306	W0SR	295	K8PYD	281	NN4Q	276
K9MM	313	K1MEM	306	K3UA	293	WA4JTI	281	K4SE	275
N6AV	313	OK1MP	306	W9RY	293	YU2RTW	281	DL1QT	275
K6JG	313	K9QVB	306	W7CNL	292	EA2IA	281	W0HZ	275
K6EC	312	W9BW	304	K9IW	292	K7ZR	280	WA4DAN	275
N6CW	311	N4KG	304	AB4H	291	WA2HZR	280	K4CXY	275

S.S.B.

K2FL	315	K4MQG	311	XE1KS	303	K9UAA	295	WD8PUG	283
W6EUF	315	I4LCK	311	W2LZX	303	SM4CTT	295	YU7KV	283
K6WR	315	N4MM	311	I0MBX	303	WA9PWN	295	VP9CP	283
W3GRS	315	W0YDB	311	W7OM	303	XE1OX	295	XE1OW	283
W3NKM	315	N7RO	311	W6DN	302	W0IYR	295	XE1OX	283
DL9OH	315	W9SS	311	K1MEM	302	KK0C	295	VE3CKP	283
W4UG	315	VE1YX	311	N5FG	302	W6NLG	295	VE3MV	283
VE3MR	315	LU3YL	311	W6FET	302	AI5I	294	AE5B	282
I0AMU	315	EA4LH	310	W2FGY	302	I8ZTE	294	CT1UA	282
F9RM	315	K6XP	310	K9HQM	302	NN4Q	294	KC8YM	282
VE3MJ	315	OE2EGL	310	KB8DB	302	WD0BNC	294	AI9R	282
W4EEE	315	DK2BL	310	KV2S	302	K4SE	293	I0SGF	282
I8AA	315	I3LLD	310	G4CHP	301	NA5W	293	VE3DLR	282
W9DWO	314	K4XO	310	VE3FJE	301	WD8MOV	293	TG9EP	281
I0ZV	314	VE3GCO	309	WB4NDX	301	KB8KW	293	I1POR	281
I8KDB	314	W2SUA	309	WA3HUP	301	WA4LOF	292	K9TI	280
K6YRA	314	DL6KG	309	K8CMO	301	I5BDE	292	N5FW	280
ZL1AGO	314	N4PN	309	W8ILC/QRPp	301	WB4KTG	292	K8ZZU	280
ZL3NS	314	VE7WJ	308	AI8S	301	AC0A	292	W8IMZ	279
VE3GMT	314	W1NG	308	KU9I	301	I2MQP	291	KA8T	279
XE1AE	313	VK4VC	308	K9IW	301	VE3IPR	291	KB5DN	279
I4ZSQ	313	YV5AIP	308	W6SN	301	N5AWS	291	EA3KW	279
W9KRU	313	ZL1BIL	308	W1LOQ	301	WB3DNA	291	EA6DE	279
YV1KZ	313	N6AV	308	W9RY	301	KB5FU	291	W6MFC	278
W3AZD	313	EA2IA	308	W4OHZ	300	WB6GFJ	291	AI8M	278
ZS6LW	313	AA6AA	308	I5EFO	300	W4JFE	291	K4BYK	278
DJ9ZB	313	K9BWQ	308	K9QVB	300	KB3OQ	291	I5EFO	278
W4DPS	313	N6OC	308	WA0TKJ	299	JH4PRU	290	VE3IUE	278
N4WF	313	OZ8BZ	308	I6PLN	299	KK0C	290	K3LUE	278
K6JG	313	N2SS	307	YU2RTW	299	W4BQY	290	KB3KV	277
W9JT	313	VE4SK	307	KB9OC	299	KZ2P	289	KB8O	277
OE3WWB	313	K8PYD	307	DJ7CX	298	JA5PUL	289	KP4EQF	277
K9MM	313	N4KG	307	K9SM	298	W9TA	289	WB0UFL	277
OK1MP	313	I0MBX	307	I8LEL	298	KC8JH	289	W4PTT	277
VE2WY	312	K1UO	307	K8NA	298	W7FP	289	KB0SY	277
F2MO	312	YU1DZ	307	K8VFV	298	K0GT	288	I8XTX	277
N6AW	312	W8JXM	307	WB4UBD	298	OK1AWZ	288	N7ASL	276
K9LKA	312	N4KE	306	HP1JC	297	I8KCI	288	WA6DTG	276
W3GG	312	W8PCA	306	K3UA	297	N2ATD	288	ZL1BOQ	276
W9BW	312	W0SR	306	K5DUT	297	W0ULU	288	WA4OPW	276
I8YRK	312	W8ILC	305	JH1VRQ	297	K1VHS	288	WA2FKF	276
OZ3SK	312	WB1DQC	305	WA4DAN	297	EA9IE	287	VE6PW	276
CT1FL	312	W2CC	305	KR9O	297	AB9E	287	AI9U	276
W0SD	312	VK3JF	305	WA0DCQ	296	VE3FEA	297	I8INW	275
K9RF	312	LA7JO	305	XE1NL	296	KB9KD	287	W8LKG	275
K5OVC	312	9H4G	304	K4CXY	296	KE3A	287	WB3CQN	275
YV5DFI	312	WA4JTI	304	WD9IIX	296	W6BCQ	286	WB1EAZ	275
W0SFU	312	WA4WTG	304	VE4AT	296	VE3CYX	285	VE7BSM	275
4Z4DX	312	XE1J	304	W4UNP	296	KB5RF	284	K8NWD	275
K8LJG	312	KM6B	304	I8ACB	295	W0KU	284	K4LR	275
K6EC	311	WD8MGQ	304	IV3YRN	295	N8BKF	284		
W4SSU	311	VE3MRS	304	I3OBO	295	WB3HAX	283		

2. Because of this and the proximity of stations in the Pacific to Region 3, they will be allowed to operate phone from 7075 to 7100 kHz. This will include Hawaii, Alaska, and points west.

While the h.f. expansions were effective September 1st, the 40 meter changes were still going through the decision process with replies on comments due October 24th. Thus, one change is already with us, and the other is still pending in the final stages of the FCC procedures.

Along the way it might be noted that there is no longer the requirement that broadcasters obtain permission from originating stations in situations involving rebroadcasts of amateur transmissions. Also, the FCC is moving to rewrite the rules to specifically prohibit the use of amateur stations for broadcast news gathering or for production purposes.

DXCC Accreditation Criteria

Everyone understands just what constitutes a DXCC country, but some might wonder what is needed to travel to a far-away place and do a bit of DXing.

Most any DXCC operation will be accepted if you are properly licensed to operate and are physically in the country. However, in those places where there has been a continuing policy prohibiting or limiting amateur radio activity, documentation may be required and often is asked for. This documentation can include some or all of the following:

a. License to operate or operating authority;

b. Photocopies of passport entry and exit visas;

c. Where there are no inhabitants, such as offshore islands, or no customs posts, statements signed by the ship's captain indicating dates of arrival and departure, transit data, or any other pertinent data;

d. Where it is known that special permission is needed or where in past instances permission has mostly been denied, evidence that operating permission was given.

This covers the main points. Sometimes hotel receipts, travel vouchers, boat charter documents, and even photos have been used to establish the documentation. Years back an overseas telephone call came one morning from a group about ready to head for Spratly who had started to worry about the callsign they planned to use, 1S1A; the "1" was and still is an unofficial prefix. They wanted to know if the use of 1S1A from Spratly would bar acceptance for DXCC credit.

A phone call to Bob White, W1CW, at the ARRL DXCC Desk brought a terse and pithy reply: "I don't care what callsign they use just as long as they can prove that they were there!" When you think it over, this still sums it up most neatly. Actually, Bob was a bit more forceful with his words, as he sometimes could be.

Some Late Fall DX Notes

There will be a couple of stations heard out of Svalbard until early next year. JW3NI is due to leave this month, but JW5IJ will be there until early next year. JW6BAA is said to be leaving Bear Island this month. Bill Poellmitz, K1MM, is now on the DXAC; Bill should be remembered for working DX from more than one distant spot. Charles Singer, WA9INK, was in Somalia in August trying to get permission to operate. Charles may be remembered as the DX Editor for *Worldradio* some years back and was a member of the 1978 Clipperton effort. Last year Charles was headed towards Egypt with one of the U.S. AID Agencies and probably will be heard from some DX spots in the future.

The Bouvet planning still appears to be going on, but in September it was not quite distinct. Some reports were that there would be no experienced amateurs in the Norwegian scientific crew, that there would be a possible nine-day stop, and that there might be another approach made to putting 3Y-Bouvet on the air for the Deserving. January was the time often mentioned, and the January-February period is the most likely time for this needed one. If your need is high and your power low, just be patient for the first two or three days should this one show and you be muscled out. Longevity and patience have brought more than one needy DXer to the Honor Roll.

From Sierra Leone 9L1GW was expecting to get on the lower frequencies before the end of the year, 40 and 80 being planned. The FCC turned down the ARRL request to allow W1AW operation by headquarters people during some of their paid employment hours. The comment was that it would jeopardize the "no-pay" status of amateur radio. Dave Bell, W6AQ, of the Southern California DX Club and the Dayton Hamvention Amateur of the Year, was the man behind the TV full-length movie *Nadia* seen about the time of the Los Angeles Olympics.

If you worked the Olympic NG84O station, QSL to the Sixth Call Area QSL Bureau. The station got a lot of attention, though some of the special-event stations in areas other than Los Angeles ran into problems trying to explain the third-party traffic restrictions. Norm Koch, K6ZDL, the WPX Manager, was part of the NG84O operating team.

The Third Call Area QSL Bureau is now being handled by the Cumberland County Radio Club, Box 448, New Kingstown, PA 17072 (5 × 7½ clasped envelopes, s.a.s.e. only).

HB9NL operated about a full month, up to October 14th, signing HB0NL from Liechtenstein. A third-party agreement has been signed with St. Christopher (St. Kitts), Nevis, and Anguilla; the prefixes involved are VP2E and VP2K. K7ZR and W7JIE noted after the Northwest DX Convention that the average age of amateurs is now something over 50. Some have even mentioned that all newcomers are trying to take over things, and the impatience of those 50-year-olds has been noted more than once. Years back, way back in the early sixties, we would hear about ". . . . the youngest DXer to attain the Honor Roll!" when some locals touted the glories of a youngster and a member of the DX club hereabouts. But then this young one disappeared, and years later we detected him hidden behind a full beard in an advertisement for marine electronics. Often DXers feel the need to prove themselves, and if it is not the Honor Roll, then it is the Senior Citizens Golden Discount card that they display—or maybe even a full beard.

But even old DXers, and there are a lot of those, may find that *Westlink* is essential to keeping up with the changes in amateur radio. It has no equal, and if you have to be convinced, drop them a line at 11119 Allegheny Street, Sun Valley, CA 91352.

The Thanksgiving weekend will be with all good DXers shortly, so give your thanks for the *CQ* World-Wide C.W. Test the last weekend of November. Most DXers are thankful that it comes on a four-day weekend. Frank Anzalone will be expecting every true-blue DXer to be at the rig!

DX Ten Years Back

In November 1974 Jim Henderson was stuck on Tokelau and looking for someone to answer his ZM7AH call. The amateur subcommittee then already working on the 1979 WARC was looking for the return of 160 meters, to eliminate any 80 meter sharing, to expand 40 meters and eliminate sharing, to expand 20 meters and eliminate any sharing, to expand 15 meters by 100 kHz and new bands at 10.1, 18.1 and 24.1 MHz. Son of a Gun! Never lose hope. VP8MS was headed for South Georgia. Some south Jersey operators were on the way to Navassa. Marty, OH2BH, and Ville, OH2MM, were headed for Lebanon and the CQ WW C.W. Test, this after being on with ZD3X in the phone portion. John Lunsford who was the "Chester" at XV5AC, was in Ghana looking for a 9G1AC callsign. FR7ZL was on from Juan de Nova. A SCDXC crew was on Wallis for the WW C.W. Test. It was reported that a Norwegian had permission to operate from BY; that was the rumor a month back then. Someone always had the inside track to put BY on the air, and when it was not BY it was YI.

73, Cass, WA6AUD

QSL Information

Bob Kroh, K5RK, says that he is not the QSL route for XE2FU nor any other station. He also would like a line on anyone giving information on his being a QSL Manager.

Walter Zuercher, HB9BMU, P.O. Box 577, 8212 Neuhausen, Switzerland says that he is willing and able and volunteers as a QSL Manager for any DX station or DXpedition.

Maurice Cote, K1HDO, has kept the candle burning in the window these long years looking for the route to a QSL from 5A1TK whom he worked on 10 meters in March 1969. Anyone in the know where 5A1TK, David Keeler, is receiving mail these days.

All of the following was compiled with assistance from W9LNQ.

BV8YL to JG1QGT
CN8EJ to F5LW
FH8CY to F5CY
HH2B to N4WW
HH2WW to N4WW
HH2Q to I2YAE
HH5CB to K9WJU
ED8RCT to EA8RCT
FY9IS to FY7AN
HH5JS to KC8JH
HI3RST/KP5 to WP4ATF
ID7YSU to I8TSL
IK8CAK to I0JAJ
KH6JEB/KH7 to KH6JEB
OY7MJ/TF to HB9CJX
PY8TA to PY1VOY
P46S to K3UOC
TA1AS to DJ0JC
TF6IRA to Bureau
TZ6FIC to F6CRS
VP2VCW to N6CW
WP4ATF/KP5 to WP4ATF
YZ2AW YU2SRH
ZP5DXW to N4DW
3B8CD to 3B8CF
4U1ITU (July only) to VE3GCO
5X5GK to JA1BK
6O84TI to I2YAE
9M2RT to KB6UF
CE8ZIJ to Box 1, Isla Ia Pascua, Chile
DK7PE/3B9 to Rudi Klos, Kleine Untergasse 25, D-6501 Nieder-Olm, West Germany
N6AUV/FS7 to Box 9007, Stanford, CA 94305
NG84O to 6th Call QSL Bureau
OD5ZX to P.O. Box 389, Tripoli, Lebanon
TG9HH to Edward Graham, 12449 Regent NE, Albuquerque, NM 87112
VK9MR to Box 31, Winmalee, NSW 2777, Australia
VQ9AC to Box 141, Arlington, KS 67514 ('84 Callbook)
YB5ACQ/5X to Gerry Kambitus, Box 287, Entebbe, Uganda
4U1UP to Box 199, 1250 San Jose, Costa Rica

1984 CQ WW WPX C.W. Contest High-Claimed Scores

The following scores are early-bird high-claimed scores as of 25 July 1984. These are raw scores subject to verification.

U.S.A. SINGLE OPERATOR ALL BAND

N5AU	2,659,590
KC1F	2,552,261
N8II	2,104,240
WØZV	2,085,390
K3ZJ	2,028,940
KI6P	1,983,381
WC4E	1,610,360
K4POL	1,602,445
K5MR	1,510,132
KM9L	1,508,712
NI6W	1,442,396
KB3TN	1,298,220
K5RX	1,162,664
KA5W	1,020,565
KO8T	1,014,714
NE6I	946,220
W5ZR	862,792
KMØL	841,317
W9XT	777,920
K9BG	746,112

21 MHz

KW8N	889,296
WA6DBC	479,682
AI3Q	361,449
W6BIP	216,810
KY5N	119,706
K4RDU	113,472
KF2O	77,973

14 MHz

KC2X	1,074,528
W5FO	814,944
KØRWL	728,160
K9QVB	685,585
WB4TDH	600,568
WB7FDQ	427,986
KVØI	426,924

7 MHz

N6CW	960,330
KZ2S	716,870
AG6D	658,840
W6TMD	562,788
KV8Q	127,440
AF5M	96,384
WD4DII	70,656

3.5 MHz

KJ9D	21,816
N2AU	21,018
N7DF/Ø	21,000
W2XL	5,612
W8IMZ	5,040
WØJU	4,896
W4MGX	2,720

1.8 MHz

KA1SR	108

MULTI-SINGLE

N4WW	3,769,800
KRØY	3,581,359
K1VR	2,677,950
K1XA	2,513,974
N7TT	2,004,480
AK6A	1,952,160
KG7D	1,855,282
AC8W	1,545,650
KY2P	1,514,436
NI8V	1,439,128

MULTI-MULTI

NM5M	4,432,883

QRP/p

NY4D	A	484,575
AC5K	A	180,469
W6YMH	21	6,270
NN4Q	14	133,042
AA2U	7	46,816

DX SINGLE OPERATOR ALL BAND

9H1EL	2,550,384
K3ZO/HK3	2,450,160
5Z4MX	2,264,342
OK1DWA	2,029,188
6Y6A	1,997,593
IK2DVG	1,869,600
OH8PF	1,739,496
VE3IY	1,707,040
JA5BJC	1,659,339
VE6OU	1,319,136
YU2OB	1,264,630
HZ1HZ	1,187,641
OH3RF	1,026,000
KL7Y	1,010,793
JA1DDH	981,464
CR7BOH	951,000
JH7DNO	909,896
OK1AVD	865,050
YO3CD	844,875
ZC4CZ	824,694

28 MHz

OK3LZ	50,908
4M7QP	46,134
YO3KWJ	21,402
JH1RNZ	11,234
JO1NZT	7,392
OK3ZAF	2,520
VE2AEJ/3	1,960

21 MHz

4N2CQ	1,300,075
G4CNY	1,111,800
LU4FDM	1,004,250
I2UIY	876,300
VE3OCU	809,100
4M7PF	581,250
SM6CVT	354,090

14 MHz

YU4GD	2,147,148
CX7BY	1,832,850
YV1TO	1,830,696
YT3M	1,564,477
YZ2OG	1,185,510
ZY4OD	1,005,894
JR1RNC	676,347

7 MHz

VE3BMV	1,489,950
IO3JSS	1,062,864
YU7AD	1,036,672
YU3EY	1,010,840
CT2CQ	955,632
YZ2AW	777,360
HA9RE	626,400

3.5 MHz

EA8RL	453,456
YU7SF	192,885
SP5GIQ	122,010
LA4O	107,448
VE1AIH	101,008
OK3CEL	90,144
OZ5PA	35,404

1.8 MHz

YU3EF	69,596
OK2PLH	23,074
SP3IBS	22,400
OK1DTM	20,960
G3XTT	9,638
OK1DRU	9,440
OK2PGT	6,844

MULTI-SINGLE

VP2EC	7,599,480
ZF2HF	6,445,686
KH6XX	4,646,659
KD7P/NH2	4,229,355
OK7MM	4,096,614
EA3VY	3,945,678
ZS1CT	3,129,216
OK6DX	3,012,841
GB2MM	2,712,892
SLØZG	2,684,535

MULTI-MULTI

KL7RA	4,653,283
EA9CE	4,383,308
JA3YBF	2,710,272
JA1YXP	1,516,396
JA6YDH	1,071,372

QRP/p

4T8CP	A	377,856
DL6FBL	A	276,338
4X6IF	A	211,328
JA2KPV	21	23,048
JA2DN	14	84,597
SM5CCT	7	87,552
OK1DIQ	3.5	9,540
OL1BIP	1.8	16,132

Note: Queries pertaining to the WPX Contest should be sent to N8BJQ via *CQ* Magazine, 76 N. Broadway, Hicksville, NY 11801.

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811A	12.00	8844	26.50
813	35.00	8873	175.00
M2057	13.00	8874	185.00
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CIRCLE 80 ON READER SERVICE CARD

Announcing

• **Armed Forces Mail Call** - The Armed Forces mail call for 1984 has been announced for the Christmas season. For those who would like to send messages to the U.S. Armed Forces overseas, send a business-size s.a.s.e. to Armed Forces Mail Call, Box 427, Bowie, AZ 85605.

• **DARA VEC Licensing Exam Schedule** -Following are the December exam dates (exams by appointment only; send s.a.s.e. and form 610 with copy of license to person listed by date given). Exam date Dec. 8; place Toledo, OH; 610 deadline Nov. 10; contact Elmer Zieroff, KU8B, 2614 106th St., Toledo, OH 43611. Exam date Dec. 15; Jackson, MI; 610 deadline Nov. 19; contact Barry A. Polack, AI8D, P.O. Box 2, Pleasant Lake, MI 49272.

• **K4MJN Special Event** - On Nov. 3 K4MJN will operate from Blythewood, South Carolina, on or around 14.290 MHz from 1400–1800Z and on 21.390 MHz from 1800–2200Z, to commemorate the birthplace of J. Gordon Googler. All stations working K4MJN will receive a certificate when sending an s.a.s.e. with QSL and contact number. Send info to K4MJN, Rt. 3 Box 154, Blythewood, SC 29016.

• **Clock Tower Special Event** - The Benicia ARC will operate KA6BPR from 1500–2400 UTC on November 10 from the Clock Tower Fortress in Benicia, California. Phone frequencies will be 28.510, 21.360, 14.240, and 7.240. C.w. will be 28.110, 21.110, 14.110, and 7.110 MHz, ±QRM. A QSL/certificate will be available from BARC, Box 899, Benicia, CA 94510 upon receipt of QSL and s.a.s.e.

• **Veteran's Day Special Event** - The Armored Force Amateur Radio Nationwide Emergency Team (A FAR Net) will sponsor a Veteran's Day activity on November 10 and 11. A commemorative certificate will be available to all amateur stations that make contact with one member station. To obtain the certificate, send QSL and a large-size s.a.s.e. to Alfred G. Beutler, 36 Manchester Road, East Aurora, NY 14052. Operation will be from 1200 GMT Nov. 10 through 2400 GMT Nov. 11. Frequencies will be 7285, 14,325, 21,375, and 28,640 kHz ±QRM.

• **CQWE Contest** - The 25th Annual CQWE contest, sponsored by the Bell System Amateur Radio fraternity, contains various sessions from 1900Z Nov. 10 until 0500Z Nov. 12. The contest is open to present and retired employees of Bell, Western Electric, AT&T, and subsidiaries of AT&T. Contact your local interworks coordinator for logs and complete rules, or write to Jim Baremore, K5QQ, Sandia National Laboratories, Dept. 5210, P.O. Box 5800, Albuquerque, NM 87185, telephone (505) 844-5553 or (505) 296-9267.

• **North Carolina QSO Party** - Sponsored by the Alamance ARC (K4EG), this event will be held from 1700Z Nov. 17 until 2159Z Nov. 18. Work stations once per band and mode. Work mobiles again as they change county. NC-to-NC QSOs allowed for QSO point credit. Exchange signal report and QTH (county for NC stations; ARRL section for others). Suggested frequencies: phone—3.980, 7.280, 14.280, 21.380, 28.580; c.w.—60 kHz up from lower band edges; Novice—20 kHz up from lower band edges. Contact NCQP Coordinator for complete rules and scoring procedures. Write to NCQP Coordinator, c/o K4EG, Alamance ARC, P.O. Box 3064, Burlington, NC 27215.

• **Plimoth Plantation Special Event** -The Whitman ARC will sponsor this event on Thanksgiving Day, Nov. 22, from Plymouth, MA, using the call WA1NPO from 1300–2000 GMT. For a list of frequencies call KA1CZS at 617-826-4772, or WB1CNM at 617-586-7524. For a certificate send proof of contact and $1.00 (4 IRC's, foreign) to Whitman ARC, P.O. Box 48, Whitman, MA 02382.

• **Hollywood, California** - The BOMB Squad (Best of Mt. Baldy) will operate W6HCP (Hollywood Christmas Parade) from 1600Z on Nov. 25 to 0400Z on Nov. 26. Operation from the parade communications center of the 1984 Hollywood Christmas Parade will be on 7.284, 14.284, and 21.284 MHz s.s.b. S.a.s.e. to W6GVR for special commemorative QSL.

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

Nov. 3, **Foothills ARC Hamfest,** South Greensburg, PA. Contact WA3HOL, or write to FARC, P.O. Box 236, Greensburg, PA 15601.

Nov. 4, **R.F. Hill ARC Winterfest,** Sellersville, PA. Contact Robert Garland, P.O. Box 29, Colmar, PA 18915.

Nov. 10, **RadioExpo '84,** Montvale, NJ. Contact Robert Greenquist, P.O. Box 325, Montvale, NJ, or call 1-201-666-3902.

Nov. 10, **AMSAT Technical Symposium & General Membership Meeting,** Los Angeles, CA. Contact Dennis Dinga, N6DD, P.O. Box 4111, Diamond Bar, CA 91765.

Nov. 10, **Newmarket Fleamarket,** Newmarket, Ontario, Canada. Contact Geoffrey Smith, VE3KCE, 7 Johnson Road, Aurora, Ontario, Canada L4G 2A3.

Nov. 10–11, **Stone Mountain Famvention,** Stone Mountain, GA. Contact Jim Garner, KE4BI, 490 Village Green Court, Lilburn, GA 30247, or call 404-921-7588.

Nov. 11, **Massillon ARC Auctionfest '84,** Massillon, OH. Contact MARC, 920 Tremont Ave. SW, Massillon, OH 44646.

Nov. 11, **Fort Wayne Hamfest,** Fort Wayne, IN. Contact Hamfest Chairman AC-ARTS, P.O. Box 10342, Fort Wayne, IN 46851, or call KA9FFT at 219-493-2439.

Nov. 24–25, **Greater Greensboro, NC Hamfest,** Greensboro, NC. Contact Coy Hennis, WD4NHL, Rt. 7 Box 729, Greensboro, NC 27407.

Nov. 25, **Radio Central ARC Ham-Central,** Stony Brook, LI, NY. Contact Bob Yarmus, K2RGZ, 3 Haven Ct., Lake Grove, NY 11755, telephone 516-981-2709 Mon.–Fri. after 6 p.m.

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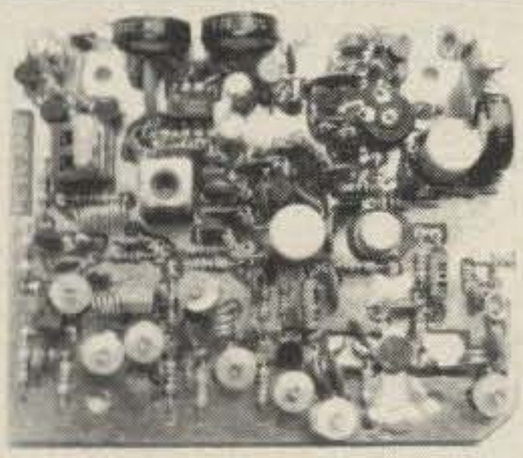

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CIRCLE 73 ON READER SERVICE CARD

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Since this issue of *CQ* should reach most subscribers prior to the *CQ* World-Wide DX Phone Contest weekend of October 27–28, here is an updated day-to-day forecast for that weekend. Conditions still look like low normal for the entire contest period. See the Last Minute Forecast appearing in this month's column for a day-to-day forecast of conditions expected during the C.W. Contest weekend of November 24–25.

Sunspot Cycle Progress

The plateau in the present solar cycle appears to have ended. After holding in the range between 65 and 68 for 6 months, the cycle dropped by 5 numbers at last count.

The Royal Observatory of Belgium reports a monthy mean sunspot number of 37 for July 1983. This results in a 12-month running smoothed sunspot number of 60 centered on January 1984. The sunspot cycle is measured by the value of smoothed sunspot number.

Contest Tips

The C.W. weekend of the 1984 *CQ* World-Wide DX Contest will be held November 24–25. With the apparent end of the solar cycle plateau, the expected level of solar activity during the contest period is now revised downward to the low 40's rather than the mid-40's. A smoothed sunspot number of 68 was recorded in October 1983 and 67 in November 1983. This year is the lowest level of solar activity expected during any contest period since 1977. On the other hand, it is almost certain to be higher than the levels expected during the next three or four years.

Last month's column contained special DX Propagation Charts for use during the C.W. section of the contest. If you plan to participate in the contest, be sure to check last month's column for band-opening predictions, work plans, and other propagation data that should be helpful in piling up contacts and points. For a day-to-day forecast of general propagation conditions expected during the month, including the contest weekend, see the Last Minute Forecast appearing at the beginning of this column.

Here are some propagation rules of thumb that should be useful for working DX during November, and especially during the C.W. contest weekend:

1. During and shortly after *sunrise*, excellent DX conditions are expected on *20* meters in practically all directions. Also check reception at this time from the south and west.

2. From a few hours *after sunrise* until *late afternoon*, it should be a toss-up between *15* and *20* meters for the optimum DX band, with openings possible to many areas of the world during this period. Some openings should also be possible on *10* meters, but considerably below last year's level. Openings on these three bands should favor signals from an easterly direction before noon, from the north and south shortly after noon, and from southerly and westerly directions during the late afternoon hours.

3. During the *late afternoon* and *early evening* hours, *20* meters is expected to be the best DX band, with openings in almost all directions. Fairly good DX openings to the east and south should also be possible on *40* meters during the early evening hours.

4. Expect *40* meters to be the best DX band during the *late evening* and *early morning* hours, with openings possible to most areas of the world. *Eighty* meter DX openings should be possible to many areas of the world during this period, and some *160* meter openings are also expected. In addition, look for *20* meter DX openings towards the south and the west during the period of darkness.

V.H.F. Ionospheric Openings

Two significant meteor showers are expected during November, which

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1984

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 11, 20	A	A	B	C
High Normal: 7, 17, 19, 21, 26	A	B	C	C-D
Low Normal: 1-2, 5-6, 8, 10, 12, 15-16, 18, 22-25, 27-29	A-B	B-C	C-D	D-E
Below Normal: 3-4, 9, 13, 30	B-C	C-D	D-E	E
Disturbed: 14	C-E	D-E	E	E

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

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-good (B-C) on the 1st and 2nd, fair-to-poor (C-D) on the 3rd and 4th, fair-to-good (B-C) on the 5th and 6th, etc. Conditions during the C.W. weekend of the CQ WW DX Contest are expected to be fair-to-good on November 24-25.

HOW TO USE THE SHORT-SKIP CHARTS

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

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

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

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

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

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

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

CQ Short-Skip Propagation Chart
November & December 1984
Local Standard Time
At Path Mid-Point (24-Hour Time)

Band (Meters)	Distance between stations (Miles) 50-250	250-750	750-1300	1300-2300
10	*Nil*	*Nil*	08-11 (0-1) 11-17 (0-2) 15-17 (0-1)	08-09 (1) 09-11 (1-2) 11-15 (2) 15-17 (1) 17-19 (0-1)
15	*Nil*	09-11 (0-1) 11-15 (0-2) 15-18 (0-1)	07-08 (0-1) 08-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-16 (1-3) 16-18 (1-2) 18-19 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-16 (3) 16-18 (2-3) 18-19 (1-2) 19-21 (0-1)
20	10-12 (0-1) 12-14 (0-2) 14-16 (0-1)	06-07 (0-1) 07-10 (0-2) 10-12 (1-3) 12-14 (2-4) 14-16 (1-4) 16-17 (0-3) 17-19 (0-2) 19-22 (0-1)	06-07 (1) 07-09 (2-3) 09-10 (2-4) 10-12 (3-4) 12-16 (4) 16-17 (3-4) 17-19 (2-3) 19-22 (1-2) 22-00 (0-1)	06-07 (1-2) 07-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (2-3) 21-22 (2) 22-23 (1-2) 23-00 (1) 00-06 (0-1)
40	07-08 (0-2) 08-09 (1-3) 09-17 (3-4) 17-19 (2-3) 19-21 (1) 21-00 (0-1)	06-07 (0-2) 07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (1-3) 21-00 (1-2) 00-03 (0-2) 03-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-19 (4) 19-21 (3-4) 21-03 (2-4) 03-06 (1-3)	06-08 (3-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-03 (4) 03-06 (3)
80	08-21 (4) 21-01 (3-4) 01-04 (2-3) 04-07 (1-2) 07-08 (3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-01 (4) 01-04 (3-4) 04-07 (2-3) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4) 04-06 (3-4) 06-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4) 04-06 (4-2) 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 (4-2)	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 (4-2) 04-06 (2-1) 06-07 (1-0)

HAWAII
November & December 1984
Openings Given in
Hawaiian Standard Time

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

ALASKA
Openings Given In GMT

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

should make possible some meteor-scatter-type openings on the v.h.f. bands. The *Taurids* shower is scheduled to occur between November 2 and 4, peaking during the early morning hours of the 3rd with a rate of about 15 meteors per hour. Later in the month the *Leonids* shower should take place. This shower will peak on the 15th, but its effect should be noticeable from the 14th through the 16th. During the peak of the *Leonids* shower about 15 meteors should enter the earth's atmosphere each hour.

Some auroral-type v.h.f. ionospheric openings are likely to occur during the month, especially when ionospheric conditions on the h.f. bands are below normal or disturbed. Check the Last Minute Forecast at the beginning of this column for the days that are most likely to be in these categories during November.

Solar activity is now too low to expect any regular 6 meter F-2 ionospheric openings. There is a possibility, however, although very slim, for an occasional 6 meter Trans-Equatorial (TE) scatter-type opening during November, mainly between the southern tier states and deep South America. If a TE opening is to occur at all, the most likely hours are between 8 and 11 p.m. local standard time.

This month's column contains short-skip propagation data for use between distances of approximately 50 and 2300 miles, and between the states of Hawaii and Alaska and the continental areas of the United States.

Good luck on the WW DX C.W. Contest weekend. Be sure to let me know how these special contest propagation forecasts work out. For the past 33 years the contest forecasts have held up with an accuracy better than 90%.

73, George, W3ASK

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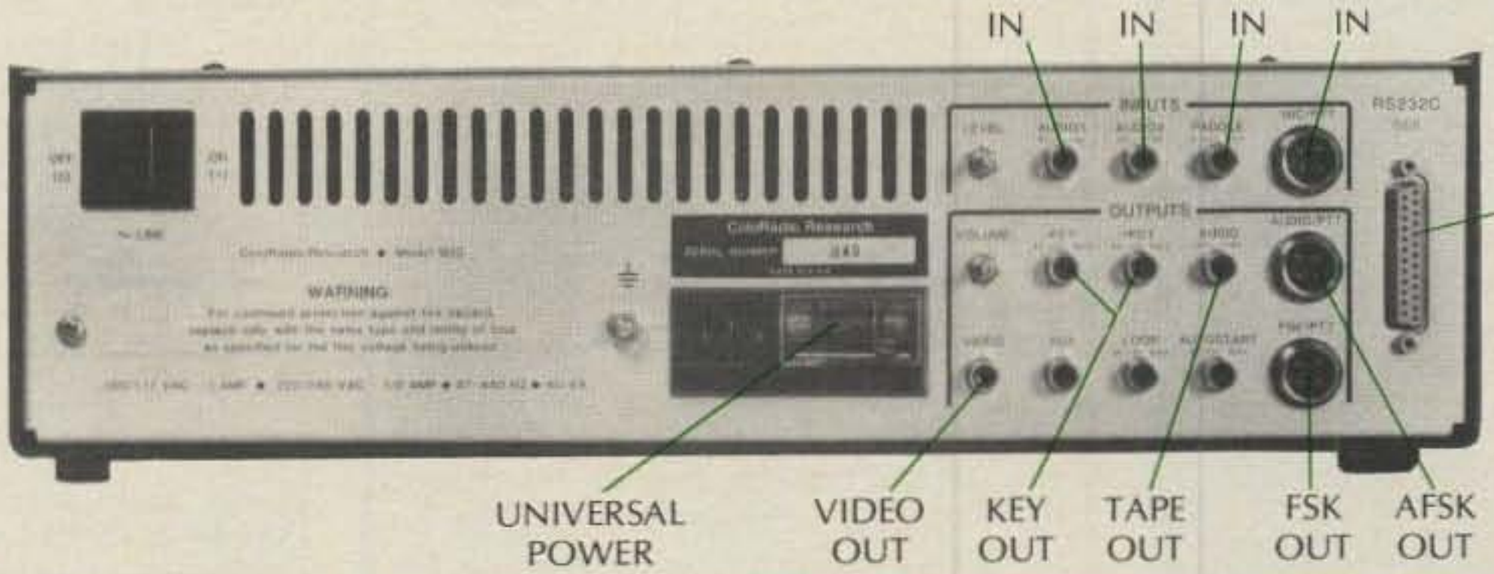

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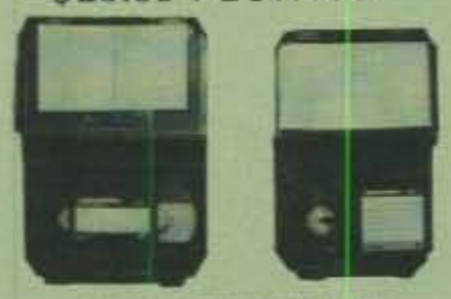

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NOVEMBER SPECIALS: AMP Supply LA-1000A 1200 watt amplifiers $379.95, and AT-1200 Tuners $169.95. MINI-QUADS $135.00. UPS additional, NY Residents add 7% sales tax. Send stamp for flyer on other specials. Don, WB2RTW, Hart Eastern Communications, 1444 Darlington Drive, Derby, New York 14047.

SLEP SPECIALS: Military USM-207 frequency counter, measures frequency to 500 MHz, similar to HP5245L, all solid state, late type counter $285.00. HP608C signal generator 10 MHz to 480 MHz $345.00. HP614A signal generator 900 MHz to 2100 MHz military SG-3/URM-70 FM signal generator 50 MHz to 400 MHz $285.00. HP8708A synchronizer $325.00. Military RT-505/PRC-25 manpack transceiver $285.00. Antique National Radio NC-TV7M table-top 7" TV in original grey HRO style metal cabinet $245.00. Military R-278/GR UHF 200–400 MHz receiver $225.00. Drake RV-7 VFO, new boxed $125.00. Collins 637T-1 portable dipole reel-type antenna new $275.00. Drake TV-300, TV-75, high pass TVI filters, new, each $14.00. Collins 180S-1 antenna tuner $225.00. We accept M/C, VISA, or check. Add shipping. Phone Bill Slep 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

SWAN 400 transceiver and PS, 80–10 meters, exc. condx. $150. ARC-5's and other surplus for sale. Have many tubes, mostly octals, all checked, priced low. KXØY, 94 Walnut St., Albion, PA 16401 (814-756-3217).

NYE automatic SWR/PWR meters, $80. Drake DL-300 dummy load, $12. Nine inch 24 hr. wall clock, $14. Wawasee SWR/PWR meter, $35. I ship. Carl, N2EOQ, 518-374-6399.

COAXIAL RELAY, 5 IRCs for catalog. Yoshio Noguchi, 4-37, Matsugamoto, Ibaraki-City, Osaka, 567 JAPAN.

COMPUTER OWNERS: Commodore, Timex/ZX, TI99/4A HAM/SWL programs. RTTY/ASCII/CW for TS from $25. C-64 logbook, $15. More programs from $5.95 postpaid. SASE for more information. Kentronics, P.O. Box 586, Vernon, AL 35592.

Ross $$$ Your Ham Shopping Center: Hundreds of pieces of used gear in stock, thousands of new gear. Call or write for a personal price-quote. Send for Christmas gift ideas book and other specials. All major lines stocked. Mention ad. Closed Monday at 2:00. Ross Distributing Company, 78 South State Street, Preston, Idaho 83263, phone (208) 852-0830.

160 METER top-loading sections and systems for fixed, mobile, and multiband verticals. Free information. Wavemaker Products, POB 397, Niceville, FL 32578 (tel. 904-678-8943).

WANT: 1920's and 1930's radios, magazines, and horn speakers. W6THU, 1545 Raymond, Glendale, CA 91201.

GREAT CIRCLE BEARING. Send us your QTH or Lat. and Long. and get a computer printout of bearings and mileage from your QTH to over 500 countries and cities throughout the U.S. and World, $3.95. APCA Systems, P.O. Box 978, Arbuckle, CA 95912.

"FANTASTIC DISCOUNTS" ICOM ICR-71H $689.50. Kenwood R-2000 $499.50, R-1000 $409.50. Sony 2002 $219.50. Uniden 2021 $159.50. Bearcat DX-1000 $479.50. Regency MX-5000 $388.50, HX-1000 $249.50. IN STOCK CALL!! Bearcat BC-155, BC-180, BC-201, IN STOCK!! BC-250 $266.50, BC-300 $359.50. Panasonics, CB's, Coax, Antennas, MFJ, CW/RTTY decoders. FREE UPS SHIPPING & INSURANCE TO 48 STATES. 25-Page Picture Catalog $1.00 (REFUNDABLE). GALAXY ELECTRONICS, Box 1202, 67 Eber Ave., Akron, OH 44309 (216-376-2402) 9–5 pm EST.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath, and others. Six ½" digits. Write for information. GRAND SYSTEMS Dep't. D, P.O. Box 3377, Blaine, Washington 98230 (604-530-4551).

ROHN TOWERS: Wholesale direct to users; 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributors for Antenna Specialists, Regency, Hy-Gain. Hill Radio, 2503 G.E. Road, P.O. Box 1405, Bloomington, IL 61701-0887 (309-663-2141).

HAVE AM CAPABILITY? Join SPAM (Society for Promotion AM). Membership is free. For free info send SASE to: SPAM, c/o F. Dunlap, WA5TWF, 14113 Stoneshire, Houston, TX 77060.

WANTED: Old keys for my collection. Spark keys, Boston keys, pre-1940 bugs (Martin, Abernathy, D&K, Mecograph, etc.), omnigraphs, miniature and unusual keys, cable keys, and pre-1900 landline gear (camelbacks, victors, pocket sets, etc.). K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081.

OUTGOING DX QSL SERVICE. $.08 per card. SASE for details. WD8AWS, Robert L. Gaudio, 1613 Merrill St., Kalamazoo, MI 49008.

WANTED: "Science and Mechanics" magazine issues mid '50s thru mid '60s. Also S/M's full-size science project blueprints published in that same era. Jim Davis, Box 1765, Fayetteville, AR 72702.

NEED manuals for: Johnson Viking II, VFO & Matchbox, Kenwood HC-10 World clock, CDE H-IV/CD45 rotor control, ICOM IC-RM2 computerized controller. Steve Sanow, 3101 Washington #93, Bellevue, NE 68005 (402-291-4942).

MAKE PRINTED CIRCUIT BOARDS without messy chemicals. Complete instructions $2.00 post paid. Ken Hand, WB2EUF, P.O. Box 708, East Hampton, NY 11937.

SELL: Complete ham station, $200. Fred, Box 706, Orange City, FL 32763.

NEW CODE COURSE: From KA4ETI. New and informative. Includes Morse Code and actual QSOs on tape plus instructions and tips on sending and receiving. Send SASE to G. P. Miller, 3528 Kirby Lane, Louisville, KY 40299.

TRADE: Collector items for Elco VFO small rcvr, or? N4ZB, 1420 Mt. Vernon Drive, Holiday, FL 33590.

WANTED: C.W. Transceiver 100 W. min. in good condition. D. Benke, 415 N. Hyatt Apt. 10, Tipp City, OH 45371.

HF, UHF, ATV KITS: High-quality professional kits from Wood & Douglas, England. Designs for RX's, TX's, Xcvr's, Pre-Amp's. Catalog. Lance Lyman, K8IXZ, Tactical Electronics Corp., P.O. Box 1743, Melbourne, FL 32902.

CLANDESTINE CONFIDENTIAL NEWSLETTER: Latest info on secret broadcasters. Six issues $10 US, $13 foreign, US funds. RR4 Box 110, Lake Geneva, WI 53147.

FOR SALE: Kenwood R-300 RCVR., mint cdx, US $200 or nearest offer. VE7EHD, 604-265-3175.

FOR SALE: Yaesu FT101B (like new) w/manual & DC cord, also LL ph. patch. WANTED: SP-107P,-FC-107, or FTV-107. Lyn, 969 Nelson Rd., Bozeman, MT 59715 (406-587-0508).

YAESU FT101E Transceiver with cooling fan, cw filter, DC power cord, mic., manual, orig. carton $375. W2KZT, 70 Mitchell Ave., Poughkeepsie, NY 12603, tel. 914-454-4846.

FT-102 OWNERS: You're invited to write/call me. Will share my FT-102 experiences with you in exchange for yours. KA2PSQ/NY (212) 729-0714.

Please send all reader inquiries directly.

Advertiser's Index

We'd like to see your company listed here too. Contact Jack Gutzeit, W2LZX, Herb Pressman, KA2UGV, or Arnie Sposato, KA2TYA, at 516-681-2922 to work out an advertising program tailored to suit your needs.

Please send all reader inquiries directly.

The Yaesu FT-209RH. 5 watts that your batteries can live with.

Have the power you need when you need it with Yaesu's new 5-watt, 2-meter handheld. Power to get out in situations where ordinary HTs just won't make it.

We designed our HT with a unique user-programmable Power Saver that puts the rig to "sleep" while you're monitoring and "wakes it up" when the squelch breaks. So you can listen for hours and still have plenty of power to hit those hard-to-reach repeaters when you need to.

With the FT-209RH there's no need to fiddle with knobs when you change from one memory channel to another. That's because you can independently store everything you need in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode with an optional module. And then recall any channel at the touch of a button.

It's easy to hear what's happening on your favorite repeaters or simplex frequencies. Just touch a button and scan all memory channels, or selected ones. Or all frequencies between any two adjacent memories. Use the priority feature to return automatically to your special frequency when it becomes active.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Listen for tone-encoded signals on selected channels—without having to hear a bunch of chatter—by enabling the decode function.

The FT-209RH, which covers 10 MHz for CAP and MARS use, comes complete with a 500-mAh battery, charger and soft case.

For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

So when you visit your dealer, let him know you won't settle for anything but the best. A radio built by Yaesu.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007.

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100.

CIRCLE 141 ON READER SERVICE CARD

Prices and specifications subject to change without notice.

FT-209RH shown actual size.

FT-203R transceiver

ICOM IC-745

160-10 MTR 100W XCVR / 0.1-30MHz RCVR

The IC-745 represents a major breakthrough in the ham industry...a full featured HF base station transceiver with a combination of standard features found on no other transceiver in its price range.

Compare these exceptional standard features:

- 100KHz - 30MHz Receiver
- 16 Memories
- 100% Transmit Duty Cycle Transmitter with exceptionally low distortion
- IF Shift AND Passband Tuning
- Receiver Preamp
- 10Hz/50Hz/1KHz Tuning Rates with 1MHz band steps
- Adjustable Noise Blanker (width and level)
- Continuously Adjustable AGC with an OFF position
- Full function Metering with a built-in SWR Bridge
- Optional Internal AC Power Supply

CIRCLE 17 ON READER SERVICE CARD

Other Standard Features.
Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, all-mode squelch, program band scan, memory scan (frequency and modes are stored), receiver and transmitter incremental tuning and VOX.

ICOM's proven transceiver designs and technology are used in the IC-745 all ham band transceiver which includes SSB, CW, RTTY, AM receive and an optional FM **plus** a 100KHz to 30MHz general coverage receiver.

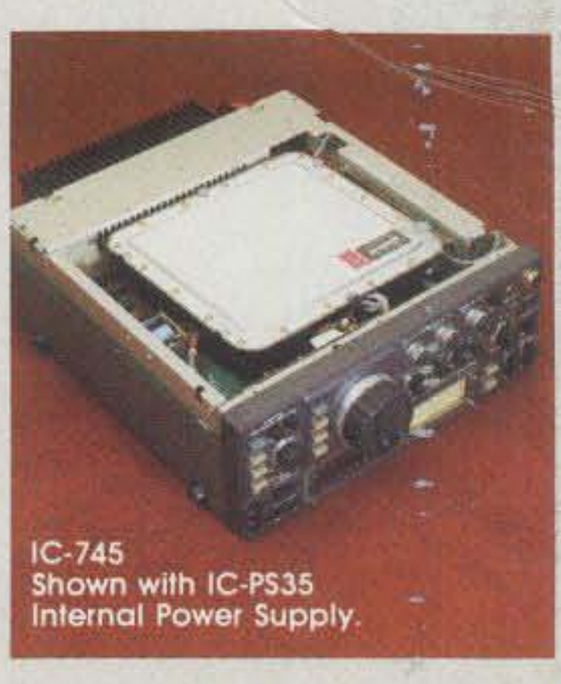
ICOM System.
The IC-745 is compatible with ICOM's full line of standard HF accessories.

Accessories available include the IC-PS15 base supply, IC-PS30 system power supply (switching), IC-PS35 internal power supply, the IC-2KL linear amplifier, AT100 automatic antenna tuner, AT500 automatic antenna tuner, HP1 headphones, and HM12 hand or SM6 base microphone.

Options. The EX241 marker and EX242 FM module, plus a wide variety of filters for sharp audio reception are available.

Filter	-6dB Width	Center Freq. MHz
FL45	500 Hz	9.000
FL53A	270 Hz	9.000
FL44A	2.1 KHz	0.455
FL52A	500 Hz	0.455
FL54	250 Hz	0.455

The IC-745 is the only transceiver today that has such features standard...the number of options and accessories available...and such an affordable price.


IC-745
Shown with IC-PS35
Internal Power Supply.

ICOM
The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780**

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