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Amateur Radio

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CQ

Exclusive CQ Interview:
Mr. Edward J. Minkel
Managing Director, FCC . . . p. 13

Full Test Report

The Rockwell-Collins

KWM-380

Transceiver . . . p. 50

R TTY 0060 02:02:56

THIS IS N5AEH
AUTORESPONSE.
HUMAN OPERATOR
HAS BEEN NOTIFIED.

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T

Special RTTY Issue

74820 08241 11

THE RADIO AMATEUR'S JOURNAL

NEW

TS-930S

"DX-traordinary"... superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

A superlative, high-performance, all solid-state HF transceiver, that covers all Amateur HF bands, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.

TS-930S FEATURES:

- 160-10 Meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC, on SSB, CW, FSK, and AM. UP conversion digital PLL circuit.
- Excellent receiver dynamic range. Typical two-tone dynamic range, 100 dB (20 meters, 50-kHz spacing, 500 Hz CW bandwidth).
- All solid-state 28 volt operated final amplifier. Lowest IM distortion. Power input 250 W on SSB/CW/FSK, 80 W on AM. SWR/ Power meter.
- Available with AT-930 automatic antenna tuner built-in, or as an option. Covers 80-10 meters, including WARC bands.
- CW full break-in. CMOS logic IC, plus reed relay. Switchable to semi break-in.
- Dual digital VFO's, 10-Hz steps, includes band information.
- Eight memory channels. Stores frequency and band data. Internal battery memory back-up, est. 1 yr. life. (Battery not Kenwood supplied.)
- Dual mode noise blanker. NB-1, with threshold control, for "pulse" noise. NB-2 for "woodpecker."
- SSB IF slope tuning, allows independent adjustment of the low and/or high frequency slopes of the IF passband.
- CW VBT and pitch control. VBT tunes out interfering signals. CW pitch control shifts IF pass-band and beat frequency. "Narrow-Wide" filter switch.
- Tuneable, peak-type audio filter for CW.
- AC power supply built-in.
- Fluorescent tube digital display, with digitalized sub-scale, in 20-kHz steps.
- RF speech processor.
- One year limited warranty.
- SSB monitor circuit.

Optional Accessories:

- AT-930 Auto. antenna tuner.
- SP-930 External speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455 kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83 MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83 MHz IF.
- SO-1 commercial grade TCXO.
- MC-60A deluxe desk microphone, 8-pin, with pre-amplifier, UP/DOWN switches.

TR-7730

Dyna-"mite"... miniaturized, 5 memories, memory/ band scan.

The TR-7730 is an incredibly compact, reasonably priced, 25 watt, 2 meter FM mobile transceiver, with five memories, memory scan, automatic band scan, plus other convenient operating features. It is available with a 16-key autopatch UP/DOWN microphone, (MC-46), or with a basic UP/DOWN microphone.

TR-7730 FEATURES:

- Dimensions: 5-3/4 W x 2 H x 7-3/4 D, inches. Weighs 3.3 lbs.
- Extended frequency coverage, 143.900-148.995 MHz, in 5 or 10-kHz steps.
- 25 watts RF output power, with HI/LOW power switch.
- Five memories. Simplex or repeater operation, with transmit offset switch. The 5th memory stores receive and transmit frequencies independently, for non-standard splits. Memory back-up terminal on rear panel.
- Memory scan, plus automatic band scan. Locks on busy channel, resumes when signals disappear, or when scan switch is pressed. Scan HOLD or PTT switch on microphone cancels scan.
- UP/DOWN manual scan on microphone, either version.
- Four digit LED frequency display.
- S/RF bar meter. LED indicators for BUSY, ON-AIR, REPEATER operation.
- Tone switch for internal tone encoder (not Kenwood supplied).
- Offset switch ±600 kHz, or simplex. Fifth memory for non-standard offset.

Optional Accessories:

- MC-46 16-key autopatch UP/DOWN microphone.
- SP-40 Compact mobile speaker.
- KPS-7 Fixed station power supply.

TR-8400

Synthesized 70-cm FM mobile rig

- Covers 440-450 MHz, in 25-kHz steps, with two VFOs.
- Transmit offset switch for ±5 MHz. Non-standard offset uses fifth memory.
- HI/LOW power switch selects 10 or 1 watt RF output.
- Similar to TR-7730 in other features, including five memories, memory scan, automatic band scan, UP/DOWN manual scan, four digit display, S/RF bar meter, LED indicators, tone switch, and same optional accessories.
- Basic UP/DOWN microphone supplied with unit.

KENWOOD

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

R-600

"Now hear this"...digital display, easy tuning

The R-600 is an affordably priced, high performance general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands. Use of PLL synthesized circuitry provides maximum ease of operation.

R-600 FEATURES:

- 150 kHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning.
- Five digit frequency display, with 1 kHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filter for SSB, CW and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates "pulse-type" noise.
- RF Attenuator allows 20 dB attenuation of strong signals.
- Tone control. • Front mounted speaker.
- "S" meter, with 1 to 5 SINPO "S" scale, plus standard scale.
- Coaxial and wire antenna terminals.
- 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel.
- Optional 13.8 VDC operation, using DCK-1 cable kit.
- Other features include carrying handle, headphone jack, and record jack.

Optional accessories for R-600 and R-1000:

- DCK-1 DC Cable kit. • SP-100 External Speaker.
- HS-6, HS-5, HS-4 Headphones.
- HC-10 Digital World Clock.

R-1000

High performance, easy tuning, digital display

The R-1000 high performance communications receiver covers 200 kHz to 30 MHz in 30 bands. An up-conversion PLL synthesized circuit provides improved sensitivity, selectivity, and stability.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock/timer.
- RF step attenuator.
- Three IF filters for optimum AM, SSB, CW.
- Effective noise blanker. • Tone control.
- Built-in 4-inch speaker. • Dimmer switch.
- Wire and coax antenna terminals.
- Voltage selector for 100, 120, 220, and 240 VAC. Operates on 13.8 VDC with optional DCK-1 kit.

TS-530S

"Cents-ational"...IF shift, digital display, narrow-wide filter switch

The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530S FEATURES:

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

Optional accessories:

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

TS-660

The TS-660 "QUAD BANDER" covers 6, 10, 12, 15 meters.

- FM, SSB (USB), CW, and AM
- Dual digital VFO's
- Digital display
- IF shift built-in
- 5 memories with memory scan
- UP/DOWN microphone
- All-mode squelch
- Noise blanker
- CW semi break-in/sidetone
- 10 W on SSB, CW, FM; 4 W on AM.

Optional accessories:

- PS-20 power supply
- VOX-4 speech processor/VOX
- SP-120 External speaker
- MB-100 Mobile mount
- YK-88C, YK-88CN CW filters
- YK-88A AM filter.

KENWOOD

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1111 West Walnut, Compton, California 90220

It's Time To SANTEC uP

It's time for you to get the best of the excitement of full-feature synthesized handheld operations, and SANTEC/nology hands you the uP-to-the-minute radio whose time has come. Here are just four great reasons why you should SANTEC uP:

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- **Less than 10 ma drain in receive** means more standby time for SANTEC owners. The ST-144/μP saves its power.
- **High power output when you need it.** You can choose to transmit at 0.1W, 1.0W, or even 3.5W (all nominal), and your SANTEC can reach out through all types of operating conditions.
- **Outstandingly good warranty and service.** Your SANTEC comes with the back uP that doesn't back down in 90 days: a full two year extended service period, which no one else can match, in addition to the regular 90 day limited warranty for parts and labor.

When it's time to compare features and value, nothing else stands uP with SANTEC. Now that it's time for you to get the best, it's time to SANTEC uP.

Shown with optional SM-1 speaker microphone.

Accessories for SANTEC Handheld Radios
clockwise from upper left:
- Leather Case (ST-LC)
- Base Charger & Power Supply (ST-5BC)
- Remote Speaker (MS-50S)
- Mobile Charger (ST-MC)
- Speaker Microphone (SM-1)

The ST-144 μP is approved under FCC Part 15

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Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: 516 681-2922. CQ (ISSN 0007-893X) is published monthly by CQ Publishing Inc. Controlled circulation paid at Hicksville, NY and Gordonsville VA. Subscription prices: Domestic—one year $14.00, two years $25.00, three years $36.00; Canada/Mexico—one year $16.00, two years $29.00, three years $42.00; Foreign—one year $18.00, two years $33.00, three years $48.00; Foreign Air Mail—one year $71.00, two years $139.00, three years $207.00. Entire contents copyrighted CQ Publishing Inc. 1982. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address. Printed in the United States of America.
Postmaster: Please send change of address to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

CQ The Radio Amateur's Journal

ON THE COVER: Ralph Amdursky, W2DFS, enjoys the wonderful world of RTTY. In this shot by Milt Mann, W9PRH, we can see Ralph not only reading the mail, but generating a reply via video. It's a far cry from the green keys days.

NOVEMBER 1982 **VOL. 38, NO. 11**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

By the time you read this, a lot of things will have occurred, some of which are only good bets as of now. First, the President did sign the RFI Bill (on Sept. 13), enabling the FCC to set and enforce standards. Although our own Ted Cohen, N4XX, will heap praise on the League and others for bringing this about (and deservedly so), let us not forget that Ted was a lone voice some ten or so years ago calling out for such legislation, and it was he who helped start the whole thing. Thanks, Ted.

The rumored move towards an easement for our use of 10 MHz may happen. The volunteer examiner program for amateur licensing may also be closer to fruition. We should keep in mind that this will not and should not be looked upon as a replacement for the FCC. The concept of limits and enforcement for our service go beyond the scope of a volunteer program. Also keep in mind that although we are using the term *volunteer,* there probably will be some sort of fee schedule to pay for supplies, test materials, and, yes, even the so-called volunteers themselves. This most likely will be true for the various groups gearing up to handle exams and also for the ARRL. After all, they can't be expected to subsidize this aspect of amateur radio, too.

As we close in on 1983, we should see movement towards the code-free license. My September editorial still says it like it is, and the open Technician Class is still the prime choice. Despite some obvious intellectual objections, the Technician Class offers the self-fulfilling promise that attracts circular reasoning.

My question in that September editorial concerned the code privileges already enjoyed by holders of the pre-Code-Free Technician license. The circular reasonists offer that these Technician Class license holders would not lose a thing. First, through demonstration they have earned their right to use c.w. The new Code-Free license would pose no problem, neither for enforcement nor testing, if Techs chose to operate c.w. The logic is simple. International regulation only stipulates a "knowledge" of the code; no speeds are mentioned. By using c.w., the licensee is demonstrating his or her knowledge, and the stipulation is satisfied. It is self-fulfilling and very neat. That, in a nutshell, shot down part of my September comments on how it legally could be done.

On The Road, Sort Of

On Saturday, September 11, Dick and I drove down to Gaithersburg, Maryland, for the big bash there. Well, it turned out to be a comedy of errors. The hotel lost our magazine for starters. Oh, they were there all right, but they just couldn't be located. It's just that various factions within the hotel kept moving them from department to department and from various meeting rooms to other meeting rooms, so we always seemed an hour behind them. There was an overnight snafu in tables at the commercial exhibits which left us with no choice other than not to exhibit. It was unfortunate, and I expect that things will be better next year.

However, not having to be at our booth did give Dick and me ample time to wander through the fleamarket for a change. We spent a couple of hours going through all the aisles of "great stuff" and picking up a great many bargains to bring home. There was indeed a large turnout for the fleamarket, with new cars and pickup trucks arriving all morning. We didn't stay the entire day, but we did have a good time for the few hours we spent there.

CQ WW DX C.W. Contest and 30 Meters

At this writing, there has been some apparent movement towards getting a special easement for U.S. amateurs to have use of the new 10 MHz band. By the time this issue of *CQ* reaches the newsstands and subscribers, some sort of action should have been taken. Regardless of the outcome, for the purposes of the 1982 *CQ* World Wide DX C.W. Contest, contacts made on 30 meters will *not* count. Only the traditional h.f. amateur bands (160, 80, 40, 20, 15, and 10 meters) which are available to *all* amateur radio operators in the world will be considered.

Free United States Frequency Allocation Chart

There aren't too many things offered these days absolutely free. Well, we have one free offer that doesn't need box tops, coupons, or minimum purchase. Varian Associates (that's Eimac to most of us) is offering a 15″ × 21″ fold-out wall chart featuring a ledger guide plus color and line coding for easy reference. The frequency chart shows all frequency allocations from 3 kHz through 300 GHz and would look very impressive on the wall of your shack. To get your free copy write to Varian Associates, Electron Device Group Marketing, 301 Industrial Way, San Carlos, CA 94070.

Price Increase

So what else is new? The price for everything seems to be going up these days, but we've worked to keep this increase at a minimum. Starting in January 1983, the new prices for a subscription to *CQ* will be:

	U.S.A.	Canada/Mexico	Foreign
1 Year	$16.00	$18.00	$20.00
2 Years	$29.00	$33.00	$37.00
3 Years	$42.00	$48.00	$54.00

This will still make *CQ* the best magazine buy in the amateur market.

Another increase will be instituted in the price for our USA-CA Special Honors Plaque. Starting in January, the price will increase from $35.00 to $40.00. This is to offset the increase to us from our supplier. Check the Awards Column next month, as W2GT will have more to say about it.

CQ Reviews

This month exemplifies how much we have been keeping John Schultz busy. Through his efforts we are pleased to present two major reviews of amateur equipment. Both the HAL System II and the Rockwell-Collins KWM-380 represent new directions in the development of amateur radio equipment.

We have also been assigning reviews to several other very competent reviewers so that in the months to come you can get a handle on what's available in the amateur marketplace, how it works, and how *well* it works. While "CQ Reviews" is certainly not a new feature for *CQ*, it is an area that we are expanding.

Heading Towards 1983

As the year's end closes in and as I check the calendar for 1982, it becomes very evident that we have indeed been on the road quite a bit. By year's end *CQ* will have been represented at about 22 hamfests and trade shows, plus several visits to amateur manufacturers. As of this writing in mid-September, there are still about eight trips to go. The response so far to "Travels With *CQ*" has been overwhelmingly positive. Of course, there are a few bored readers who don't think the travels are as interesting as Wayne's exotic visits, but the purposes are a bit different. My purpose is to let you know that there is a tremendous amount of amateur activity out there, some of which is right in your own backyard. It is also to encourage you to get out of the shack for a few hours and meet other amateurs face to face. It's a show of support for local clubs and organizations, and it's a chance to see and touch the latest amateur equipment. Most of all, it's really a lot of fun. Come on out next time.

73, Alan, K2EEK

DRAKE

TR5 Transceiver

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Anniversary in business
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A NEW DIMENSION IN PERFORMANCE

• U.S. Made • Competitive Price • All Solid State • 12V DC • SWR Protected •
• Broadband • No Tune Up • Full Break-in CW • 150 Watts PEP, SSB or CW Input •
• High Dynamic Range • Excellent Sensitivity/Selectivity • Digital Readout •
• 160-10 Meters Plus WARC Bands and MARS Coverage*•

Front panel switching allows independent MODE and optional crystal filter selection.

A passive double balanced mixer is employed in the receiver front end. This stage is preceeded by a low noise high dynamic range bipolar rf amplifier to provide good, strong signal performance and weak signal sensitivity.

Accurate digital readout of operating carrier frequency is displayed to 100 Hz.

A rugged, solid-state PA provides continuous duty in SSB and CW modes. A cooling fan (FA7) is available for more demanding duty cycles, such as SSTV or RTTY. The PA also features very low harmonic and spurious output.

VOX GAIN, VOX DELAY, VOX disable, QSK, selectable AGC time constants, RIT and noise blanker selection are front panel controlled for ease of operation.

The TR5 is designed with modular construction techniques for easy accessibility and service.

GENERAL

Frequency Coverage: 1.8-2.0*, 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 18.0-18.5*, 21.0-21.5, 24.5-25.0*, 28.0-28.5*, 28.5-29.0, 29.0-29.7* MHz. (*With accessory range crystal).

Modes of Operation: Usb, Lsb, Cw.

Frequency Stability: Less than 1 kHz drift first hour. Less than 150 Hz per hour drift after first hour. Less than 100 Hz change for a ±10% line voltage change.

Readout Accuracy: ± 10 ppm ± 100 Hz.

Power Requirements: 13.6 V-dc regulated, 2 A. 12 to 16 V-dc unregulated, 0.8 V rms maximum ripple, 15 A.

Dimensions:
Depth: 12.5 in (31.75 cm), excluding knobs and connectors.
Width: 13.6 in. (34.6 cm).
Height: 4.6 in. (11.7 cm) excluding feet.

Weight: 14 lb. (6.35 kg)

TRANSMITTER

Power Input (Nominal): 150 Watts, PEP or Cw.

Load Impedance: 50 ohms.

Spurious and Harmonic Output: Greater than 40 dB down.

Intermodulation Distortion: Greater than 30 dB below PEP.

Carrier Suppression: Greater than 50 dB.

Undesired Sideband Suppression: Greater than 60 dB at 1 kHz.

Duty Cycle:
Ssb, Cw: 100%.
Lock Key (w/o FA7 Fan): 30%, 5 minutes maximum transmit.
Lock Key (w/FA7 Fan): 100%.

Microphone Input: High Impedance.

Cw Keying: Instantaneous full break-in, adjustable delay.

RECEIVER

Sensitivity: Less than 0.5 uV for 10 dB S + N/N except less than 1.0 uV, 1.8-2.0 MHz.

Selectivity: 2.3 kHz minimum at −6 dB. 4.1 kHz maximum at −60 dB (1.8:1 shape factor).

Ultimate Selectivity: Greater than −95 dB.

Agc: Less than 5 dB output variation for 100 dB input signal change, referenced to agc threshold.

Intermodulation: (20 kHz or greater spacing) *Intercept Point:* Greater than 0 dBm. *Two-Tone Dynamic Range:* Greater than 85 dB.

I-f Frequency: 5.645 MHz.

I-f Rejection: 50 dB, minimum.

Image Rejection: 60 dB, minimum below 14 MHz. 50 dB, minimum above 14 MHz.

Audio Output: 2 watts, minimum @ less than 10% THD (4 ohm load).

Spurious Response: Greater than 60 dB down.

ACCESSORIES AVAILABLE

CIRCLE 21 ON READER SERVICE CARD

Model 7021 SL300 CW Filter
Model 7022 SL500 CW Filter
Model 7027 SL1000 RTTY Filter
Model 7023 SL1800 RTTY Filter
Model 7026 SL4000 AM Filter
Model 7024 SL6000 AM Filter
Model 1570 PS75 AC Power Supply
Model 1545 RV75 Synthesized Remote VFO
Model 1531 MS7 Speaker
Model 1507 CW75 Keyer
Model 1558 NB5 Noise Blanker
Model 7077 Microphone

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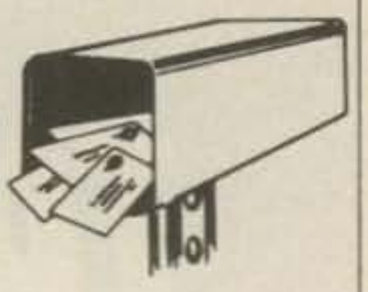
Our Readers Say



A PRB To Be Proud Of

Editor, *CQ:*

I very much admire the way your Private Radio Bureau treats the amateur radio community. By stark contrast, our home office takes little or no notice of individual amateurs and only concerns itself with what the RSGB says.

As the RSGB conducts all its meetings with the home office in secret, no one knows, apart from the committee members, what they are up to. By contrast, you have an open system which is much more responsive to individual radio amateurs who want to make a contribution. I trust you are proud of it.

Ian Abel, G3ZHI
Yorkshire, England

The One for the DXer

Editor, *CQ:*

How right you are! I do not want to miss out on any *CQ*'s. I love your awards program, your photos of other amateurs, and your great departments. I own *CQ* WAZ award No. 10 for 40 meter SSB, and am trying to *delay* the completion of 5B WAZ. Don't want it to end! How about 5B WAZ all on phone or CW?

Antenna articles also appeal to me. All in all, *yours* is the *best* magazine for the active DXer. No doubt at all. I get only *CQ*. No others, not even the local publication.

Derek Duffy, ZL1BOQ
Auckland, New Zealand

WA6AUD A Definite Plus

Editor, *CQ:*

After having been out of the hobby for a while, it is good to be back, and also good to see your magazine again. I started reading it in the 50's, when I first became serious about getting my license, and it was a joy then, as it is now. Those were the days when Danny Weil of Yasme was in evidence, and Wayne Green was young, brilliant, and witty . . . my, how time does fly.

My greatest motivation for subscribing now, in addition to the other quality features you provide (for me, primarily DX and contests), is the fact that you are now the only place where one can read Hugh Cassidy, WA6AUD. Do not let him resign, and keep up the great work. You are a most reasoned voice in the QRM of amateur radio literati.

Donald J. Bussear, K6UJS
Vallejo, CA

Thanks for Novice Column

Editor, *CQ:*

Just a note to thank Bill Welsh, W6DDB, for all the great information in his Novice Column. It has sure helped me a lot. I was a ham back in the thirties, but due to the service and college, I lost my license. So, after retiring here I decided to get back to hamming and got my Novice license. As I do not know any hams here, his column has been invaluable to me as to operating procedure, etc. Keep up the good work. I was torn between *QST* and *CQ*, but W6DDB's articles persuaded me to subscribe to *CQ*.

Tris C. Milne, KA4NRM
Vero Beach, FL 32960

Support Those Conventions

Editor, *CQ:*

On behalf of the 1982 California International DX Convention Committee and the Southern California DX Club, I wish to thank you for your support of this year's convention. Your donation was significant in making the event such a complete success.

The DX column and other related articles in your magazine are very interesting monthly reading for all DXers. Thanks again for the two subscriptions and your convention support.

Jim Stevenson, KM6B
President
Southern California DX Club

Corrections on Resume Scan for the IC-255A

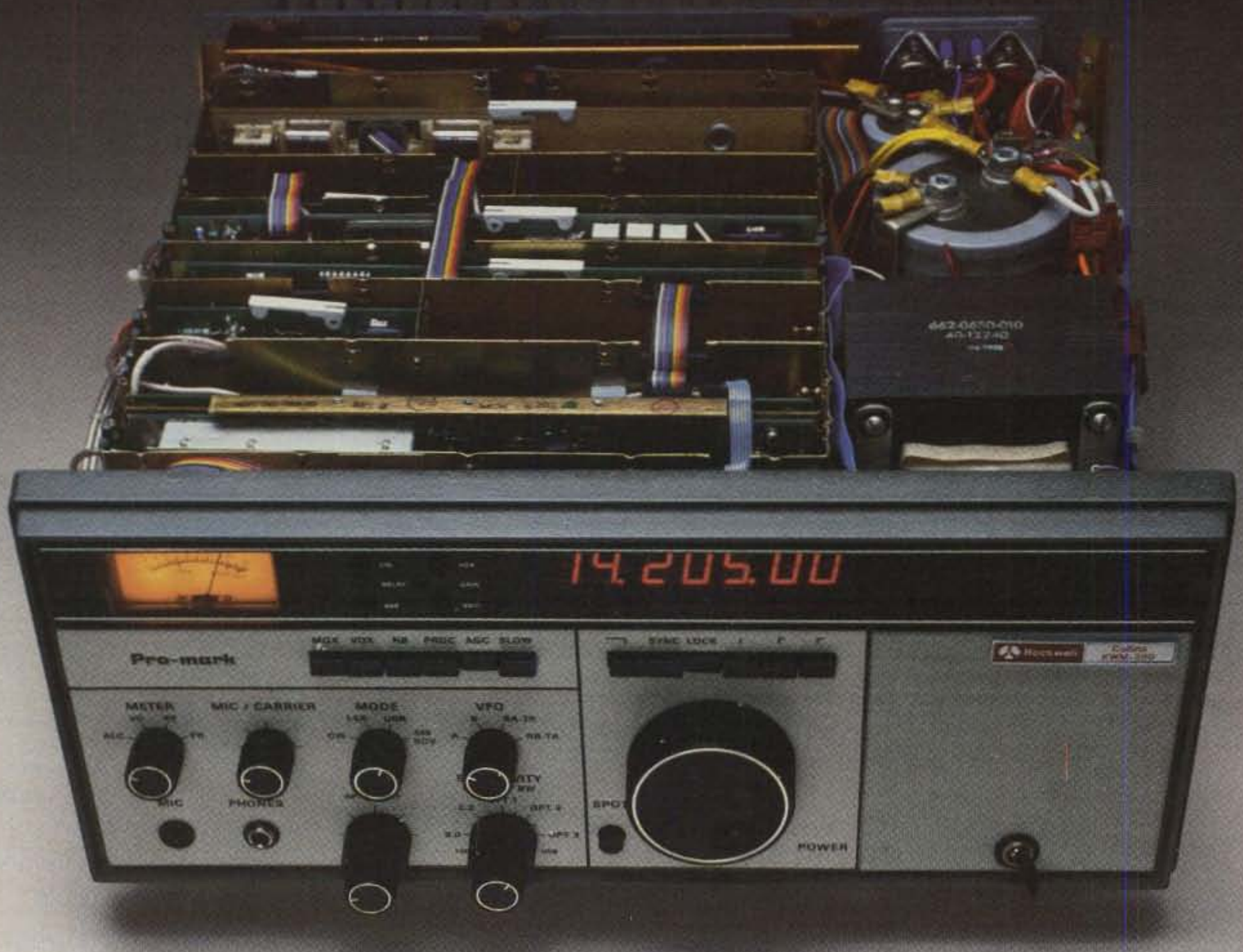
Editor, *CQ:*

Just received the July issue of *CQ*. I am quite pleased with your treatment of my article on Resume Scan for the IC-255A (page 48).

However, several errors did creep into the fig. 2 drawing of the circuit board layout. The bottom side of the circuit board does not show a hole drilled for pin 13 of U1 which connects to the collector of Q2 and the lead to plug 2, pin 4. Also, on the bottom side of the circuit board pads for pins 5 and 6, U1 and the lead to pin 6 on accessory socket should be connected. In addition, pin 13 of U2 should be connected to one end of C1 instead of pin 14 as shown. There is also no hole shown for connecting one end of R1 to pin 2 of U4. The top side of circuit board, fig. 2, and the schematic, fig. 1, are both correct.

George E. Black, WA0YJX
Adrian, MO

The real beauty of the Collins KWM-380 is behind the panel, not on it.



At Collins, we know serious amateurs won't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually

unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter. Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

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The TR7A and R7A offer performance and versatility for those who demand the ultimate!

TR7A Transceiver

• **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).

• **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.

New! **Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard,** plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.

New! **The very effective NB7 Noise Blanker is now standard.**

New! **Built in lightning protection** avoids damage to solid-state components from lightning induced transients.

New! **Mic audio available** on rear panel to facilitate phone patch connection.

• **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

R7A Receiver

• **CONTINUOUS NO COMPROMISE 0 to 30 MHz frequency coverage.**

• **Full passband tuning (PBT).**

New! **NB7A Noise Blanker supplied as standard.**

• **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.

New! **Standard ultimate selectivity choices** include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.

• **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

The "Twins" System

• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

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* Patent pending

CIRCLE 84 ON READER SERVICE CARD

Announcing

● **Photovoltaic Seminar** - On November 4th at 7:30 p.m. at the Dearborn Hyatt Regency, Dearborn, Michigan, Encon Corp. in conjunction with Solarex Corp. will provide a free photovoltaic (electricity from the sun) seminar: a talk on its history, production of solar cells, and applications. It will be an informative and educational seminar for all those who attend. For further information, contact Encon Corp. 27584 Schoolcraft, Livonia, MI 48150, or call 313-261-4130.

● **Foothills ARC Annual Swap & Shop** - On November 6th, the Foothills ARC will hold their Swap & Shop at St. Bruno Church, South Greensburg, Pennsylvania. For more information, contact Mario Carrerra, W3TTN, or write to P.O. Box 236, Greensburg, PA 15601.

● **R.F. Hill ARC Hamfest** - The R.F. Hill ARC will hold its 6th annual hamfest on November 7th in the Sellersville National Guard Armory, Sellersville, Pennsylvania. Doors open at 7 a.m. for sellers and 8 a.m. for buyers. Talk-in on 28/88 and 52. For further information, contact R.F. Hill ARC, Box 29, Colmar, PA 18915.

● **Cabarrus ARC Hamfest** - The Cabarrus ARS will hold its annual hamfest on November 7th from 9 a.m. to 5 p.m. at the Concord Boys' Club, Spring Street, Concord, North Carolina. Admission is $2.50 in advance, $3.00 at the door. Prizes, bingo, speakers, forums, refreshments. Flea market tables are $4.00, table space $2.50. Talk-in on 146.655. For tickets and space reservations, contact CARS, P.O. Box 1290, Concord, NC 28025.

● **Selma ARC Swapfest** - This annual event will be held on November 7th from 9 a.m. to 3 p.m. at the Selma Convention Center, Dallas Ave. and Washington St., Selma, Alabama. Tables $3.00. Talk-in on 146.52. For more information, contact SARC, P.O. Box 211, Selma, AL 36701.

● **ABC-TV Washington Engineering Group On The Air** - The ABC-TV Washington Engineering Group, celebrating the first year of operation from the network's new Washington news bureau, will be on the air Saturday, November 13th for 8 hours from 1400Z to 2200Z on the following frequencies (±5 kHz): s.s.b. 7.245, 14.285; and on c.w. for Novice and Technician contacts on 7.125 listening at 45 minutes past each hour. KB7ZZ/3 will also be on 145.190 f.m. (W3DOS/R) throughout the operation period. Special events QSLs via business-size s.a.s.e. to Steve Malis, KA4ORL, 2520 Heathcliff Lane, Reston, VA 20091.

● **Sandusky Radio Experimental League QSO Party** - The 50th anniversary of the Sandusky (Ohio) Radio Experimental League, Inc. will be observed and celebrated with a QSO party on Saturday and Sunday, November 13–14. Members of the club will operate on five amateur bands using the club call, W8LBZ. Operating times will be 1800 UTC Saturday, November 13, until 1800 UTC Sunday, November 14. Frequencies will be: Novice 28150 and 7125; c.w. 3740, 7040, 14040, 21040, and 28040; phone 3910, 7265, 14280, 21360, and 28600. All frequencies will be ±10 kHz. All amateurs worldwide are invited to participate. A special QSL card/certificate will be sent to all who send their QSL card to the QSL Manager, W8LBZ, 2909 West Perkins Ave., Sandusky, OH 44870.

● **N8COY, Gaylord, Michigan** - The Tri County Wireless Group will mini-DX to the 45th parallel, halfway between the Equator and the North Pole, on phone 3.925, 7.250, 14.300, 21.375, 28.550, November 13–14, 1400Z–0600Z. Certificate for QSL to N8COY (s.a.s.e.).

● **Fort Wayne Hamfest** - The 10th annual Fort Wayne Hamfest will be held on November 14th. Sponsored by the Allen County Amateur Radio Technical Society, Inc. (AC-ARTS), it will be held at the Allen County Memorial Coliseum. Admission: $3.00 at the door, $2.50 advance, children under age 11 free. Regular tables $6.00, premium tables $20.00. Parking fee $1.00. Doors open to the general public at 8:00 a.m. Vendor set-up starts at 5:00 a.m. For further ticket or table information, contact Becky Skinner, KA9GWE, 9720 Pinto Lane, Fort Wayne, IN 46804.

● **Trinidad and Tobago QSO Party** -The 9Y4 QSO Party has been organized by the Trinidad and Tobago ARS, Inc. to commemorate 20 years of independence, 5 years as a republic, and 50 years of amateur radio. Contest period: 0000 UTC Saturday to 2359 UTC Sunday, November 20–21. Bands: 10 through 160, s.s.b./c.w., satellites. Exchange: the usual 5 and 6 figure serial number signal report plus a progressive 3 digit number starting with 001. Awards: certificate will be awarded to any station working 5 or more 9Y4 or 9Y5O stations. Logs: date/time in UTC, station worked, number sent, and number received; copy of log. Send $2.00 or equivalent in IRC's for award to TTARS, P.O. Box 1167, Port of Spain, Trinidad, West Indies.

● **Massillon ARC Auctionfest '82** -This event will be held on November 21st at the Nazir Grotto Hall, 6th and Dueber Ave. S.W., Canton, Ohio. Doors open at 7 a.m. for setup, 8 a.m. for others; auction starts at 11 a.m. Advance tickets $2.50, $3.00 at the door. Talk-in on 146.52. For tickets or tables, contact Steve Nevel, WD8MIJ, 1864 Massachusetts Ave. S.E., Massillon, OH 44646.

● **Greensboro Hamfest** - This second annual hamfest will be held on November 27–28 at the National Guard Armory, Greensboro, North Carolina. Sponsored by the Greensboro ARC, hours are 9–5 on November 27, 9–3 on the 28th. Tables and tailgating available. Tickets are $4.00, $3.00 preregistration by November 12th (s.a.s.e.). Talk-in on 145.25, 19/79, 52. For more details, contact Russ Brandt, KE4KL, 1301 Dayton St., Greensboro, NC 27407.

● **Bethlehem, Connecticut, Special Event** -W1FHP Hen House Gang will operate a Christmas Special Event from the "Little Town of Bethlehem" from November 28th through January 3rd on 10, 15, and 40, general portion of the bands. Special QSL for an s.a.s.e. to the Call Book address.

● **Radio Central ARC Ham-Central** -This event will be held on November 28th at Temple Isaiah, 1404 Stony Brook Road, Stony Brook, Long Island, New York. Flea market, W2LH lecture, WA2UEC slide show, and more. Doors open at 7:30 a.m. for sellers, 8:30 general admission. Tables $5.00 each, half tables $3.00. Admission $2.00, XYL's and children free. Talk-in on WA2UEC 144.550/145.150 and 146.52. For more information and reservations, contact KA2EQW, 80 7th St., Bohemia, NY 11716 (516-589-2557); or K2RGZ, 3 Haven Ct., Lake Grove, NY 11755 (516-981-2709).

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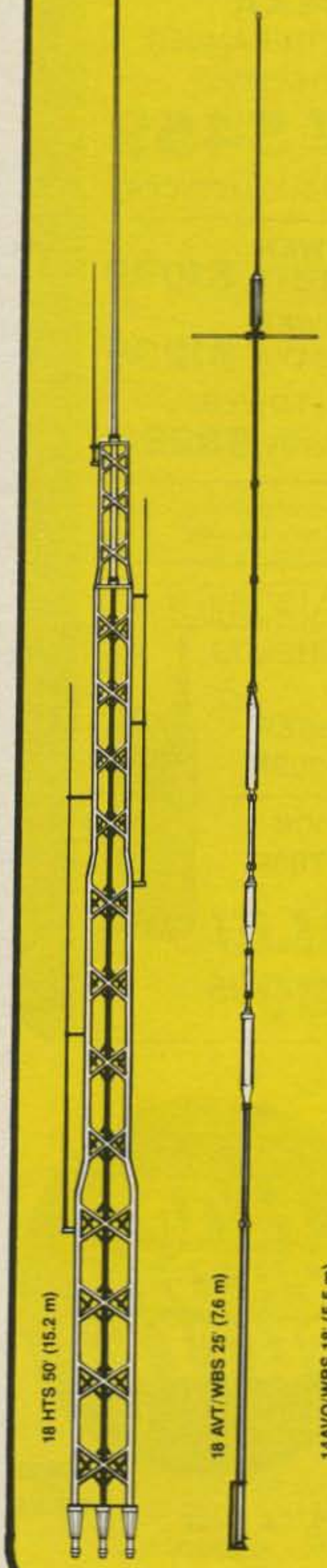

18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

14AVQ/WBS (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

18 HTS (80-10 meters. 160 meters with optional loading coil) The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended ¾ wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware. WARC kits to be available.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.

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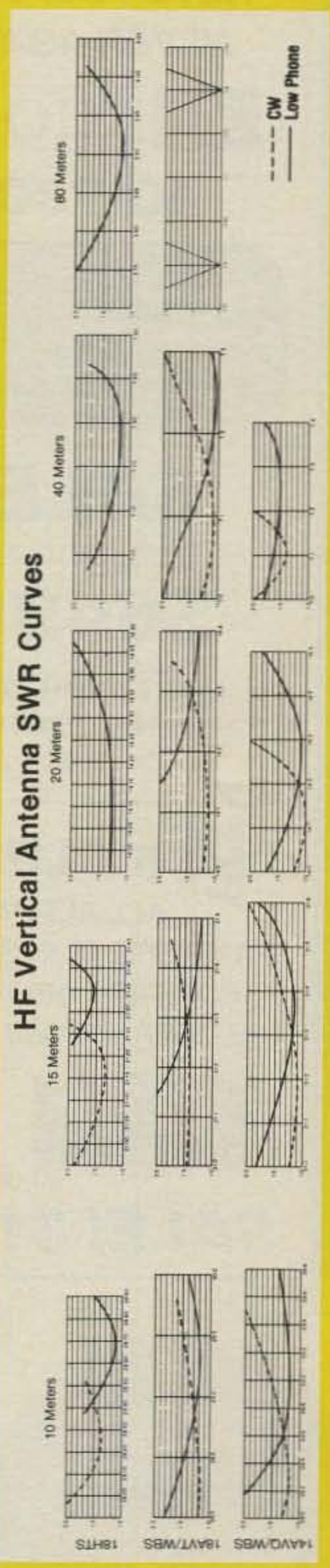

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A CQ EXCLUSIVE

CQ Interviews:

Mr. Edward J. Minkel

Managing Director
Federal Communications Commission

BY THEODORE J. COHEN*, N4XX

Edward J. Minkel is a native of Staten Island, New York. He received his BS degree from Manhattan College, New York, N.Y., and an MS degree in System Management from the University of Southern California in 1972.

A veteran of World War II, Korea, and Vietnam, Minkel entered the Army as a Private and retired from the U.S. Army Signal Corps in July 1976 with the rank of Colonel. He headed the Department of the Army Spectrum Management Division prior to his retirement.

In 1976 he managed the Chicago regional office of the FCC's Safety and Special Radio Services Bureau (now the Private Radio Bureau—ed.), *and he was named head of that Bureau's Land Mobile Spectrum Management Division in 1977. In 1979, however, he moved to the National Oceanic and Atmospheric Administration, National Weather Service Communications Division, serving as Deputy Division Chief until 1981.*

In May 1981, Minkel joined the new Chairman of the Federal Communications Commission, Mark S. Fowler, as the Chairman's Advisor for Management. On October 19, 1981, Minkel became the Managing Director of the FCC's new Office of the Managing Director.

Ed resides in Annandale, Va., with his wife, Catherine. Their favorite hobbies are hiking, water skiing, photography, and duplicate bridge.

We take great pride in presenting this exclusive CQ interview with Mr. Edward J. Minkel, Managing Director, FCC.

*8603 Conover Place, Alexandria, VA 22308

CQ: Ed, what does the Managing Director of the FCC do?
Minkel: As Managing Director, I serve as the Commission's chief operating and executive officer. My position was established last October *(1981—ed.)* by the Commission on the recommendation of Chairman Fowler to provide a strong, central focus of management authority and accountability.

My position was established to provide a strong, central focus of management authority and accountability.

In the simplest terms possible, I assist the Chairman in carrying out his administrative and executive responsibilities as head of the Agency. Also, I have a leadership role in relation to the Commission's bureaus and staff offices with respect to all management and administrative matters. That's it in a nutshell.

CQ: How about some specifics?
Minkel: In carrying out this broad mandate, I formulate and administer the Commission's management and administrative policies and programs. This includes areas such as data automation, personnel management, labor relations, management analysis, budgeting and financial management, procurement, security, and all of the other management programs and administrative support services required to run the FCC. I should also add that, under the direction of the Defense Commissioner, I am responsible for coordinating and directing the defense preparedness and emergency communications activities of the FCC. This includes the Emergency Broadcast System, the common carrier priority restoration system for leased intercity private lines, and a host of emergency communications plans for various groups of FCC licensees, including, of course, the amateur service.

CQ: What's your highest priority task?
Minkel: Ted, my highest priority task is to develop and implement the Commission's new Management-by-Objectives (MBO) System which was introduced by Chairman Fowler. Our MBO system is performance oriented. It provides a comprehensive mechanism for managing all of our activities, and it establishes priorities in a period of rising costs and declining resources. It is the keystone of Chairman Fowler's and my efforts to improve Commission operations and to make better use of our staff and other resources.

CQ: What is your background in amateur radio or its related activities?
Minkel: My involvement in amateur activities started in 1951 when I was a radio officer with the First Army Headquarters. The functioning radio station was located at Fort Woodsworth on Staten Island, New York. I was a MARS director, and one of my first jobs was to recruit amateur operators into MARS. We had, in my opinion, an outstanding eight-state emergency radio network. This net also included intra- and inter-state networks and an interface with the Civil Defense Headquarters. It was really a great experience. Later, in 1952, I was transferred to Korea, and when conditions there became stable, I started a MARS station in order to develop a phone patch system. I did the same type work in Vietnam, Hawaii, and Libya.

CQ: What is your involvement with the amateur service today?
Minkel: Although I am not presently a licensed amateur, I am still very interested in the activities of amateurs. As the Commission's alternate Defense Coordinator, I'm involved with both the Federal Emergency Management Agency (FEMA) and the National Industry Advisory Committee (NIAC). Specifically, insofar as the amateur service is concerned, the NIAC has an Amateur Radio Service Subcommittee. As I recall, this Subcommittee in 1979 approved and recommended to the Commission an Amateur Radio Communications Emergency Plan known as *The Amateur Radio Service Plan for the Support of Local Government During Emergencies*—the so-called Tacoma Plan. This plan was again reviewed by the Executive Committee of the full NIAC, approved, and unanimously recommended to the Commission as a prototype that could be used for communities nationwide to tailor to their specific needs for use during emergencies. FEMA and the National Weather Service (NWS) concurred with this Plan, and are actively supporting its implementation at both the National and Regional levels.

CQ: How do you personally feel about amateur emergency communications?
Minkel: As you know, amateur operators have a long history of assisting their community and country during emergencies. I feel that a simple, concise emergency plan developed at the local level can go a long way toward assisting local officials and amateurs to preplan for possible emergencies, with the probable saving of life and property.

CQ: Is there a good understanding of the amateur service today among the Chairman and the Commissioners?
Minkel: Ted, I can assure you that the Chairman and each Commissioner have a very good understanding of the amateur service and are fully aware of current amateur concerns. You can thank Jim McKinney *(Chief, PRB—ed.)*, Dick Smith *(Chief, FOB—ed.)*, and their staff members for their involvement with the Chairman and with each Commissioner on amateur proceedings.

Thomas P. Campbell, Associate Managing Director—Operations, FCC. (Photo courtesy Reni Newsphotos, Inc.)

CQ: To what extent have the Administration's budget cuts affected the Commission's ability to administer matters pertaining to the amateur service?
Minkel: The cuts have had some impact, primarily in providing amateurs with services such as preparing and administering operator examinations, and monitoring for violations. Fortunately, these cuts are coming at a time when legislation appears to be forthcoming which will permit the FCC to accept the voluntary services of amateur operators to do this work.

CQ: Ed, the amateur service, as defined in Part 97 of the Commission's Rules, has a number of purposes (for example, to foster experimentation, to provide emergency communications, and so forth). Yet, to many, amateurs are seen by and large as "communicators." Does the Commission favor the concept of amateurs as communicators, or does it hold a more "back to basics" philosophy with respect to our service?

I see a place for communicators, experimenters, and every possible combination of the two.

Minkel: The amateur service, as I am sure you are aware, is international in scope. It is recognized by practically every country in the world as defined in the International Radio Regulations: "A service of self-training, inter-communications and technical investigations carried on by . . .

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CIRCLE 34 ON READER SERVICE CARD

Alan R. McKie, Deputy Managing Director, FCC. (Photo courtesy Reni Newsphotos, Inc.)

persons interested in radio technique solely with a personal aim and without pecuniary interest." Here in the United States, the FCC Rules elaborate further on the basis and purpose of the Amateur Radio Service in Section 97.1. Within these concepts, I see a place for communicators, experimenters, and every possible combination of the two. Furthermore, I haven't seen or heard anything which would lead me to believe that the Commission favors one interest over the other.

It appears to me that amateur radio does very well indeed in the international arena.

CQ: How do you think a strong amateur service best serves the interests of the United States?
Minkel: In many ways. For instance, some of the finest engineers I have been associated with over the years have told me their career choice was influenced through their amateur radio activities as a youth. I see that the recent ARRL survey indicates over half of the amateurs working in a related field reported that amateur radio was useful to them. Another way that I feel that amateur radio fills a need is in emergency communications. As Chairman Fowler pointed out in his interview with you *(CQ, March 1982—ed.)*, the very presence of amateur radio operators in practically every inhabited area of the world—amateurs who are ready, willing, and able to communicate when a disaster knocks out normal means of communications—is a wonderful resource to have at hand.

As the demand for spectrum increases, you can continue to strengthen your position by making the best possible use of your existing allocations.

CQ: What should the amateur service do that it is not now doing to strengthen its position *vis-a-vis* frequency allocations?
Minkel: From the success of the amateur radio service at the 1979 WARC, it appears to me that amateur radio does very well indeed in the international arena. One must always keep in mind that all segments of the radio spectrum are continually sought by various potential users. That means that every radio service, including the amateur service, must be able to respond effectively to charges of non-efficient use. Such charges could be founded upon claims of failure to use spectrum-saving modulation schemes, for example. As the demand for spectrum increases, you can continue to strengthen your position by making the best possible use of your existing allocations.

CQ: How about the domestic situation?
Minkel: On the domestic scene, I would recommend that hams keep in mind that many of their allocations throughout the frequency spectrum were authorized on a shared basis. In most cases this came about because it was felt that amateur radio would be compatible with the primary users' operations. Therefore, I think it is clear that hams should strive to continue to make such arrangements work well.

CQ: The complaint has been made that the Commission is dragging its feet on implementing WARC-79 decisions. With specific reference to the new amateur band at 10 MHz, just what are the options the Commission can exercise at a time when the Senate has yet to ratify the WARC-79 Treaty?
Minkel: Until the U.S. ratifies the 1979 WARC Treaty, the Commission feels it would not be appropriate to authorize operation on the new 10 MHz band. As you know, we testified back in May along with State, NTIA, DOD, Motorola, and the ARRL that we support an early ratification. We are, of course, now preparing some basic strategy, which may include rulemaking, while we await ratification.

Until the U.S. ratifies the 1979 WARC decisions, the Commission feels it would not be appropriate to authorize operation on the new 10 MHz band.

CQ: Do amateurs have a legitimate concern with respect to the delay in the granting of 10 MHz privileges, or are we making a "mountain out of a mole hill"?
Minkel: Of course, amateurs have a legitimate concern with this frequency band; it directly relates to them. But I also want to point out that they are not the only service that is affected since a spectrum reallocation would be involved. I assure you and the amateurs that all services will be fully represented in this matter, and that the Commission will seek an equitable solution.

CQ: Sen. Schmidt has recommended against ratifying the WARC-79 Treaty until the ITU has had a chance to review its administrative procedures at the ITU Plenipotentiary Conference and until the U.S. has had an opportunity to evaluate any changes made. What is the Commission's position on Sen. Schmidt's stand against ratification?

The Commission believes that holding up the (WARC-79) ratification denies ... hams the benefits and protection of the provisions of the Final Acts.

Minkel: Senator Schmidt's evaluation is correct in that we should not approach each international conference on an isolated basis. However, the Plenipotentiary Conference will not deal directly with frequency allocation issues as did WARC-79, but rather, it will concern itself mainly with administrative and organizational matters. In the past, conferences dealing with frequency allocation matters have been linked directly to other conferences dealing with similar subject matters; for example, ratification of the 1977 Broadcast Satellite WARC was delayed so that it could be considered with ratification of WARC-79. As such, Ted, the Commission believes that holding up the ratification denies users such as yourself and other hams the benefits and protection of the provisions of the Final Acts of WARC-79. Given the tenuous linkage between ratification of the Final Acts of WARC-79 and the potential outcome of the Plenipotentiary Conference, it would appear that we would be unduly penalizing U.S. users, while having very little impact, if any, on the ITU member administrations, should ratification action be deferred.

CQ: Ed, for some time, operators in a number of telecommunication services have complained about the Soviet Union's over-the-horizon (OTH) high-frequency radar systems *(the so-called "Woodpeckers"—ed.)*. What actions has the FCC taken—either directly with the So-

viet Union or through the State Department—in an attempt to bring Woodpecker operations into compliance with the ITU Rules and Regulations? To what extent have the Commission's efforts been successful?

Minkel: We have repeatedly brought this problem to the attention of the FCC's counterpart in Moscow without success, and have finally turned the matter over to the State Department. This situation was brought up at the 1978 Aeronautical WARC, but to no avail. The sad part is that under ITU Rules, the Russian signal is entirely legal, interference included, if it is for national defense purposes.

CQ: At least one bureau chief *(Richard Smith, Field Operations Bureau—ed.)* has stated that while the Commission will deregulate the various radio services wherever possible, it will vigorously enforce those Rules which remain "on the books." Is this the general position today within the Commission?

Minkel: Yes, it is. All of the bureaus and offices are committed to carrying out the Commission rules and regulations, and the provisions of the Communications Act. My responsibility is to ensure that the resources and support systems such as data automation are available to provide them with the support they need to carry out their mission.

CQ: How effective are Congressional inquiries in influencing Commission operations and decisions?

Minkel: Well, Ted, this is another avenue that Congress uses to indicate their concerns to us, in addition to hearings or special inquiries held on Capitol Hill. We are always responsive to their informational requests, and we factor their concerns into our policy deliberations.

CQ: If the r.f.i. provisions of Senate Bill S. 929 and House Resolution H.R. 5008 are signed into law by the President, will the Commission move to set strong-signal susceptibility standards for electronic home-entertainment equipment?

Minkel: The wording of the r.f.i. provisions of Senate Bill S. 929 and House Resolution H.R. 5008 is quite clear in that they both propose *enabling* legislation which would provide the FCC with the regulatory authority to set minimum performance standards to reduce the susceptibility of home electronic entertainment equipment to r.f.i.

Speaking of r.f.i., a Further Notice of Inquiry in Docket 78-369 was adopted by the Commission a year ago. The comments received reflect many opinions. There are respondents who would like to see only voluntary industry standards. There are also many respondents who prefer direct regulation. Significant are the comments from trade associations and standards organizations. These entities prefer voluntary standards. The ARRL prefers direct regulation. At this

Josephus J. Knippenberg, Associate Managing Director—Information Management, FCC. (Photo courtesy Reni Newsphotos, Inc.)

time, various options available to the Commission are being studied; however, a specific course of action has not been formulated. We believe that it would be premature to do so until such time as we receive clear guidance as to the intent of Congress in any enabling legislation they may eventually adopt.

CQ: Are there any other areas you would like to discuss?

Minkel: I would like to say a few more words about our MBO program and how the Chairman has made it a success here. The basic foundation is built on five objectives which are to (1) create, to the maximum extent possible, an unregulated, competitive marketplace environment for the development of telecommunications; (2) eliminate unnecessary regulations and policies; (3) provide service to the public in the best manner possible; (4) promote the coordination and planning of international communications assuring the American public's vital interest in commerce, defense, and foreign policy; and (5) eliminate government action that infringes on the freedom of speech and the press.

These five basic objectives guide the overall Commission effort. They are general enough to give each bureau considerable latitude and flexibility in developing their own objectives and action plans. Also, we kept the process as simple as possible so bureau and office chiefs could adapt the system to their own particular needs. The plan is essentially a "top-down, bottom-up" process. Each bureau and office develops a set of objectives in relation to the five overall Commission objectives. Then, each division responds to the bureau chief's objectives and develops a set of its own. Objectives are developed at the branch level also. Then action plans are developed at the lower levels and flow upward. The Chairman personally approves all bureau objectives, action plans, and priorities.

I have established a quarterly review system that I use on behalf of the Chairman to track the accomplishments and progress of each bureau and office formal MBO objectives. The Chairman is also personally involved in semi-annual MBO progress reviews.

Our MBO System is integrated with all of our other Management Systems, including those pertaining to budgetary and performance appraisals. Also, each Commission agenda item is examined from an MBO perspective to make certain that staff proposals are consistent with our objectives.

I believe the Commission has done an outstanding job of meeting its objectives which, of course, include specific amateur proceedings. You can credit Chairman Fowler for really providing the support and motivation for these achievements.

CQ: Ed, thank you very much for an enlightening and informative interview!

Minkel: I appreciate having had the opportunity to discuss these issues.

WA7HRA shows us how to get the keyboard c.w. and RTTY from an Apple II computer. All you need is the proper software and the few hours it takes to build the interface described in this article.

The TU][

A C.W. RTTY Interface For The Apple II Computer

BY BOB HART*, WA7HRA

The most embarrassing question asked of most microcomputer owners is, "What does it do?" Other than games, the performance of a computer is not much of a crowd-pleaser. That is, unless it magically transforms those funny tones on your amateur radio into legible characters and words. Even other amateurs are impressed when the c.w. signals print out on the screen. Getting the computer on the air has probably been a goal since its purchase was originally considered. With the proper software and an interface between the computer and the radio, you will be on the way to enjoying the wonderful world of RTTY and keyboard c.w.

Apple II computer owners have available to them an excellent bit of software entitled "Ham Radio Communications Package" by Dr. Christopher Galfo, W4JMD.[1] The package currently sells for $20 on tape and $30 on disk in either DOS 3.2 or 3.3. Documentation is included. The software has provisions to send and receive Morse or RTTY in either Baudot or ASCII. There are virtually no practical limits on speeds. The package also includes a logging system for received text and text to be transmitted, plus a system to make hard copy on the printer. Also included are all the common prosigns such as **BK**, **AR**, **KN**, etc., and the ability to compose and store messages to later be recalled from the keyboard. The software even automatically sends a c.w. ID at the end of your RTTY transmission. The Apple must have at least 16K of RAM and be able to handle Integer BASIC.

Dr. Galfo uses the computer's built-in game port as an interface for the user-supplied terminal unit. The terminal unit (**TU**) is the device that transforms the tones from the receiver to signals the computer will accept, and in turn furnishes the transmitter with compatible signals from the computer.

A reliable terminal unit capable of both c.w. and RTTY can be built with only three integrated circuits plus five optoisolators to safely interface with Apple. The computer can supply the necessary voltages to operate the unit.

*P.O. Box 178, Hoodsport, WA 98548

The author's neat layout. The interface unit can be seen on top of the stacked disk drives to the right of the screen.

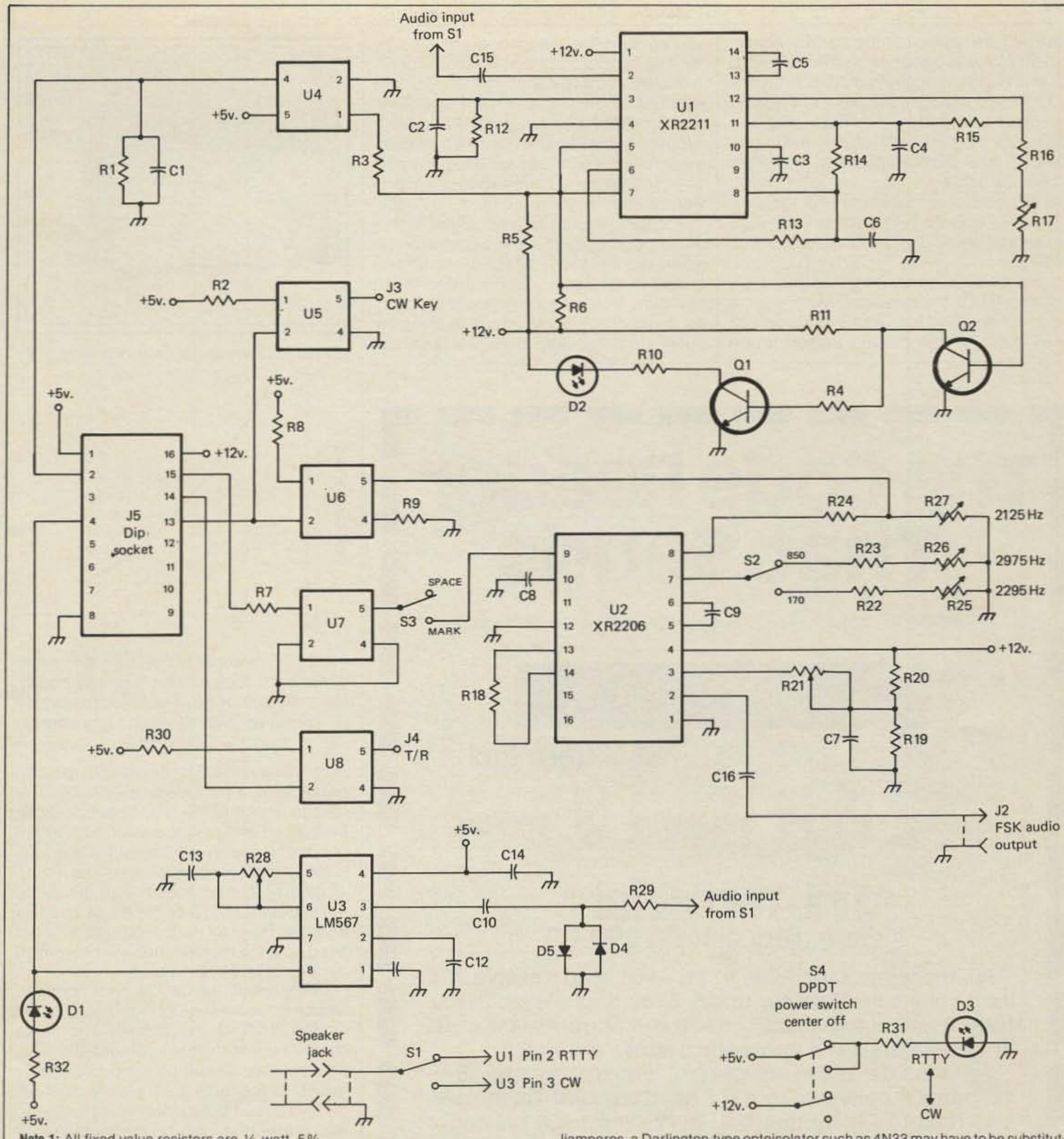
The circuit uses two IC's manufactured by Exar Integrated Systems that have been successfully used by amateurs for some time now in RTTY TU's.[2,3] They are the XR-2211 demodulator/tone decoder and the XR-2206 function generator. In addition, the LM567 tone decoder that is available from most local sources is used to decode c.w. signals.

The LM567 tone decoder (U3) receives c.w. audio input from the speaker jack of the receiver. The on/off tone of the signal is decoded by the chip, which in turn supplies a digital pulse to pin 4 of the game port. Since the frequency of the c.w. tone is determined by the passband of the c.w. filter or by the preference of the operator, the internal VCO of the chip must be adjusted to accommodate the input. This is accomplished by tuning the proper tone on the receiver and then adjusting R28 until the **TUNE** indicator on the screen stays on. LED D1 will also go on when the c.w. pulse is received.

Transmitting is accomplished by applying the output from pin 13 of the game port to optoisolator U5. Pin 13 goes low on key down which turns on U5. When U5 is on, it grounds the c.w. keying circuit and keys the transmitter.

The decoding of the received teletype tones is accomplished by the XR-2211 f.s.k. demodulator (U1). Values were selected for R12 through R17 and C2 through C6 to obtain optimum performance with a frequency shift of 170 Hz at speeds of 60 to 100 words per minute.[4] These standards comply with standard amateur practice. Audio from the receiver's speaker jack is applied to pin 2 of the chip. When a mark tone is detected, the PLL in the chip locks up, which causes pins 6 and 7 to go high, which turns on optoisolator U4. Pin 2 of the game port then goes high. When the frequency of the incoming RTTY signal shifts 170 Hz, the PLL unlocks and pins 6 and 7 go low. U4 then turns off, and pin 2 of the game port goes low. An indicator circuit is provided at pin 5 of the chip. Since pin 5 is the complement of pins 6 and 7, the signal is inverted by Q2.

Transmit tones are generated by the XR-2206 function generator (U2). The frequencies of the tones are set with R25, R26, and R27. Standard amateur mark



Note 1: All fixed-value resistors are ¼ watt, 5%

Note 2: Two 0.1 uF, 50V ceramic discs in parallel normally provide necessary capacitance to accommodate receiver tones. The value may have to be adjusted for your application.

Note 3: 7.5K ohms will give a c.w. ID shift of approximately 250 Hz. The shift may be adjusted by changing the value. (See fig. 2.)

Note 4: If the c.w. keying circuit or the push-to-talk circuit draws more than 3.5 milliamperes, a Darlington-type optoisolator such as 4N33 may have to be substituted for U5 (c.w.) or U8 (PTT).

Note 5: Printed circuit boards are available from the author for $10.00. A complete set of PC components and switches is available from the author for $50.00. Send check, money order, or bank card number (including expiration date) to: HRA TU-II, P.O. Box 571, Hoodsport, WA 98548. Please include 5% for postage and handling, 5% for Visa or MasterCard, and Washington residents add 5.9% state sales tax.

C1, C5: 0.022 Mylar
C2, C6, C10: 0.05 uF, 50V ceramic disc
C3, C15, C16: 0.1 uF, 50V ceramic disc
C4: 0.005 uF, 50V ceramic disc
C7: 10 uF, 25V, tantalum
C8, C11: 1.0 uF, 25V, tantalum
C9, C12: 0.047 uF Mylar
C13: see note 1
C14: 10.0 uF, 16V, electrolytic

R1, R14: 100K ohm
R2, R7, R8, R10, R11, R30: 1K ohm
R3, R23: 4.7K ohm
R4: 3.3K ohm
R5, R6: 10K ohm
R9: see note 2
R12, R13: 470K ohm
R15: 220K ohm
R16: 18K ohm
R17: 10K ohm, 15 turn, linear taper, pot.
R18: 220 ohm
R19, R20: 5.1K ohm
R21: 50K ohm, single turn, linear taper pot.
R22, R24: 6.8K ohm
R25, R26, R27: 5K ohm, 15 turn, linear taper pot.
R28: 10K ohm, single turn, linear taper pot.
R29: 100 ohm
R31, R32: 470 ohm
Q1, Q2: 2N2222
U1: XR-2211 (Exar Integrated Systems)
U2: XR-2206 (Exar Integrated Systems)
U3: LM567 (Radio Shack 276-1721 or equiv.)
U4: 4N33 optoisolator
U5–U8: 4N28, optoisolator or equiv.
S1, S2: spst switch
S3: spst switch
S4: dpdt, center off, switch
D1, D2, D3: LED
D4, D5: 1N34

Fig. 1–The circuit diagram for the Apple II Interface unit.

and space tones can be had by adjustment of these components.[5] Pin 15 of the game port is normally high, which causes U7 to be on and ground pin 9 of the chip. With pin 9 grounded, the chip produces a mark tone at pin 2 that is fed to the microphone jack of the transmitter. When pin 15 of the game port goes low, U7 turns off and lifts the ground from pin 9 of the chip. The tone now shifts to a space tone. Audio output level at pin 2 is adjusted with R21.

Pin 13 of the game port is normally low during RTTY transmission. Whenever a c.w. ID is called for, pin 13 goes high on key down, which causes U6 to turn off and remove the resistance provided by R9. This action shifts the mark tone for ID.

Power requirements for the TU are supplied by the Apple. Pin 8 of the game port provides a circuit ground and pin 1 supplies + 5 volts. The television modulator connector located near the game port on the computer's main circuit board provides a convenient source for + 12 volts. The *Apple Reference Manual* will locate these ports for you.[6] The above manual points out that the + 12 volt pin is not protected in the power supply; therefore, a fast-blow fuse is recommended. I attached a fuse block to the inside of the computer's cabinet with double-sided foam tape. Since the TU draws 20 milliamperes, a ½ amp fuse does the job. The lead to pin 16 of the game port plug can be clipped and peeled back from the ribbon cable and then attached to the fuse block. It is also recommended that a drop of glue be put on socket 9 of the game port, and that pin 9 of the game paddles and the TU plug be cut off. Pin 9 is not used, and the modification will prevent inserting the plug backwards.

Close-up view of Apple II interface unit.

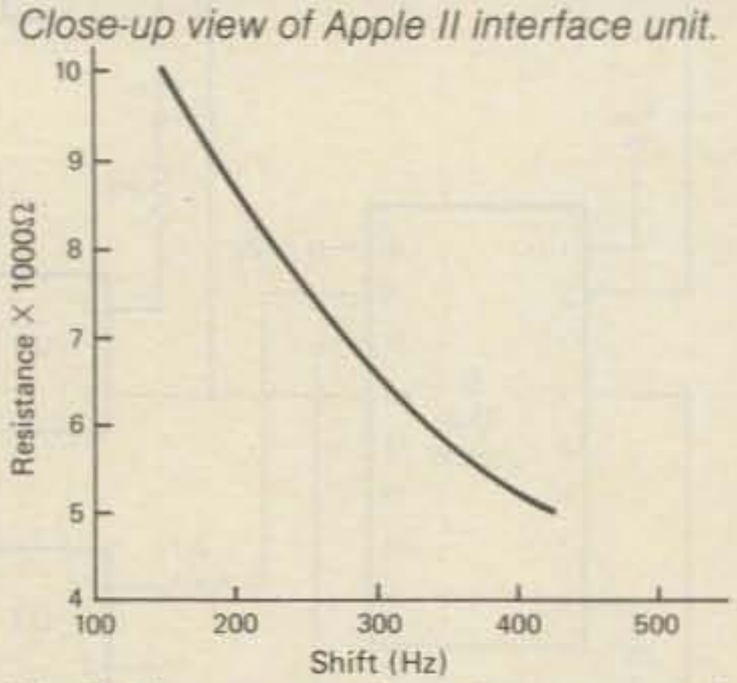


Fig. 2–The amount of c.w. frequency shift of the mark tone can be varied by changing the value of R9. The mark frequency (2125 Hz) will shift down on ID by approximately the value shown above.

Component layout is not critical. Switches and indicator lights should be on the front of the cabinet and jacks should be on the back. Shielded microphone cable should be used to connect the TU to the radio. I will supply a drilled, printed circuit board (see fig. 3) for those who prefer that form of construction (see parts list for further information).

Tuning the TU for RTTY is straightforward. To tune the RTTY tone generator (U2), load the RTTY program into the computer. Input a fill character of "none" (**n**) and hit **esc** to place the computer in the transmit mode. Turn on the TU, place S1 in **RTTY**, S2 in the **170 Hz** position, and S3 in the **mark** position. With a frequency counter attached to the a.f.s.k. output at J2, adjust R27 to indicate 2125 Hz on the counter. Switch S3 to **space** and temporarily adjust R25 to 2125 Hz. Place S2 in the **850 Hz** position and adjust R26 to 2975 Hz.

To adjust the demodulator, turn S3 to **space**, place S2 in **170 Hz**, hit **esc** to go to

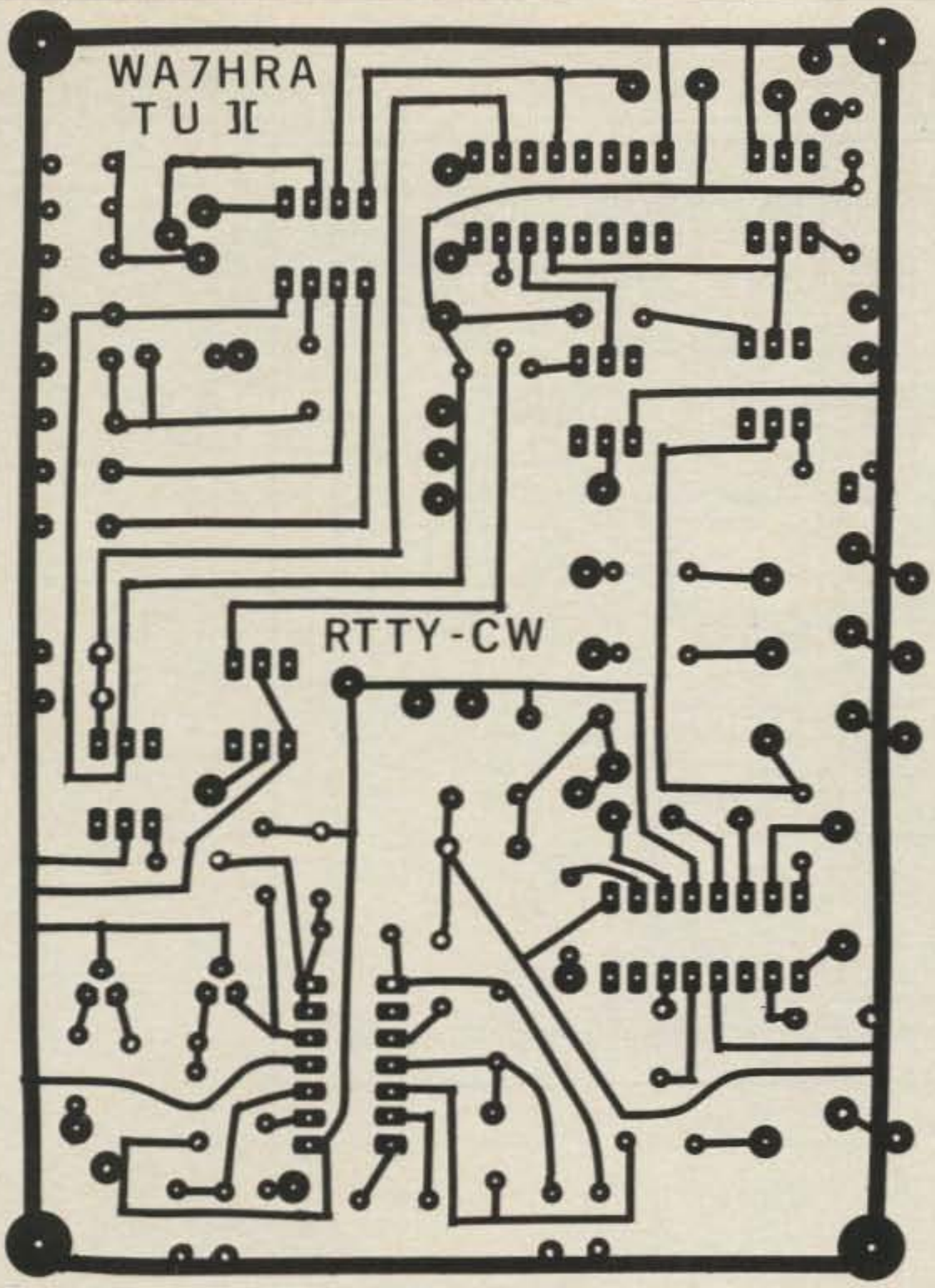
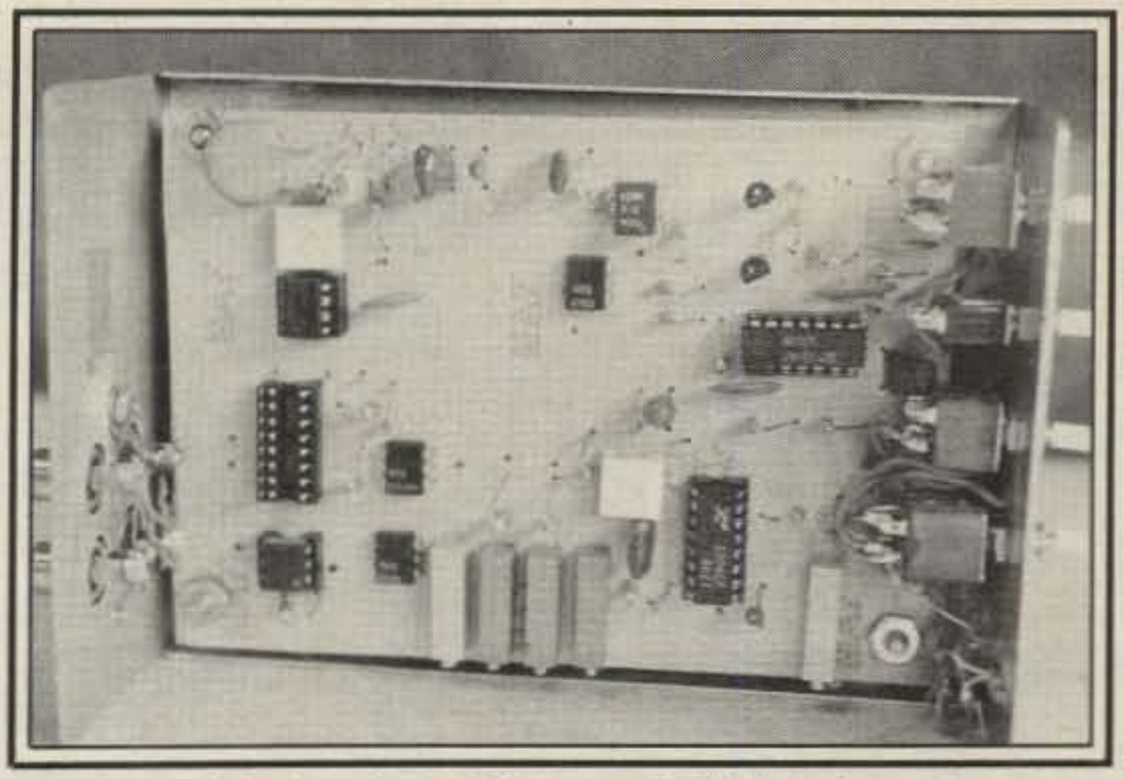


Fig. 3– Full-size artwork for PC board.



Interior view of the c.w. RTTY interface.

The small package neatly fits atop the Apple II disk drive.

the **receive** mode, and connect the audio output from J2 to J1. This will simulate a 2125 Hz mark tone at the input to the demodulator. Slowly adjust R17 until the **TUNE** indicator on the screen goes out. Continue turning until it goes on, noting the number of turns. Back R17 off half the number of turns to center the lock range of the chip's internal VCO. LED D2 will light when the tune indicator is off. On occasion, the indicator and D2 are not in exact synchronization. It is normal. Do not be concerned. Disconnect the jumper and readjust R25 to 2295 Hz.

With the computer in the **receive** mode, switch S2 to **mark** and measure the frequency at J2. It should be shifted to the c.w. ID frequency determined by R9 and fig. 2.

Use of the TU is simple. Connect J1 to the receiver's speaker jack. Transmitter connections are: J2 to the microphone jack, J3 to the c.w. key jack, and J4 to the push-to-talk circuit at the microphone jack.

To tune c.w. reception, load the program into the computer and set the parameters for Morse at 17 words per minute. Turn on the TU and switch to the c.w. position. S2 and S3 can be in any position. Tune a strong c.w. signal so the indicator (D1) lights brightly. Do not be surprised if the words do not print out perfectly. The old saying "garbage in, garbage out" certainly applies to the sending habits of many amateurs. The computer prints exactly what it hears, and some of it does not make sense. If you are fortunate enough to find a computer- or machine-generated signal, it will print perfect copy. You can load the transmit buffer while you are receiving. Before transmitting, set the speed to that of the sending station and simply hit **esc** to transmit.

To receive teletype, load the program with RTTY at 45 baud (60 w.p.m.), which is the most common amateur speed. Set your s.s.b. receiver to lower sideband and tune for a strong RTTY signal. The indicator (D2) should light brightly and stay lit. Carefully tune until the words print on the screen. Adjust the audio level so that it is just strong enough to print error-free copy. On v.h.f./u.h.f. f.m., tuning is very simple because it is generally a channel-type operation. Most amateur RTTY is 170 Hz shift. However, in some areas 850 Hz is used on v.h.f./u.h.f. If this is the case in your area, switch to 850 Hz.

On occasion, you may encounter a signal that is inverted because the operator is transmitting on upper sideband. Galfo provides for this in the program, and all you need do is select the **invert** option after hitting **ctrl s**.

Transmitting is accomplished in the same manner as c.w., except that you will not need to set the speed. One final adjustment is required once you are on the

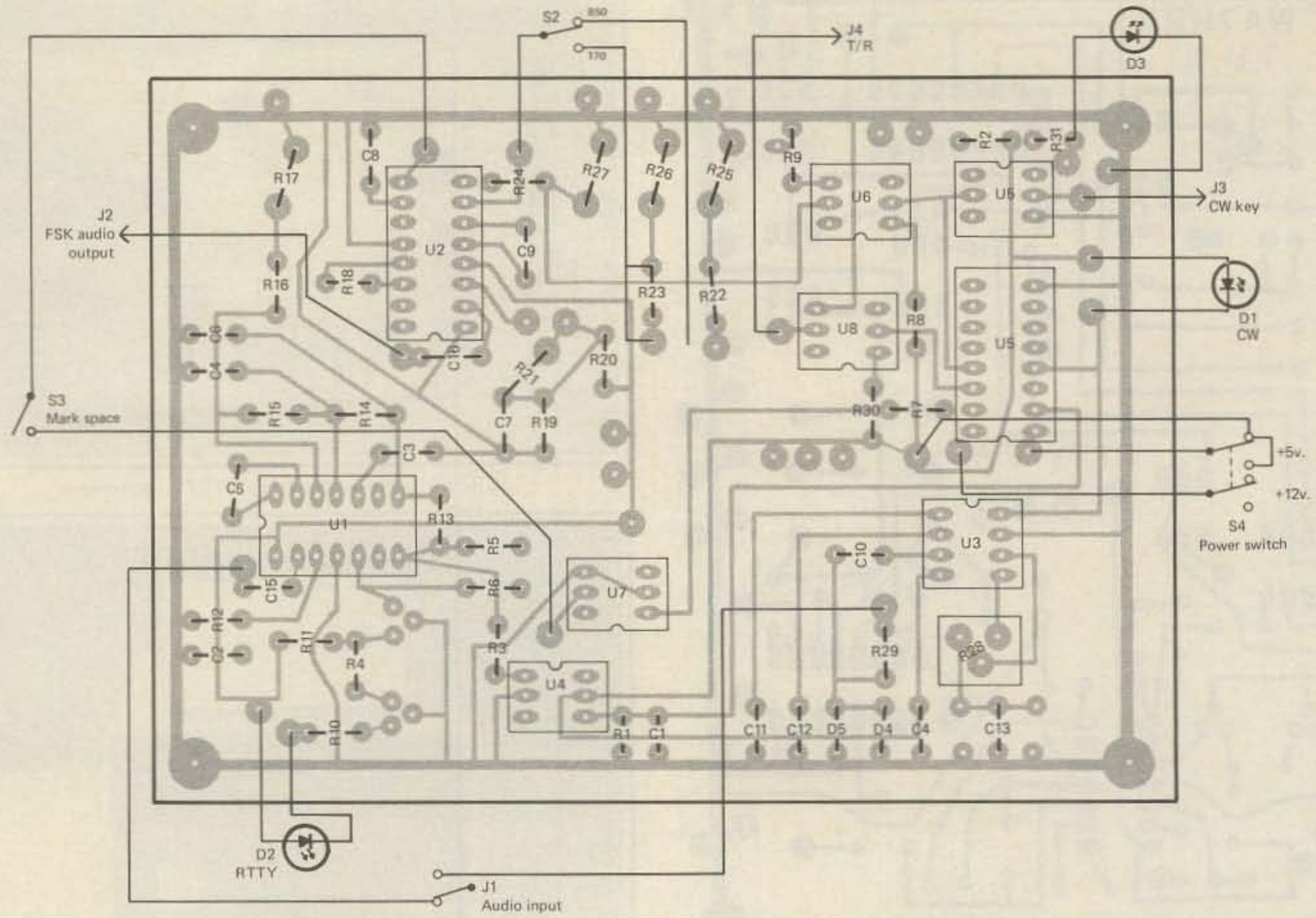


Fig. 4– Parts placement layout. Parts are shown on the non-foil side of the circuit board. The completed board will fit in a 4" × 6" cabinet (Radio Shack 270-252 or equivalent). If 850 Hz is not desired, R23 and R26 may be eliminated, and S2 may be replaced with a jumper wire from pin 7 of U2 to R22.

air. While another amateur listens to your signal, adjust R21 to the proper level. It should be loud enough to give a strong, clean signal, but not to the point of distortion.

My TU has given me months of trouble-free service. It is stable and has never needed readjustment. It is simple and inexpensive to build and will give you a modern, efficient means of interfacing two wonderful hobbies.

References

[1]"Ham Radio Communications Package," by Dr. Christopher Galfo, 6252 Camino Verde, San Jose, CA 95119.

[2]"A State of the Art Terminal Unit for RTTY," by Michael J. DiJulio, WB2BWJ, *QST*, December 1980, p. 20.

[3]"Charlie Special Teletype Demodulator" and "AFSK Generator," *RTTY Journal*, December 1978, p. 14.

[4]"XR-2211 FSK Demodulator/Tone Decoder Data Sheet," Exar Integrated Systems, 750 Palomar Ave., Sunnyvale, CA 94086.

[5]"XR-2206 Monolithic Function Generator Data Sheet," Exar Integrated Systems.

[6]"Apple II Reference Manual," Apple Computer, Inc., 10260 Bandley Dr., Cupertino, CA 95014.

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DRAKE Theta9000E

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Seven large 256 character memories are backed up with battery power so there is no need to reload information with each use. Memories may also be partitioned providing up to 29 separate storage locations. A type-ahead buffer of 3120 characters makes it easy to compose your response while still receiving. Operator controlled scrolling permits review of up to 10,720 previously received characters. Line length is selectable at 40 or 80 characters, your choice, and all mode and speed indicators are displayed on the screen for instant status recognition. The 9000E has 3 tone groups and 3 shifts which are all keyboard selected.

You won't buy any other communications terminal once you have studied all the advanced operating convenience built into the **Drake Theta 9000E**. It's complete.

DRAKE Theta550

The **Drake Theta 550** is a compact receive-only communications terminal and is designed to demodulate and display the three most popular over-the-air modes of data communications: CW (Morse Code), RTTY (Baudot), and ASCII. Any standard TV monitor can be used.

A full-featured microprocessor controlled unit, the Drake Theta 550 has selective calling, battery backed-up memory, audio monitor, and informative L.E.D. tuning indicators. There is also interfacing to permit the addition of a dot matrix printer for "hard" copy and a keyer paddle input to permit CW transmission with full iambic operation.

CW automatically tracks over a speed range of 5 to 50 words per minute and RTTY modes offer nine selectable standard speeds of transmission. 12 volts DC is required.

This unit is ideal for shortwave listeners and hams who have been missing the increasing volume of data communications over the air.

LA7 Line Amplifier

Line output, input levels as low as 15 mV rms (47 kilohm) will result in an output of 1 mW nominal into a 600 ohm balanced line. Output level adjustable by internal preset level control. Interfaces low level audio to RTTY terminal unit or phone line that requires a 600 ohm balanced/unbalanced input. One 36″ phono to phono cable supplied.

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CIRCLE 6 ON READER SERVICE CARD

CQ Reviews:

The HAL System II RTTY/Morse Communications Terminal (CT-2100 Terminal, KB-2100 Keyboard, and Video Monitor)

BY JOHN J. SCHULTZ*, W4FA

Although I have been around radioteletype equipment for many years in my professional engineering life, I could never warm up to the equipment as a radio amateur. Everything about RTTY seemed to impress me as being a mechanical engineer's delight and an electrical engineer's nightmare. Well, of course, all that has changed drastically. RTTY is now finally electronic thanks to equipment such as that pioneered by HAL Communications. The purpose of this article is to review a very sophisticated RTTY/Morse communications terminal composed of HAL components, but to approach the subject from the viewpoint of the average amateur in terms of system description, while giving some meaningful subjective and objective equipment comments useful to those already "into" RTTY. For the amateur who enjoys c.w. and who might have been toying with the idea of getting into RTTY, I suggest that electronic RTTY will pose the same pleasant surprise to him as many of us encountered years ago when manual keys gave way to electronic keyers.

But, first, a short digression on an important definition. In RTTY, the word "terminal" has conventionally meant the device that prints or displays the received signals, while perhaps also allowing one to type or otherwise send a transmitted message. Terminals could be either receive only or send/receive, such as the famous, old mechanical monsters: the Teletype Corp. Model 15 and 28 machines. However, I suggest that a newer definition be used, in that the "terminal" designate the entire electronic "ball of wax" that is needed to interface with a transceiver or a separate receiver/transmitter to provide electronic RTTY/Morse operation. Many amateurs seem to be almost unconsciously adopting this definition in conversation anyway. As shown in fig. 1, a terminal could then be as simple as possible or as elaborate as one wants to make it. For basic receive-only operation, a demodulator and a video monitor or page printer would suffice. For send/receive operation, at least a keyboard also has to be added. As one wants to make a terminal more elaborate, one could add features such as electronic message storage or even a computer for complete programmed control of the terminal.

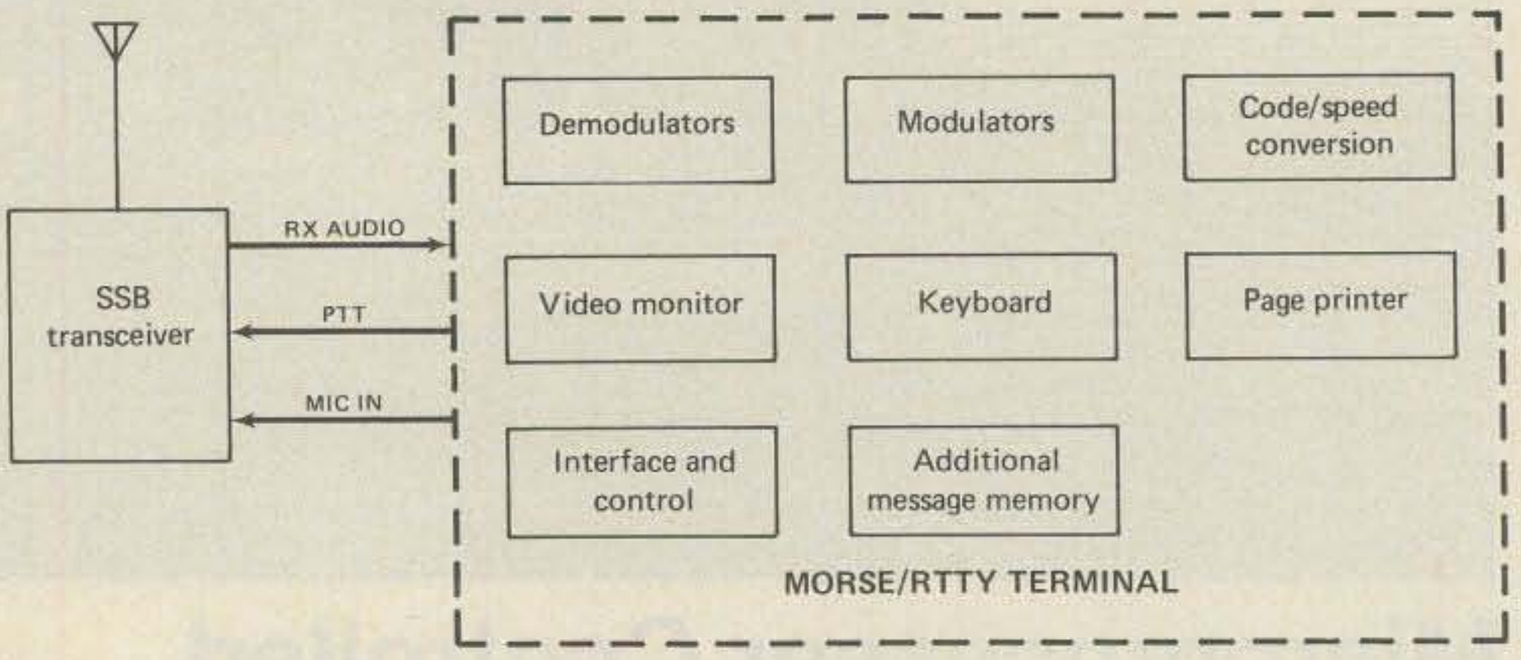


Fig. 1– Some of the functional blocks that might go into a modern-day Morse-RTTY communications terminal.

The HAL System II RTTY/Morse Communications Terminal basically consists of three units: the Model CT-2100 Communications Terminal, the Model KB-2100 Keyboard, and the Model ESM-914 Video Monitor. These three units are sufficient to provide complete send/receive operation for RTTY and Morse and contain some very sophisticated features.

The heart of the system is the CT-2100 Communications Terminal. Although labeled a terminal, it is more aptly looked at as a microprocessor-controlled package that demodulates and converts various transmission modes, generates various transmission codes, provides for interface with various external display and input devices, provides send/receive control, and provides audio monitoring of the signals coming into or leaving the unit.

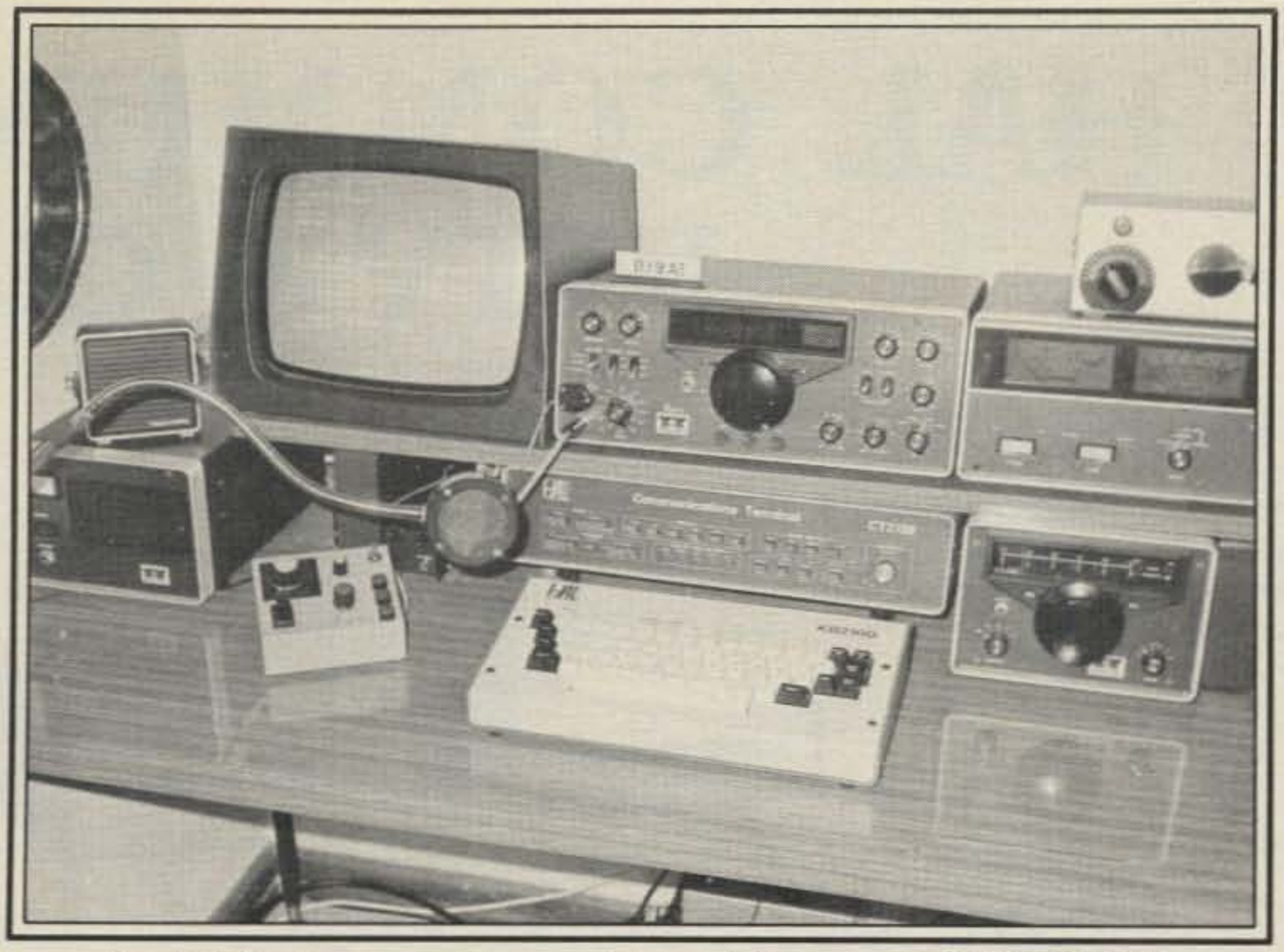
Table I lists the specifications for the unit. They will tell quite a bit to those already involved in RTTY operation, but they may seem a bit overwhelming to others. So, rather than comment on all of the specifications, first a description will be given of how the CT-2100 can be placed into operation for various modes of operation. After understanding this, one can then go back to the specifications to get a better feel for the advanced capabilities of the unit.

The basic interface wiring for the CT-2100 with a transceiver is shown in fig. 2. All of the connectors on the CT-2100, except to the keyboard, utilize standard phono connectors. If one wanted to visualize the CT-2100 being put into operation for receive-only purposes for the moment, the keyboard connection and those to the c.w. key, Microphone In, and PTT can mentally be eliminated, the point being to emphasize that although the CT-2100 has a host of interconnection possibilities, only a few basic ones are necessary to get the unit operating.

C.W. Operation

Looking at the front panel of the CT-2100, one can see that the push buttons are grouped into functional areas, such as for Data, Display, TX/RX Control, etc. Once all of the buttons have been preset, there is not much one has to do in operation. For instance, once the unit has been set up for c.w. operation, one would see appearing on the video monitor a status line that among other things displays "**MORSE.**" When tuning-in a c.w.

*c/o CQ Magazine



The HAL System II gear being put through its paces at DJØAT (W4FA).

signal, one adjusts the receiver tuning so the c.w. LED in the **Tuning Indicator** block on the CT-2100 flashes in sync with the desired c.w. signal. The CT-2100 uses a heterodyne phase-lock-loop detection circuit for c.w. which has a center frequency of 800 Hz and will lock on to a keyed tone of that frequency and track it over about a ± 100 Hz range.

The center frequency can be internally adjusted from 600 to 1200 Hz, and adjustment might be needed with some transceivers when using very sharp c.w. i.f. filters, such that, for example, a 700 Hz tone only instead of an 800 Hz tone is produced during c.w. reception. One can check that lock is achieved by using the input/output button in the **Monitor** block of the unit. Selecting "input" one hears the received signal, and selecting "output" one hears the regenerated c.w. signal from the CT-2100. There are no speed adjustments on receive since the unit automatically tracks from 1 to 100 w.p.m. speeds and recognizes all letters and numbers in Continental Morse plus all common punctuation signs and groupings such as AR, BT, KN, etc. The tuning is fairly sharp, and it does require practice to tune-in a c.w. station quickly, but it can be done. However, for extremely short c.w. transmissions one will usually find that the decoder we have programmed in our brains will react much faster.

Once the signal is tuned in, the decoded characters will appear on the video monitor starting at the bottom of the screen. Each line of received text as it is completed scrolls smoothly upward to make space for the next new line. It's really quite nice to see a good c.w. signal displayed, but on the other hand, a sloppy fist will produce a more than sloppy looking copy on the screen. This is because the computer in the CT-2100 "prints 'em as it hears 'em." The computer will sense longer than normal pauses between letters as spaces and put a space on the screen, and if a station runs words together, the unit will display them as one word. At slow c.w. speeds one's brain can decode Morse faster than the CT-2100, but as speed increases, it is a completely different story. The CT-2100 will merrily run along and decode high-speed c.w. that is an aural blur to one's ears.

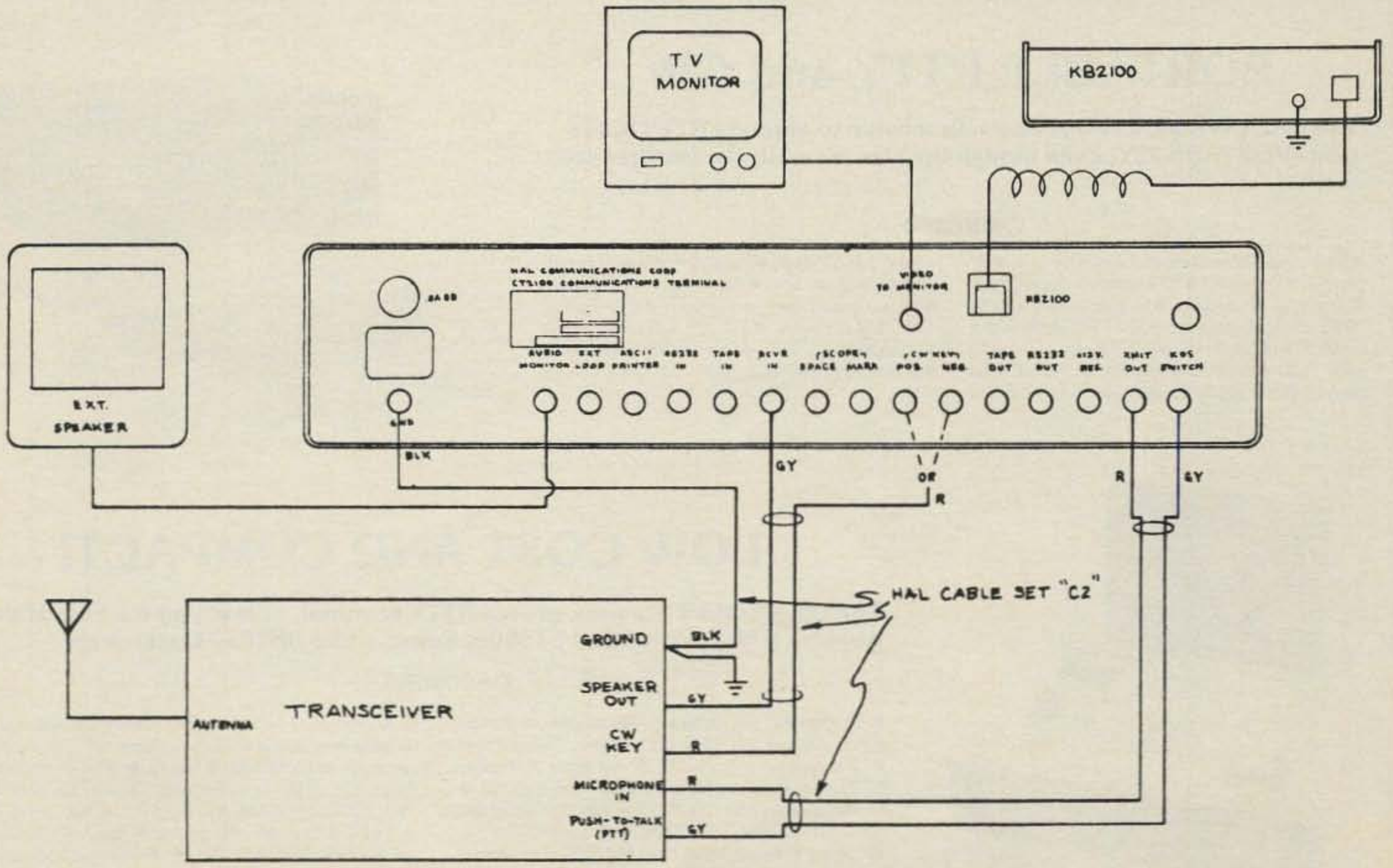


Fig. 2– Basic interface wiring of CT-2100 for use with a transceiver.

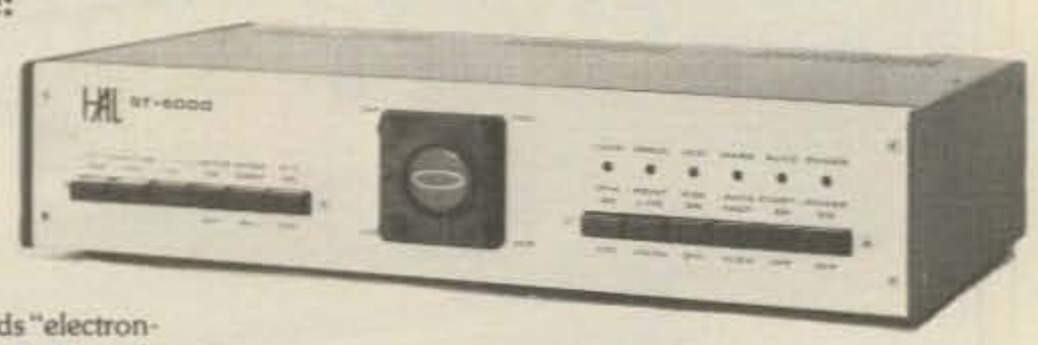
HAL COMMUNI
RTTY & CW

PROFESSIONAL SYSTEM!

The DS3100ASR Terminal and ST6000 Demodulator are the choice of professional RTTY operators the world over. Some of the advanced features offered by this equipment are:

DS3100ASR:

● True ASR capabilities ● 200 line display storage ● 150 lines receive ● 50 lines transmit ● Baudot, ASCII, and Morse Codes ● 45 to 9600 baud RTTY ● 5 to 175 WPM CW ● WORD, LINE, and CONTINUOUS modes ● SYNC idle ("diddle") ● Unshift on space (USOS) ● WRU answerback ● Selective call printer control (SELCAL) ● Serial ASCII printer output for received text in any code ● Four keyboard controlled accessory switches ● RS232 or loop RTTY I/O ● 10 user-programmable HERE IS messages ● EAROM non-volatile storage of 4 HERE IS messages and operating conditions ● On-screen status indicators ● Custom labeled 3-legend keytops for non-confusing control operations ● Built-in 12 inch P31 display ● 120/240V, 50/60 Hz AC ● 13.5″ × 20.5″ × 15.25″ ● 60 lbs. (two cartons)



MSO3100:

● Inserts into DS3100 ● Adds "electronic mail box" to DS3100 ● Extends DS3100 storage by 32K ● Works with all codes, Baudot, ASCII, or CW ● User-programmable call-up code ● May be used with 'KOS to switch TX and RX on/off ● Inserts CW ID when required ● Sends user "HELP" and "RYRY" and "QBF" test messages when requested ● Lists directory contents, size, and date created ● Allows password for delete or read protection of files ● Use for brag tapes as well as for message storage ● Commands include: ".DIR .SDIR .READ .WRITE .ENDFILE .HELP .SEND .FILEHELP .KY1ON .KY1OFF .KY2ON .KY2OFF .PRINTON .PRINTOFF .QBF .RYS .DELETE .EXIT" ● Factory installation only

ST6000:

● Super RTTY demodulator ● Perfect companion to DS3100 i "dream station" ● All three standard RTTY shifts (170-425-850 Hz ● Receive and Transmit circuitry ● Transmit tones crystal controlle ● Transmit CW ID - 100 Hz shift down in frequency ● Available fo "high" or "low" tones (*High tones recommended for United States* 2125 Hz mark) ● Wide bandwidth limiter for superior signal captur ● FM or AM operation ● Multipole active filter front-end ● Activ filter discriminator ● Active low pass filter ● Synthesized transmi tone outputs ● ATC (automatic tone threshold control) ● DTH (de cision threshold hysteresis) ● RS232, MIL188, CMOS, and curren loop I/O ● Built-in 175 VDC, 60 ma neutral loop supply ● Moto control relay for autostart ● Antispace ● Built-in tuning oscilioscop ● 120/240V, 50/60 Hz AC ● Table or Rack cabinet (specif which) ● 3.5″ × 9″ × 17″ ● 15 lbs.

PORTABLE RTTY and CW

The HAL CWR6850 brings a new dimension to amateur RTTY operation - PORTABILITY! Even though the size is small, the features are many:

CWR6850:

● Built-in display screen and demodulators ● 5″ green CRT display ● 32 character display lines ● 4 pages of display ● 6 user-programmable HERE IS messages ● Internal RTTY demodulator for both "high" and "low" RTTY tones, three shifts each (170-425-850) ● Baudot or ASCII baud rates of 45 to 300 baud ● Morse code send and receive 3 to 40 wpm ● Parallel ASCII printer output for received text ● Separate, small keyboard ● Tape input/output connections ● Requires 12 VDC, 1.8 Amperes ● 12.75″ × 11.75″ × 5″ (CWR6850); 13.75″ × 2″ × 7.25″ (Keyboard) ● 20 lbs, including keyboard

LOW COST AND COMPACT!

The DS2050KSR is a time-proven RTTY terminal, combining the best of the popular HAL DS2000 and ST5000. Some of the DS2050 features are:

DS2050KSR:

● One cabinet for keyboard, display generator, and demodulator ● Full 72 character line by 24 line screen ● 2 programmable HERE IS messages ● Built-in RTTY demodulator for two shifts (170 or 850 Hz) ● Send and receive Baudot RTTY at 45 to 100 baud and ASCII RTTY at 110 to 300 baud ● Send CW at 5 to 100 wpm ● Receive CW (with MR2000 option) from 5 to 100 wpm ● RTTY CW ID is built-in ● KOS (Keyboard operated switch) ● Full current loop interface for send and receive RTTY loop (external loop supply required) ● SYNC idle ● USOS ● WORD mode ● Bright-dim video to distinguish TX and RX text ● 120/240V, 50/60 Hz AC ● 14.1″ × 8.8″ × 4.7″ ● 18 lbs ● Two-tone tan cabinet ● External TV monitor required (HAL KG12 or ESM914 recommended).

CIRCLE 10 ON READER SERVICE CARD

CATIONS CORP.
EQUIPMENT

COMMUNICATIONS TERMINAL

The CT2100 and KB2100 make up a very versatile and convenient RTTY and CW communications terminal. The CT2100 offers capabilities available in no other single-unit RTTY system. Some of these features are:

CT2100 & KB2100:

● KSR or split-screen operation ● Large or small character video ● 72 or 36 character display lines ● 24 lines per display page ● 2 pages of 72 character per line display or 4 pages of 36 character lines ● 12 line split screen transmit pretype buffer ● 2 user-programmable HERE IS messages ● Very large brag tape storage in MSG2100 (2K characters) ● 4 Built-in RTTY demodulators ● "High" tone RTTY (170-425-850 shift) ● "Low" tone RTTY (170-425-850 shift) ● 103 Modem RTTY (1070-1270 Hz; to 300 baud) ● 202 Modem RTTY (1200-2200 Hz; to 1200 baud) ● Baudot, ASCII, or Morse code ● 45 to 1200 baud Baudot or ASCII RTTY ● 5-100 WPM CW ● Crystal controlled synthesized transmit tones match receive filters ● RS232, Loop, or audio I/O interface ● Tape in/out connections ● KOS (keyboard operated switch) for auto TX/RX ● HDX or FDX ● Transmit data from loop device (paper tape distributor, etc.) ● Small separate keyboard with flexible cord for comfortable lap operation ● On-screen status line and tuning indicator ● Serial ASCII printer output to print all received text ● 120/240V, 50/60 Hz AC ● 16.75″ × 3.625″ × 10.375″; 19 lbs (CT2100) ● 14″ × 2.375″ × 7″; 7 lbs (KB2100) ● Two-tone gray cabinet with color front panel graphics ● External monitor required - HAL KG-12 or ESM914 recommended.

RS2100 - NEW RTTY TUNING SCOPE:

● Matches CT2100 cabinet ● Gives crossed-ellipse type of RTTY tuning indication for CT2100 ● Also includes built-in 175 VDC, 60 ma current loop supply ● Connects directly to CT2100 rear panel ● Also may be used with these other HAL products: DS2050, DS2000, ST5000, CWR685, CWR6850, CWR670, CWR6700, and ST5 or ST6 (with modification) ● One inch green phosphor CRT ● Front panel positon, focus, and intensity controls ● 120/240V, 50/60 Hz AC ● 3.5″ × 8.25″ × 10.156″ ● 12 lbs.

MSG2100 - Message Storage ROM Option:

● Installs in CT2100 ● Stores 7 - 256 character and 1 - 192 character "brag-tape" or reply messages ● Also stores contents of both HERE IS messages ● Non-volatile storage is not lost when power is turned off ● Type 2716 EPROM programmed by HAL or by anyone with EPROM programmer ● Have several made - one for home, one for field day, etc. ● Coding forms included with each CT2100 - KB2100 system.

SWL - RTTY and CW, TOO!

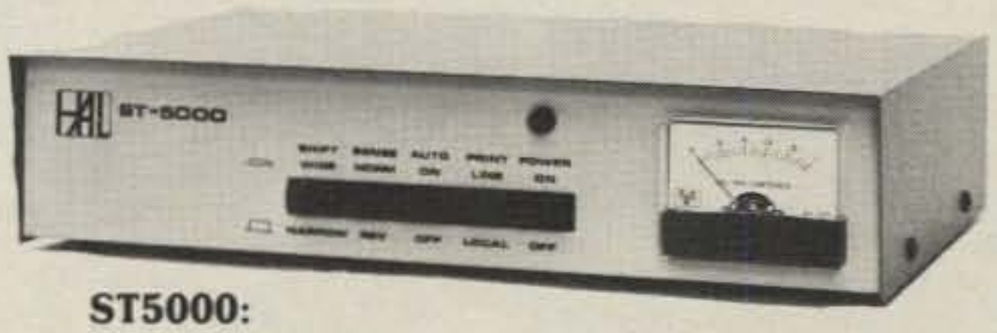
Now you can also enjoy shortwave listening to RTTY and Morse code transmissions with a unit designed for that purpose. The CWR6700 offers many advance features, previously available only in more expensive transmit-receive terminals. Some of these features are:

CWR6700:

● Receive ASCII, Baudot, or Morse code transmissions and see the decoded characters on the TV monitor screen ● RTTY speeds from 45 to 300 baud (60, 66, 75, 100, and 300 wpm) ● CW speeds from 4 to 50 wpm ● Unshift on space (UOS) for Baudot reception ● Parallel ASCII printer output ● Printer prints received ASCII, Baudot, or Morse signals ● Requires external TV monitor (HAL KG12 or ESM914 recommended) ● Runs on 12 VDC, 0.8 Ampere ● 8″ × 2.85″ × 12.6″ ● 8 lbs

RTTY DEMODULATORS:

HAL has long been a leader in the RTTY demodulator market. Our first two demodulator products, the ST5K and ST6K, are still in use all over the world and are still available on special order from HAL Communications (kit form only). The ST6000, as mentioned above, is a "standard of comparison" for performance and reliability. The ST5000 is a simplified version of the ST6000, particularly suited for limited budget installations where high performance is still a requirement. Some of the ST5000 features are:



ST5000:

● Two shifts - 170 and 850 Hz (others available on custom order) ● Internal 175 VDC, 60 ma current loop supply ● Motor control autostart with motor relay and outlet ● Built-in AFSK transmit tone generator with narrow-shift CW ID ● Meter tuning indicator with provision for external tuning scope (RS2100 recommended) ● 2.75″ × 8″ × 12″ ● 9 lbs shipping ● Two-tone blue and beige cabinet.

HAL COMMUNICATIONS, YOUR RTTY COMPANY:

HAL Communications Corp.
P.O. Box 365
Urbana, Illinois 61801
(217) 367-7373

Since 1969, we have been designing and selling RTTY equipment for amateur and commercial use. We can claim many firsts in this business, including the first amateur video display of RTTY (RVD1001 and RVD1002) and the first commercial electronic amateur Baudot keyboard (DKB2010). The HAL people are proud of the equipment they sell and have a lot of experience in interfacing many types of equipment for RTTY and CW. Yes, RTTY can be confusing, but we'll be glad to help you if you give us a call.

DX 1,500 CONTACTS

120 COUNTRIES IN 2 DAYS

A4

"I used your new A4 during the 1981 Phone ARRL DX contest. It was dynamite!! In 24 hours I had worked 99 countries. After 48 hours my total was 125. The A74 add-on kit allowed me to work 28 countries on 40 meters alone. It added new versatility to my 40 meter activity. By the end of 48 hours I had worked almost 1500 contacts with 285 multipliers. Thank you for making my operating more fun." ART HAMBLETON, K1LL.

SPECTACULAR PERFORMER

Top performance, easy installation, 4 band operation, and moderate price are yours with Cushcraft's new A4, 4 element beam. A4 operates on 10-15-20 meters. A74 add-on kit expands operation to either 40 meters or the new 30 meter WARC band. New engineering gives better performance through improved trap design with fewer parts, less installed weight and greater strength. You too can experience exciting DX contacts with A4 available through dealers worldwide.

CIRCLE 72 ON READER SERVICE CARD

cushcraft CORPORATION

THE ANTENNA COMPANY
48 Perimeter Road, P.O. Box 4680
Manchester. NH 03108
TELEX 953050 CUSH SIG

*Logs to be verified

INPUT/OUTPUT:

Audio Input:	0.5 V p–p, 4–600 ohm audio 800 Hz for Morse receive 1000–3000 Hz for RTTY
Audio Output:	XMIT OUT = −32 dBm (20 mV nom), 600 ohms (adj.) TAPE OUT = −32 dBm (20 mV nom), 600 ohms (adj.) MON OUT = adj. to 2 Watts, 4–8 ohms All harmonics below 9th are attenuated >30 dB
RS232 I/O:	Standard RS232 data interface levels; Mark = −5 to −15 VDC Space = +5 to +15 VDC
Loop I/O:	Standard current loop; Voltage = 200 VDC maximum Current = 18 to 120 mA Mark = Loop current on Space = Loop current off Loop referenced to chassis ground at the CT-2100; External loop power supply required; data may be transmitted from external loop device.
ASCII Printer:	Serial, RS232-C, 300 baud ASCII printer output; all received and transmitted text may be printed on the ASCII printer, regardless of code, up to the data rate of the printer itself.
Video to Monitor:	RS170 standard composite video output; 1.0 V p–p, 72 ohms, 6.1 MHz bandwidth.

DATA CODES AND RATES:

Baudot Code:	U.S. Standard 5-level International Telegraphic Alphabet No. 2 Baudot Code with 1 unit start and 1.5 unit stop bit. (Interchange of BELL and ' available on export units for CCITT 2.)
ASCII Code:	American National Standard Code for Information Interchange (ASCII) as defined by ANSI Standard X3.4–1968. 8 unit code with 1 unit start pulse; 2 unit stop pulse for 110 baud and lower rates; one unit stop pulse for 150 baud and higher rates. Full 128 character set may be transmitted and received; 8th data bit ("parity bit") set to space condition.
RTTY Data Rates:	Baudot or ASCII codes may be transmitted and received at 45, 50, 57, 74, 100, 110, 150, 300, 600, and 1200 baud.
Morse Code:	Continental Morse Code including all letters, numbers, period, comma, colon, semi-colon, dash, apostrophe, parenthesis, quote, question mark, and AA, AR, AS, BT, KN, SK, and error prosigns. Receive speed automatically tracks from 1 to 100 w.p.m. speeds; transmit speed may be set for 1 to 100 w.p.m. in 1 w.p.m. increments.
103 Modem:	Mark = 1270 Hz Space = 1070 Hz C.W. ID = 1370 Hz
202 Modem:	Mark = 1200 Hz Space = 2200 Hz C.W. ID = 1100 Hz

DISPLAY

Video:	Standard RS170, 1.0 V p–p, 72 ohm composite video; 6.1 MHz (72 character lines) or 3 MHz BW (36 character lines).
Screen:	24 lines of 72 or 36 characters per line; top line may be used to display terminal status or for programming of HERE IS messages; vertical tuning bar in upper left margin indicates RTTY tuning.
Page Memory:	48 lines of 72 characters per line (2 pages); or 96 lines of 36 characters per line (4 pages).
Split Screen:	Bottom 12 lines of page 2 (page 4 in 36 character line mode) devoted to pre-typing of transmit text. Cursor may be repositioned in four directions for full editing. Available only when KB-2100 is used; text may be typed while receiving.
Characters:	Full upper and lower case letters, all numbers and punctuation of the ASCII character set, special graphic symbols for ASCII control codes; 5 × 7 dot matrix with half-dot shift; full lower case descenders.

TX/RX CONTROL:

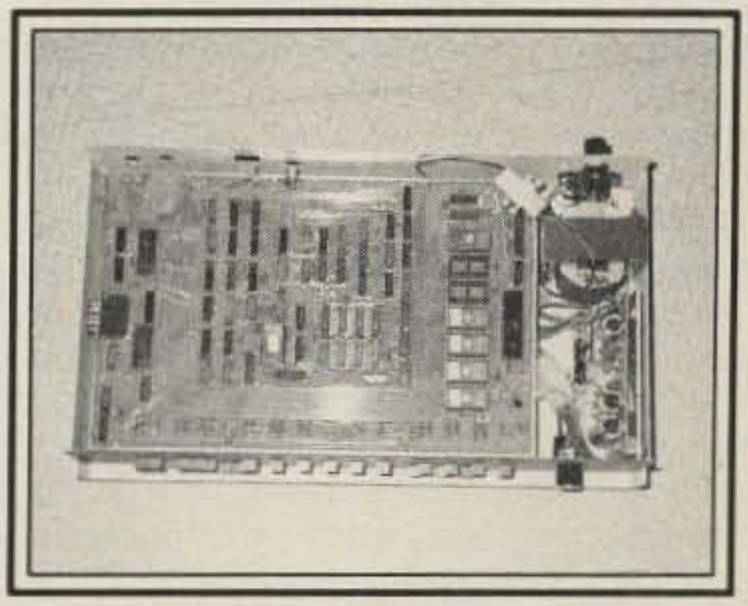
HDX/FDX:	Operate terminal in either half-duplex (HDX) or full-duplex (FDX) modes; HDX gives screen display of typed text and local "echo" as it is transmitted; typed text is not displayed, and there is no local "echo" in FDX mode.
LED:	Six LED indicators show MARK, SPACE, RTTY center tuning (+/+), Morse center tuning (C.W.), audio input overload (OVLD), and KOS on-off status.

MESSAGE STORAGE:

With KB-2100:	Two user-programmable HERE-IS messages, each 32 characters long, volatile.
With KB-2100 and MGS-2100:	2041 character non-volatile EPROM storage may be divided in up to seven 255 character messages, one 192 character message, and two 32 character HERE-IS messages. EPROMs are factory or dealer programmed and are socketed so that several different EPROMs may be interchanged by the user.

Table I– CT-2100 condensed specifications.

The heart of the system is the CT-2100 communications terminal. It measures about 16½" × 4" × 10½".



A look inside the CT-2100. It is a complex but very neatly constructed unit. Basically, there are two large PC boards. The top one, which can be seen, contains some optical message EPROM's on the left.

The **Display** block on the CT-2100 does several interesting things. It allows for the selection of a 72 character per line mode or a 36 character mode. The page in use appears on the status line on the display. When text is received (or typed in from a keyboard), it starts on the high numbered page and works up from the bottom line on the screen. When the bottom line reaches the top of the page, it is dumped over into the bottom line of the next lower numbered page. It moves up again on that page and then is transferred to the next lower page, if one is available, or dumped and lost. By a pushbutton one can recall any page not being displayed. One can also choose reverse video if desired. That is, instead of black characters on the screen, it will produce white characters centered in a black field.

When transmitting c.w., one does have to choose a transmission speed. The **Increase/Decrease** buttons on the CT-2100 allow setting the speed in 1 w.p.m. increments from 1 to 100 w.p.m. The speed selected is shown on the status line on the monitor. This line will also display a notation such as "WT = 4" to indicate the selected weight of the transmitted Morse. Nine different weights can be selected by keyboard commands. Fig. 3 is an interesting display of the selectable weight feature. One can transmit c.w. either using a continuous mode or a word mode. In the continuous mode, characters are immediately transmitted as one types them into the keyboard. In the word mode, a

word is not transmitted until the next word is started (unless one presses a **New Line** key to end a transmission). Thus, one can type several lines of text, and depending upon how fast one types and the transmission speed chosen, one might easily get several lines ahead of the text being transmitted.

The typed characters automatically appear on the screen in reverse video. As the characters are transmitted, a cursor moves across the screen. There is a **Rub Out** key which allows for text editing of untransmitted characters. Each depression of the key backs up the display one character, and one can insert a correction before transmission. One can also use all of the "pages" available to pretype text for later transmission for a total of 48 lines of 72 characters each—a total of 3,456 characters. However, one can only do one thing at a time using the full "page" capacity—either compose keyboard text or receive text on the screen.

A special feature of the CT-2100 is a split-screen display mode. When selected, one half of the screen displays received characters, while simultaneously one can pretype-in characters to be transmitted on the other half of the screen. The received text is in normal video, while the pretyped text is in reverse video, so it is very easy to separate them. An arrow also appears at midscreen. Up to 12 lines can be pretyped (stored for transmission), and, of course, as soon as transmission starts, one can type-in additional characters.

The CT-2100 has transistor switches incorporated which can be used to directly key any positive or negative voltage keying circuit in a transceiver.

RTTY Operation

In general terms, RTTY reception and transmission are very similar to that described for c.w., but one has to make a few "decisions" before operation can start. The CT-2100 provides for the selection of a very wide range of RTTY shifts, data rates, and audio tone pairs (for feeding into the microphone input of an s.s.b. transmitter). Three shifts are available: 850, 425, and 170 Hz. Data rates or speeds can be selected for 45 baud (60 w.p.m.), 50 baud (66 w.p.m.), 57 baud (75 w.p.m.), 74 baud (100 w.p.m.), etc., on up in steps to 1200 baud! So-called high tones (Mark = 2125 Hz; Space = 2295, 2550, or 2975 Hz) or low tones (Mark = 1275 Hz; Space = 1445, 1700, or 2125 Hz) or "modem" tones (discussed later) can be selected. Of course, all of this versatility should not become confusing. When turned on, the CT-2100 will automatically set itself to 45 baud, and if one then selects 170 Hz shift, normal polarity, and high tones, one is then ready to go for most h.f. RTTY work on the amateur bands. Reception of commercial RTTY stations will usually require trying at least the other shifts and some higher speeds.

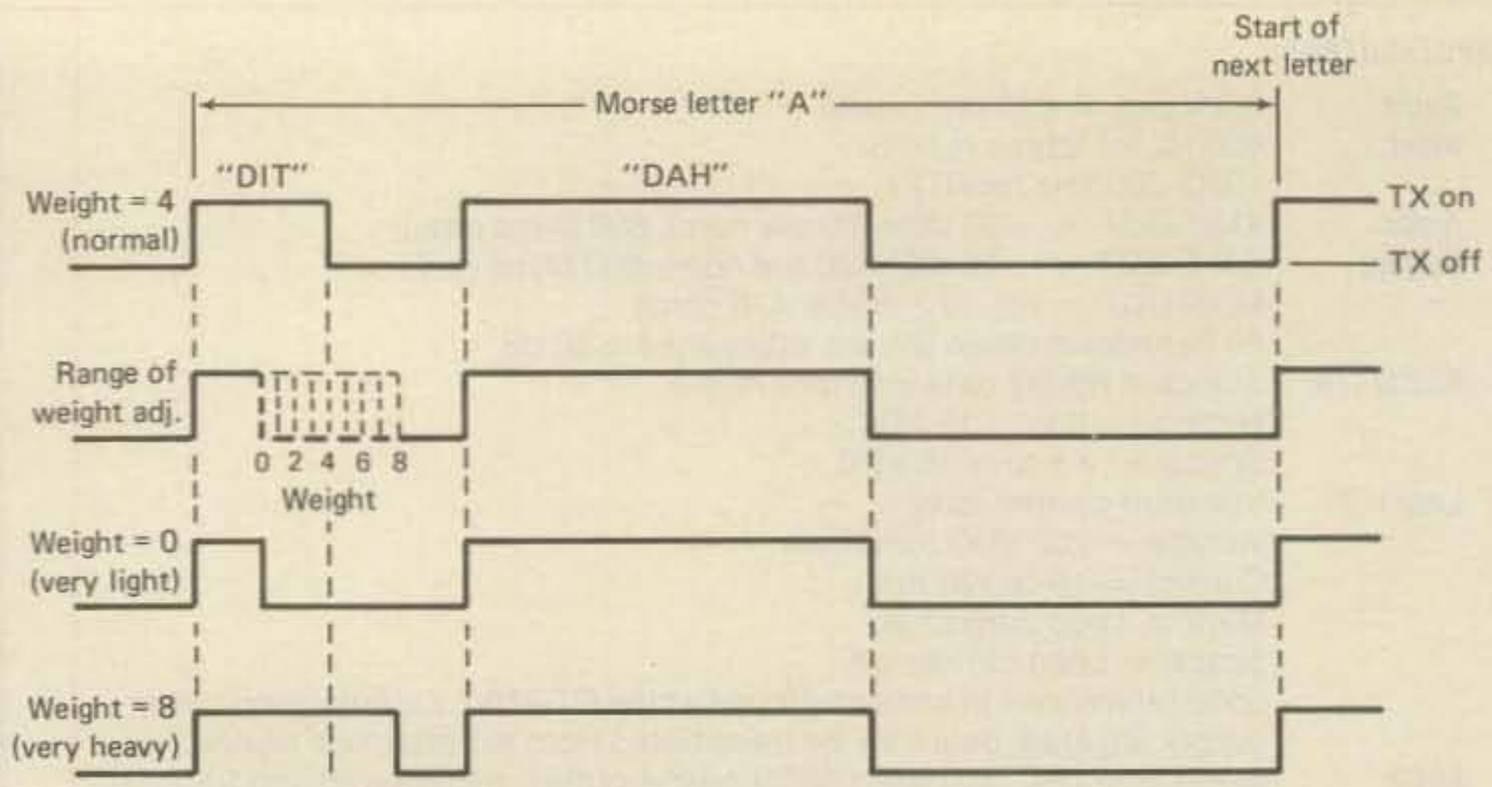


Fig. 3– The CT-2100 allows the "weight" of transmitted Morse to be set with digital precision to any one of eight steps.

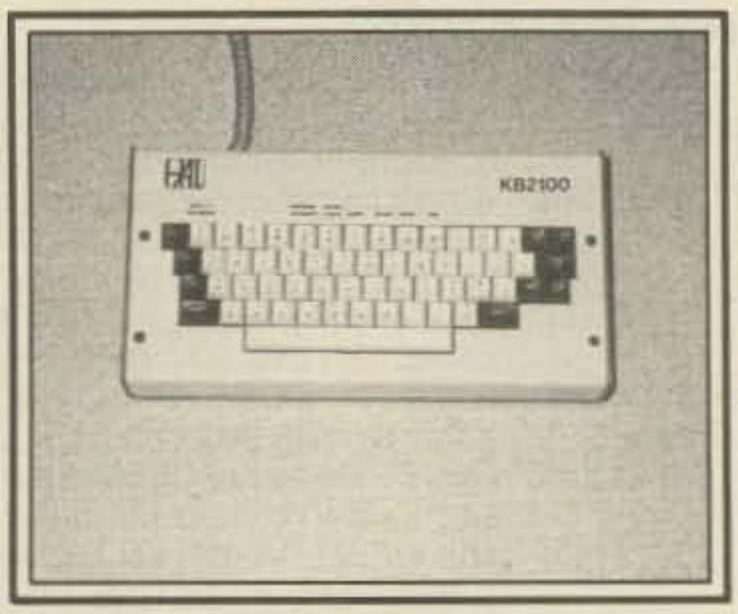
The speed to which the CT-2100 is set will be displayed on the status line on the monitor.

The tuning aids available for RTTY reception include, as for c.w., audio tone comparison between the audio in/out on the CT-2100, so one can hear that mark and space signals are within the filter passbands and are being regenerated. Also, there is a three LED display for Mark, +/+, and Space. When proper tuning is achieved, the +/+ LED glows steadily, while the other two flicker. In addition, there is a tuning bar on the monitor. The vertical length of the tuning bar will vary as one tunes an incoming signal through the mark and space filter. Correct tuning occurs when the length changes little between mark and space conditions. An optional tuning aid can be used if one has an X-Y oscilloscope. The CT-2100 has rear-panel **Mark** and **Space** outputs so one can achieve a crossed ellipse indication on the scope.

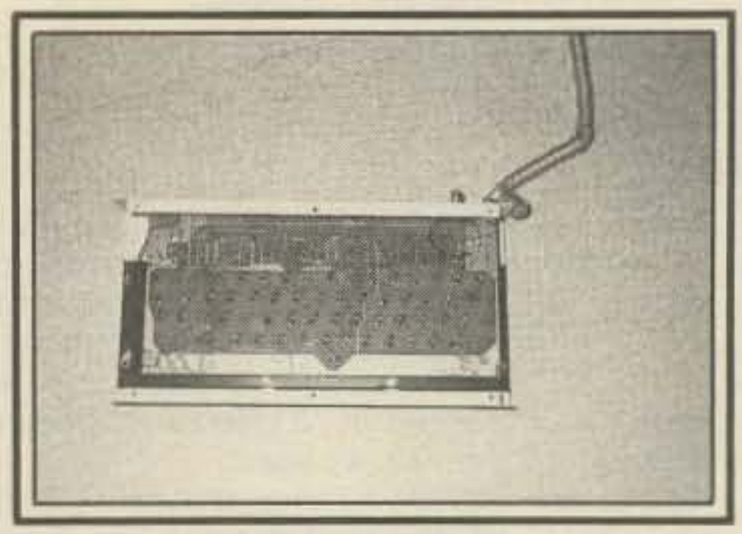
Transmission can be direct from the keyboard using the word mode, or one can precompose all available "pages" while not receiving or use the split-screen mode to simultaneously receive while pretyping a half page (various types of memory messages available from the keyboard or externally are discussed later). A word wrap-around feature (also effective on receive) prevents splitting of a word at the end of a line. If one over-types a word, all of that word (back to the last space) is transferred to the next upcoming line.

Two additional features on RTTY are an **Idle** (or "diddile) mode and a **KOS** mode. The Idle feature, when selected, inserts a continuous stream of nonprinting characters during pauses in typing, thus helping the receiving station maintain sync. The KOS (**K**eyboard **O**perated **S**witch) is the RTTY equivalent of s.s.b. VOX to avoid manual transmit-receive switching.

Since current FCC regulations require a c.w. identification before and after



The KB-2100 keyboard. It plugs directly into the CT-2100.



Looking inside the KB-2100, one notes again the very clean, professional construction typical of the units.

RTTY transmission, this feature is also included in the CT-2100. Current regulations also provide only for the use of the 45, 50, 57, and 74 baud rates when the Baudot RTTY code is used.

ASCII Operation

The CT-2100 will receive and transmit the full unabridged 128 ASCII code set (upper and lower case, symbols, control codes, etc.) at all of the baud rates previously listed, although 110 baud is commonly used on the h.f. bands. ASCII operation is essentially the same as that described above for regular RTTY, with all the features of word wrap-around, word

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MFJ-962

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MFJ-10, 3 foot coax with connectors, $4.95.

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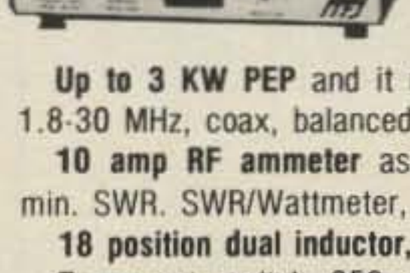

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mode, pre-loading full pages or split-screen operation, Idle character, and KOS being available when normal half-duplex operation is used. However, full duplex (simultaneous send/receive) is also available in ASCII, and then the preceding features are not available. Characters are transmitted as they are typed and are not displayed. This mode is sometimes used between a terminal and a computer, with the computer providing an echo of the transmitted text (which will appear on the monitor) to verify data acceptance. The CT-2100 may be interfaced to other ASCII equipment through the four available tone pair demodulators/demodulators, "RS232" data interface level in/out connections, and RTTY Loop connections (noted below). An output is also provided for a serial ASCII data printer. All received and transmitted data of the CT-2100 is outputed to the printer regardless of the code or data rate used up to 300 baud. The output provides a code and speed conversion, allowing printing of Morse, Baudot, or ASCII data on the same printer.

Additional Features

The CT-2100 has **Tape In/Out** connections for an audio tape recorder for recording and/or playing back messages in any mode. Messages can be made up from the keyboard or recorded as they are transmitted, and, of course, can be as long as the tape will accommodate. Transmitted tape text is reprocessed by the regenerator circuits in the CT-2100 for a clean output. Recorded received data is also reprocessed for a clean recording.

An **RTTY Loop** connection provides for interface with conventional, mechanical TTY machines. There is no speed or code conversion associated with this output (e.g., if 45 baud is selected for the monitor, the loop output will be 45 baud). Data may also be transmitted from a loop connected device such as a tape reader (TD) unit.

The "modem" tones incorporated (so-called 103 or 202 standard) are the same as those used for phone-line computer data transfer. They will allow transmission of high data rates using v.h.f. AFSK techniques.

Fig. 4 indicates the connection to the CT-2100 if practically all possible external devices were used. Cable salad, anyone?

KB-2100 Keyboard

This keyboard connects to the CT-2100 through a single coiled telephone-type cable. It has 59 keys arranged similar to those on a standard typewriter with extra control keys (colored black). The standard alphabet, numbers, and punctuation keys are used in all modes just as one would use them on a typewriter, except that only ASCII transmission provides for upper and lower case. To type some of the special commands in ASCII such as DLE (**D**ata **L**ink **E**scape), one would type CTRL-P. For RTTY Baudot to send #, one would type SHIFT-3. For Morse, some of the prosigns are not obvious from the keyboard. For instance, to send AR, one depresses the @ key. The keys have an automatic repeat feature. Any key combination held down for more than ½ second will repeat at 7 characters per second.

There is a host of functions associated with the control keys, but only a few highlights will be mentioned. The **IDENT** key will always produce a Morse output which is the same as that programmed into one of the two **HERE IS** keys. These latter keys transmit two different user programmed (by keyboard entry) messages, each being up to 32 characters in length. Using the HERE IS keys, the messages are transmitted in any selected mode. The message storage is volatile unless an optional message EPROM is installed.

The **NEW LINE** key selects the next line for typing for Morse, and generates "carriage return - line feed - letters" for Baudot and "carriage return - line feed" for ASCII, thus saving many individual key depressions in the latter two modes. The **RUB OUT** key, as explained previously, allows editing of errors made while typing. The **BRK** key produces key-down conditions in Morse or a continuous space in Baudot and ASCII. Special use is made of the **CTRL** and **SHIFT-CTRL** keys with the top row of number keys. Just a few examples:

CTRL-1 produces the split-screen option. **CTRL-5** affects the Morse weight options.

Fig. 4– The extremely versatile interface possibilities for the CT-2100 are shown by this diagram.

CTRL-7 turns the CT-2100 transmit text on/off.
CTRL-8 produces 36 RY's.
CTRL-9 produces the complete THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG'S BACK 0123456789 test message.
CTRL-0 produces a string of four CQ characters.

The sequence SHIFT-CTRL-1 to 8 prepares for transmission one of the eight messages which can be programmed into the optional HAL MSG-2100 message storage EPROM. The ROM (a 2716) can take 256 characters in each of the first seven message blocks and 192 in the eighth block. Blocks can be combined if desired for longer messages. If you buy the EPROM from HAL, they or a dealer will program it for you according to the text you supply (it can also be reprogrammed when desired).

The KB-2100 keyboard, because of the coding used, is the only one that can be used with the CT-2100.

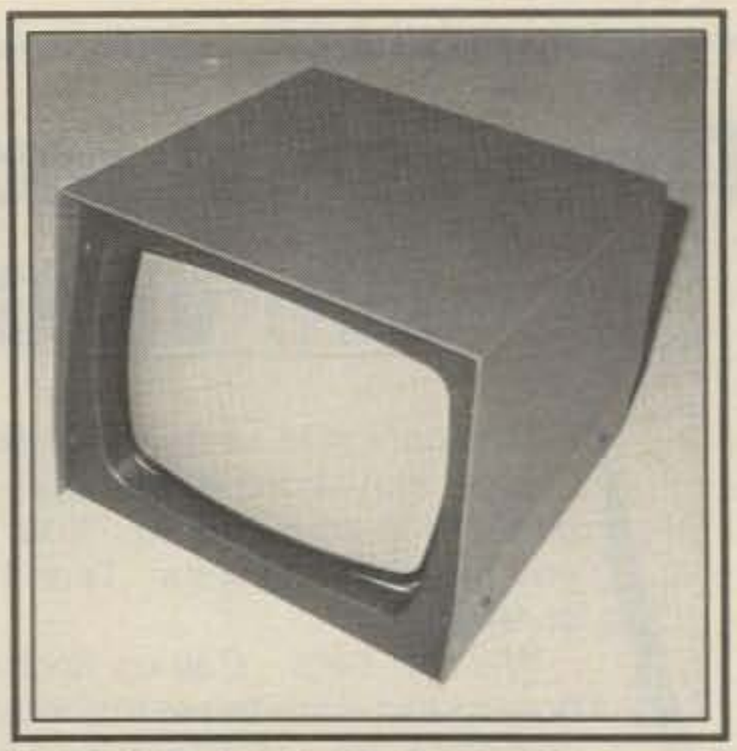
Video Monitor

A high-quality video monitor that has a video bandwidth of at least 8 MHz and preferably 12 MHz should be used with the CT-2100. The green phosper display screens are preferred since they are very easy on the eyes as compared to harsh black-and-white displays. The monitor used for these tests was the Model DV3100, the normal companion monitor for the more expensive HAL DS3100 ASR (supplied by HAL because of the 220 v/50 Hz power I have in Germany). However, the Model KG-12/N monitor is recommended by HAL for use with the CT-2100. This monitor is available from your HAL dealer for several power voltage and frequency combinations (KG-12/NU for 120 v/60 Hz; KG-12/NE for 220 v/50 Hz).

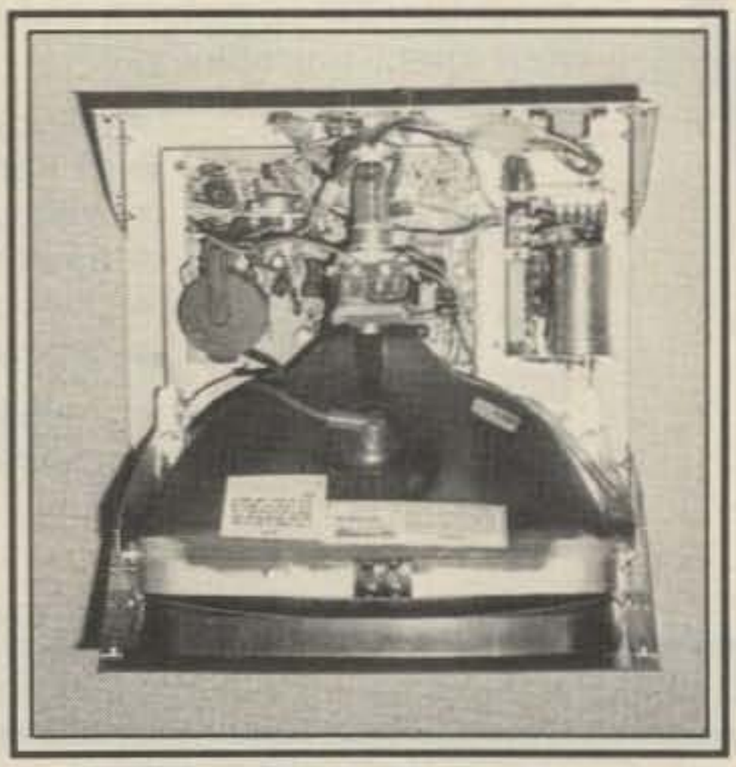
To give a good display of the 72 character lines, a monitor such as the KG-12/NU will provide the sharpest display. But, even as HAL admits in their literature, some good-quality black-and-white TV sets can easily be modified to serve as a video monitor. Some horizontal/vertical size adjustments will probably be necessary so one can see all four corners of the raster, and a means has to be provided to couple the CT-2100 video output to the input of the first video amplifier stage in the set. The literature for the CT-2100 provides details on how to accomplish this.

Construction and the Manual

HAL is a commercial equipment manufacturer, and this is reflected in the construction of their System II units. Rugged steel or aluminum material wrap-around cabinets are used. The lettering on the keys and controls is outstandingly clear and sharp (the CT-2100 has groupings of red and blue buttons with white lettering on a gray background). If one starts to take equipment covers off (see photos), one will find very neatly laid out, double-sided PC boards. There is a generous use of connectors between various boards and between other components so that any board/major component can be removed for servicing. All of the units, by the way, can be internally changed over for 110/220 or 50/60 Hz operation.



The video monitor is housed in a well-shielded cabinet.



A look inside the ESM-914 video monitor. The a.c. supply is on the right, and the rest of the circuitry is on a large PC board.

The manual supplied with the CT-2100 runs some 87 pages, and it is all operation/adjustment information and not servicing data (that is in a separate manual). However, HAL has organized the manual quite realistically. The first main chapter, "Simple Hook-Up for the Eager and Impatient," gives one just enough information to get the units interconnected and on the air. Then, after one gets over the initial fascination or seeing how the units work, one can read detailed chapters which thoroughly explain all the features. Variations in hook-ups are covered, plus how to use a TV set as a monitor, r.f.-induced problems, user adjustable controls, self-programming of an optional 2716 EPROM (if you have the equipment), etc. A one-year warranty applies to the units, subject to the usual conditions of no misuse, abuse, etc., by the owner.

Operational Tests

There was just no way that a bench check could be made of all the shift/tone/speed combinations available in the filters, demodulators, and modulators in the CT-2100. The specialized test equipment necessary was not available. However, what could be checked with regard to levels and the tone frequencies for various shifts was done. The levels all came out to within 5% of those specified, and the tone frequencies to within ± 2 Hz (the latter to be expected since they are all crystal derived). The lower baud rates which could be checked were exactly correct (e.g., 45 baud).

On-the-air operation was, of course, the most fun, and the gear performed excellently. It took quite a few hours to get a feel for all the capabilities of the units, and I still feel I have missed learning a few features. Initial operation was on c.w., which ranged in satisfaction from poor (when encountering a very sloppy fist, which made the monitor display alphabet soup) to excellent (when QSO'ing with a station using keyboard generated c.w.). But, operation quickly shifted to RTTY where one could really have a bit of fun using all the automated and message-storage features of the units. The text, displays, and RTTY pictures that one can generate (especially using an ancillary audio tape unit) are up to one's imagination. Many QSO's with excellent reports were had with European amateurs in the 14.075–14.100 MHz range.

ASCII operation was not tried while using the gear in the European area. However, there is no reason why it would not perform perfectly.

I can only advance two cosmetic criticisms. The LED display gets confusing at times. It would help to have the c.w. one blanked out on RTTY and the RTTY ones blanked out on c.w. (I used tape). The "bell" tone burst makes one jump out of a chair. Some will say that such is its purpose, but I'd trade it for a simulated gong-type sound.

General Comments

If you have read this far, it should be apparent that HAL's System II is very sophisticated. It is also not inexpensive. So, if one is interested in this type of equipment, one has to consider the quality, versatility, interface possibilities, expansion capabilities, non-obsolescence features, etc., of such equipment versus a less expensive, simpler approach. It's up to you.

If one has just started to become interested in RTTY and/or ASCII, two free pamphlets from HAL (Box 365, Urbana, Ill. 61801) might be of interest: "Questions About RTTY" and "ASCII, Baudot and the Radio Amateur." Both are excellently written and do not attempt to "promote" HAL gear to the exclusion of just giving the reader a clear idea of what electronic RTTY and data transmission are all about.

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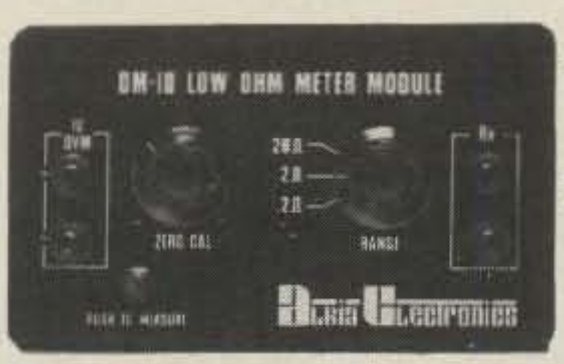

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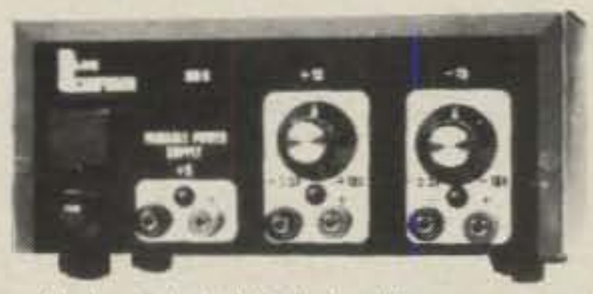

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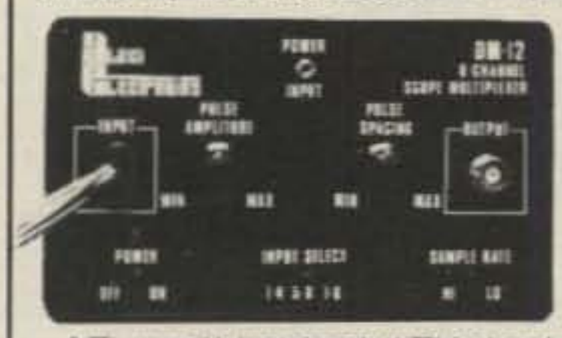

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Packet Communications In The Amateur Radio Service

BY ROY DANIEL ROSNER*, K4YV

Portions of this article have been extracted by permission from Packet Switching: Tomorrow's Communications Today, *by Roy Daniel Rosner, Lifetime Learning Publications, Belmont, California 94002.*

The many contributions of amateur radio operators and experimenters are well known in the fields of electronics and communications. In much the same vein, computer hobbyists are making major strides in the application of low-cost computer hardware to a variety of popular and practical applications. It is estimated that at present there are between ten and twenty active computer amateurs in the United States for every active amateur radio enthusiast. Among youngsters in grades seven to twelve, amateur computing is one of the most rapidly growing interests, and formal programs both inside and outside of the school systems are found throughout the country.

As in any field, the *exchange* of information among enthusiasts is a major element in the enjoyment of the hobby. For those interested in home computers, that exchange is often implemented using the computers themselves by linking them together using telephone lines, either directly to each other or to shared storage facilities (mailboxes) in a central computer. In essence, electronic communication among hobby computers is nothing more than a nationwide RTTY network using dial-up telephone lines rather than r.f. communication.

One of the major advances over the past decade in communications among computer devices is known as **packet switching**, or **packet communications**. Packet switching networks allow the communications facility—whether it is a telephone line, an r.f. link, or a satellite channel—to be used with the utmost efficiency and to serve the greatest number of possible users. The many amateur radio enthusiasts who have also developed an interest in home computing are beginning to translate this new technology to the amateur services in a variety of applications. Packet radio operations on v.h.f. repeaters are already operational in many metropolitan areas, and packet operation over the Phase III AMSAT satellites is being planned. Future applications of packet operations are virtually unlimited, both in commercial services as well as in amateur radio.

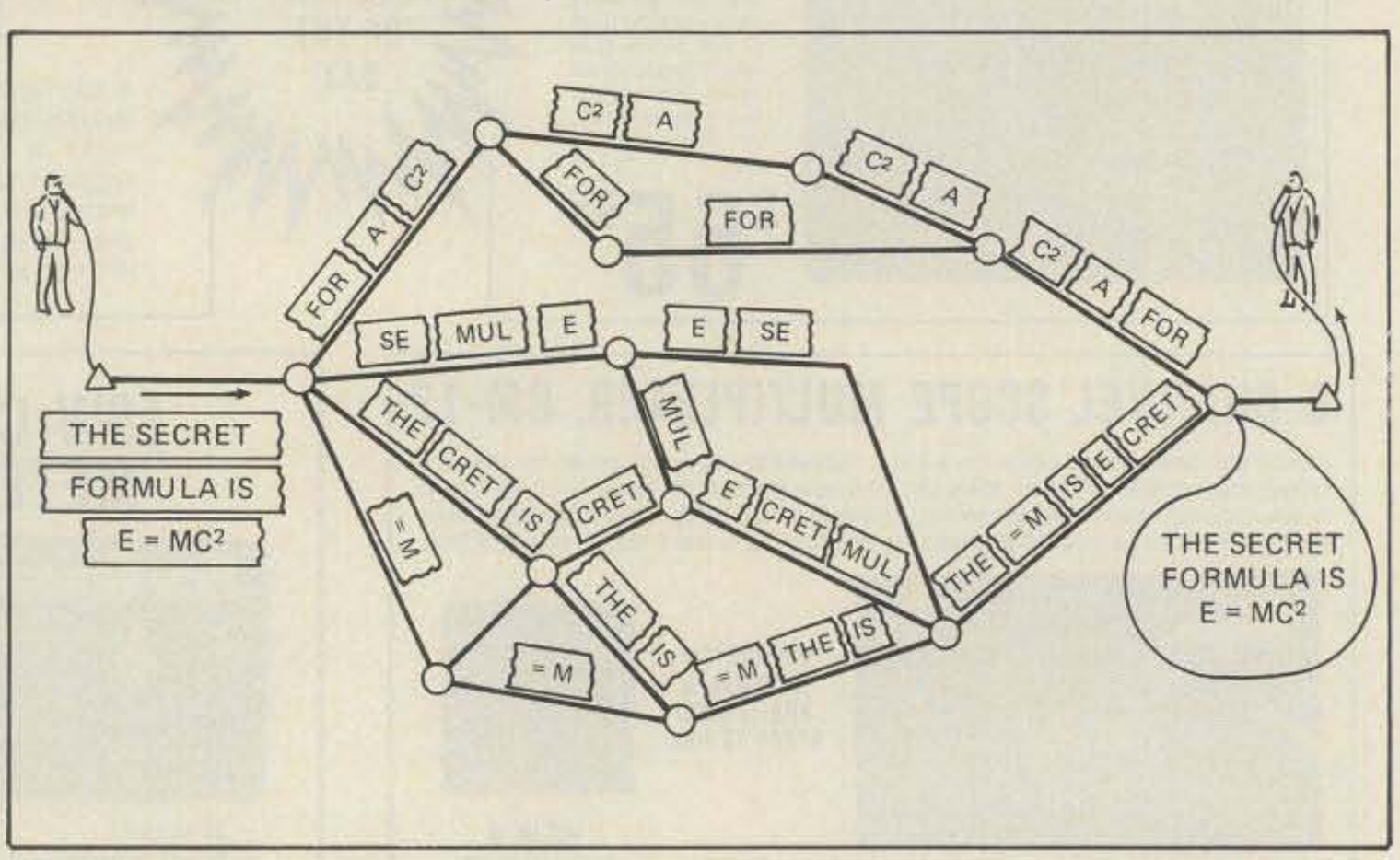

Fig. 1– A packet switched network used for voice communications.

What Is Packet Communications?

Packet communications derives from the recognition that communications between individuals, or between an individual and a remote computer which contains useful information, occurs in short bursts of transmission separated by relatively long intervals of time during which the computers and the humans think. It is thus very inefficient to tie up a two-way (full duplex) communication circuit, dedicated to a single pair of users, during the entire course of any extended period of intercommunication. Information is stored *(buffered)* temporarily at each end of the circuit to form a packet of data (in most systems containing up to 128 characters) and is then sent in a single burst over the transmission facility. During idle periods in the use of the circuit by one user, the capacity is available for use by any of a number of other users.

While most present application of packet communications is for the exchange of computer-based data, packet switching was originally conceived as a voice communications technique for the purpose of achieving protection from interception or wiretapping. These ideas, developed at the RAND Corporation in the early 1960s, started with the notion of breaking a voice conversation between two parties into short, separate pieces (packets) as depicted in fig. 1. At each switch, the pieces of a call would be mixed with pieces of other calls and sent piece by piece over several different routes to the destination. Only at the destination would it be possible to collect all of the pieces and, after reassembling them in proper order, make the voice intelligible. If the wires were tapped anywhere in the network, or if communications between two radio relay points were intercepted, all that would be heard is the garble of dozens of interleaved bits and pieces of many conversations. Although these ideas were published in 1964, the technology was not really available to perform the complex processing, routing, and control functions required to implement this concept in a large-scale communications network.

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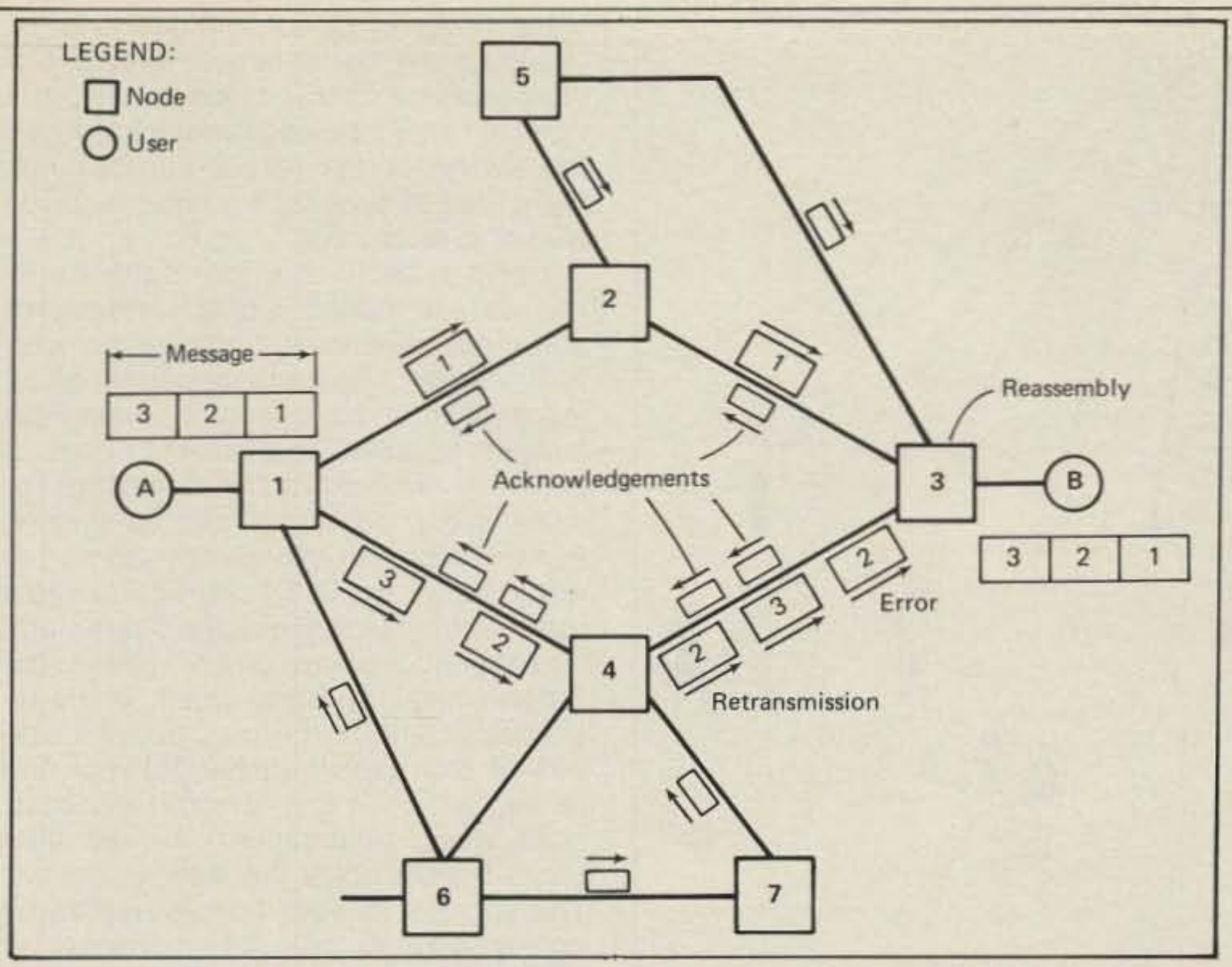

Fig. 2– Basic operation of a packet switched network. Movement of a three packet message from User A to User B.

The practical application of packet communications came later in the decade, when, in 1969, the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense developed a nationwide data communications network to tie together many of the large-scale computers being used in a wide variety of research programs throughout the country. Packet operation was chosen to achieve good utilization and sharing of the very costly 50,000 bit per second telephone lines needed to tie the computer facilities together. What evolved was not only a nationwide networking capability, but an entirely new way of communicating among "intelligent" computer devices.

An Example of a Packet Network Operation

The concept of packet switching is based on the ability of modern high-speed digital computers to act on transmitted information so as to divide the calls, messages, or transactions into pieces called **packets.** Packets move around the network from relay point to relay point on a "hold-and-forward" basis, where each relay point holds a copy of each packet in temporary storage until the next relay point is sure that it has been received properly by the next relay point or by the destination user. This form of operation permits the network to achieve low overhead for short messages and eliminates the call setup time, which is required in conventional circuit-based telephone networks.

Because all communications are broken down into similar component pieces known as packets, long messages and short messages can move through the network with a minimum of mutual interference with each other. By moving through the network in (nearly) real time, the relay points can adapt their operation quickly in response to changing traffic patterns or failure of part of the network. These capabilities can be seen by looking at an example of what might be a typical packet network operation.

Fig. 2 illustrates a portion of a hypothetical packet switched network. **User A** is a subscriber attached to Switch 1, and **User B** is a subscriber attached to Switch 3. As an example, we shall trace the flow of a three packet long message from **User A** to **User B,** focusing on Switches (relay points) 1, 2, 3, and 4. It is important to remember, however, that many other packets flowing among other users are simultaneously moving through the network.

The flow of the message is initiated by the transmission of Packet 1 between **User A** and Switch 1. Depending upon the exact implementation, this first packet may simply be a new message request, or may be the first block of user data. When Switch 1 fully receives the first packet, it, following a set of routing rules, transmits the first packet toward the destination by sending it via Switch 2. In the meantime, Packet 2 is moving from **User A** into Switch 1. During this time the conditions in the network change. For instance, a large amount of traffic from Switch 5 arrives at Switch 2, which causes the routing rules to change. As a result, the second packet of the message, arriving at Switch 1 soon after the first packet, is routed via Switch 4. The third packet of the message, arriving at Switch 1 soon after the second, is similarly routed via Switch 4.

After being received correctly by Switch 4, the second packet is transmitted to the destination switch, Switch 3. But, during that transmission an error occurs. When Switch 3 receives Packet 2, the error-detection mechanism is able to detect the error and requests a retransmission of Packet 2. While this is occurring, Packet 3 has been transmitted immediately behind the first and errored copy of Packet 2. As a result, the second (correct) copy of Packet 2 is received at Switch 3 after Packet 3. If we look at the network from the perspective of Switch 3, first Packet 1 is received, then Packet 3,

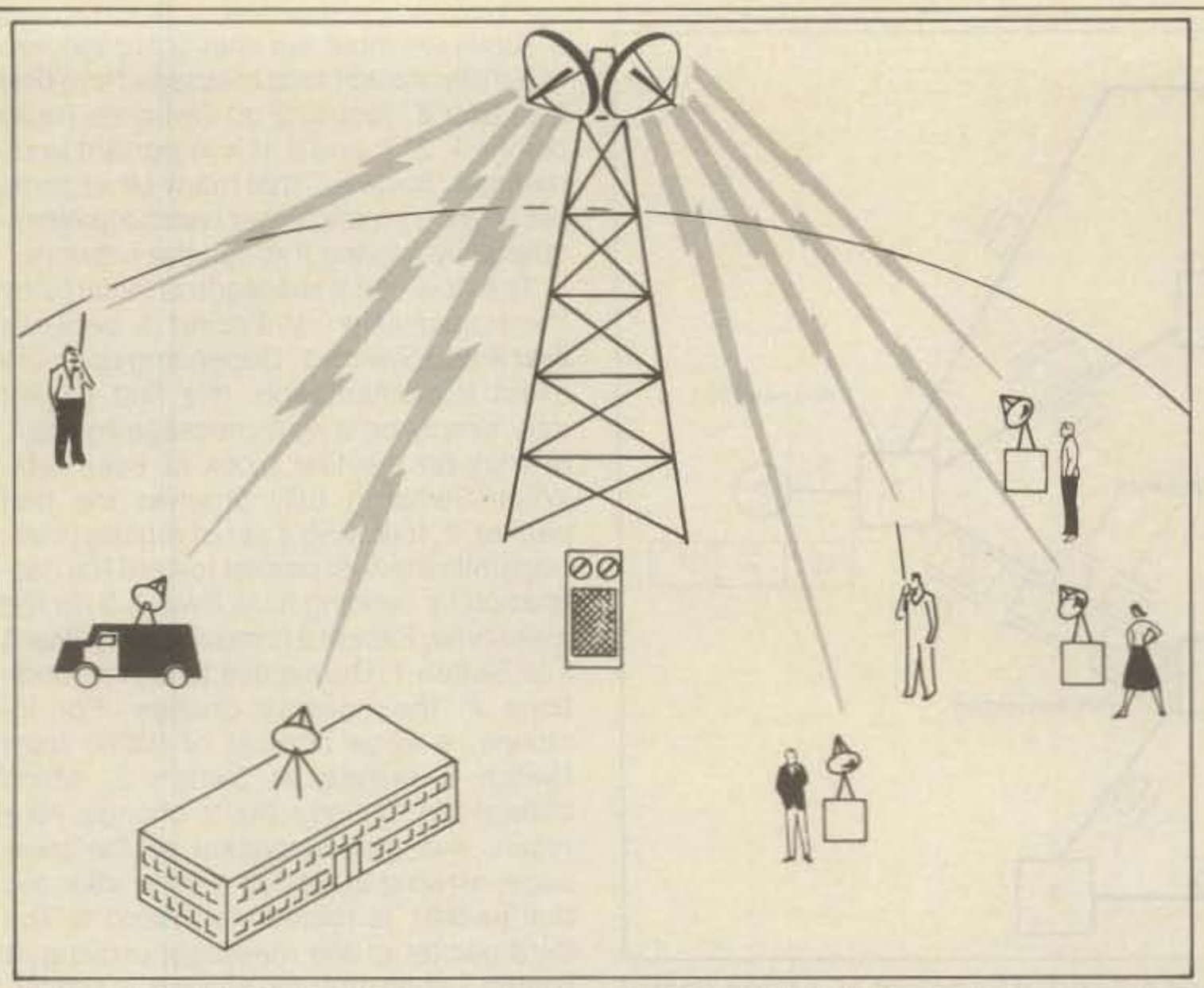

Fig. 3– Packet operation over a terrestrial v.h.f. repeater.

and finally Packet 2. If Switch 3 delivered the packets to the destination (that is, to **User B**) in the same order that they arrived at Switch 3, **User B** would receive the packets in a different order than they entered the network.

Furthermore, by other interplays of the interswitch protocols, error control mechanisms, and packet flow control mechanisms, it is possible to completely lose packets as well as to create duplicate packets. In order to protect against several types of network-introduced errors, the network has to contain a certain amount of redundant overhead information, which has to be transmitted through the network in order for the switches to properly handle the transmission and delivery of a call or message.

Packet Operation in the Amateur Service

While this previous description was based on terrestrial lines between discrete switching relay points, the translation of the packet technology to radio channels is quite straightforward. In fig. 3 we see the typical v.h.f. repeater situation, where stations can communicate with each other via a repeater installation which is centrally located and is visible because of its height over a large geographic area. However, instead of letting users gain control of the repeater channel for a long period of time, users are permitted to transmit only discrete length data signals via the repeater.

Transmission would be similar to any RTTY type of transmission, using either audio or r.f. frequency shift keying (FSK), but the data code used would probably be eight bit per character ASCII rather than Baudot, and the data characters would be buffered in the computer terminal device and sent continuously until the maximum allowable packet length was reached. The beginning of each packet transmitted would contain a packet header, the standardized information which would contain the destination address, source address, and any other control and routing information necessary to get the packet to the proper destination. In amateur use, the addresses need be nothing more than the station call letters, since all call letters are unique. However, a geographic code, like a city, might be appended to allow the packets to be routed to the repeater station closest to the ultimate destination user.

Many different techniques for sharing the repeater channel are available. A class of such techniques, known as **C**arrier **S**ense **M**ultiple **A**ccess (CSMA), requires that each user monitor the channel and transmit only when the channel is observed to be vacant. The major problem with CSMA is that at the transition between a busy channel and a vacant one (that is, just as a given user finished his transmission), everybody who has been waiting would likely begin at the same time as soon as the channel apparently becomes vacant. To overcome this, stations either have to monitor for such simultaneous operation (collision detection) or have to wait a random length of time before transmitting when the channel becomes available.

Another key element of packet operation is the use of standardized error detection mechanisms to ensure that information transmitted is accurate upon receipt. These error control mechanisms, based on the mathematical structure of the sequence of bits in the packet, provide with very little additional information the ability for the receiver to tell with more than 99% reliability if the received packet is error free.

Using publicly available software or hardware to make this check one packet at a time, the prospect of essentially error-free message transmission on an intercontinental basis over h.f. amateur bands is possible. Thus, an RTTY contact between two amateurs thousands of miles apart would not use continuous transmission as is presently done, but would buffer the RTTY characters into a packet processor, group the characters, and append the error check code. At the receive end, the error check would be used to determine the accuracy of the received data before displaying it on the screen or printing it. Errored transmissions would automatically be repeated under the control of the terminal device. The terminal devices operate rapidly by comparison to the h.f. transmission speeds; the operation would essentially be invisible to the operators.

Another very exciting possibility for amateur packet operations is over the next-generation amateur satellites. Operating at either v.h.f. or u.h.f., data speeds as high as 4800 bits per second could be used, which means that packets with even several lines of data would last only a fraction of a second on the channel.

In fig. 4 we see a typical satellite situation with each user able to access the satellite directly. In this figure we hypothesize a synchronous satellite (at an altitude of 22,300 miles), but the situation is similar for a high-orbit nonsynchronous satellite. For example, AMSAT's Phase III satellites are planned to reach an apogee of more than 20,000 miles above the northern hemisphere. Because of the high altitude, the propagation delay to the satellite means that the information on the present receive channel is not very accurate. Since the receive channel is about one-quarter second behind (delayed) relative to the transmitter channel, the fact that the channel sounds free now does not necessarily mean that it is really vacant. However, if we restrain our packet lengths to be less than the round-trip delay to the satellite, we have the ability to transmit a packet, turn off our transmitters, and then listen to the channel to see if we can hear our own packet correctly. If our packet does not collide with any other user's packet, we should be able to hear our own packet soon after we transmit it. This permits both the satellite uplink and downlink to operate on the same frequency, with the satellite repeater merely retransmitting the packet on the same frequency on which it was received. If cross-band repeaters are used, which is the present situation on amateur satellites, then the users are able to simultane-

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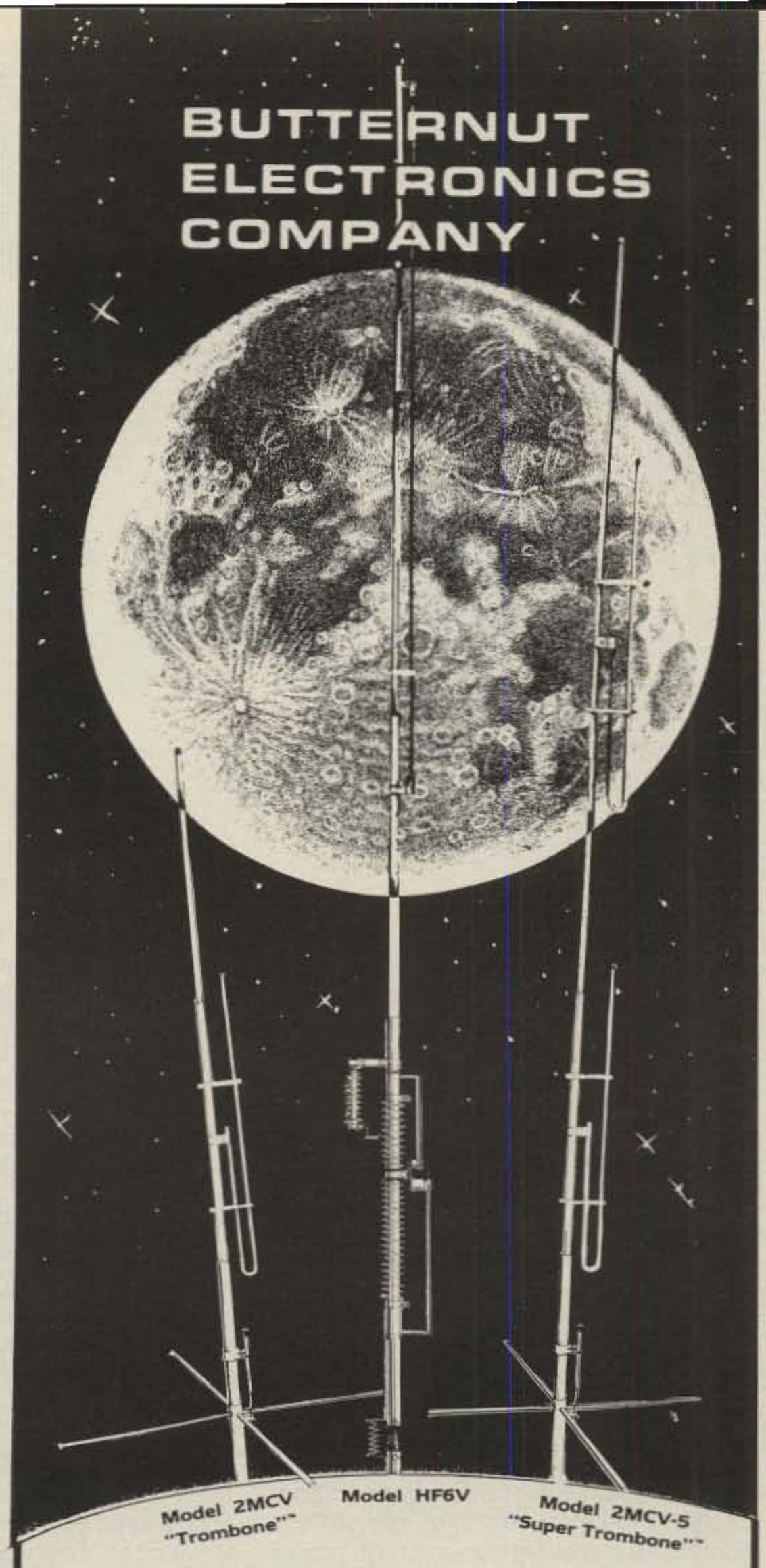

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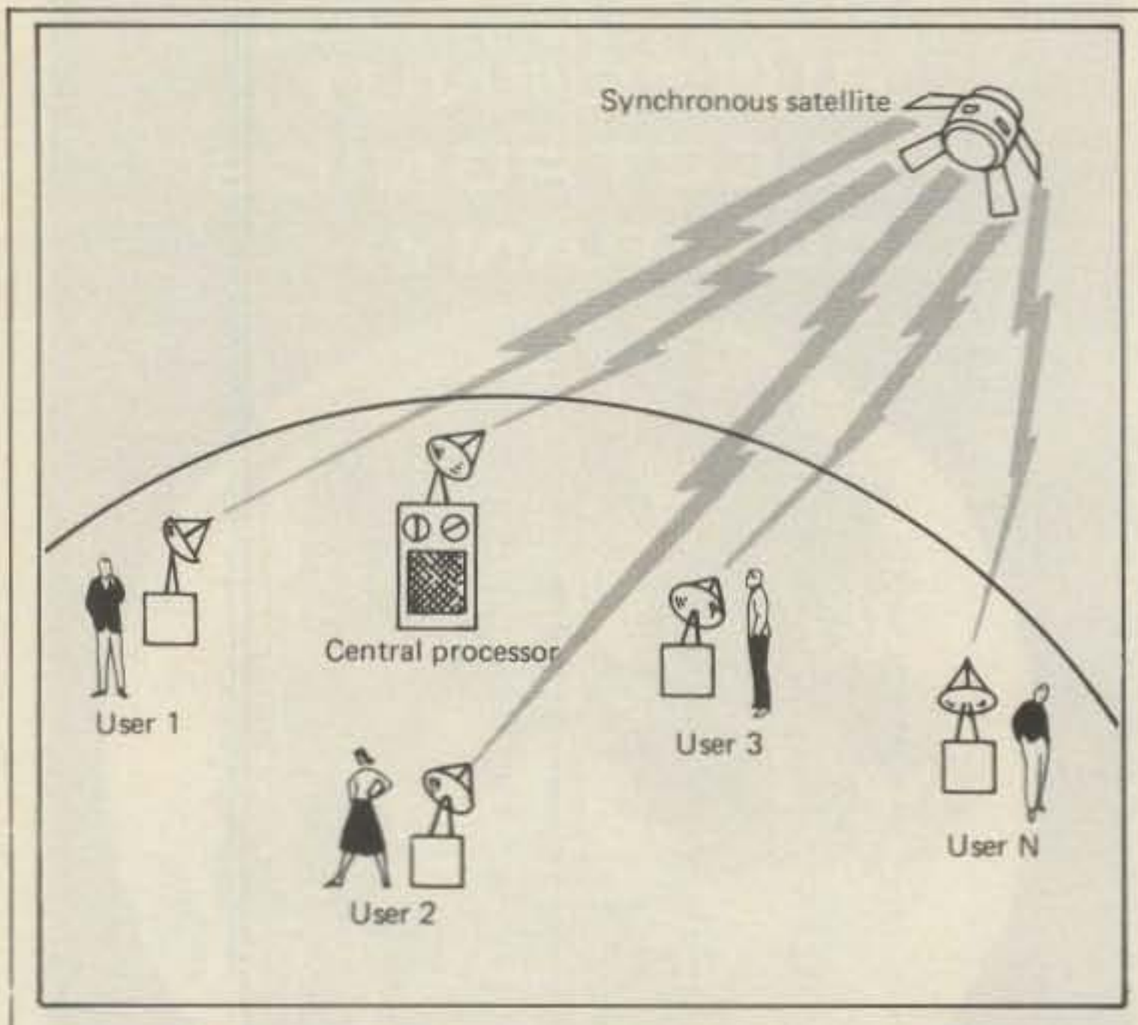

Fig. 4– Packet operation over a high-altitude satellite channel.

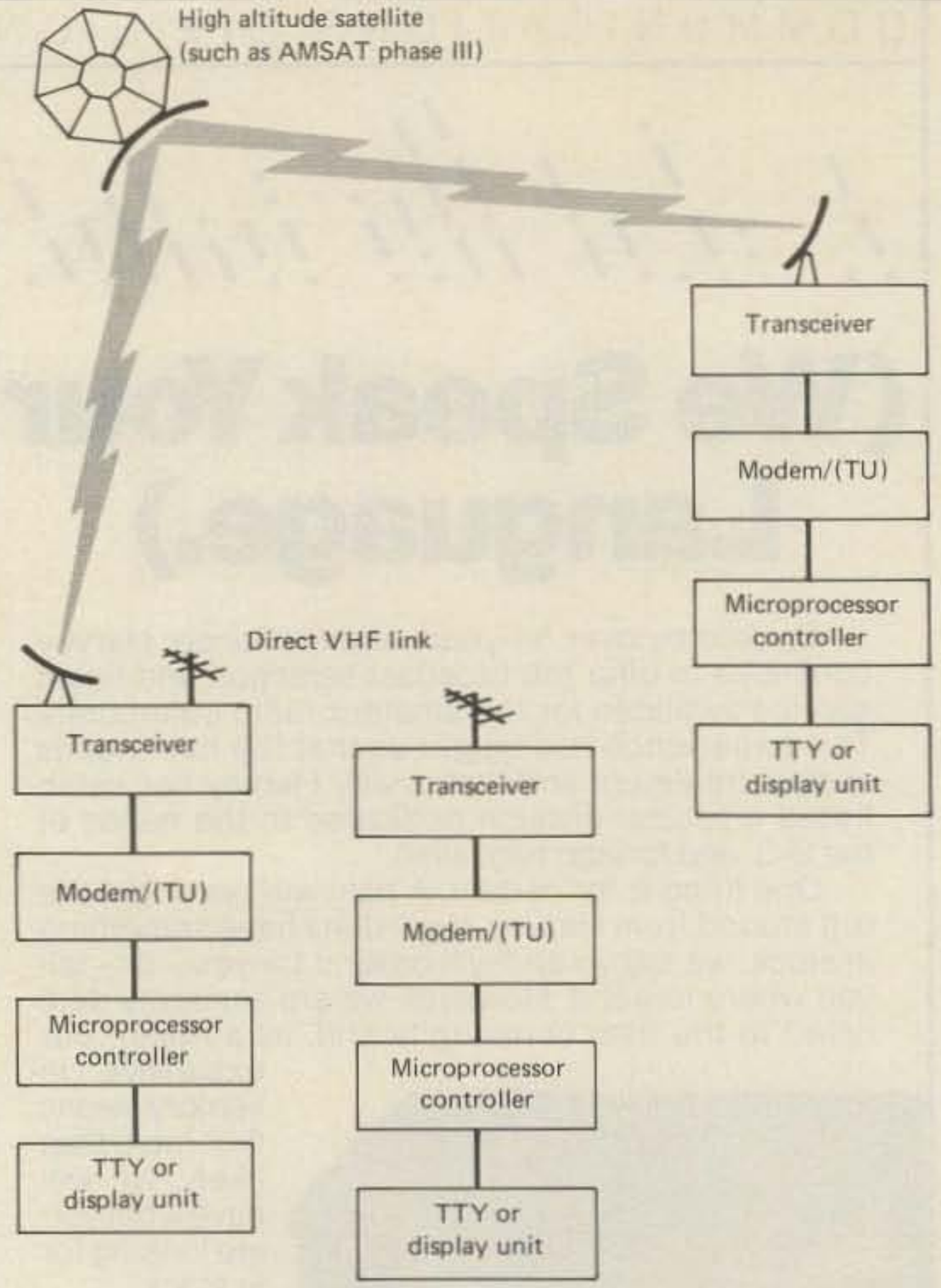

Fig. 5– System block diagram—packet operation over satellite and terrestrial links.

ously transmit and receive, which permits the user to immediately detect if a collision between his packet and some other user's packet is occurring.

Packet operation over satellites has the potential of accommodating a very large number of users over a single satellite channel using relatively simple equipment. Since transmissions take place in very short bursts, the transmitters do not require the ability to maintain high average power over a sustained period. Short, high-power transmission bursts separated by relatively long idle periods means that the sustained average power of the transmitters is quite low. Since user information is buffered and sent at high speed over the common data channel, many user messages can be accommodated over a relatively short time, making the capacity of the channel available to many essentially simultaneous users.

Equipment and Software Needs

This article is not intended to be a "how to" construction project. It is designed to give you some insight into the new technology of packet communications and outline some of its potential applications in the amateur services. In the relatively near future, it is most likely to be used by amateur operators who are also fairly experienced in the application of home computing systems to communications functions.

The key components in achieving amateur packet communications are illustrated in fig. 5. As can be seen, the only unique unit is the microprocessor controller. The transceiver is any amateur transmitter/receiver capable of FSK operation. The modem, or transmit unit (TU), merely converts the d.c. pulses of the microprocessor output into the suitable tones or signals to modulate the transmitter and to convert the receiver signals back to d.c. pulses for the microprocessor. The TTY could be a standard, five-level electromechanical transmitter/printer unit, or one of the newer electronic versions. The heart of the system, however, is the microprocessor, which through a combination of hardware and software rapidly buffers the characters coming from the TTY, forms packets, appends the packet header (address) information to the packet, appends the error check bits, commands the transmitter on, and transmits the packet, all within a fraction of a second. On receive, the reverse process takes place: the microprocessor buffers the received packets, checks for errors, and then plays the information out on the receiver printer or display screen.

A set of international standards has been developed by the CCITT for operation of packet networks.[1] Known as CCITT X.25, these standards are far more complex than is necessary for amateur operation. However, a number of devices are becoming available which do the packetizing process in a single chip device consistent with the standards. It eventually may become cost effective for amateur operation to use a subset of the CCITT standards because of the availability of such devices. In the meantime, local implementation of packet radio amateur operation has evolved, with each group defining its own packet structure and channel protocol.

Additional Information

The amount of information presently available on packet operation is fairly limited. The following references, however, will help you get started in the exciting field, especially if you are already involved in microcomputer hobby activities and/or amateur RTTY operation.

Borden, D.W., and P.L. Rinaldo. "The Making of an Amateur Packet Radio Network," *QST*, Vol. LXV, No. 10, October 1981, pp. 28–30.

Magnuski, H. "First Packet Repeater Operational in U.S.," *QST*, Vol. LXV, No. 4, April 1981, p. 27.

Rouleau, R., and I. Hadgson. *Packet Radio*, 1981, Tab Books, Inc., Blue Ridge Summit, Pa. 17214.

Rosner, R.D. *Packet Switching: Tomorrow's Communications Today*, 1982, Lifetime Learning Publications, Belmont, Calif. 94002.

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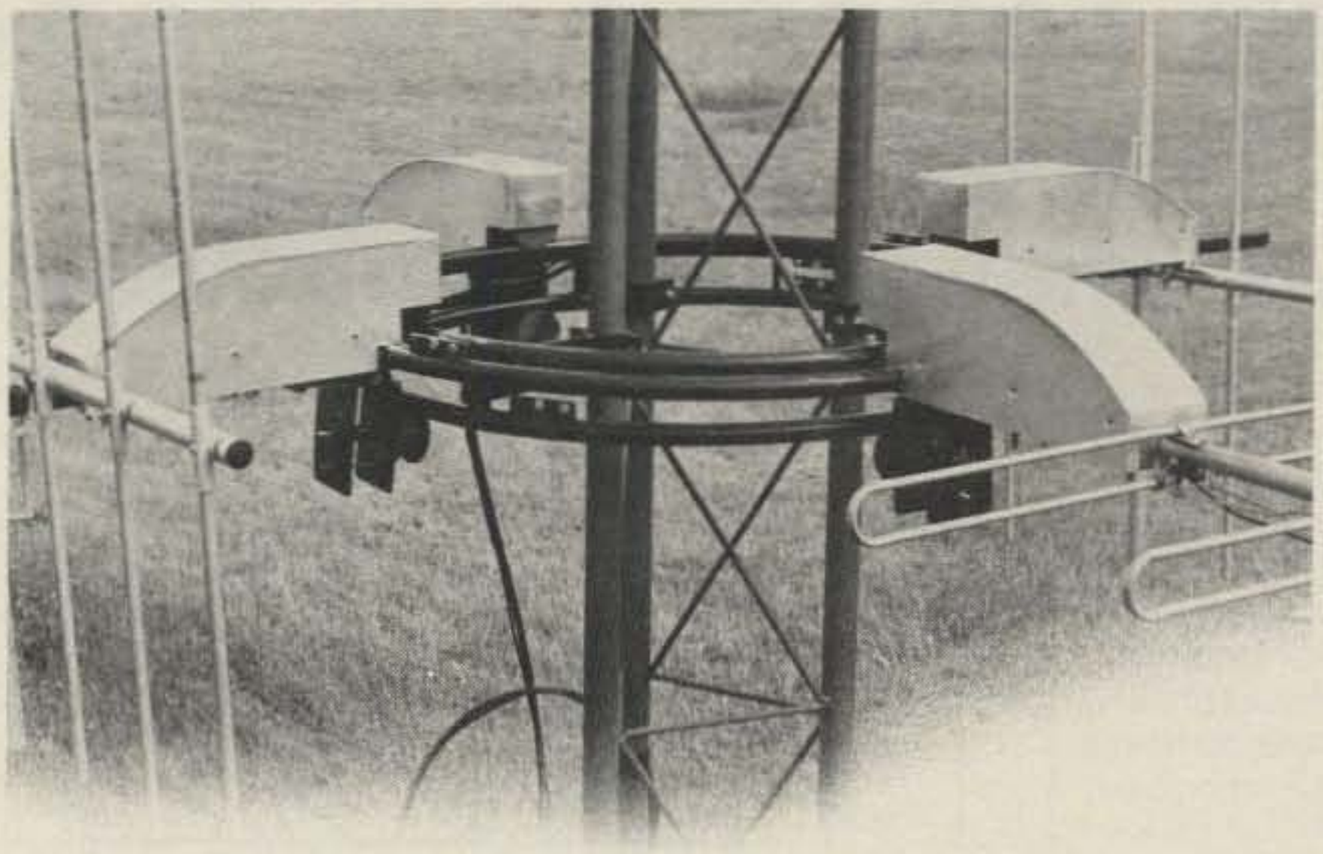
[1]*Comite Consultatif International Telegrafique et Telephonique, which in English is the International Telegraph and Telephone Consultative Committee.*



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High Tones, Low Tones, Modem Tones

What Are They and What Do They Mean?

BY BILL HENRY*, K9GWT

Our RTTY hobby has grown a lot in the past ten years, and we have added many features and terms that, while they certainly expand the usefulness of our equipment, also generate a certain amount of confusion. One of the most confusing RTTY concepts for both newcomers and old-time RTTY operators is this business of RTTY tones: "high," "low," "modem," and "IARU" tones.

Why Use Tones?

Many of the early amateur radio RTTY techniques were adapted from existing standards developed for commercial printing telegraph systems. The use of audio tones and the frequency of the tones evolved from existing commercial standards. The RTTY data from the keyboard is actually a series of pulses of current or voltage. The "standard" Baudot teleprinter hook-up uses a 60 milliampere current loop, the **Mark** or "rest" machine condition being with current *on* and the **Space** condition with current *off* (somewhat "upside down" from what you might think). On a telephone line, this information can be transmitted simply by opening and closing a series circuit. A printer's selector magnets are connected at the other end and the RTTY circuit is complete. However, when long lines are used, it is much more convenient to send a.c. signals over the telegraph lines because of the relative simplicity of a.c. amplifiers as compared to d.c. amplifiers. Therefore, most long-distance RTTY circuits use two different audio tones to represent the **Mark** and **Space** RTTY conditions. Early amateur RTTY operators used this same tone technique for v.h.f. RTTY communications. A typical RTTY pulse waveform and a frequency diagram of the audio tones used are shown in figs. 1(A) and (B).

When we transmit RTTY on v.h.f., we use these tones to directly modulate the f.m. or a.m. transmitter to produce the F2 or A2 type emission. (F2 emission is audio tone modulation of a frequency modulated signal; A2 is audio tone modulation of an amplitude modulated signal.) Two different audio tone frequencies are used to

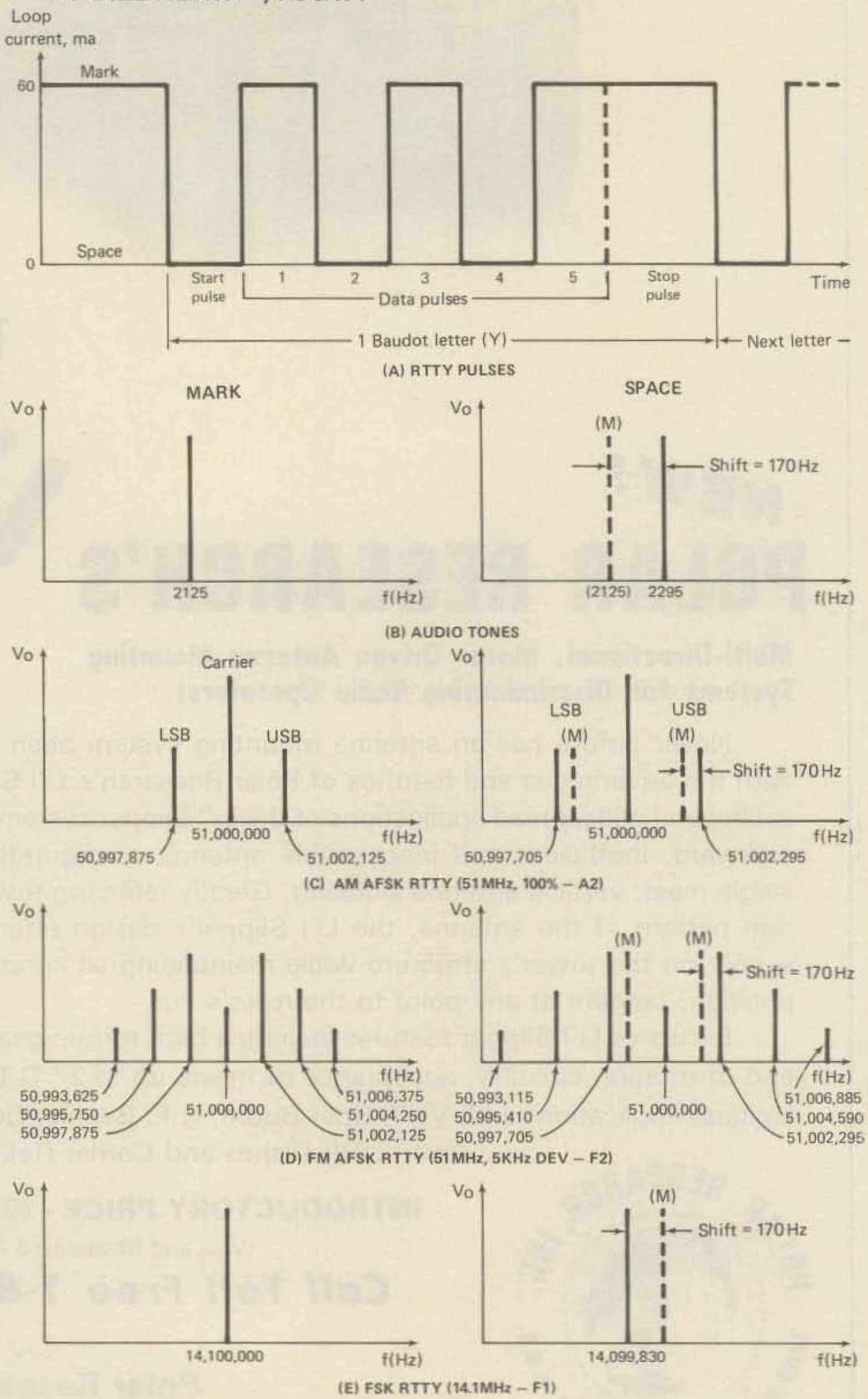

Fig. 1– A visualization of Audio Frequency Shift Keying (AFSK) and Frequency Shift Keying (FSK) RTTY. See text for details.

*Box 365, Urbana, Illinois 61801

represent the RTTY mark and space conditions; the difference between them is called the "RTTY Shift Frequency" (**Shift** for short). This technique is commonly called **AFSK** (**A**udio **F**requency **S**hift **K**eying). Notice that you need two electronic interfaces to the v.h.f. station: (1) a tone encoder (audio oscillator) that converts the transmit mark and space pulses into mark and space audio tones, and (2) a tone demodulator that converts the mark and space tone frequencies back into keying pulses which drive the RTTY printer. The combination of the transmit tone encoder and receive tone decoder is often called an RTTY **demodulator**, **tuning unit (TU)**, or **Modem** (computer term for modulator-demodulator). Frequency diagrams for typical 51 MHz a.m. and f.m. RTTY signals are shown in figs. 1(C) and (D).

RTTY operation on the high frequencies (below 30 MHz) is done in a slightly different manner. We are allowed to use only type F1 **FSK** (**F**requency **S**hift **K**eying) for RTTY transmission on the lower frequencies. (F1 emission is the direct shifting of the radio carrier frequency by the RTTY data.) The reason for this restriction is to minimize the bandwidth required by each station in this crowded section of the spectrum. The FSK RTTY signal is transmitted so that the mark condition corresponds to one radio frequency and the space to a lower radio frequency. Note that only one radio signal, at either the mark or space frequency, is transmitted at a time.

To receive this RTTY signal we use a communications receiver with a **b.f.o.** (**b**eat **f**requency **o**scillator) and adjust the frequency dial so that two different audio tones are produced, one for the mark pulse and the other for the space pulse. An RTTY demodulator is then used to recover the RTTY data pulses from the tones, just like for v.h.f. AFSK operation. Note that because we are using the b.f.o. on the receiver, the audio tone frequency produced at the receiver speaker can be controlled simply by turning the receiver frequency dial. Any number of different mark and space tone frequency pairs may be chosen for reception; however, they will all differ in frequency by the same amount—the original difference between the transmitted mark and space radio frequency. This frequency difference is called the **RTTY Shift Frequency**, or **Shift** for short (as in the previous discussion of v.h.f. AFSK operation). A frequency diagram of a 14.100 MHz FSK signal is shown in fig. 1(E). Note that none of the diagrams in fig. 1 present the full frequency spectra; the sidebands caused by the digital switching between the mark and space are omitted for clarity.

From the previous discussion, you can see that there are some similarities and differences between v.h.f. and h.f. amateur RTTY operation. Obviously, since both require use of a receive tone demodulation unit, it is desirable to be able to use the same unit for reception of both v.h.f. and h.f. RTTY signals. Note that although the tone frequencies produced by the h.f. receiver can be set to most any convenient frequency by adjusting the tuning, the v.h.f. receiver does not have this capability. Since F2 or A2 modulation is used for v.h.f. AFSK, the receiver demodulator frequencies must match the tones transmitted. Therefore, if we are to use the same demodulator for v.h.f. and h.f., we would want to choose a unit that is compatible with the tones used by other stations. Here is where the "great high versus low tone controversy" starts, and we will discuss it in greater detail shortly. First, however, we need to consider just how h.f. FSK RTTY is generated.

Transmitting H.F. FSK RTTY

As we discussed above, our h.f. amateur RTTY must be transmitted using type F1 emission, frequency shift keying (FSK). The classic way of generating the FSK RTTY signal is simply to use a circuit that directly shifts the transmitter carrier frequency as the RTTY pulses change between mark and space conditions. In fact, this is the way we generated RTTY for years, and it is still used in some commercial amateur transceivers (e.g., the TS820 and IC720). This technique is called **direct FSK** and will give very pure FSK RTTY emissions. A simple "direct FSK" transmitter system is shown in fig. 2(A).

However, there are a number of problems with this technique that may not be convenient for many of us. For example, if the transmitter or transceiver does not include a direct FSK input connection, it will be necessary to add a frequency shifting circuit. Most of us are understandably reluctant to modify our new radio, particularly when a modification to the oscillator circuits could degrade the frequency stability of the entire unit. Also, changing the frequency shift to be transmitted involves further changes in both home-brew and commercial direct FSK circuits. For example, one commercial radio requires that you remove 37 screws, get out the counter, adjust a trimmer, change a jumper, put the screws back, and hope nothing has changed!

A second technique which is much simpler for the operator to hook-up and use may be used to generate h.f. FSK RTTY. This technique makes use of the l.s.b. (lower sideband) mode of the transmitter and the same transmit RTTY tone encoder used for v.h.f. AFSK. This procedure has become quite popular and has a number of strong advantages, as well as some potential problem areas to watch out for. The technique works as follows:

(1) Separate audio tone frequencies are generated with an AFSK oscillator to represent the transmit mark and space pulse conditions.

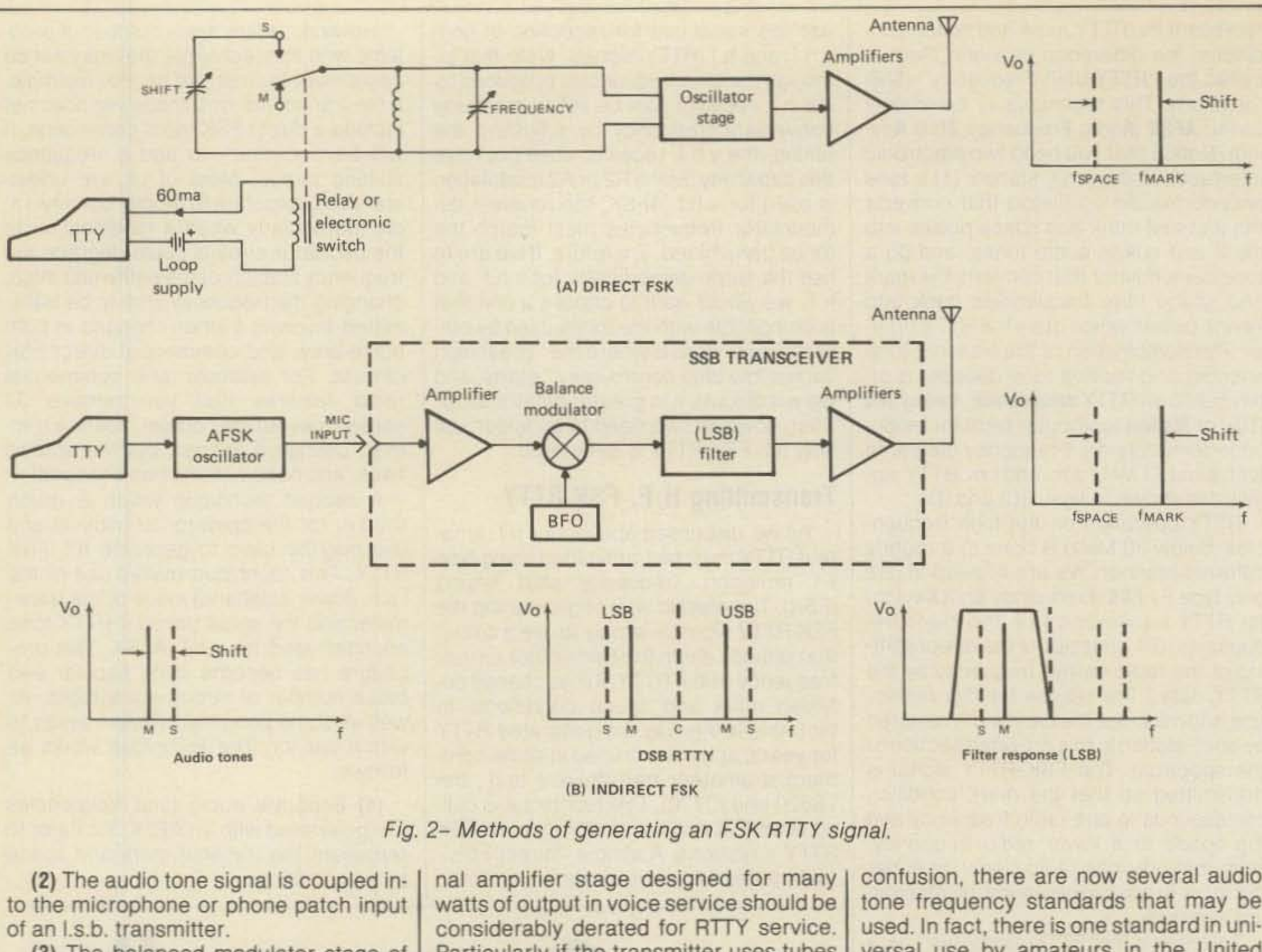

Fig. 2– Methods of generating an FSK RTTY signal.

(2) The audio tone signal is coupled into the microphone or phone patch input of an l.s.b. transmitter.

(3) The balanced modulator stage of the transmitter generates a double-sideband, suppressed carrier signal.

(4) A bandpass filter stage in the transmitter selects only the lower of the two sidebands and further suppresses the carrier.

(5) The heterodyne oscillator and mixer circuits convert the l.s.b./FSK RTTY signal to the desired band and output radio frequency.

Since the lower sideband was chosen, the lower audio tone frequency input (v.h.f. AFSK mark) will produce the higher radio frequency output signal (h.f. FSK mark). Thus, the two h.f. and v.h.f. tone standards are made compatible. The **indirect FSK** transmitter system is shown in fig. 2(B).

Because we are using a transmitter designed for one service (voice s.s.b.) for something completely different (RTTY FSK), there are a number of precautions that should be observed. Foremost among these is the consideration of the **100% duty cycle nature of RTTY.** In voice, the average transmitter power is only 50% of the peak power developed while talking—called "50% duty cycle." For RTTY, however, we have a strong carrier on the air for the entire time we are transmitting—"100% duty cycle." Therefore, we need to be very heat conscious when using s.s.b. equipment for RTTY. Often, a final amplifier stage designed for many watts of output in voice service should be considerably derated for RTTY service. Particularly if the transmitter uses tubes not specifically designed for transmitter service (so-called "TV sweep-tubes," for example), we should decrease the output power from the normal voice or c.w. values. Also, if a very strong audio signal is introduced into the l.s.b. transmitter, "splatter" will result. This may not be a very serious problem for voice operations, but for RTTY, many spurious RTTY signals will be generated, *all of which are illegal!* Finally, consider the high-gain audio input of most transmitters: if the wires to the mike jack are not properly grounded or shielded, 60 or 120 Hz "hum" can be introduced and another spurious RTTY signal will be the result! These considerations are really just common sense, and most s.s.b. transmitters can be used for h.f. RTTY if these precautions are observed.

The technique of using audio tones with an h.f. s.s.b. transmitter results in an r.f. output that is a true F1, FSK emission, undistinguishable from a signal generated by shifting the transmitter oscillator frequency. I recommend we call this technique **indirect FSK** to reflect the fact that tones and s.s.b. techniques are used to generate the FSK signal. This technique is *not FSK* as it has been mistakenly called. AFSK is what we use for v.h.f. RTTY!

If all of this seems complicated, wait. It gets even deeper! To further add to the confusion, there are now several audio tone frequency standards that may be used. In fact, there is one standard in universal use by amateurs in the United States (high tones) and quite a different standard used by amateurs elsewhere in the world (low tones). Also, computer operators now use entirely different tone frequencies for phone-line and r.f. data communications. The differences and uses of these tone frequency standards are discussed below.

Low Tones or High Tones?

The **high tones** (for higher frequency audio tones) are really the traditional standard U.S. RTTY tones used since the early days of amateur RTTY. The **low tones** are the IARU international standard used extensively in most other countries of the world. When receiving (or transmitting) on the h.f. bands (3–30 MHz), either set of tones will work since you tune the receiver to produce the desired beat note frequency. However, when AFSK modulation is added to an f.m. or a.m. signal, you must be prepared to receive the same tone frequencies as those used by the transmitting station; the a.m. or f.m. receiver does not use a b.f.o. to produce the audio tone.

In the United States, the long-standing v.h.f. AFSK tone standard has been to use the *high tones* (2125 Hz mark and 2295, 2550, or 2975 Hz space). To be compatible with other U.S. v.h.f. RTTY stations, you must use a high-tone de-

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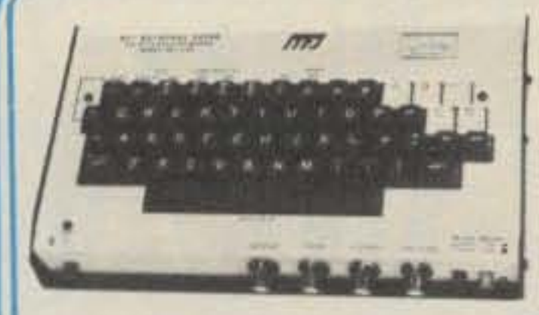

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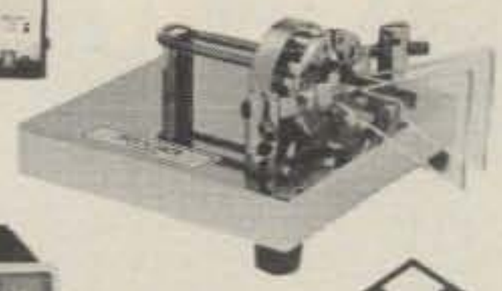

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	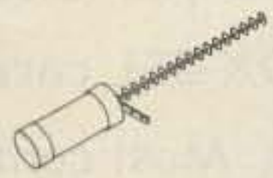	
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modulator! In Europe, in particular, the reverse standard is developing; the IARU *low tone* (1275 Hz mark and 1445, 1700, or 2125 Hz space, depending upon the shift chosen) is the standard to be observed. The two systems are basically incompatible for v.h.f. AFSK operation! Due to low-pass filter parameters, use of data rates greater than 150 baud is not recommended when "high" or "low" tone demodulator combinations are used. Frequency relationships between "high" and "low" tones are shown in fig. 3.

Each tone set has its advantages and disadvantages. Some of the considerations for each tone set are as follows:

High Tones (Mark = 2125 Hz)

Advantages:

1. High tones are the U.S. v.h.f. AFSK standard. Their use is required for compatability when operating v.h.f. AFSK in the U.S. A high tone demodulator may be used for both v.h.f. and h.f. use in the United States.

2. When tones are connected to the audio input of an h.f. l.s.b. transmitter, there may be less problems with spurious signals when high tones are used rather than low tones. Since the tone frequencies are high, harmonics and distortion products that may be caused by overdriving the transmitter input occur at audio frequencies beyond the audio passband of the transmitter, and therefore *should* not be transmitted. The rejection of the frequency components of the unwanted sideband will also be greater for high tones than for low tones.

Disadvantages:

1. The relatively high audio frequencies used in the high tone set may not fall within the audio frequency response of the receiver or transmitter. In general, the standard amateur shift, 170 Hz, will pass most current receivers and transmitters (the Collins S-Line is an exception). However, a few pieces of equipment will pass the tones for both receiving and transmitting 425 or 850 shift with high tones (the Drake TR-7 is an exception). The use of high tone demodulators for h.f. RTTY is therefore restricted to transmission of just 170 shift, and only receivers incorporating either a variable b.f.o. or passband tuning will receive all three shifts.

2. High tones are not the IARU standard and will not be compatible with v.h.f. AFSK in many countries of the world.

Low Tones (Mark = 1275 Hz)

Advantages:

1. Low tones are the IARU international standard, and their use assures compatibility with v.h.f. AFSK operations in many areas of the world.

2. Low tones can be used with virtually all s.s.b. receivers and transmitters for all three standard shifts. Variable b.f.o. or passband tuning features are not required to assure good reception of 425 and 850 Hz shift stations.

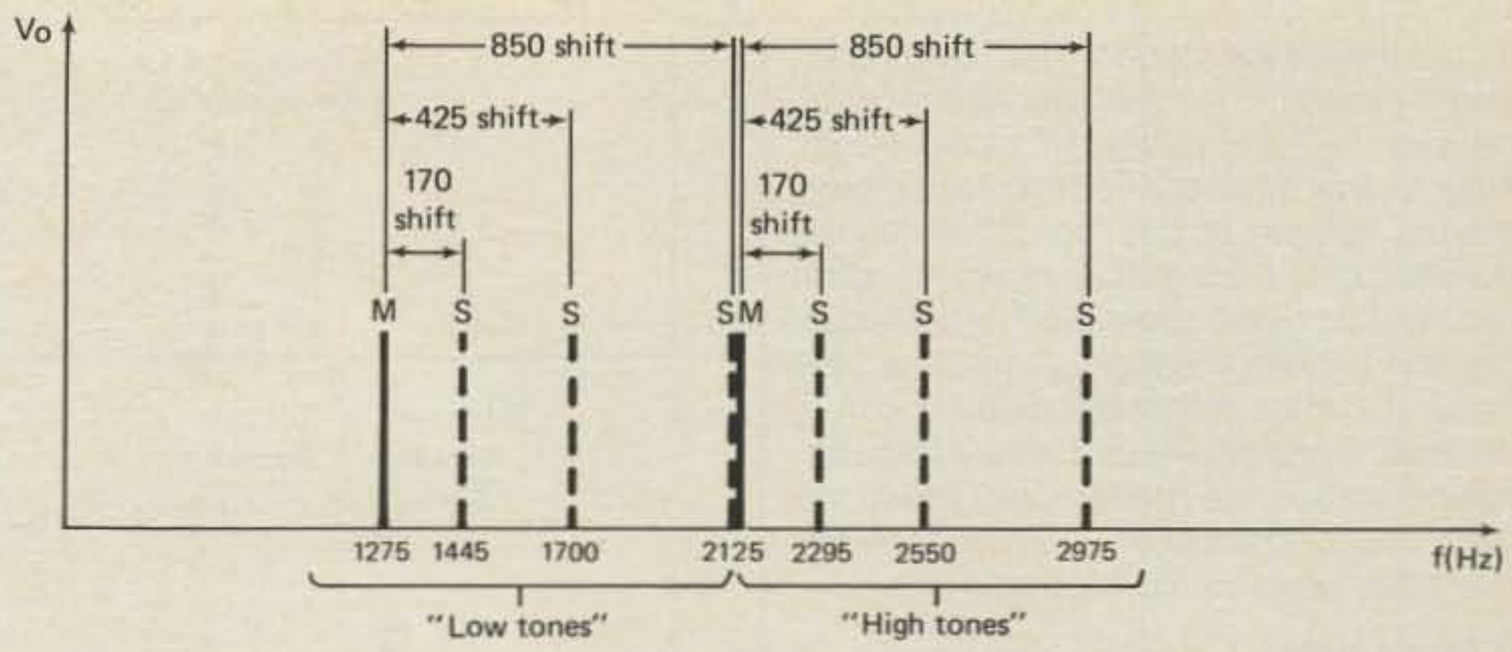


Fig. 3– Low and high tones.

Disadvantages:

1. Low tones are not compatible with existing U.S. v.h.f. AFSK operations. Since there is a great deal of high tone AFSK equipment already in use in the United States and neighboring countries, it is unreasonable to expect that the U.S. standard will shift to low tones.

2. When low tones are used with an l.s.b. transmitter to generate F1 RTTY emissions, there is a strong probability that overdriving the transmitter audio and modulator stages *will* result in spurious harmonics and mixer products that will be radiated. Of course, these problems will not occur if the audio drive level is properly set.

Although you may develop your own personal preferences, I recommend that you consider the following operating conditions as a starting point:

In the United States

Use **high** tones for all v.h.f. AFSK amateur communications and for normal 170 Hz shift h.f. operation. Use **low** tones when receiving h.f. commercial RTTY stations unless you have a receiver with a variable-pitch b.f.o. or with i.f. passband tuning. The exception applies to use of the older Collins S-Line equipment: use **low** tones for all h.f. operations, amateur or commercial.

In Europe (and all other areas where IARU standards apply):

Use **low** tones exclusively for both v.h.f. AFSK and h.f. operations. The only exception would be when you communicate with another v.h.f. AFSK station who is using **high** tones.

Modem Tones

With the increasing popularity of personal computing, more and more amateur radio operators are combining the two hobbies and using their radios to exchange computer ideas and programs. Recent U.S. FCC approval of amateur use of the ASCII computer code has certainly encouraged this growing section of our RTTY hobby, particularly among v.h.f.-f.m. RTTY repeater users. Some of us have used the "standard" high tones of 2125/2295 Hz for 110 and 300 baud ASCII communications and 2125/2975 Hz for up to 1200 baud ASCII. If the demodulator low-pass filters are readjusted (and they must be on practically all good-quality h.f./v.h.f. demodulators), these tone pairs work well for ASCII.

However, commercial standards already exist for ASCII communications on telephone circuits. These tone standards are particularly attractive for amateur use since modems can often be obtained from surplus sources for low cost or can be built with a minimum number of parts from diagrams published in semiconductor manuals. Since these tones are not the same as those we have used for 45 baud Baudot for years, there is often little interference caused between users of ASCII and Baudot. Sometimes the same v.h.f. repeater can be used simultaneously for both applications! For these reasons there is a growing popularity in the use of two commercial data set standards for v.h.f. amateur operation: the **Bell 103 Modem** and the **Bell 202 Modem** standards.

The **103 Modem** is used for telephone line data communications at data rates up to 300 baud. The modems that are sold include both transmit tone generation and receive tone demodulation circuitry. Control circuitry is also included to permit automatic send-receive control or "handshaking" between two data terminals; a touch-tone dialing circuit sometimes is also included. The 103 Modem is designed for full duplex **(FDX)** operation, meaning that data or text may be received and printed even while you are typing and transmitting data. Our amateur communications are usually carried out using half duplex **(HDX)**; we take turns talking or exchanging data.

Because the 103 Modem operates in FDX, two sets of tones are used for data transfer between data terminals, one set for each direction of data flow. Since any terminal on the telephone circuit can start or originate a data connection, a convention has been established to keep track of what set of tones is used with each terminal. The terminal or station that places the initial "call" is called the **originate** station; the receiving terminal is

called the **answer** station. The "originate" and "answer" modes are set in each mod-em by control signals at the beginning of the data connection, and these modes remain in this condition for the duration of the exchange. However, after the call has been completed and the connection broken ("hang-up" the line), the second station may now place a call to another terminal. Since it is now the originating station, its modem will select the originate tone sets for use. The tone frequencies used in 103 Modems are:

Originate Mode

Transmit data: 1270 Hz mark, 1070 Hz space

Receive data: 2225 Hz mark, 2025 Hz space

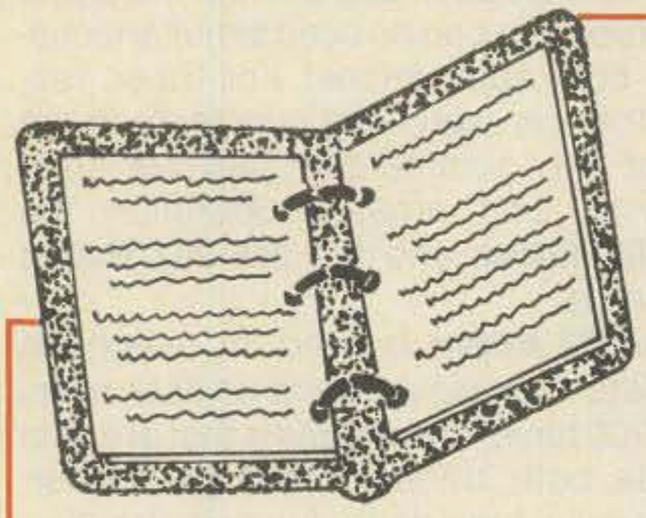
Answer Mode

Transmit data: 2225 Hz mark, 2025 Hz space

Receive data: 1270 Hz mark, 1070 Hz space

Notice that the transmit tones of one station correspond to the receive tones of the other station, assuring simultaneous data flow in both directions (full duplex).

Amateur radio communications are generally conducted using half-duplex communications. Also, when we are transmitting, we prefer to transmit the same set of tones that we use when receiving. It is recommended that amateurs use the **originate-transmit** mode set of



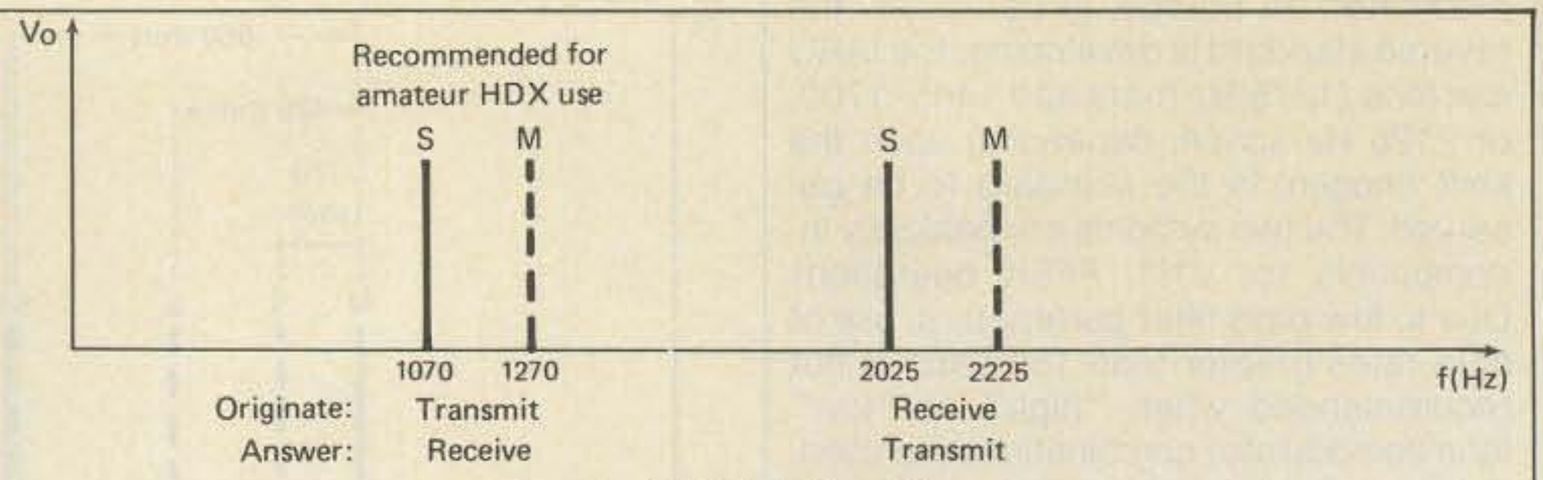


Fig. 4– "103 Modem" tones.

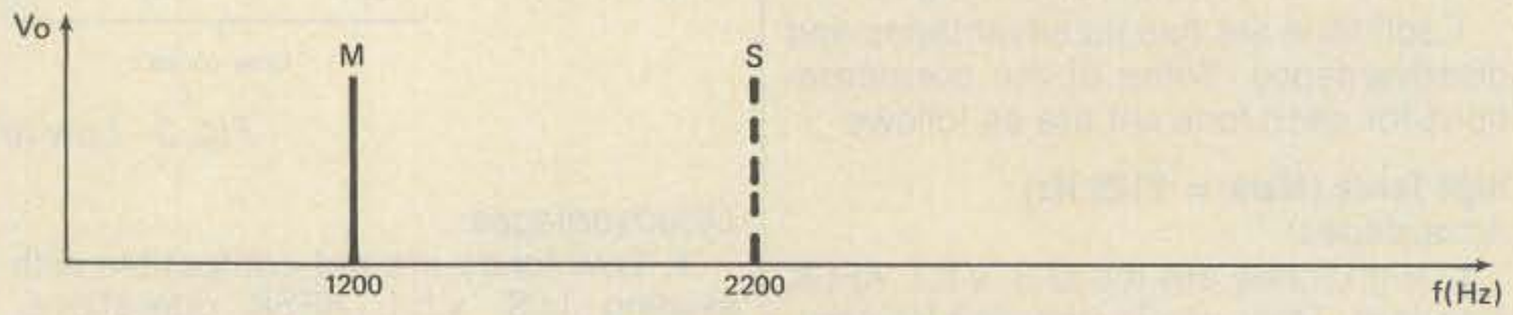


Fig. 5– "202 Modem" tones.

103 Modem tones for v.h.f. ASCII transmissions (1270 Hz mark, 1070 Hz space). These tones agree with the above commercial standards and are sufficiently removed from the standard Baudot tones (2125 Hz and 2295 Hz) to prevent interference. A frequency diagram of the 103 Modem is shown in fig. 4.

The **202 Modem** is used for data transmission at rates up to 1200 baud. The 202 Modem is a half-duplex device, and therefore only one set of tone frequencies is commonly used: 1200 Hz for mark and 2200 Hz for space. Here again, these tones are different from those used by amateur Baudot stations. The 1200 baud data rate is certainly attractive when a large amount of data must be sent and the communications channel has little noise (typical v.h.f.-f.m. situation). However, the tone frequencies of 2125/2295 Hz and 1200/2200 Hz are not easily separated, and it probably is not feasible to use the two simultaneously on the same channel as may be done with 1270/1070 and 2125/2295 Hz tone pairs. A frequency diagram of the 202 Modem is shown in fig. 5.

Since the major application for use of 1200 baud data exchange will probably be over v.h.f.-f.m. links, signal-to-noise ratios will generally be quite good and high-performance demodulation circuitry is not needed. A good phase-lock-loop circuit will give very satisfactory performance at 300 or 1200 baud over an f.m. communications link. Often, a satisfactory demodulator can be constructed from diagrams given in a manufacturer's application notes and may involve only one or two integrated circuits. Such circuits are available for the 565 PLL IC, the 6860 IC, and the XR-2211 IC, for example.

Recommended Standards for Amateur RTTY Tones

Based on the previous discussions of the features and reasons for the various RTTY tone frequencies used, the following standards are recommended:

H.F. RTTY (Mark = higher radio frequency)

U.S.A.:

2125 Hz mark, 2295 Hz space—45 through 110 baud (ASCII or Baudot)

2125 Hz mark, 2550 Hz space—110 through 300 baud (ASCII)

C.W. ID = 2025 Hz (all shifts)

Europe:

1275 Hz mark, 1445 Hz space—45 through 110 baud (ASCII or Baudot)

1275 Hz mark, 1700 Hz space—110 through 300 baud (ASCII)

C.W. ID = 1175 Hz (all shifts)

V.H.F. RTTY:

U.S.A.:

2125 Hz mark, 2295 Hz space—45 to 74 baud Baudot

C.W. ID = 2025 Hz

1270 Hz mark, 1070 Hz space—110 to 300 baud ASCII

C.W. ID = 1370 Hz

1200 Hz mark, 2200 Hz space—300 to 1200 baud ASCII

C.W. ID = 1100 Hz

Europe:

1275 Hz mark, 1445 Hz space—45 to 100 baud Baudot

C.W. ID = 1175 Hz

1270 Hz mark, 1070 Hz space—110 to 300 baud ASCII

C.W. ID = 1370 Hz

1200 Hz mark, 2200 Hz space—300 to 1200 baud ASCII

C.W. ID = 1100 Hz

As our small section of the amateur hobby continues to grow, it is important that we establish some compatible standards so that we may continue to communicate with each other. V.h.f. repeater groups in particular are presently isolated groups who may choose their own standards with little concern about techniques and procedures used elsewhere. However, this isolation is probably short-lived, particularly if current trends for repeater linking and satellite development continue. A little preplanning and agreement now can prevent a very big compatibility problem later when the hobby has grown and these techniques are in use.

Parameter	Specifications
Physical	
Size	394 mm (15.5 in.) wide; 190 mm (7.5 in.) high, including 25 mm (1 in.) feet; 457 mm (18.0 in.) deep
Weight	27.2 kg (50 lb.), max
Environmental	
Operating temperature	0 to 50°C (32 to 122°F)
Operating humidity	0 to 90% relative humidity
Operating altitude	0 to 3049 m (0 to 10,000 ft.)
Vibration	2 g's, 10 to 33 Hz
Electrical	
Primary power	Strappable for: 105, 115, 125/210, 220, 230, 240, 250 V ±5%, 50 to 60 Hz; or 12 to 15 V dc, negative ground: 120 watts max in receive, 600 watts max in transmit
Receiver	
Frequency	0.5 to 30.0 MHz, tunable in 10 Hz steps
Modes	u.s.b., l.s.b., a.m., and c.w.
Sensitivity (Using "soft μV measurement)	0.5 μV or better for 10 dB (s + n)/n, 2.0 to 30.0 MHz, s.s.b. and c.w.; 1.0 μV or better for 1.8 to 2.0 MHz.
Selectivity (3 dB bandwidth)	Selectable: 8 kHz *1.7 kHz *6 kHz *360 Hz 2.1 kHz *140 Hz *Optional Filters
I.f. and image rejection	Greater than 60 dB
Intermodulation distortion	−50 dB or better for two signals of −10 dB mW each, 20 kHz apart
AGC	Audio output variation not more than 8 dB for 4 μV to 200 mV open circuit r.f. input variation
Audio output	Not less than 3 W into 4 ohm load, at 1 kHz, at not more than 10% total harmonic distortion Line audio output not less than −10 dB mW nominal into 600 ohms Frequency response: 300 to 2400 Hz with not more than 5 dB variation
Transmitter	
Frequency	160 through 10 m amateur bands, tunable in 10 Hz steps 160 m 1.800 to 2.000 MHz 80/75 m 3.500 to 4.000 MHz 40 m 7.000 to 7.300 MHz 20 m 14.000 to 14.350 MHz 15 m 21.000 to 21.450 MHz 10 m 28.000 to 29.700 MHz
Modes	u.s.b., l.s.b., and c.w. (RTTY by AFSK on l.s.b.)
Output power	90 W pep, min (100 W, nominal) In c.w. or RTTY: 50% duty cycle; key down 15 minutes, max. Automatic turndown to 50 W after 10 seconds. With optional blower kit installed, power is 100 W average, 50% duty cycle, key down 1 hour max at 25°C; 30 minutes max at 50° C for all modes.
Unwanted signal suppression	
Carrier	−50 dB or better
Undesired sideband, 1 kHz ref	−55 dB or better
Harmonics (all)	−40 dB or better
Mixer products	−50 dB or better
Third order distortion	25 dB below each tone of 2-tone test
Synthesizer accuracy and stability	Accuracy within ±5 Hz after 10 minutes warmup when 39.6 MHz and 455 kHz oscillators are set to within ±3 Hz. Stability within ±150 Hz over temperature range of 0 to 50°C (32 to 122°F) if oscillator's set within 10 Hz at 25°C (77°F)
Antenna impedance	50 ohms, nonreactive. (Full transmitter power output with v.s.w.r. of 2:1 or less. Automatic power output turndown with v.s.w.r. greater than 2:1.)
Audio inputs	
Microphone	Low or high impedance, dynamic; 3.3 kΩ nominal impedance
Line	600 ohm, unbalanced; 40 mV input sufficient for full r.f. power output

Table I– Manufacturer's specifications.

various specific functions. An examination of slightly more detailed receive and transmit signal path block diagrams should help to clarify the situation.

For instance, fig. 2 shows details of the receive signal path. The "front-end" of the KWM-380 is unique in several respects. There is no r.f. amplifier stage, and there are none of the usual bandpass filters as are usually associated even with transceivers having a "high" first i.f. (above 30 MHz). The filter blocks that an incoming signal goes through before being amplified are not quite what one would expect. The first filter block is a 0.5–1.6 MHz rolloff one, simply designed to protect the transceiver from BC band overload. The high-pass filter block works in conjunction with a following 30 MHz low-pass filter block. The latter is fixed in frequency at 30 MHz, while there is a selection of three high-pass filter cutoffs of about 20, 14, or 7 MHz. So, an incoming signal can be "bracketed" between 7–30 MHz, 14–30 MHz, or 20–30 MHz.

The reason for this arrangement is not simply to provide image signal rejection; the very high first i.f. frequency takes care of that. The high-pass filters ensure that the transceiver does not generate second order intermodulation products of commercial/broadcasting stations. For instance, in the European area the "breakthrough" of 13–15 MHz signals on "simple" transceivers operating on 10 meters can be a very severe problem. The problem doesn't exist with the KWM-380. In between the high- and low-pass filter blocks one can see a PIN diode attenuator (CR104). This diode is controlled by a voltage from a.g.c. amplifiers in the KWM-380. Essentially, the diode performs the same function in an automatic fashion as the manual r.f. attenuator switches one finds on many h.f. transceivers.

The 39.145 MHz i.f. signal is produced by the first "U100" mixer. This i.f. signal is amplified, passes through an optional noise blanker unit, and then goes on to mixer "U102," where the i.f. signal is translated to 455 kHz and routed to a passband tuning assembly. An up/down frequency translation takes place in this assembly in that the 455 kHz i.f. is translated to an i.f. of 6.255 MHz and then back down again to 455 kHz. True signal selectivity takes place in crystal filters associated with the 6.255 MHz i.f. The final 455 kHz i.f. signal is demodulated to provide an audio output and rectified to provide the control voltage for an elaborate "hang" a.g.c. loop which controls both the incoming signal attenuation (PIN diodes between the high-pass and low-pass filter blocks) and the final 455 kHz i.f. signal attenuation (PIN diodes before the "U700" stage shown in fig. 2). The **800 Hz Spot Tone** input shown in the lower left-hand corner of fig. 2 provides for a convenience feature, in that in the c.w. mode only, one can enable an 800 Hz test tone

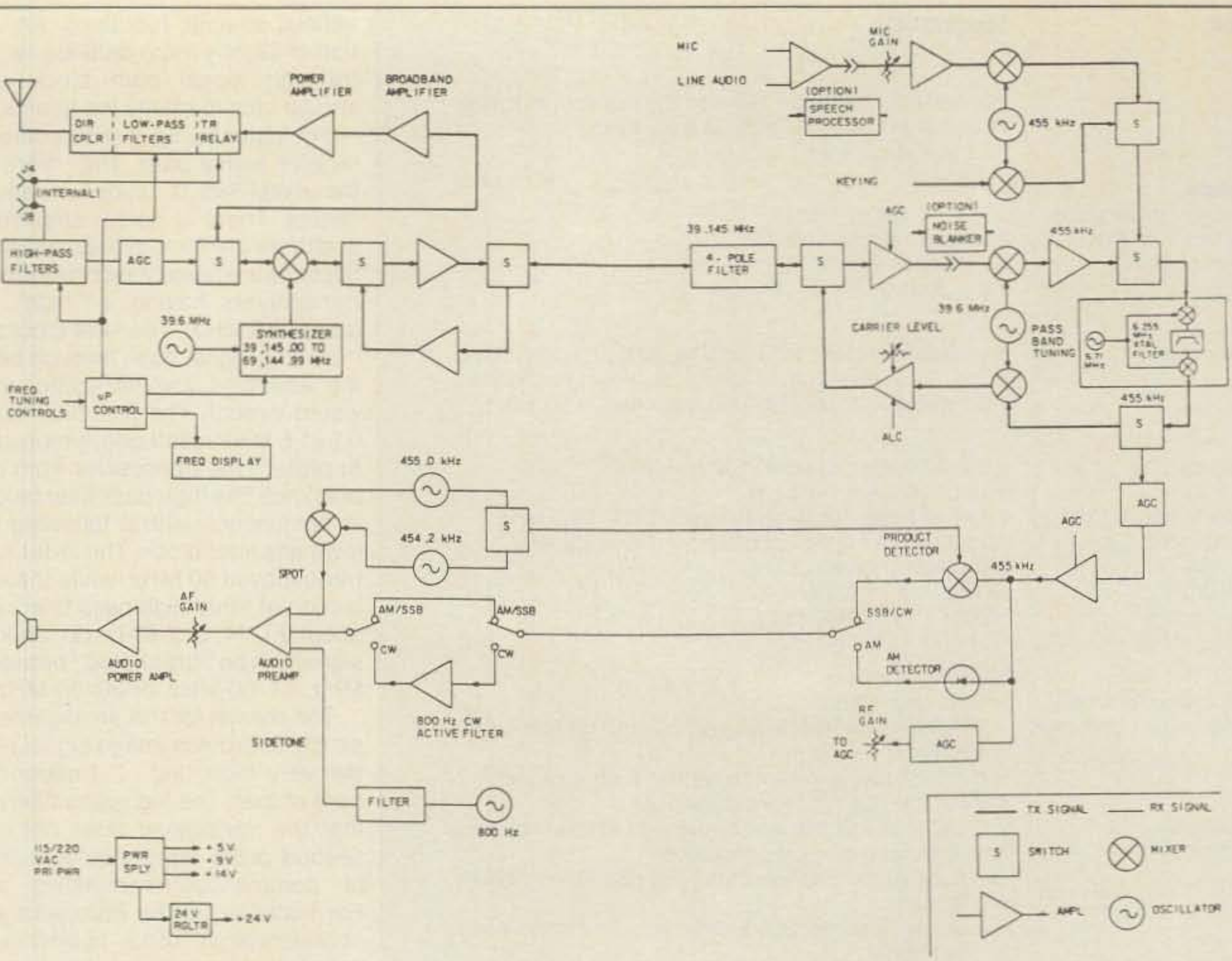


Fig. 1– Overall block diagram of the KWM-380.

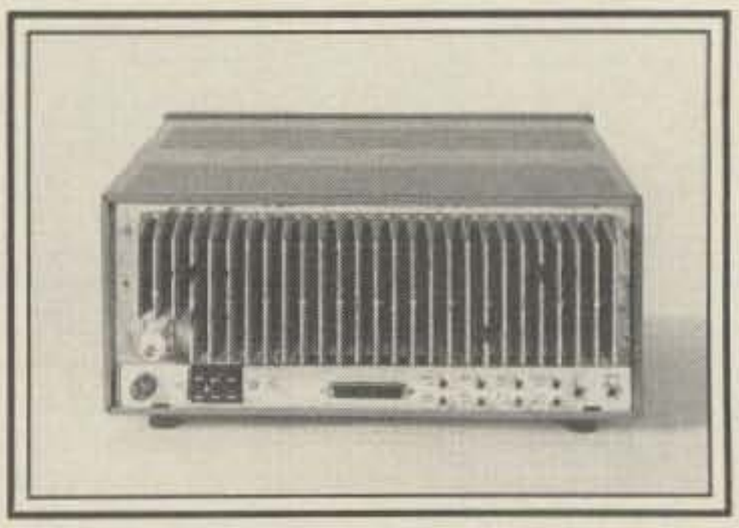
to which a received c.w. tone (centered on 800 Hz by a c.w. i.f. filter) can be matched for exact transmit/receive frequency coincidence.

It would be fun to highlight in detail numerous unique circuits used in the KWM-380. However, if one has to use a practical approach by both serving potential purchasers of the KWM-380 and giving readers some circuit ideas, the following should be of special interest.

The basic "front-end" of the KWM-380 is shown in fig. 3. This diagram shows in detail and with circuit values the various filter sections previously mentioned. The antenna signal first encounters the multiple-pole BC band rolloff filter shown as L800-804 and C800-801. The three high-pass filters are each composed of a similar number of components (e.g., five capacitors and two inductors). The 100 μh coils on each side of each filter are RFC's which are used for signal isolation in the PIN diode switching scheme used.

If one studies the diagram a bit, it should be clear that when point K(7) is grounded, the filters are bypassed by diodes CR800-801. When one of the points L(7), M(7), or N(7) is grounded, one of the three filters is selected. The incoming signal then passes on to the diode section between C825-C102. This diode section is an overload protector composed of zener diodes VR100-101 and limit at the 7 volt level. C104 is switched to ground by the variable resistance of PIN diode CR104, which in turn is driven by the chain of a.g.c. amplifiers shown at the bottom of this diagram. The incoming signal then goes through the fixed 30 MHz low-pass filter and on to mixer U100. U100 is a commercial diode ring mixer (type SRA1H from Mini-Circuits Lab., Brooklyn, N.Y. 11229). The signal is, of course, then translated to the first i.f., but note that only then does signal amplification take place. The whole "front-end," so far, has been passive.

The concept and practical usage of the passband tuning used in the KWM-380 is illustrated in fig. 4. The 455 kHz signal coming into mixer U4 has a bandwidth up to 8 kHz. After mixing, the resultant 6.255 MHz signal is routed to any one of five crystal filters: a standard s.s.b. filter (2.1 kHz), standard a.m. filter (8.0 kHz), an optional narrow filter for s.s.b. (1.7 kHz), or optional narow filters for c.w. (140 or 360 kHz). One also has the option of physically substituting an optional 6.0 kHz filter for a.m. for the standard 8.0 kHz one. These filters are all switched in and out by some diode/transistor switching circuitry as controlled by the front-panel selectivity control. The 6.255 MHz signal is then retranslated to 455 kHz in mixer Q1. Since mixers U4 and Q1 have a common injection oscillator, varying the frequency of that oscillator moves the selected filter bandwidth chosen within the overall



The back panel of the KWM-380 consists almost entirely of a huge heat sink. No blower fan is necessary for normal s.s.b./c.w. operation. Various jacks for accessory connections are shown on the bottom of the panel. The r.f. output connector (left, bottom) is really an SO-239. A u.h.f./BNC adapter was left in place by mistake while taking the picture.

incoming 8 kHz bandwidth of the incoming 455 kHz signal. The effect of all this is shown in fig. 4(B). It shows the passband tuning effect as one varies the passband tuning control when a standard s.s.b. filter has been selected. Two things should be noted: the filter bandwidth does not vary as its placement is varied, and the operator must set the passband tuning control so either l.s.b. or u.s.b. signals are passed.

Referring back to fig. 1, one can note that the microprocessor control block

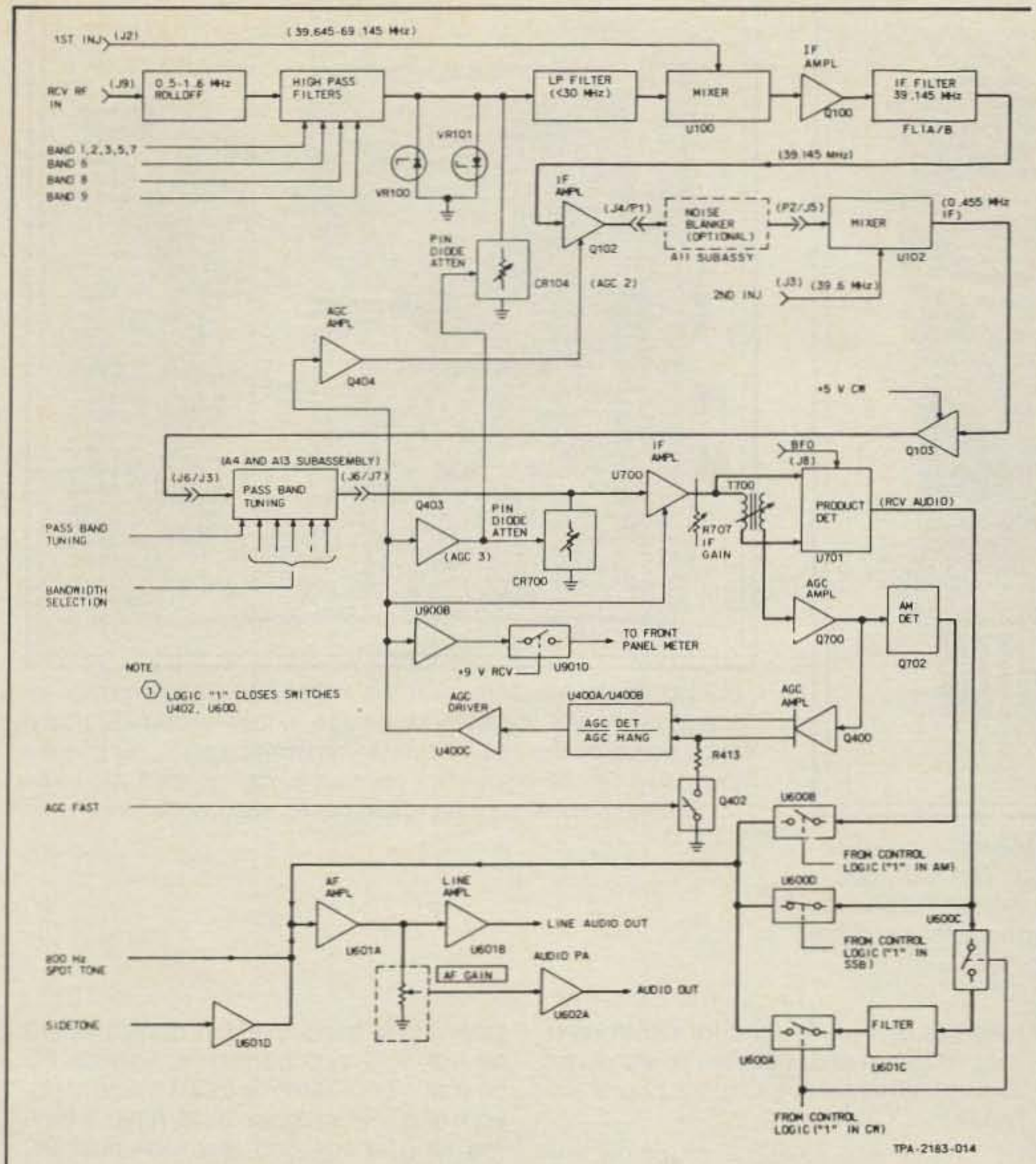
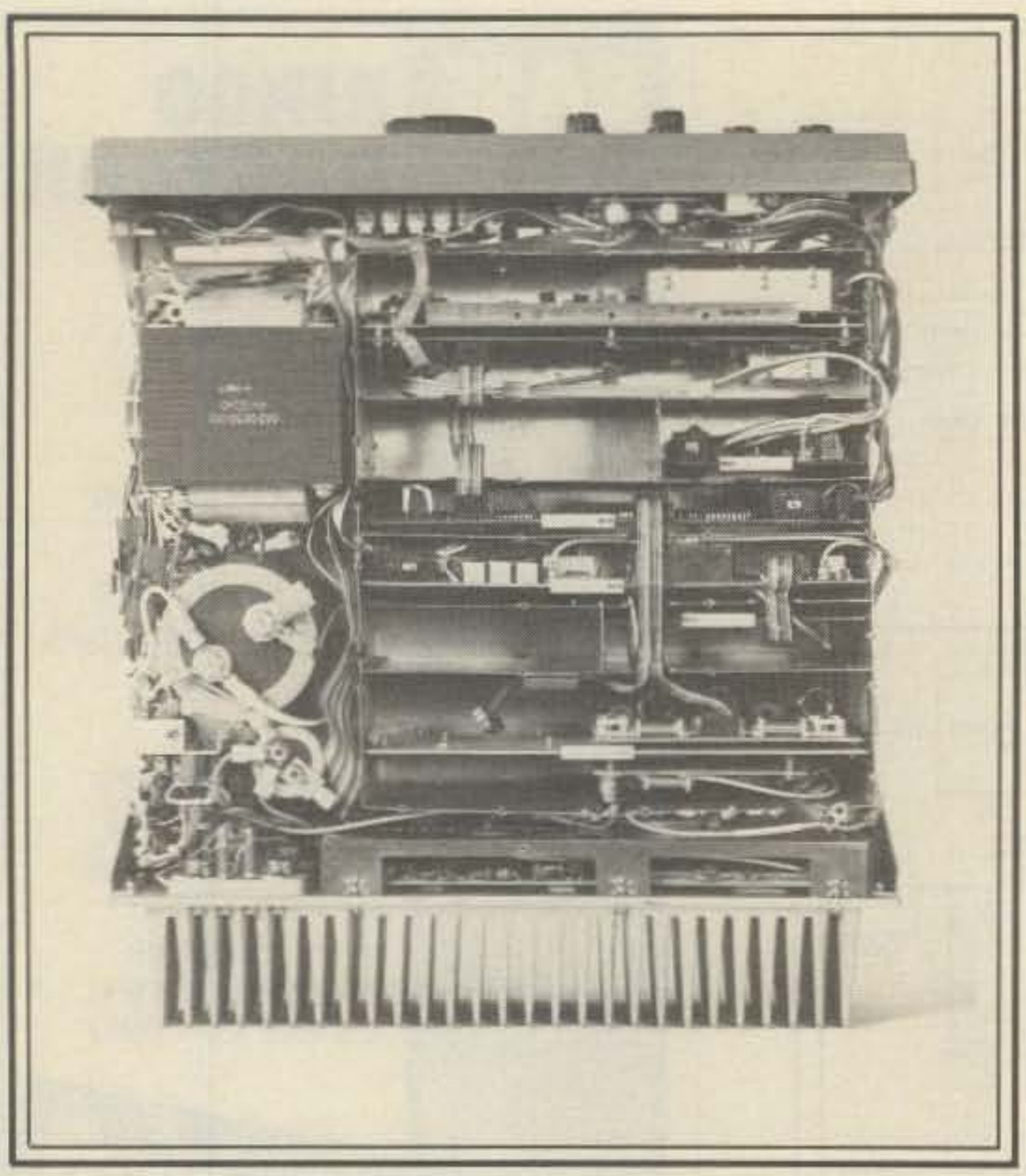


Fig. 2– Block details of the receive chain in the KWM-380.

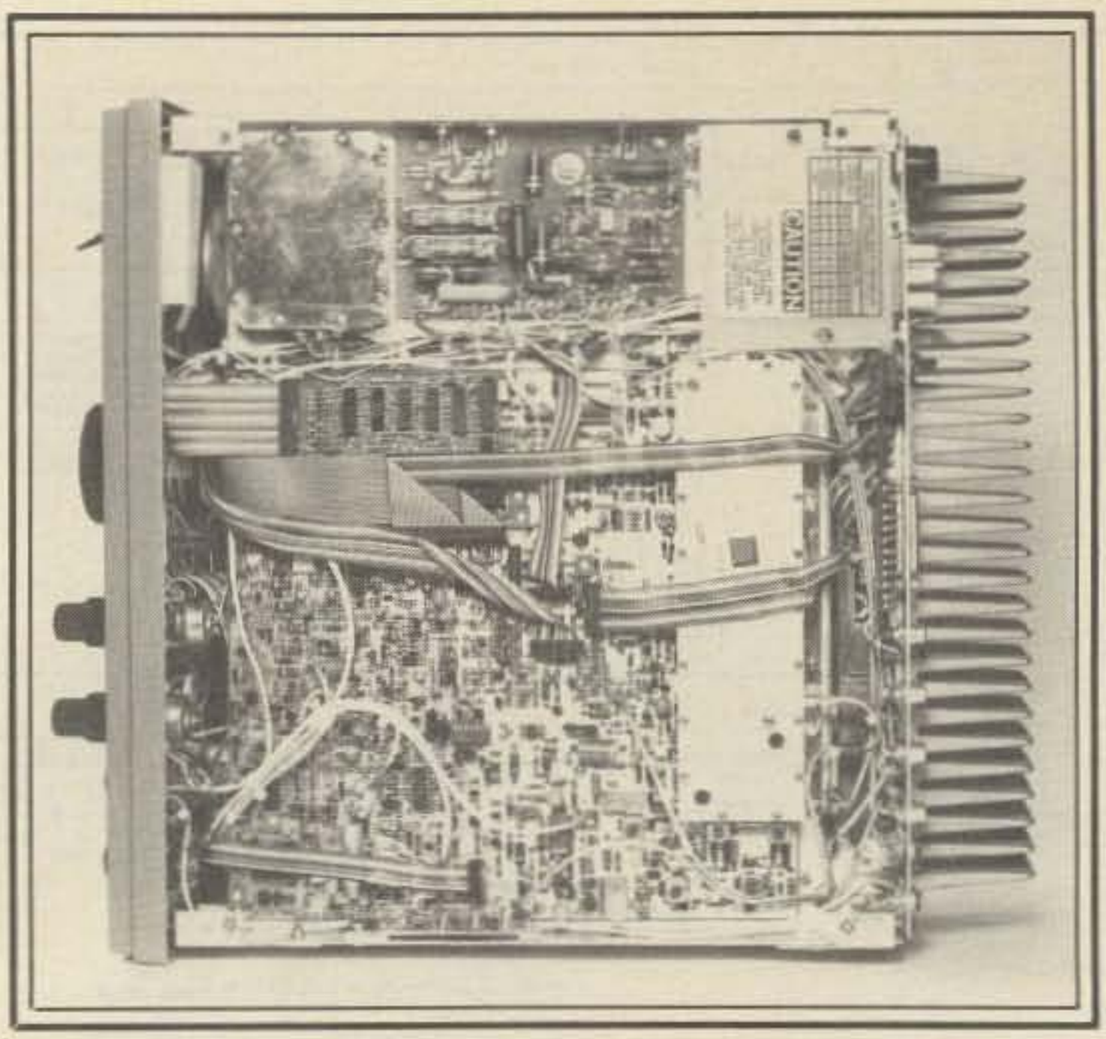
commands a central position as regards accepting input commands from the frequency tuning controls and then sending out data to various blocks such as those for the synthesizer, frequency display, and high-pass and low-pass filters. The CPU itself is a type 6802. There would be no point in going into all the complex circuitry within the microprocessor and its associated blocks. For example, there are several complex PLL loops within the synthesizer. But, the general concept of control exercised by the microprocessor is interesting. It accepts tuning information from the main tuning knob via photochoppers and senses if the tuning knob rotation is *up* or *down*. It also accepts tuning rate control information from switch settings. It then supplies this data to the synthesizer for frequency generation in 10 Hz steps and to the frequency display for readout to 10 Hz steps. When certain frequency limits are reached, it sends controls to diode switch *in* or *out* high-pass filters in the receive signal chain and relay switch low-pass filters in the transmit signal chain.

Frequency set information is stored for the two A/B v.f.o.'s in the KWM-380 during operation, and the two frequencies can be anywhere within the operating range of the transceiver. However, when power is turned off and then turned on again, the v.f.o.'s are always reset to 15 MHz. The frequency generation and control is arranged such that frequency coverage is continuous without any break for "bands." That is, if the fastest tuning rate is chosen, three revolutions of the tuning knob will completely set the transceiver on any desired frequency between 3.000.00 and 29.999.99 MHz (receive mode; transmit mode is limited to amateur band segments). The other selectable tuning rates are 200 kHz, 20 kHz, and 2 kHz for one main tuning knob revolution.

Fig. 5 shows a few details of the transmit chain in the KWM-380. The basic modes generated are s.s.b. and c.w. For s.s.b. generation a d.s.b. signal is generated at 455 kHz in balanced modulator U501. The signal is then routed through the 2.1 kHz filter contained in the passband tuning circuit used on receive and translated again to 455 kHz as an s.s.b. signal. On transmit, a front-panel mode switch automatically sets the variable oscillator in the passband tuning circuit so a selected l.s.b. or u.s.b. signal is generated. In this manner, and considering the action of the passband tuning control on



Removing the overall shell cover on the KWM-380 plus an internal shield cover, this is what one will see. The individually shielded compartments on the right contain various PC boards, while the internal power supply components (transformer, filter capacitor, etc.) are seen to the left.



Looking inside the bottom of the KWM-380 with its cover removed, one sees basically one huge, double-sided PC board which contains the basic receive/transmit circuitry (excluding filters, oscillators, frequency readout circuitry, etc.). Note the extensive use of ribbon-type cable with connectors.

receive, one has independent control of sideband selection for transmit/receive. The 455 kHz s.s.b. signal is further frequency translated up to the final operating frequency by the same mixer/oscillator circuits active in the receive mode. The signal reaches the 100 mW level in broadband amplifier stage Q202-204 and is fed on to a power amplifier block.

For c.w. operation, the 455 kHz carrier signal normally injected into the balanced modulator is diode switched into the 455 kHz i.f. chain preceding the passband tuning block. This 455 kHz carrier signal is also gated for c.w. keying by a diode switch, Q503, which is controlled by a pulse shaping circuit, U500C, which provides for controlled rise and decay times during c.w. keying. The c.w. keying circuitry also activates a sidetone oscillator feeding the microphone preamplifier stage. This is provided so the VOX circuitry can also be used on c.w. for receive/transmit switching. The sidetone output is not used to generate a c.w. carrier. The VOX circuitry provides for separate "delay" control settings in the c.w. and s.s.b. modes.

On both s.s.b. and c.w. the output level essentially can be adjusted for QRP levels to full output. On s.s.b. this is accomplished by control of the microphone amplifier gain and on c.w. by circuitry which directly controls the r.f. carrier level via controlled biasing of the a.l.c. loop.

Metering provides for monitoring the a.l.c. level, using the same scale as for S readings on receive, and for direct reading of forward and reflected power levels as sampled at the output of the power amplifier.

Physical Construction

As was mentioned before, the KWM-380 is not a "light-weight" unit. But, the weight, besides deriving from a built-in power supply, comes about from absolutely solid construction. This is initially apparent from the front-panel controls and switches which are all well-dimensioned and of excellent quality. Taking a look at the back of the KWM-380 (see photo), one sees a massive cast aluminum heat sink which covers most of the rear of the unit. It wasn't measured, but I would easily estimate that it contains more square inches of cooling area than are contained on the heat sinks of some 1 kw conduction-cooled linear amplifiers. The back panel view also shows the nice layout of the connectors used, ranging from the antenna and a.c. power connectors on the left to the various connectors for linear amplifier control, speaker, key, etc., on the right side. The special connector in the center is for a special keyboard control option (described later).

To get at the inside of the KWM-380, one has to unscrew and slip off a complete wrap-around, perforated steel shell as can be seen in the rear view photo. Looking inside from a top view, one sees the power supply components on the left side and a multi-shielded compartment on the right side containing various PC boards. Very extensive use is made of ribbon cable interconnecting runs, which are long enough so any individual PC board can be removed for test/replacement without using extender cards. Although it is not too easy to point out, the single internal crystal oscillator which locks the frequency synthesizer is in its own separately shielded compartment on one of the front PC boards. The power amplifier is in a separately shielded compartment at the rear of the unit.

Taking a look at the exposed underside of the transceiver (see photo), one again sees the very extensive use of interconnecting cables between PC boards. The PC boards in themselves are quite interesting to study. They are of a high-quality glass epoxy type with fully plated-through holes, where applicable. Someone at Rockwell/Collins must have given "orders" that no component may be diagonally mounted on a PC board, and even disc ceramic capacitors have to be absolutely lined up at "attention" rather than being allowed to find their often rather natural, helter-skelter mounting state.

Seriously, however, the physical construction of the KWM-380 has to be rated as excellent. Any constructional feature that one looks at augurs for a very long service life for the unit along with reasonably easy service possibilities should a component or board require replacement. Not to detract from the foregoing

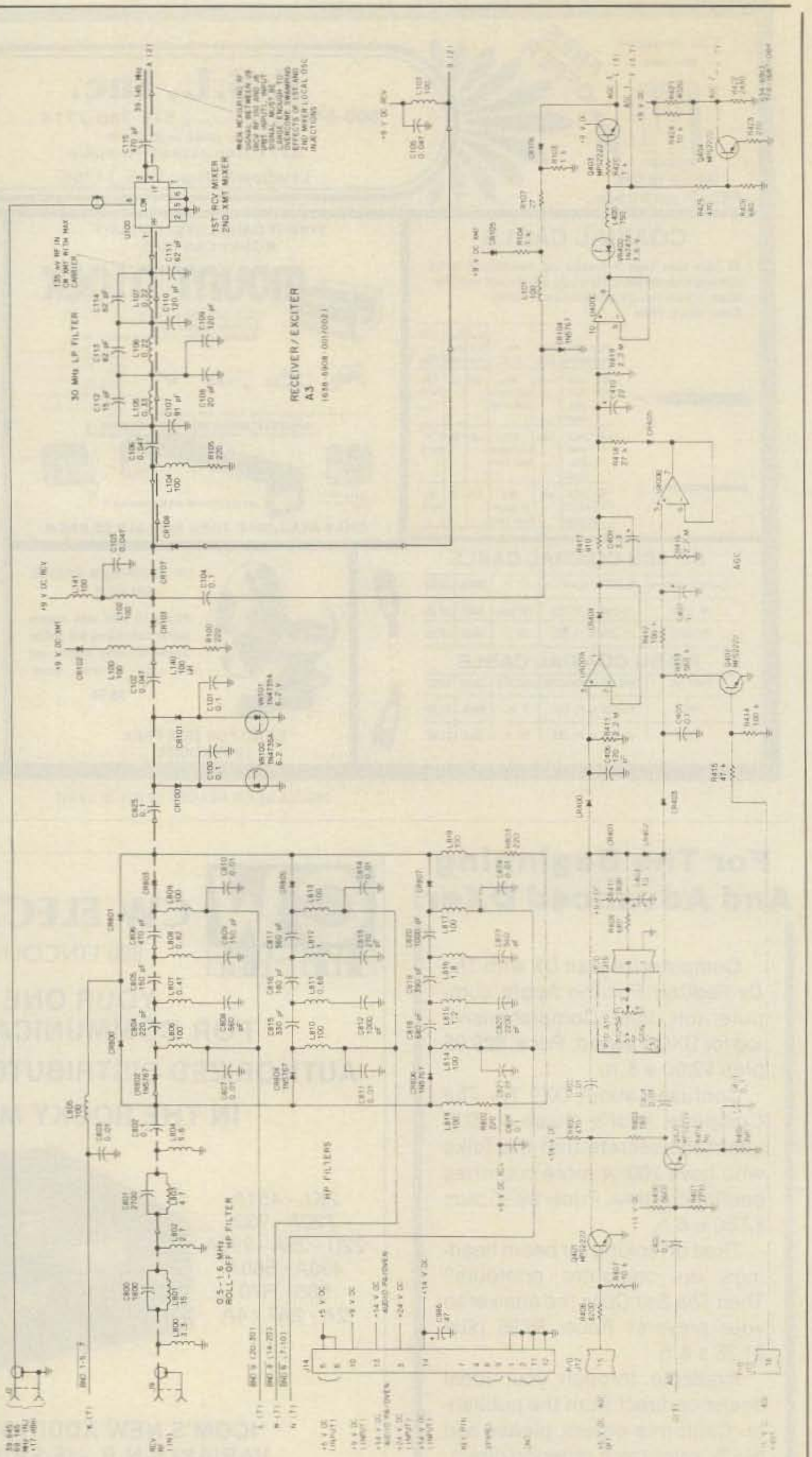
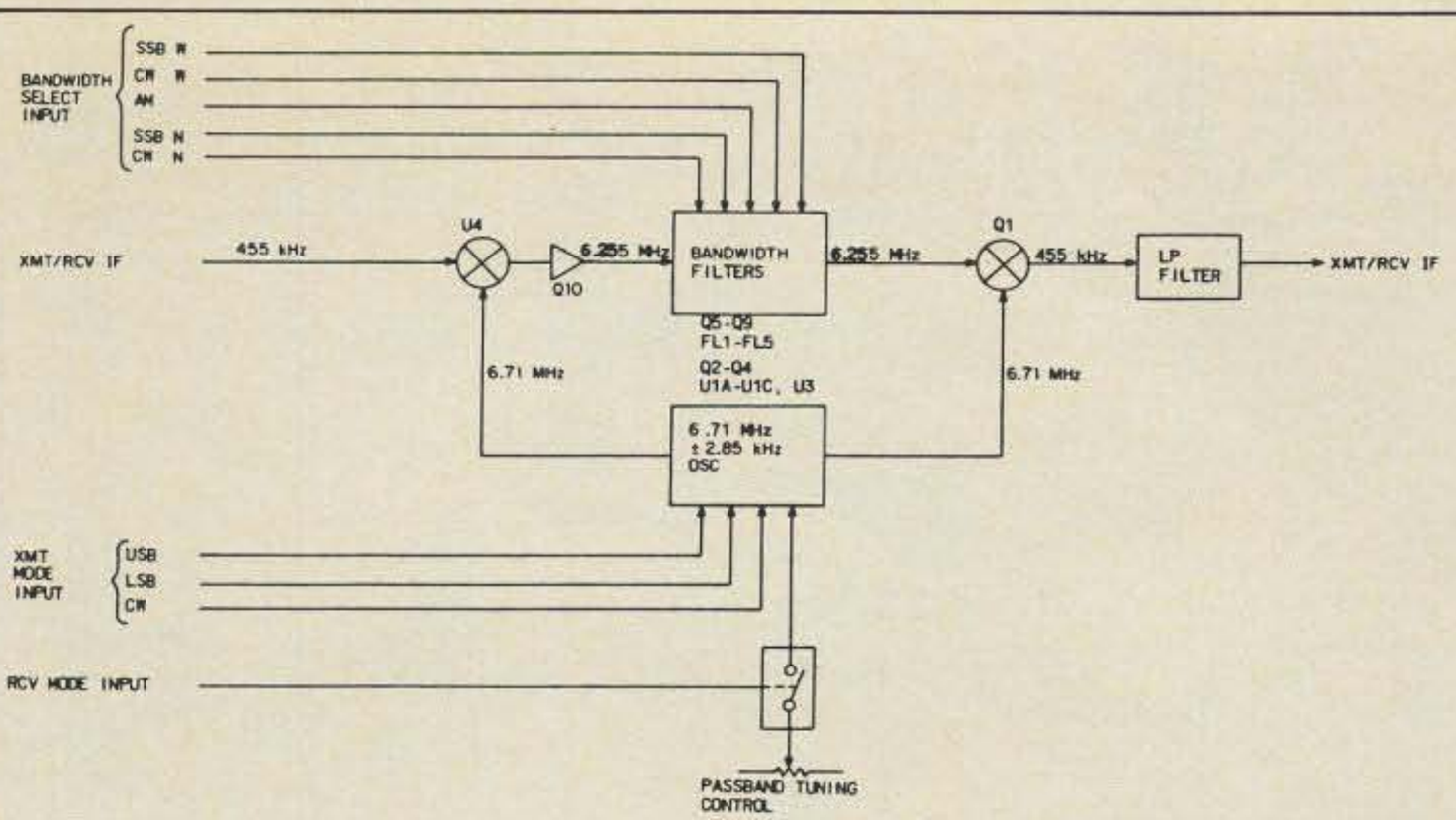


Fig. 3– Unusual "front-end" circuitry used in the KWM-380.

but yet to give the reader a complete picture of the KWM-380, one should mention two things. If one is going to use the KWM-380 under extreme environmental conditions, one has to take note of the perforated covering used. Obviously, operating placements subject to conditions such as a heavy salt-water-laden atmosphere give rise to possible problems. The other point—an extremely minor one to be sure—concerns the microphone input jack. It requires a special PJO-68 plug



(A)

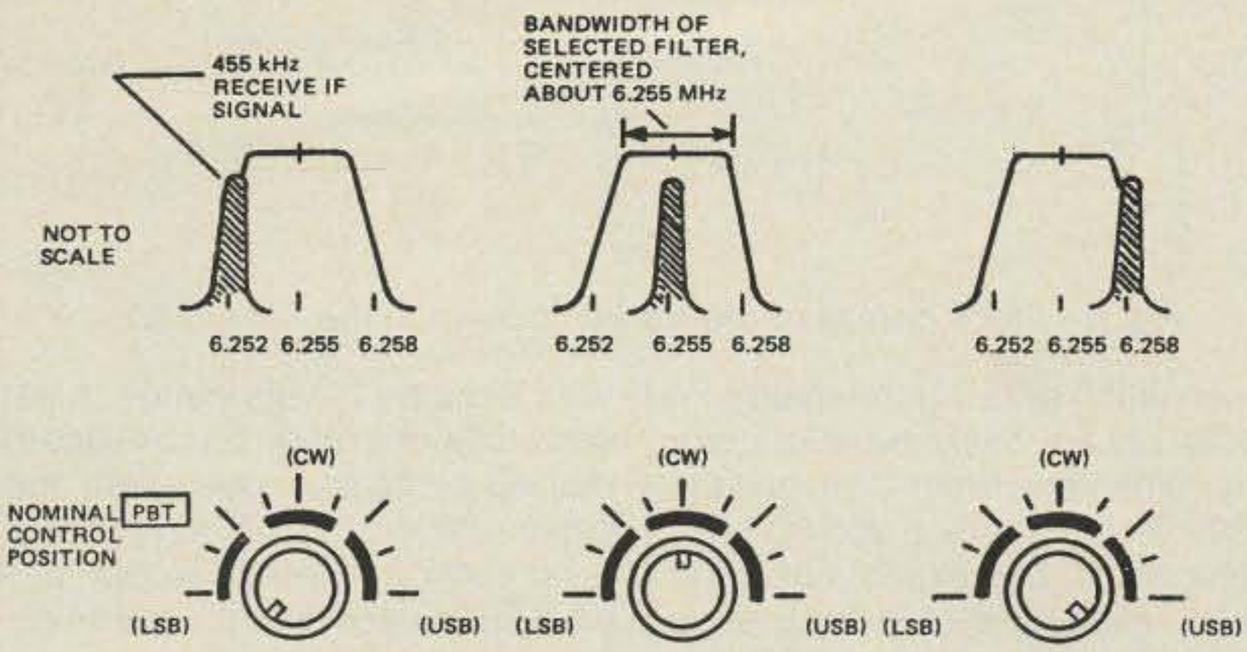


Fig. 4– (A) Basic passband tuning scheme used in the KWM-380. (B) An illustration of how an incoming signal is affected.

fairly common in military and commercial communications spheres but practically unused by radio amateurs. It has been the standard Collins plug for many years.

Test Results

Table I gives the claimed specifications for the KWM-380. To say the least after bench testing a unit, one should regard them as very conservative if not downright deliberately understated.

On the receive side, the KWM-380 greatly exceeded almost all of its claims. The sensitivity ranged around the 0.3 to 0.4 microvolt range for 10 dB STN/N ratio on s.s.b. throughout its tuning range. However, much more significant was the excellent dynamic range. The third order intercept point for 20 kHz spaced signals plotted consistently out in the range of + 14 to + 18 dBm (usually the latter). The synthesizer noise floor could hardly be found with the test equipment available. An educated estimate has to remain at better than – 100 dB.

The synthesizer design is undoubtedly a big part of the secret of the KWM-380's performance. Among other things, it allows the excellent shape factor of the s.s.b. filter to provide meaningful results in practice. The stability was only measured at room temperature rather than over the temperature range specified. A variation of only a few Hertz could be discerned over an operating period from turn-on to an hour or so later. I.f. and image rejection exceeded 70 dB. And, where did all the "birdies" and spurious responses go that one often accepts as being normal with amateur radio equipment designs? I got tired of searching for them. Perhaps there are a few of mini-microvolt proportions someplace, but certainly none are apparent. The S meter requires about 100 microvolts to indicate S9. This is more than the 50 microvolt standard for S9 frequently used, but of more importance is that the S meter response of the KWM-380 is linear within a few dB as signal levels change. So, one can provide a meaningful report to another station when testing antennas, audio devices, etc.

On the transmit side, there is no question that the KWM-380 will deliver a good 100 watts output over all of the amateur bands. It probably could be adjusted to provide 1½ times that power level and for normal s.s.b. operation would run just as cool. There is no fan included in the standard KWM-380, nor is one needed for normal c.w. or s.s.b. operation thanks to the huge PA heatsink on the rear of the unit. For AFSK RTTY operation over extended periods, there is an optional blower kit available which allows 100 watts average output with a 50% duty cycle to be maintained for one hour under keyed conditions! The power amplifier stage contains all sorts of protective circuitry, including the usual thermal and s.w.r. protection. It also contains a rather different forward power averaging circuit. This circuit senses forward power with a long time constant. If the forward power averages too high for too long, it activates a.l.c. circuitry to reduce the PA output in steps down to 20 watts. Output spurious products, including harmonics, were always below – 50 dB and sometimes ranged down to – 70 dB.

However, the most interesting aspect of the transmitted signal was the third-order IMD products. They measured – 32 to – 35 dB from PEP using a two-tone test signal. So, for all practical purposes, the KWM-380 IMD products are as good as any 100 watt class power amplifier using the ubiquitous 6146B tubes, and there is no tuning. The KWM-380 contains an internal power supply which can be strapped for input voltages ranging, in steps, from 105 to 250 volts. It can also operate directly from a 12–15 v.d.c. source. Using the latter, about 3 amperes are drawn in the receive mode and up to 18–20 amperes for 100 watt c.w./s.s.b. operation.

Operating Impressions

As was mentioned before, the transceiver is reset to 15.000.00 MHz when it is turned on. So, one first sees those digits appear rather impressively in their approximate 1 inch height above the main tuning knob. The group of push buttons above the knob controls the tuning rate, locks-out the tuning knob from changing the frequency which has been set, and can be used to synchronize the frequencies of the two built-in v.f.o.'s. Once one gets used to the rather strange symbols used for the tuning-rate buttons, it is rather easy to set up for operation, for example, on 21.195.00 MHz. One presses the ⌐ button for 1 MHz increments and turns the tuning knob less than a full turn until a reading of about 21 MHz appears. One then would normally press one of the ⌜ buttons for a 20 kHz/knob revolution rate to quickly finalize the frequency at 21.195.00 MHz. It takes longer to write about it or to read about it than it takes to accomplish it.

The **Mode** switch is used to select the desired transmit mode, and the **Passband**

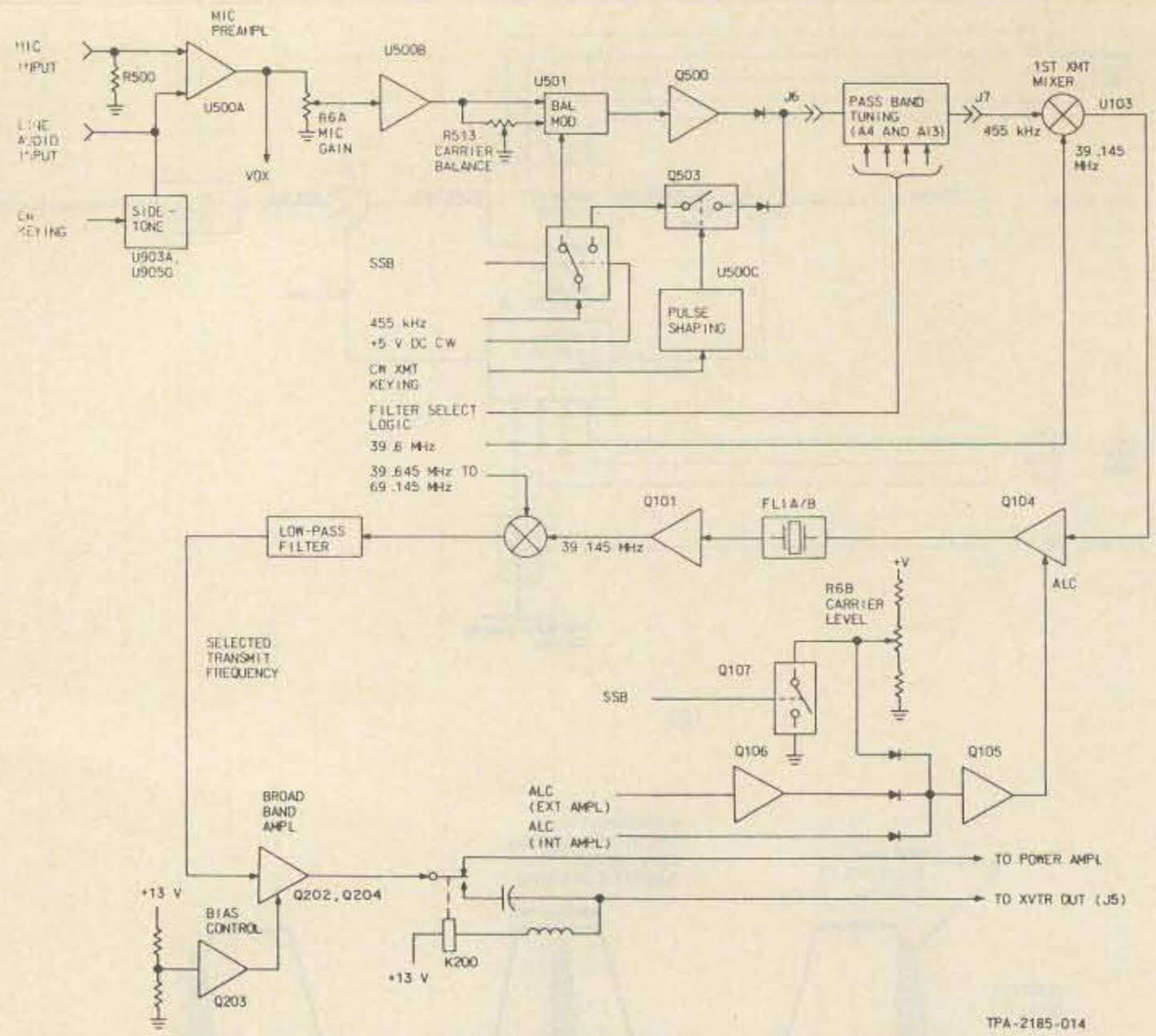


Fig. 5– Block details of the transmit chain in the KWM-380.

Tuning/Selectivity control is set to the desired receive sideband and i.f. bandwidth. There is nothing more to set up or tune on the transceiver, and it is "ready to go" assuming that one has previously chosen VOX or MOX (PTT) mode, a.g.c. speed, speed processor in/out, etc. If one has to adjust an antenna tuner, the **Mode** switch on the KWM-380 can temporarily be set to **CW** and the **Mic/Carrier Level** control used to increase carrier output while the reversed power reading is observed and the antenna tuner is adjusted for minimum indication.

The tuning "feel" of the main tuning knob is extremely good. It feels slightly "heavy," yet turns easily. The other knobs are also very well dimensioned. For instance, the concentric **AF/RF Gain** control knobs are not the disaster found on some receivers. The **RF Gain** knob can readily be manipulated, which c.w. buffs should greatly appreciate.

If one set up the transceiver as mentioned for 21.195.00 MHz (with the v.f.o. switch at **A**) and then suddenly remembered a net on 3.897.50 MHz, it's a simple matter to set the v.f.o. switch to **B**, switch-in the appropriate tuning rate buttons, manipulate the main tuning knob a bit, and be set up on 3.897.50 MHz. One can then switch back and forth between the v.f.o. **A** and **B** settings for actual operation or for just monitoring purposes. The v.f.o.'s can also be set so one controls only the transmit frequency. In other words, half-duplex operation can be carried on between any two amateur bands. If one presses the **Sync** button, the two v.f.o. frequencies align themselves, yet one can be used to control transmit and the other to control receive. In fact, this can be used as a very sophisticated RIT option since the digital display will indicate the exact transmit/receive frequencies and one has independent tuning of each. One only has to remember that the KWM-380 will transmit in the s.s.b. mode as set by the **Mode** switch and receive l.s.b. or u.s.b. as set by the **Passband Tuning** (PBT) control. Of course, once one gets used to the very flexible dual-v.f.o. capability of the KWM-380, one wishes there were a half dozen more such v.f.o.'s so one could store various frequencies within a band and various general-coverage frequencies. In reality, such a provision is provided (see accessory items described next).

The impression that one gets as one uses the KWM-380 on receive both within and outside the amateur bands is its extremely "clean" performance. There is absolutely no hint of overload under the strongest weekend signal conditions, and its uniform sensitivity makes it a completely realistic general-coverage receiver as well as an amateur band transceiver. The "hang" a.g.c. action is excellent, being long enough in time constant to combat QSB, yet not being too delayed to provide full sensitivity once a signal drops out. The sensation of using the main tuning knob to continuously tune is quite something. When one tunes from an indicated 5.999.99 to exactly 6.000.00 MHz the first few times, one expects all sorts of relays to resound, etc. In fact, all is quiet and "bands" for the operator in a practical sense no longer exist.

The audio quality produced by the front-panel-mounted speaker is perfectly adequate for normal station operation and obviates the need for any accessory speaker (none is offered for the KWM-380). The various optional filters provide for just about any selectivity problem. But, one must face the fact that the KWM-380 does not offer true variable bandwidth i.f. tuning nor a notch filter. Are they necessary? I would say no if one purchases the various optional filters available for the KWM-380, but of course, this does become a price question.

On transmit the KWM-380 consistently produced comments regarding its good audio quality. It has signal "punch" but with a "clean" sounding audio, used either in its basic configuration or with its optional speech processor (described under accessories). Perhaps one reason for this is its shaped frequency response of 300 to 2400 Hz on transmit with only a few dB's level variation within that passband. Another reason is undoubtedly the sophisticated a.l.c. system used, which keeps the average to peak level power level output closely linked. VOX operation was very smooth. C.w. operation was not tried as extensively as s.s.b. operation, but the KWM-380 appears to be as excellent a c.w. transceiver as an s.s.b. one. The separate **C.W. Delay** control on the VOX circuitry is very handy to set up for semi-QSK operation on c.w. Used for normal s.s.b. or c.w. operation, the transceiver will run "cool" indefinitely. There is no cooling needed (except for extended RTTY operation), so operation is perfectly quiet.

Accessory Items

There is an extensive line of optional and accessory items available for the KWM-380. The internal mount optional items include WARC conversion, various i.f. filters, a noise blanker, a speech processor, and a control interface. The outboard accessory items range all the way from different types of microphones and headphones to a blower kit for the heatsink. Some items have been mentioned in passing before, so only a few will be covered in detail.

The WARC conversion consists of replacing an ROM IC on a PCB within the transceiver. The conversion requires the removal of some 39 screws to get at the required PC board. Some versions of the PC board have the IC socketed and some do not. So, the conversion either can be extremely simple or require a bit of soldering. In any case, the conversion will result in the frequency coverage change shown in Table II. Note that the conversion not only provides for WARC coverage, but also expands the 80–15 meter bands for MARS transceive coverage.

The optional speech processor available for the KWM-380 is of a completely new design and a patent is pending on it. It is an audio processing type, but hardly a simple compressor or clipper. In its literature, Collins concedes that the gener-

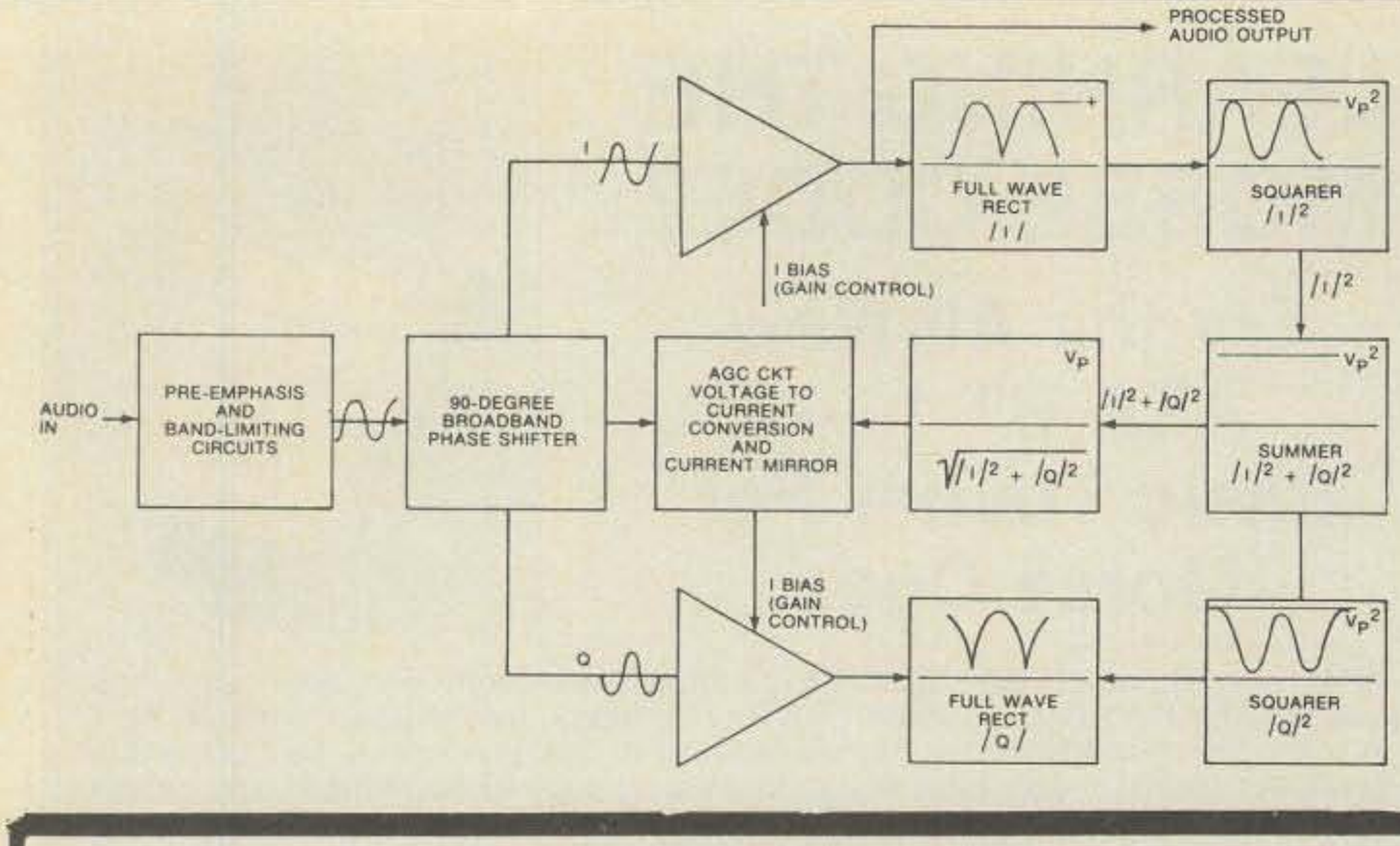


Fig. 6– Block diagram of the circuit functions in the new type of AF speech processor which is an option for the KWM-380.

al consensus is that r.f. speech processing provides the best results, but with some undesirable harmonic distortion and r.f.i. as inherent in any clipping action. They claim their method is as good as r.f. processing without any of its disadvantages. A block diagram of the processor is shown in fig. 6. The actual physical unit is a PC board measuring about 4¼ " × 4½ " and contains some 13 IC's and 8 transistors. A later article may explore the concept of this item in depth, but the general idea, as shown in fig. 6, is that the microphone signal is divided into two 90 degree phase shifted signals which are detected and recombined and produce a d.c. signal proportional to the peak signal at the detectors. The gain of the phase amplifiers is regulated to produce an a.f. signal with *peaks* maintained at a preset threshold. Harmonic distortion is claimed to be about 1½ % across the 300–3000 Hz range for about 15 dB of voice processing. From tests made with the KWM-380 there is no doubt that the optional processor does add something in the order of 4 to 6 dB of apparent increased signal intelligibility with no apparent distortion. It works and works extremely well, but whether it is the ideal solution to the question of speech processing remains open. In any case, it is an outstanding advance in audio-type processing.

The Control Interface option is innocuous sounding, but it adds tremendous versatility to operation of the KWM-380. The option itself consists of a PC board assembly and a connector which is for inter-connection with a user-supplied external key pad (any sixteen button, two-out-of-eight device) or possibly a home computer with parallel interface capability. In any case, the interface allows for the digital selection, storage, or recall of frequencies (the storage/recall capability being either 10 or 11 frequencies, depending upon whether the WARC option is installed).

Using a key pad, the operating frequency can be selected from either the main tuning knob or the key pad. One simply enters the frequency desired digit by digit. The frequency being entered on the key pad is displayed, but the transceiver's operating frequency is only changed when an "enter" key is depressed. The interface PC board contains memory locations for 10 (or 11) frequencies inde-

Band (Meters)	Without SB 10 (MHz)	With SB 10 (MHz)
160	1.8 to 2.0	No change
80	3.5 to 4.0	3.25 to 4.25
40	7.0 to 7.3	6.75 to 7.55
30	—	10.10 to 10.15
20	14.0 to 14.35	13.75 to 14.60
16	—	18.060 to 18.170
15	21.00 to 21.45	20.75 to 21.70
12	—	24.890 to 24.990
10	28.0 to 29.7	No change

Table II– Transceive frequency coverages of the KWM-380 when the SB 10 WARC option ROM is installed.

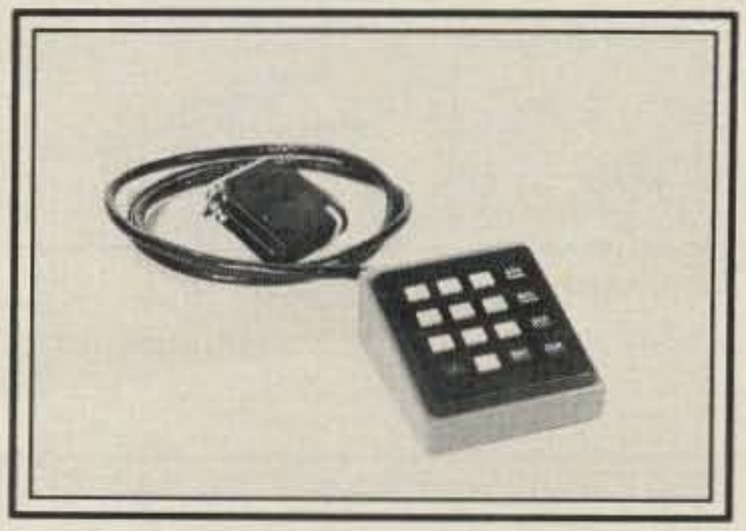
pendent of the two v.f.o. registers. To store any frequency, it is entered by keyboard selection and addressed to a desired memory location (e.g., 1, 2, 3, etc.). The transceiver can continue on its tuning knob selected operating frequency, if desired, during the process. Or, the current operating frequency can be stored by a store and memory location key pad command. Recalling a frequency consists of pressing a recall key and a memory location. This action loads the stored frequency into the v.f.o. register in use (A or B) and sets the transceiver's operating frequency to the recalled frequency. One can also use key pad commands to manually step the transceiver through each memory starting from the present memory location in use. Blank or cleared memory locations are skipped during the manual stepping process.

The key pad frequency control option obviously adds all sorts of operating possibilities to the KWM-380, ranging from serious DX chasing across several bands if desired (remember, there is no bandswitch) to switching to a news program during a boring net session. Removing power from the transceiver will clear all memory locations.

Manual and Service Notes

An operating manual does, of course, come with the KWM-380, and it contains very clear, practical information for getting the unit into operation. It has a multitude of photos and illustrations all directed towards telling the operator how to hook up the transceiver, which controls to turn for various functions, etc. It also contains a limited amount of information on maintenance and some PC board interconnection data, so if a PC board is exchanged, one can understand which interconnecting cables are involved.

A separate, quite elaborate service manual is available for about $40. This manual is extremely complete with thorough information on PC board layouts, schematic diagrams, alignment and test data, etc. Complete parts data is given along with the name and address in the U.S. of the manufacturer of every component used (except common resistors, capacitors, hardware, etc.). The manual also contains a complete set of service bulletins issued for the KWM-380 and a



The KWM-380 can be remotely controlled by a key pad such as the one shown here (or a similar one supplied by the user). A control interface option has to be installed in the KWM-380 to use the key pad, but then one will have key-pad control of frequency entry, storage, and recall. If one imagines the key pad on the right of the front-panel view of the KWM-380 showing the microphone on the left, one has a completely integrated, automated h.f. station.

postcard reply form which will put the purchaser on automatic distribution for all future service bulletins as long as the KWM-380 remains in production. Quite a few such service bulletins were issued up to January 1981. The last one contained in the manual reviewed was dated August 1981 and was only information on WARC conversion.

Dealer and factory service for the KWM-380 is available and there is a one-year warranty. Those restricted to certain APO/FPO addresses, however, might note that the KWM-380 is too large (with packing) for Parcel Post shipment, and freight shipment must be used.

Summary

The KWM-380 is an outstanding piece of equipment. It offers extremely sophisticated operating capabilities using state-of-the-art technology, but without a front panel so cluttered with knobs, push buttons, and switches that one misses out on the fun of operating while trying to figure out how to operate a transceiver. It is not inexpensive. But, its design concept is sound, and, as Rockwell/Collins is willing to put in black and white, "No yearly model changes. As circuit improvements and modifications are made to the KWM-380, its style does not become obsolete." ■

NO-61-62

Awards

a monthly feature by
A. EDWARD HOPPER, W2GT

NEWS OF CERTIFICATE AND AWARD COLLECTING

The November Story of the Month as told by Paul is:

Paul I. Wells, W4LQF
All Counties #323, 4-22-81

"I was licensed as W5HRV in 1938 at Denison, Texas, my old home town. As a National Guardsman, I operated and trained personnel in the use of Army field radio equipment during the pre-WW II years. Much of this equipment was of quite old design—possibly WW I, or at best post-WW I.

"I was mobilized with the 36th Signal Company, 36th Infantry Division, Texas National Guard for WW II training and service. Overseas service included Morocco, Algeria, Italy, France, Germany, and Austria. Ended WW II as Commanding Officer, 36th Signal Company.

"Remained in the Army after WW II and saw further service as Military Advisor to the Office of the Chief Signal Officer, Korean Army (1950–1952); and Planning Officer, Headquarters, U.S. Army Communications Zone, Orleans, France (1955–1959). Saw service with the military expedition to Lebanon (July–November 1958). All Army service was with the Signal Corps. Retired from military service in December 1960. Was employed as a Department of the Army Civilian from 1962 through March 1974.

"Operated my amateur station as F7AT while on duty in France from 1955–1959. Made my first application for USA-CA-500 through 1500 in March 1979.

"Married my wife, Louise, on January 4, 1936, and we have one son, Paul R. Wells, WA3HFL, of Newark, Delaware, who has two sons, Paul and Kurt.

"Am life member of the ARRL, QCWA member #9516, member of the Army MARS System, and life member of the VFW.

"Many thanks to *CQ* and all the wonderful County Hunters."

Awards Issued

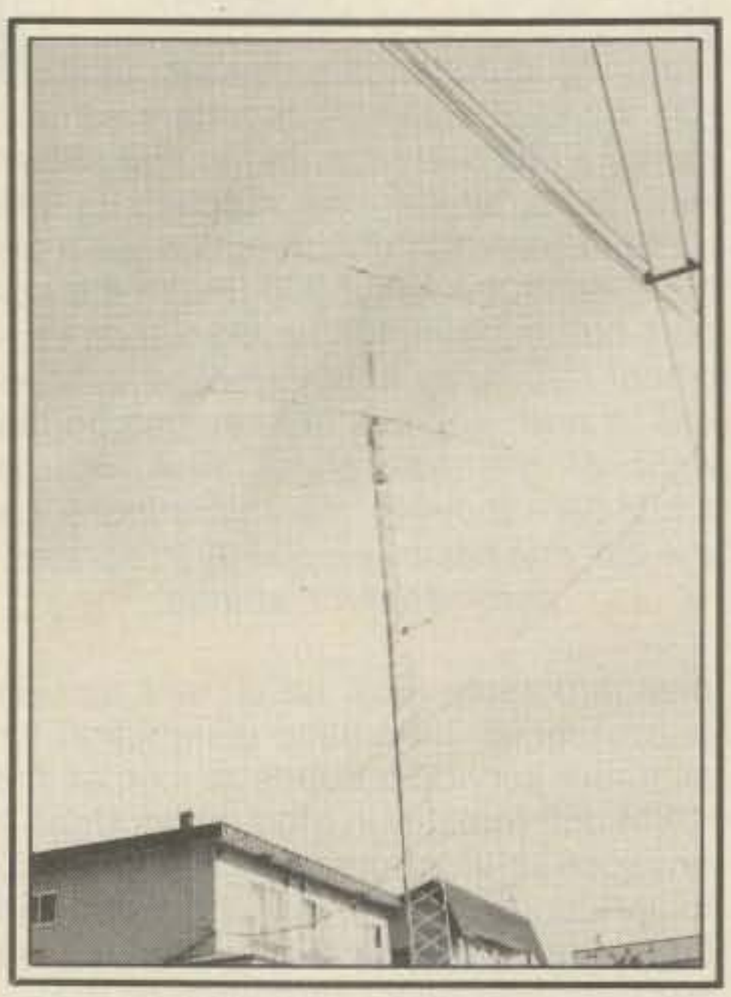
Vic Fitzgerald, WB0LOU, waited until he had them All and picked up USA-CA-500 through USA-CA-3000 endorsed All 2X S.S.B., All 20, All Mobiles; and All Counties endorsed All 2X S.S.B., All 20.

Jim Farner, KK5P, also waited until he had them All and acquired USA-CA-500 through All Counties endorsed All S.S.B., All 14, All Mobiles.

Bill Bell, KM4W (ex-WD4DAI), stayed in style by also waiting until he had them

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

Yasu, JH8GWW, winner of USA-CA-500 #1746 endorsed All 10 meter S.S.B., in his well-equipped radio room.



Antenna of JH8GWW at QTH 80 meters above sea level.

All to obtain USA-CA-500 through USA-CA-3000 endorsed All A-3, All 20, All Mobiles, and All Counties endorsed Mixed.

Dan Hammell, WA9EZT, claimed USA-CA-500 through USA-CA-3000 endorsed All S.S.B., All 75.

Ted Long, K0UQV, added to his collection USA-CA-2500 endorsed Mixed.

Bill Webb, WB1GOO, found time to do his paperwork to send for USA-CA-500 through USA-CA-2500 endorsed All S.S.B., All 14, All Mobiles.

Angelo Ferrari, I2PHN, qualified for USA-CA-500 through USA-CA-2500 endorsed All 2X S.S.B., All 20, All Mobiles. His 500 was #20 to Italy, his 1000 was #3, his 1500 and 2000 were #2, and his 2500 was #1 to Italy.

Roger Hansen, KL7HFQ (ex-WA7FHY), collected USA-CA-2000 endorsed Mixed (#2 to Alaska).

John Kray, KA2CNG, added USA-CA-2000 endorsed Mixed to his growing collection.

Inati Alcorta Goni, EA2IA, gained USA-CA-1000 endorsed Mixed (#1 to EA).

USA-CA-500 Certificates endorsed Mixed went to:

Chiaki Watanbe, JA2TK (#44 to Japan, #7 to JA2).

Tado Shimoichi, JA1WPX)#45 to Japan).

USA-CA-500 Certificates endorsed All C.W. were won by:

Horst Kampa, DJ8TJ.

James L. Jolly, W4YDL.

Dalbeni Romano, I2YJO, got USA-CA-500 endorsed All Phone.

Special Honor Roll
All Counties

#390 Roy Victor Fitzgerald, WB0LOU 7-12-82.
#391 James E. Farner, KK5P 7-23-82.
#392 William E. Bell, KM4W 7-31-82.

Awards

Island DX Award: This revised award is sponsored by the Whidbey Island DX Club and is available to licensed amateurs and shortwave listening stations worldwide. (This award is not to be confused with the Islands-on-the-Air Awards issued by Geoff Watts, 62 Bellmore Road, Norwich, NOR 72T, England.)

Awards are issued for 2X S.S.B., 2X C.W., 2X RTTY, and 2X SSTV, as well as Mixed and Single Band.

Fifty (50) IDX Islands are required for the basic award. Endorsements are given in increments of 50 islands, up to and including the maximum number of islands possible.

All DXCC countries which are bonafide "islands" are the only qualifying contacts. A special IDX Listing can be obtained for an s.a.s.e. or s.a.e. and IRC.

To be valid, all contacts must be made *after* October 1, 1977. To apply, prepare a list of contacts in prefix order. *Please*

Island DX Award.

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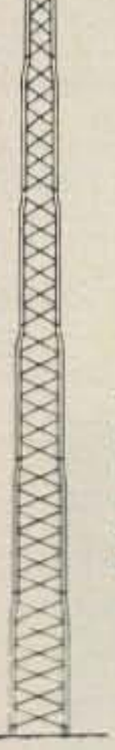

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And — Save even more — include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! Hows that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

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HF6V	80-10 mtr. Vertical	$129
TBR 160HD	160-mtr. Coil Kit	$ 49
RM KIT	Roof Mount w/Stub Tuned Radials	$ 39
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A4	4-El. Triband Beam	$229
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20-3CD	3-El. 20 mtr. Beam	$179
20-4CD	4-El. 20 mtr. Beam	$239
15-3CD	3-El. 15 mtr. Beam	$ 99
15-4CD	4-El. 15 mtr. Beam	$109
10-3CD	3-El. 10 mtr. Beam	$ 76
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 65
424B	24-El. 432 MHz "Boomer"	$ 63
214B	14-El. 2 mtr. "Boomer"	$ 69
214FB	14-El. 2 mtr. FM "Boomer"	$ 69
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ARX450B	450 Mhz "Ringo Ranger II"	$ 38
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A144-10T	10-El. 2 mtr. Satellite Antenna	$ 45
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TH3JRS	3-El. Triband Beam	$159
TH2MK3S	2-El. Triband Beam	$139
HY-QUAD	2-El. Triband Quad	$279
402BAS	2-El. 40 mtr. Beam	$199
205BAS	5-El. 20 mtr. "Long John"	$299
155BAS	5-El. 15 mtr. "Long John"	$179
105BAS	5-El 10 mtr. "Long John"	$119
204BAS	4-El. 20 mtr. Beam	$229
203BAS	3-El. 20 mtr. Beam	$139
153BAS	3-El. 15 mtr. Beam	$ 79
103BAS	3-El. 10 mtr. Beam	$ 59
DB1015AS	3-El. 10/15 mtr. Beam	$159
64BS	4-El. 6 mtr. Beam	$ 55
66BS	6-El. 6 mtr. "Long John"	$109
18HTS	80-10 mtr. Hy-Tower Vertical	$339
18AVT/WBS	80-10 mtr. Trap Vertical	$ 95
214	14-El. 2 mtr. Beam	$ 35
2BDQ	80/40 mtr. Trap Dipole	$ 49
5BDQ	80-10 mtr. Trap Dipole	$ 99
BN86	80-10 mtr. KW Balun	$ 19

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144-148-13LB	13-El. 2 mtr. Long Boomer	$ 79
432-16LB	16-El. 432 Mhz. Long Boomer	$ 69
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½" Copper Hardline w/poly jacket	$1.10/ft.
½" Alum. H.L. Conn (UHF or N - Male or Female)	$15.00
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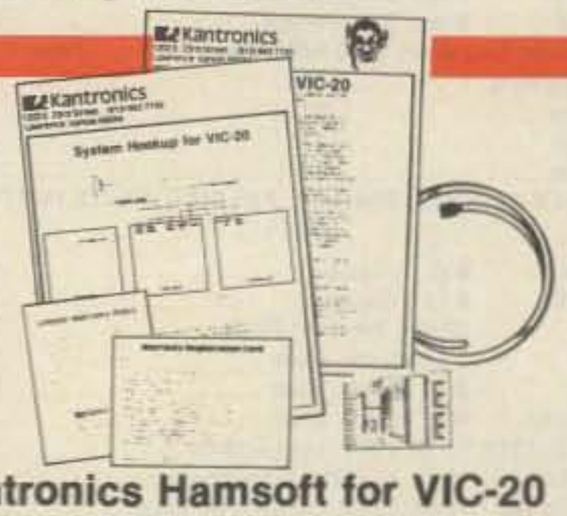

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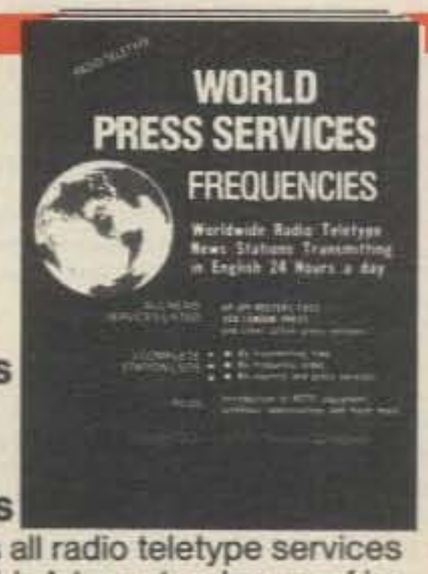

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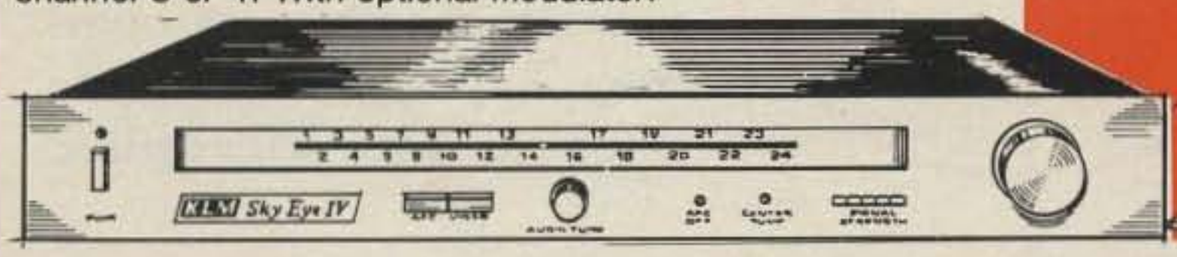
6. Chaparral feed horn: Provides 0.5 dB gain improvement over conventional rectangular horns. Virtually eliminates system noise.
Note: Customer provides all cables that run from downconverter outside to receiver inside (approx. cost $80). Customer can use conventional TV set tuned to channel 3 or 4. With optional modulator.



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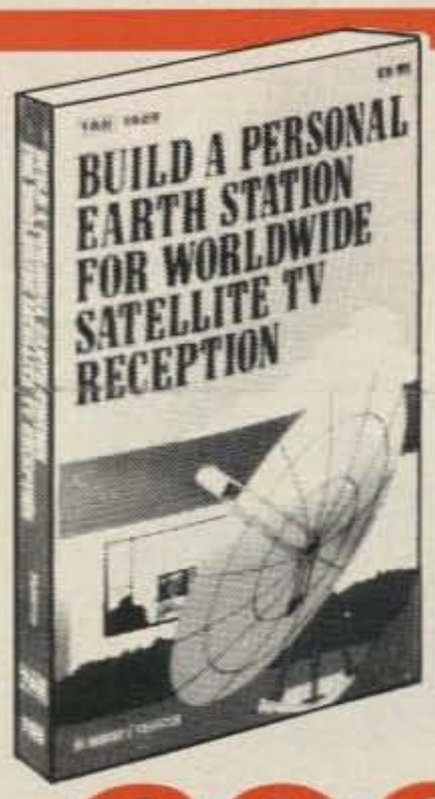

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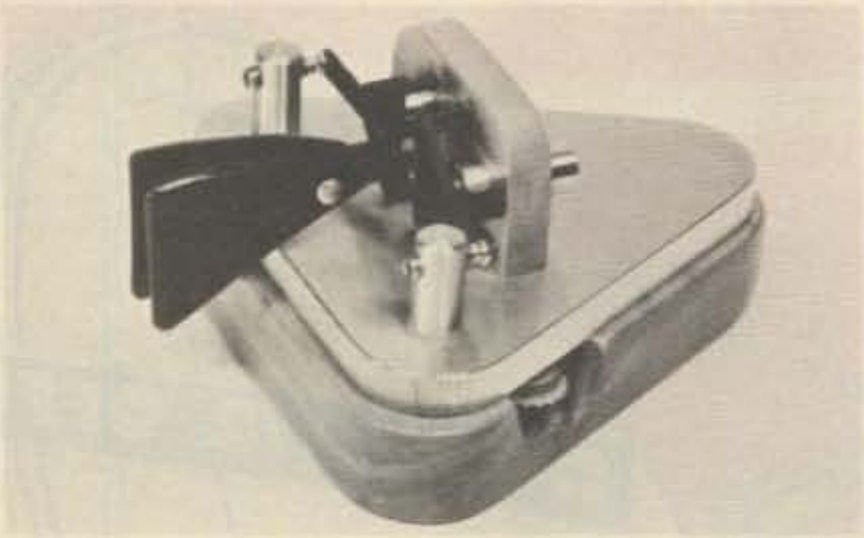

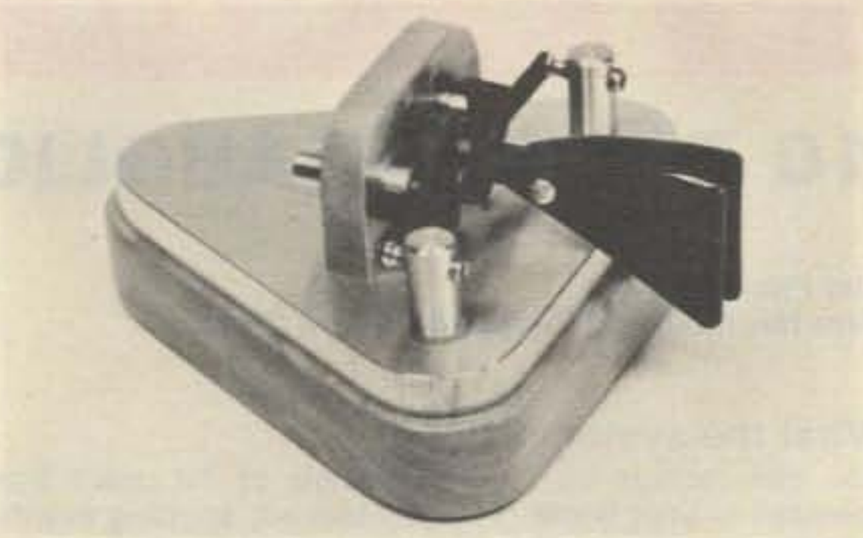

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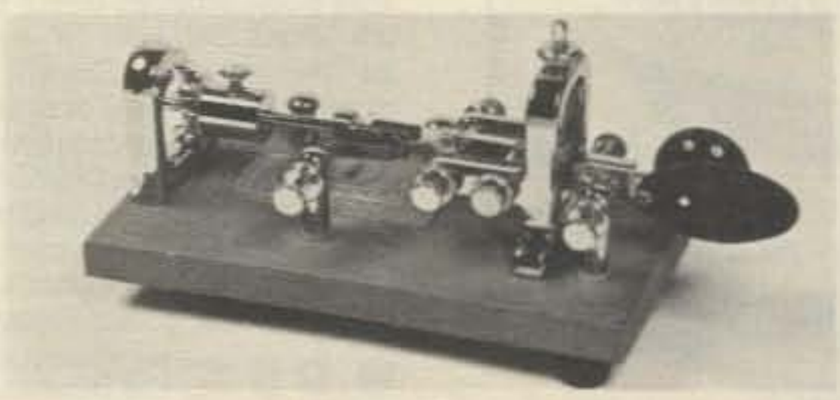

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CIRCLE 61 ON READER SERVICE CARD

number your contacts 1 through 50, etc. Include the call of the station worked, INDX Island name, band, mode, date, and GMT.

Do not send QSL cards! Have your list verified by two amateurs or local radio club officials. Confirmation of each contact must be in the applicant's possession and must be confirmed by verifying signatures.

Send your verified list of contacts with $4.00 in U.S. funds and a 4″×9″ business-size, self-addressed, stamped envelope to the following address (foreign stations may substitute the fee by enclosing twelve (12) IRCs: Whidbey Island DX Club, 2665 North Busby Road, Oak Harbor, Washington 98277.

10 Meter FM Award.

Ten Meter FM Awards: Sponsored by the North Whidbey Island Repeater Association (NWIRA).

Basic information: All contacts, to be valid, must be made on or after January 1, 1981. Crossmode contacts do not count. Contacts must be two-way 10 meter FM. Special endorsements include All Mobile, All Simplex, Single Frequency accomplishments, and contacts made within a single day, week, month, or year.

Do not send QSL cards! Forward your list of contacts showing the date, time, and frequency of each QSO and provide a brief station description. Send your list of contacts along with the fee of $4.00 for each award to the attention of: Ten Meter FM Awards Program, 2665 North Busby Road, Oak Harbor, Washington 98277.

Worked All Districts Award: To qualify, applicants must work one (1) 10 meter FM station in each of the ten (10) U.S. Call Districts.

Worked All States Award: Applicants must work a *minimum* of fifty (50) states on 10 meter FM.

Centurion Award: This award requires the applicant to work a *minimum* of 100 stations on 10 meter FM.

DX Decade Award: Applicants must work a *minimum* of ten (10) DX stations outside the 50 U.S. states and Canada on 10 meter FM.

North American Award: To qualify, applicants must work all ten (10) U.S. Call Districts, a *minimum* of six (6) Canadian Provinces and/or Territories, and at least four (4) DX countries within the North American Continent (other than the U.S. and Canada) on 10 meter FM.

Note: Members of the NWIRA monitor 29.600 MHz and also the area repeater on 29.640 MHz. (An 1800 Hz tone is required to access.)

USA-CA Honor Roll

3000		KL7HFQ	531	EA2IA	732
WB0LOU	419	I2PHN	532	I2PHN	733
KK5P	420	KK5P	533	KK5P	734
WA9EZT	421	WA9EZT	534	WA9EZT	735
KM4W	422	KA2CNG	535	KM4W	736
		KM4W	536		
2500				**500**	
K0UQV	476	**1500**		JA2TK	1749
WB0LOU	477	WB0LOU	596	WB0LOU	1750
WB1GOO	478	WB1GOO	597	WB1GOO	1751
I2PHN	479	I2PHN	598	DJ8TJ	1752
KK5P	480	KK5P	599	I2PHN	1753
WA9EZT	481	WA9EZT	600	KK5P	1754
KM4W	482	KM4W	601	I2YJO	1755
				WA9EZT	1756
2000		**1000**		JA1WPX	1757
WB0LOU	529	WB0LOU	730	W4YDL	1758
WB1GOO	530	WB1GOO	731	KM4W	1759

Specialty Communications Achievement Award—Class A-1: Sponsored by the editors of *73 Magazine*, this award is dedicated to amateurs worldwide who take pride in active participation in the field of specialty communications.

To be eligible for this award, some very rigid requirements must be met. All contacts must be made on or after January 1, 1980. Only communications via SSTV, RTTY, EME (Earth-Moon-Earth), and/or OSCAR will be recognized for award credit. Contacts may be made using any mode authorized in your country. Applicants must be cautioned, however, that mixed-mode contacts are not valid.

Specialty Communications Achievement Award.

To qualify, applicants must work a minimum of 10 DX countries from the Worked The World (WTW) DX Listing. Special recognition will be made for those exceeding the 10-country minimum.

To apply, the applicant must prepare a list of claimed contacts in call-sign prefix order. Include the date and time in GMT, the band and mode of operation, and a signed declaration as to the type and description of equipment and antenna system utilized to make your contacts.

Do not send QSL cards! Have your list verified by two amateurs, a local club secretary, or a notary public. The award fee is $4.00 or 12 IRCs to: Bill Gosney, KE7C, *73* Awards Editor, 2665 North Busby Road, Oak Harbor, Whidbey Island, Washington 98277.

Specialty Communications Achievement Award—Class A: Sponsored by the editors of *73 Magazine*.

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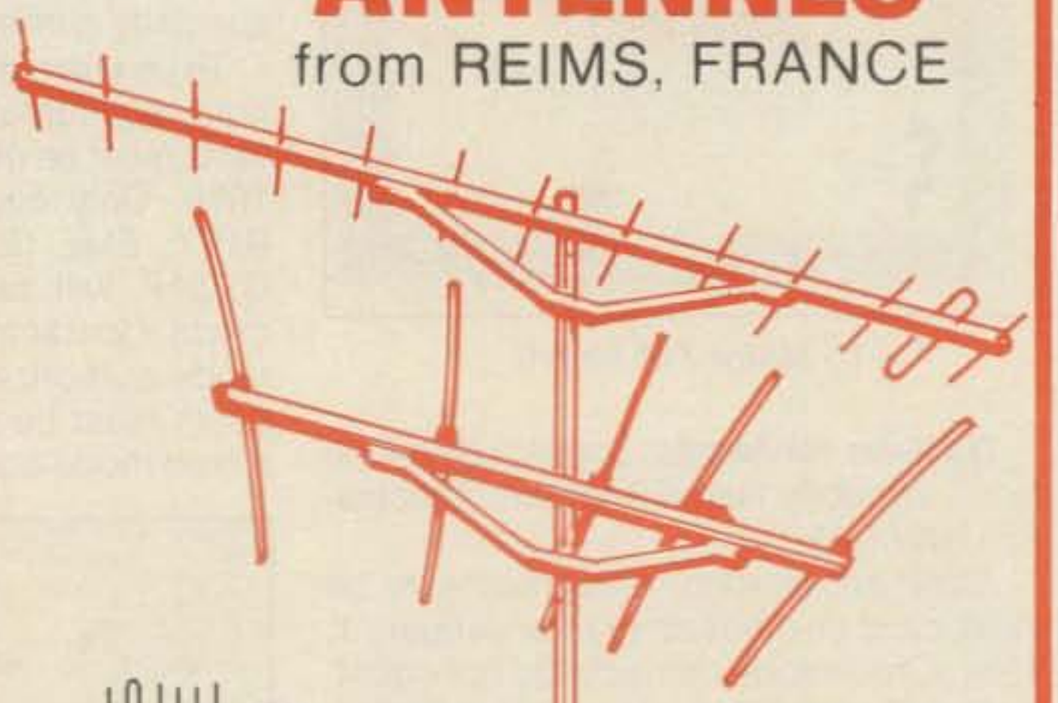

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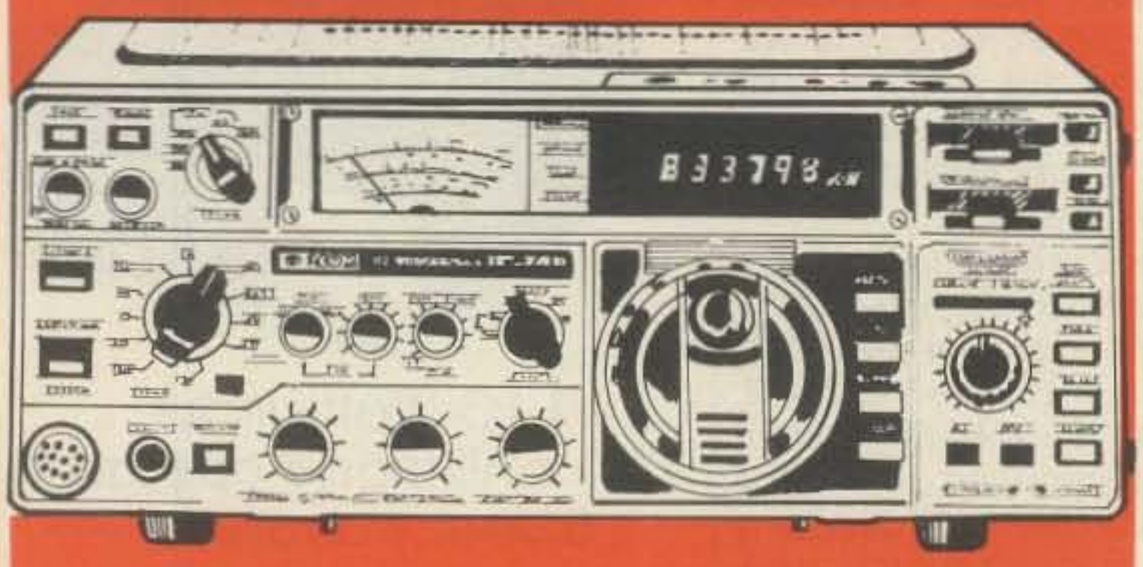

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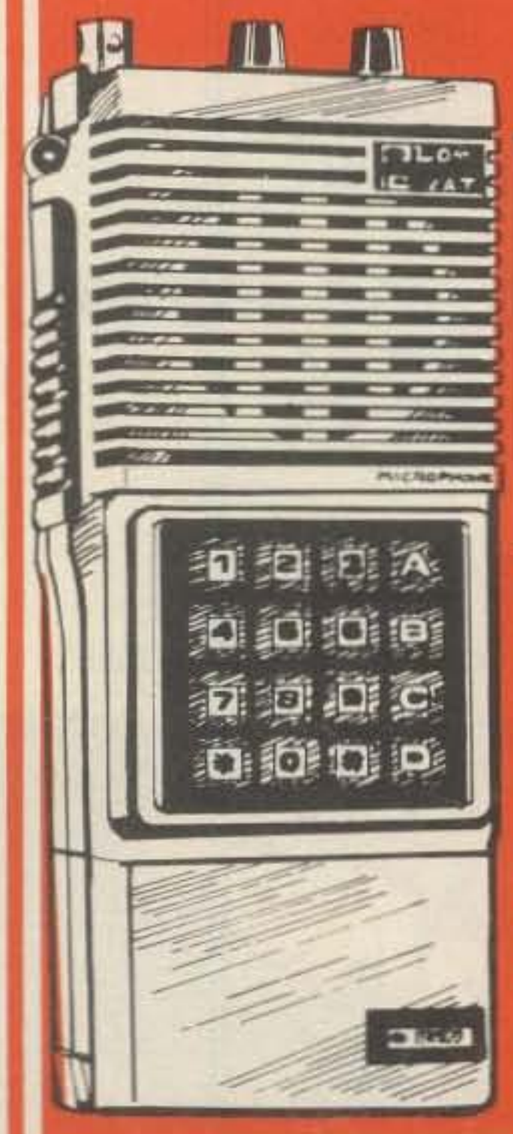

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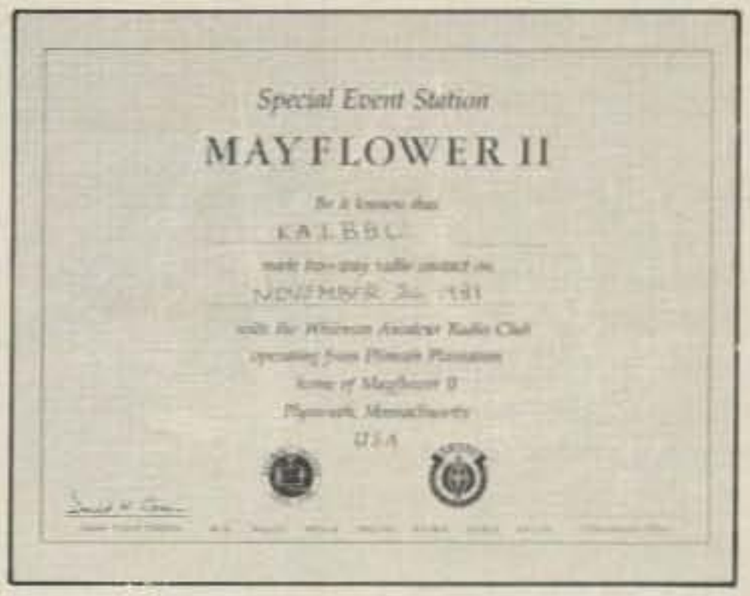
To be eligible for this award, all contacts must be made on or after January 1, 1980. In addition, only communications via SSTV, RTTY, EME, and/or OSCAR satellites will be recognized for this award. Contacts between stations on OSCAR or EME may be made using any authorized mode allowed in your country. Applicants are cautioned that mixed-mode contacts are not valid.

To qualify, applicants must work and confirm contact with each of the 50 U.S. states. There are no band requirements, but specific band accomplishments will be recognized if requested at the time of application.

To apply, applicant must prepare a list of claimed contacts in alphabetical order by state. Include the date and time in GMT, the band and mode of operation, and a signed declaration of the type and description of equipment and antenna system utilized.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club secretary, or a notary public. Enclose award fee of $4.00 or 12 IRCs to: Bill Gosney, KE7C (same address as above).



Mayflower II Award.

Worked All USA Award.

Worked All USA Award: Also sponsored by the editors of *73 Magazine*, this award is available to licensed amateurs throughout the world. To be valid, all contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but single-band and single-mode accomplishments will be recognized.

To qualify, applicants must work each of the 50 U.S. states within the same calendar year (January 1 through December 31). Annual endorsements will be awarded to applicants who can verify their claims.

To apply, prepare a list of claimed contacts in alphabetical order by state, beginning with Alabama. List the state, station call sign, date and time in GMT, and band and mode of operation.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club secretary, or a notary public. The fee for the basic award is $4.00 or 12 IRCs; endorsements are $2.00 or 6 IRCs to Bill Gosney, KE7C.

The Federacion de Clubes de Radioaficionados de Chile (FEDERACHI): This club sponsors three nice awards that are available to licensed amateurs and s.w.l.'s.

Send GCR list (showing station, date, time, band, and mode) certified by any official Radio Club in the applicant's country. Send 10 IRCs to cover postage. Mail to: Award Manager—FEDERACHI, P.O. Box 2545, Concepcion, Chile.

All Band CE Award (ABCE): Prove communications with at least one CE station on each of the 80, 40, 20, 15, and 10 meter bands. Chilean bordering countries must confirm 3 QSOs per band.

100 CE Award: Prove communications with 100 CE stations in the same mode.

50 MHz CE Award: Prove communications with 3 CE districts on the 6 meter band. (Many thanks to Roberto Ibieta B., CE5CNT, for this data and the wonderful booklet with all the interesting information on amateur radio in Chile.)

Mayflower II Award: Sponsored by the Whitman Amateur Radio Club and issued for contacts with the special events station on Thanksgiving which will operate at the historic site at the Plimoth Plantation (America's Hometown), depicting life in the 17th century Plimoth Colonies. Participating operators last year (hopefully again this year) were Ray, W1TC, whose call was used; Bob, KA1BLW; Arnie, KA1BYS; Mike, WA1FSD; Ed, KA1CZS; and Jim, WB1CNM. Bob, KA1BBU, and Don, N1BVZ, stopped in to lend a helping hand. Don, WB1CAI, came in the rain to help on the antenna setup. This year they hope to have multi-station sites from Plymouth Rock, The Mayflower II, and the Plimoth Plantation. QSL to: The Whitman Amateur Radio Club, P.O. Box 48, Pine Street, Whitman, Massachusetts 02382. (Thanks to Bob, KA1BBU, for this data).

73, Ed, W2GT

The World of Video

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Video Cloaker?

There are a number of aspects in video technology that are rather fascinating to consider from an open-minded point of view. I personally believe we have only begun to realize the many capabilities of this area, and future developments may prove quite astounding. Light, for example, is electromagnetic radiation the same as radio waves, differing only in frequency. The visible light spectrum of red to violet encompasses a range of 700 to 400 millimicrons (a small portion of a millimeter). Microwaves are also electromagnetic energy, but they encompass lower frequencies (such as 3 cm for 10 GHz, 15 mm for 24 GHz, etc.).

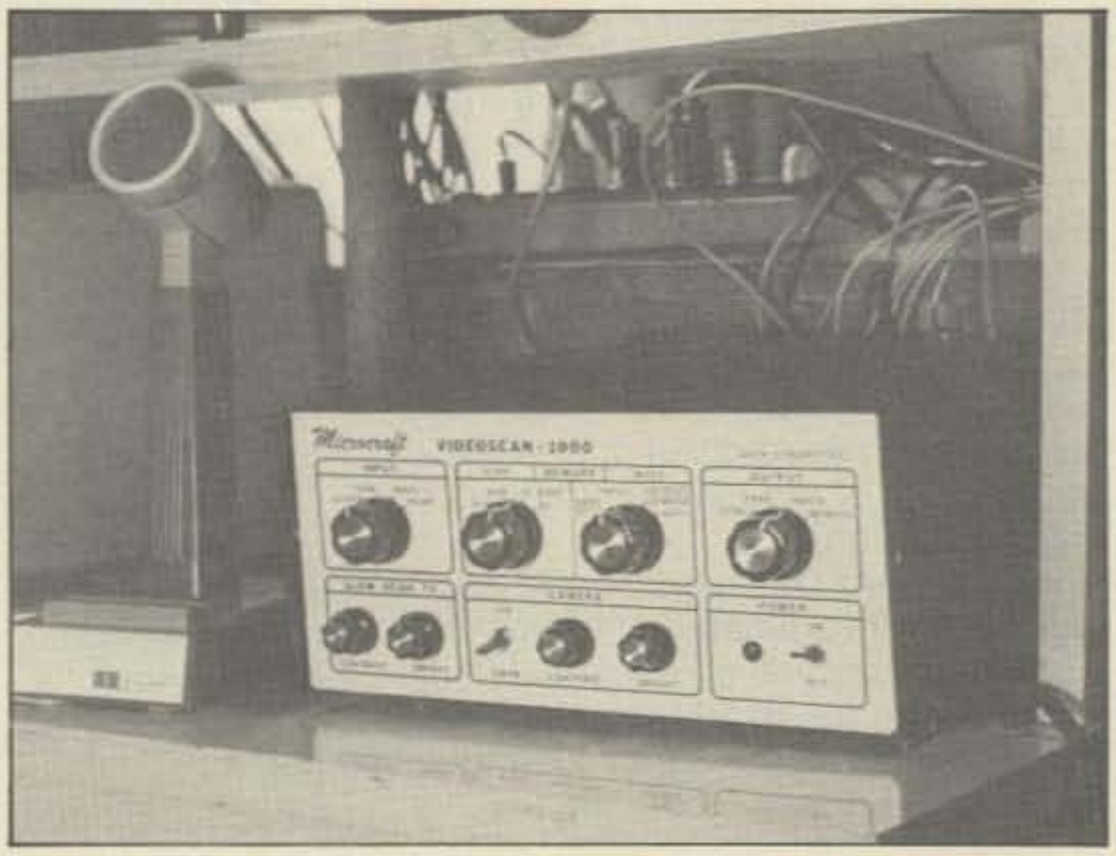
Almost every amateur is familiar with the superheterodyne, or downconversion, principle used in receiver front ends, repeaters, etc. An incoming high frequency is converted to an intermediate frequency, processed, and in the case of microwave relay systems, converted back up in frequency for retransmission. A "light repeater system" employing similar frequency conversion techniques could thus prove interesting.

Assuming the light spectrum of red through violet was linearly converted to an equivalent microwave spectrum, transmitted approximately 30 feet, and then up-converted to its original light frequencies, the conversion device (and associated items within its 30 foot microwave area) would be visible only from its "non-active" sides. Progressing a step further, let's assume that these linear frequency translations could be accomplished simultaneously in 8, 16, 32, 64, or 128 directions (think pixel theory, if you like). Suddenly everything in the "conversion area" is replaced with views appearing on its opposite side. Are such "cloaking devices" possible? Indeed, we're only one step away from this concept at the present time, and video-oriented amateurs are ideally situated to set the pioneering pace in this frontier. Any takers?

New Scan Converter Announced

A new digital scan converter has been introduced to the amateur population: the Videoscan 1000, by Microcraft Corporation, P.O. Box 513, Thiensville, Wisconsin 53092. A prototype of this unit was demonstrated at the Dayton '82 Convention by Dr. George Steber, WB9LVI, and the response was quite favorable (this unit was dubbed the MSC1000). We understand a number of these scan converters have already been sold, so you might keep an eye out for their views to appear on 20 and 10 meters SSTV during the near future.

The Videoscan 1000 can store two conventional SSTV pictures (up to 128 lines by 256 pixels by 64 shades of gray), and boasts a total memory capacity of 384,000 bits (yes, larger memory scan converters are becoming a popular trend). This seems a rather attractive feature, since it permits using one memory for viewing and storing incoming views in the "normal SSTV manner," while an in-shack view can be stored in the other memory for subsequent transmission. The dual memories can also be used in a number of additional ways if desired (store two received pictures, store two transmit pictures, etc.). High-resolution SSTV can be accomplished by a front-panel switch which combines the 1000's two memories to achieve 256 line by 256 pixel by 64 shades of gray pictures. Another "split mode" allows simultaneous display of four lower resolution 128 by 128 SSTV pictures. Bravo! The 1000's scan modes



The new Videoscan 1000 dual-memory digital scan converter. This unit is capable of either 128 by 256 by 64 or 256 by 256 by 64 SSTV resolution. (Additional details in text.)

SSTV view of Dr. George Steber, WB9LVI, and his XYL as displayed in high-resolution mode (256 by 256 by 64) on his new Videoscan 1000 unit.

are 8.5 seconds (conventional SSTV), 17 seconds (high-resolution SSTV), and 34 seconds (extra-high-resolution SSTV). A comparison of obtainable definition is included in this month's column. Bear in mind that a certain amount of resolution is lost in both photographic and magazine printing processes.

The rising popularity of Single Frame Color SSTV (25 second technique) will, we suspect, inspire Steber to instigate a comparable mod for the 1000. Since the unit has sufficient memory and microprocessor control is included, this change should be relatively simple. The Videoscan 1000 is priced comparable to the Robot 400.

256 Lines for Robots

The rising popularity of high-resolution SSTV coupled with requests for black-and-white compatible viewing of Single Frame Color (25 second pictures) has generated renewed interest in the 256-line modification for Robot 400's. We've therefore included that mod in this month's column (fig. 1) with

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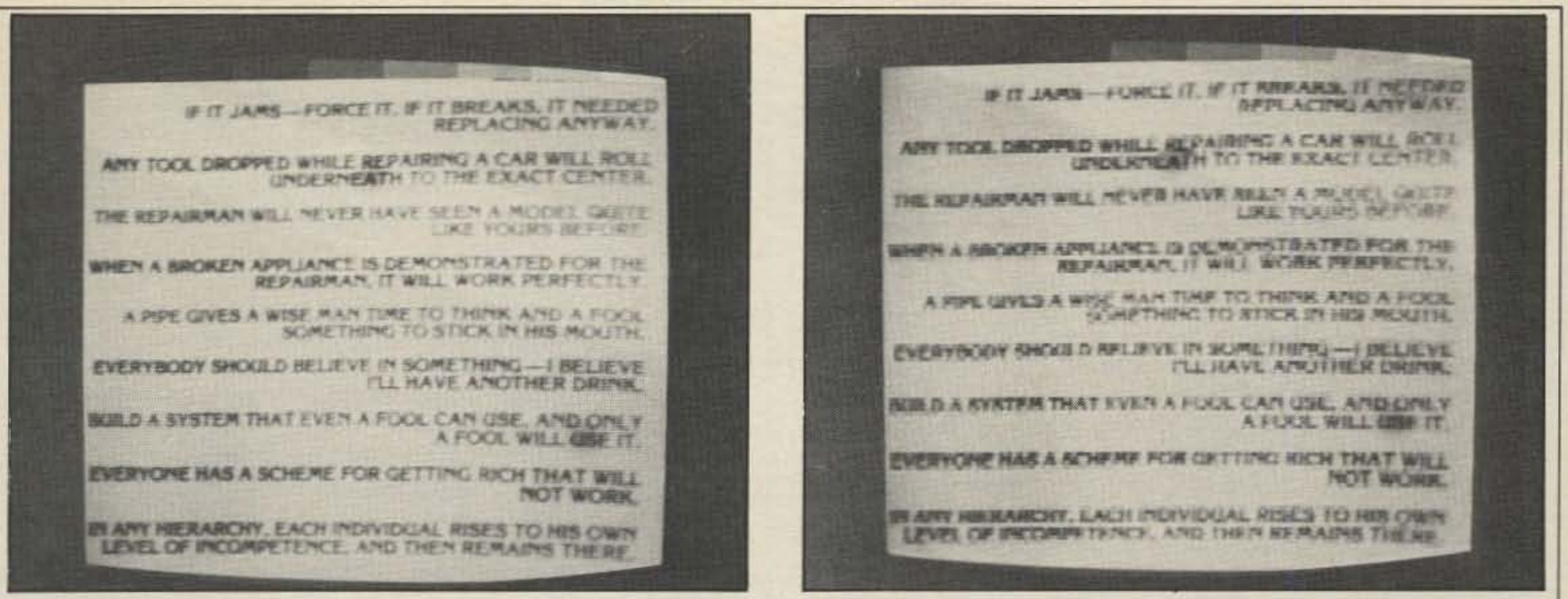

Comparison of high-resolution versus conventional-resolution SSTV. The view on the left is 256 by 256 by 64 detail. On the right is 128 by 128 by 64 view.

thanks to Sam, WA7MOV, and Howard, KD6HF, for the details.

During normal operation (128-line mode), the 1K width control is routed through S1A to the p.c. board's edge finger No. 34. During 256-line operations, the 1K width control is placed in series with the "256 width control" (10K) and routed through S1A to edge finger No. 34. A 1 mFd tantalum capacitor is also switched into the circuit by S1B. Since the 256 width control can be adjusted to display three (slightly elongated) pictures across the screen, it can be set to this position for black-and-white viewing of 25 second color pictures. If you use the Interface Systems 400/3000A tri-memory color-modified Robot 400, the 256 mod can be used for displaying all three pictures side by side and for setting color balance.

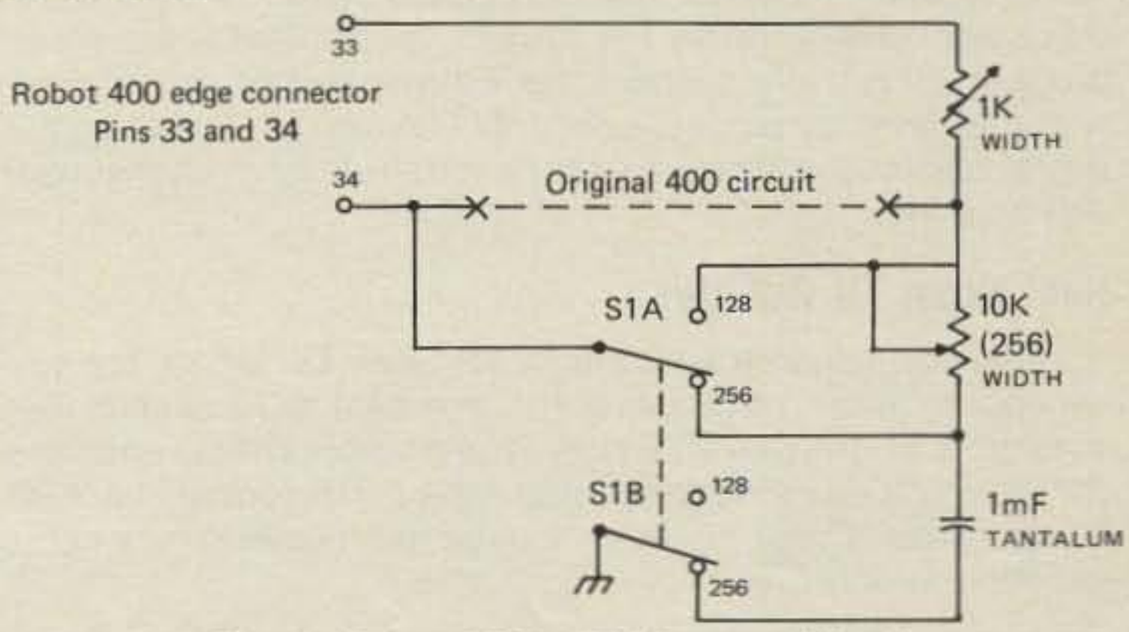

Fig. 1– Robot 400's 256 line modification.

Next Generation Scan Converter Evolving

A new form of digital scan converter is beginning to take shape on the far horizon: a unit boasting extensive memory and unlimited capabilities. Now *don't* interpret this in any way as a decline in interest in existing Slow Scan equipment. Those units will be popular for many years, and their operational SSTV parameters will remain the accepted standard. As we've mentioned in previous columns, there are two groups of Slow Scanners: the operators and the technical innovators. The latter group leads the way to future concepts and designs which may or may not be followed by commercial manufacturers.

First views of the projected new unit come from, appropriately enough, Dr. Robert Suding, WØLMD. (Robert designed the first digital scan converter approximately ten years ago.) Realizing a state-of-the-art system should be capable of storing multiple pictures of several formats, this "monster" features a

million bit memory controlled by one or two Z80A-based microprocessors. The system's operational parameters are projected to include both black-and-white and color SSTV (three informational formats of each), Medium Scan, or Half Fast TV (no pun intended!), Telidon-type graphic images (computer graphic images transmitted in a checksum manner to guarantee perfect copy), Independent Sideband adaptivity (a return of this concept would be welcomed), plus the capability of future mode modification via internal microprocessor direction and plug-in boards.

Rather than storing one, two, or three pictures in memory, the system can store up to eight pictures (128 by 128 by 64 format) in its page-access-type memory. The microprocessor can, however, "rearrange" memory planes to store one full-color picture consisting of three frames of 256 by 256 by 16 information. The list of features continues, but from the above you get an idea of "Super System '83." This system is in developmental stages as this column is being written. It uses 146 IC's, a 5 volt, 5 ampere, and ± 12 volt power supply, plus other paraphenalia (including printed circuit boards) which tallies to near $750. It should be rather obvious that a home construction project of this magnitude isn't ideally suited for light-hearted or weekend builders! The project coordinator is Bill Westbrook, VE3EKA. We suspect that Bill will be "bogged down" with the development aspects until Dayton '83. Possibly, the digital scan conversion will experience a real tenth anniversary celebration!

Fast Scan TV Goodies

Have you become active on Fast Scan TV yet, or are you waiting for more inspiration? If our recent *CQ* columns (descriptions of growing ATV activity and applications, and Tom O'Hara, W6ORG's superb video tape [VHS format] on ATV) haven't piqued your curiosity, maybe the following new items will stir your interest.

PC Electronics of Arcadia, California, recently introduced an ATV receiving downconverter for 1215 to 1300 MHz and mating QRP transmitters for 420 or 1215 to 1300 MHz operation. These inexpensive units make fairly good ATV setups for short-range communications (typical range is 5 miles; best DX thus far is 40 miles). The downconverter is similar in concept to popular MDS (2100 MHz) units; it is mast mounted and mated with a "cigar-type" antenna such as PC Electronics' 18 dB gain 1296LY loop Yagi. Coax cable is used for directing power from an indoor supply/tuner while passing signals to the viewing TV set (channel 7 or 8 output). The downconverter is also grand for full duplex ATV repeater setups (your own FSTV repeater for less than $100 when mated with the 420 MHz QRP transmitter and a surplus TV set; a power amplifier can be added later). W6ORG suggests at least 5 feet vertical separation between 1296 and 434 MHz antennas, plus a third harmonic filter when using a 10 watt transmitter for 434 MHz. Due to foliage adsorption, the 1296 antenna should receive "top priority" on the tower or mast.

The 1296 MHz transmitter is a little gem; r.f. output is 1 or 2 milliwatts, and it may be powered by a 9 volt battery. The tiny unit can be placed inside a camera for "wireless" operations (grand for relaying remote views back to the main setup), or for ATV mobile experiments. Cost of the QRP transmitters is $15 each. The downconverter is approximately $22 (shipping cost additional).

Here is the "full blown" setup of Mike Freitag, N9CRN, in Burbank, Illinois. Capabilities include FSTV, SSTV, and OSCAR. N9CRN is also set up for FSTV air mobile.

Wrap Up

Before concluding this month's column, gang, we would like to remind you of the Space Shuttle SSTV coverage slated for October 29 and 30. (This flight was originally scheduled for November, but the date was moved up.) We suggest checking with the Saturday SSTV Net (1800 GMT) and Thursday SSTV Net (2350 GMT) right away to avoid missing the action (14,230 kHz). SSTV coverage will be via W5RRR, the Johnson Space Flight Center Amateur Radio Club station. Activity should commence with shuttle launch.

The station photo in this month's column comes from Mike Freitag, N9CRN, of Burbank, Illinois. Mike operates both Slow Scan and Fast Scan TV plus OSCAR satellites with a pile of high-performance gear. Somewhere in his photo are a Kenwood TS830, ICOM 451 and 251, plus numerous ATV goodies of various types. Mike also passed along some notes on upcoming events, but didn't allow enough lead time before column deadline.

Remember, gang, this video column will continue only as long as your interest and support are reflected. Amateur video needs a voicing medium; stand up and be noticed. Drop us a note on your activites, etc., and include a photo if possible. Let's share our video enthusiasm!

73, Dave, K4TWJ

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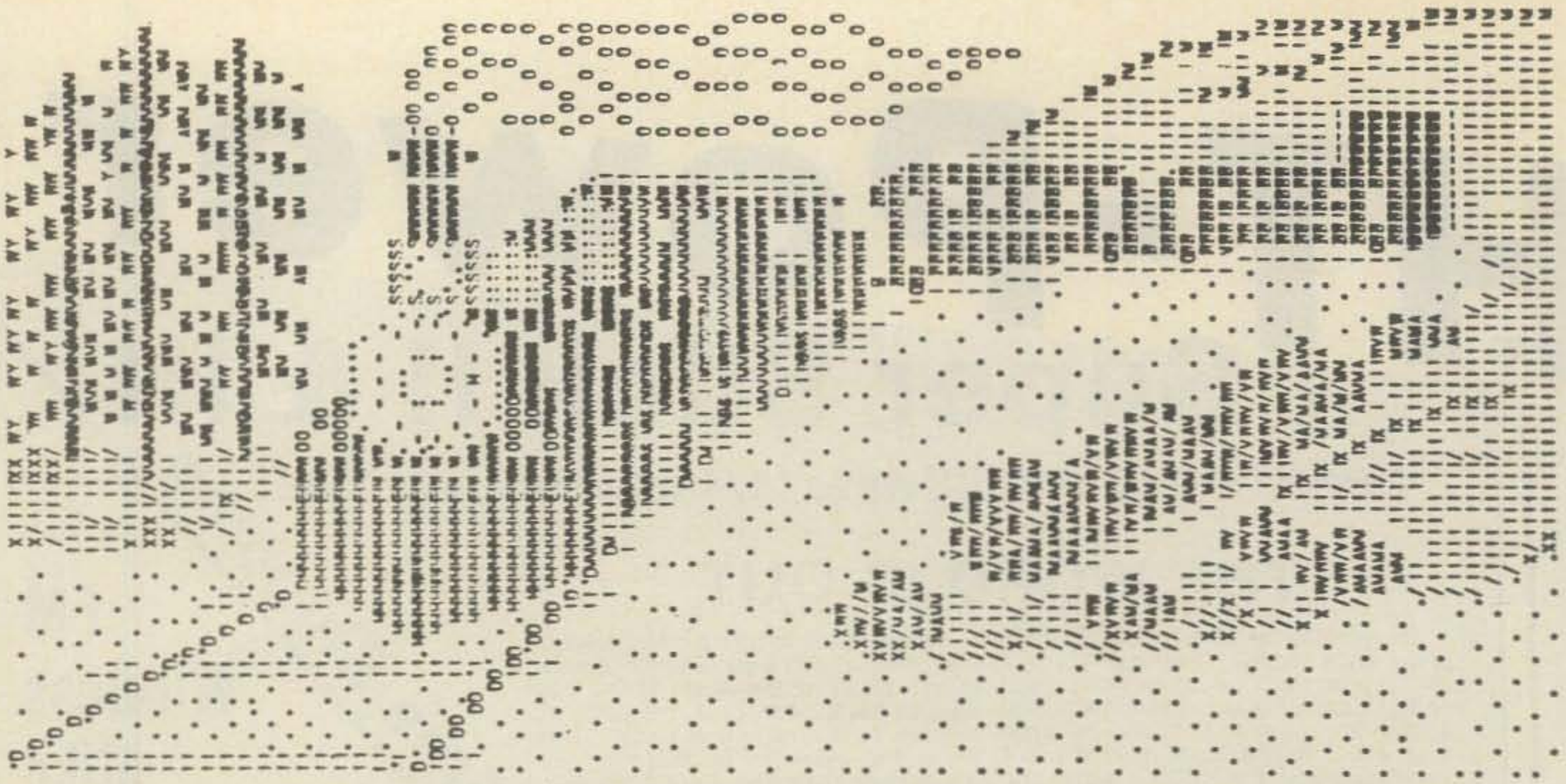


First place winner, "The Railroad," by Jean Carter, KA6HJK, of Buena Park, CA.

Here are the winners of the 1981 Worldwide RTTY Art Contest. Perhaps you'd like to try your hand at RTTY art in the 1982 contest.

THE WORLDWIDE RTTY ART CONTEST

BY HUGH WASHBURN*, WA6IEX

For the past three years the Southern Counties Amateur Teleprinter Society (SCATS) has sponsored a Worldwide RTTY Art Contest. The RTTY Art Contest goes back over many years, but in 1979 SCATS volunteered to accept responsibility of sponsorship. Last year SCATS received several letters from European amateurs requesting the contest rules be amended to a line width of 68 spaces for the pictures. U.S. and Canadian amateurs have used 72 spaces in constructing artwork for RTTY; however, the RTTY Art Contest committee agreed to change the rules to require a maximum 68-space line and consequently received many more entries from Europe. This resulted in a very popular contest for all amateurs interested in RTTY art.

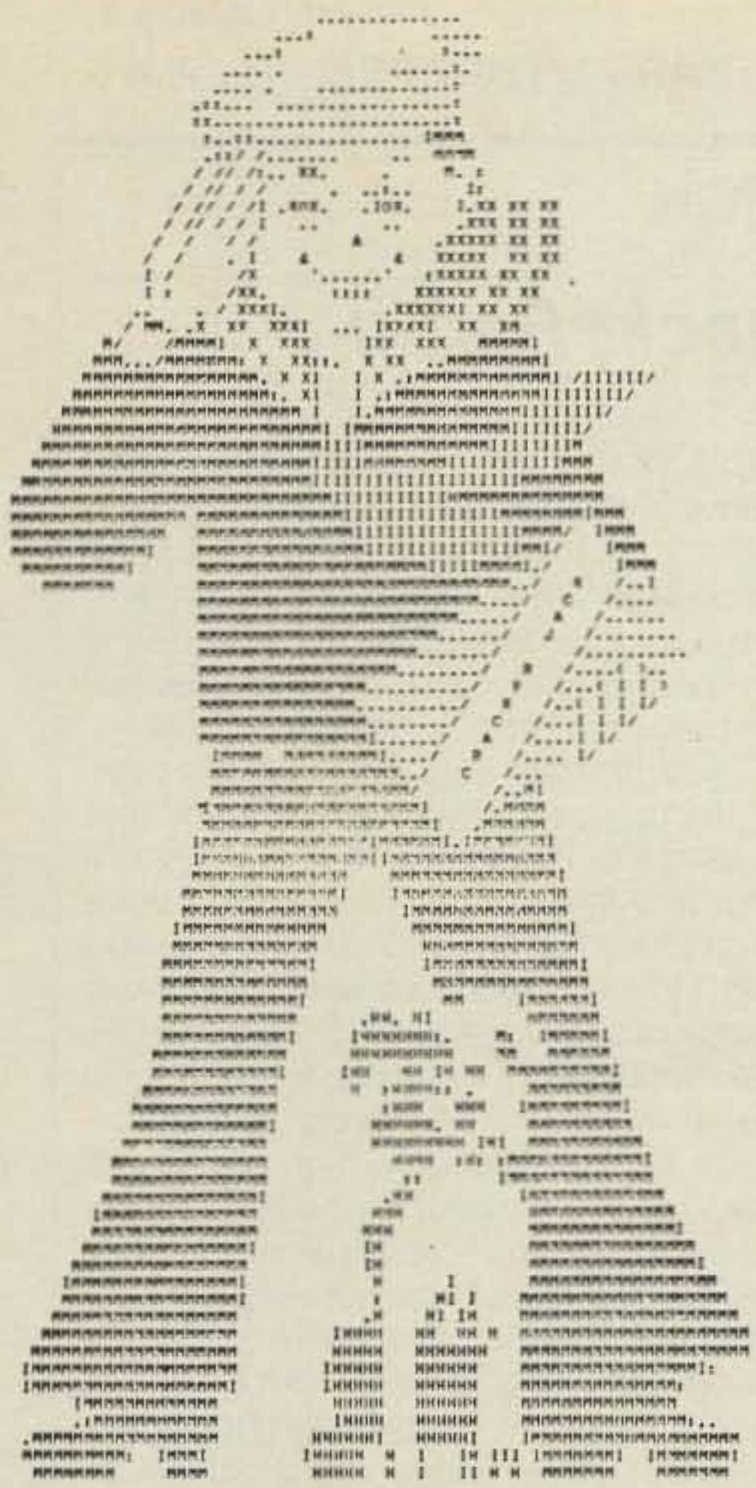
All art entries must be generated by hand and cannot be generated by computer. SCATS has improved the contest each year, and with more publicity than in past years, the 1982 Worldwide RTTY Art Contest should attract even greater numbers of hams around the world who are interested in RTTY art.

SCATS has announced that handsome, 9″ × 12″ wood and brass plaques engraved with winners' names have been forwarded to the following 1981 contestants. First place went to Jean Carter, KA6HJK, of Buena Park, CA, for her entry "The Railroad." This was Jean's first year as a ham, her first entry in an RTTY art contest, and her first prize! Second place was earned by Alfred La Vorgna, WA2OQJ, of Hicksville, NY, for "A Prize in Every Box." Third place was secured by Charles Pike, K3YUH, Monaca, PA, for his entry "What's Up Doc." There was a tie for Honorable Mention, with both receiving plaques: Bent Pedersen, OZ5RT, Copenhagen, Denmark, placed for "Freddy Fender," and Richard Camp, WA7NGN, Las Vegas, NV, got the nod for "The Wild Horse."

Entries in the Worldwide RTTY Art Contest are judged on originality of subject matter, excellence of technique in producing the art and formatting the tape, appearance of the art when viewed from a distance, and suitability for publication. The SCATS contest chairman, Norm Koch, K6ZDL, is a well-known, avid RTTY art collector (and *CQ's* WPX Award chairman) who spends much time relaying RTTY pix to hams on all bands. Norm was most enthusiastic about the response to the 1981 RTTY Art Contest, and he is anticipating an even greater 1982 contest.

SCATS is located in Southern California, primarily in the Los Angeles and Orange County areas, but it encompasses RTTY membership from quite a large surrounding region. SCATS would like to urge all RTTY enthusiasts to try RTTY art if you never have. Many newcomers to this aspect of the ham hobby have been winners in this annual contest. Now is a good time to start practicing, as SCATS will begin accepting entries in the 1982 Worldwide RTTY Art Contest after September 1, 1982. Complete rules and other pertinent information about the 1982 contest will be published prior to contest time. SCATS is looking forward to seeing *your* RTTY art entry in 1982. Don't disappoint this enthusiastic RTTY club!

*5772 Garden Grove Blvd., #415, Westminster, CA 92683

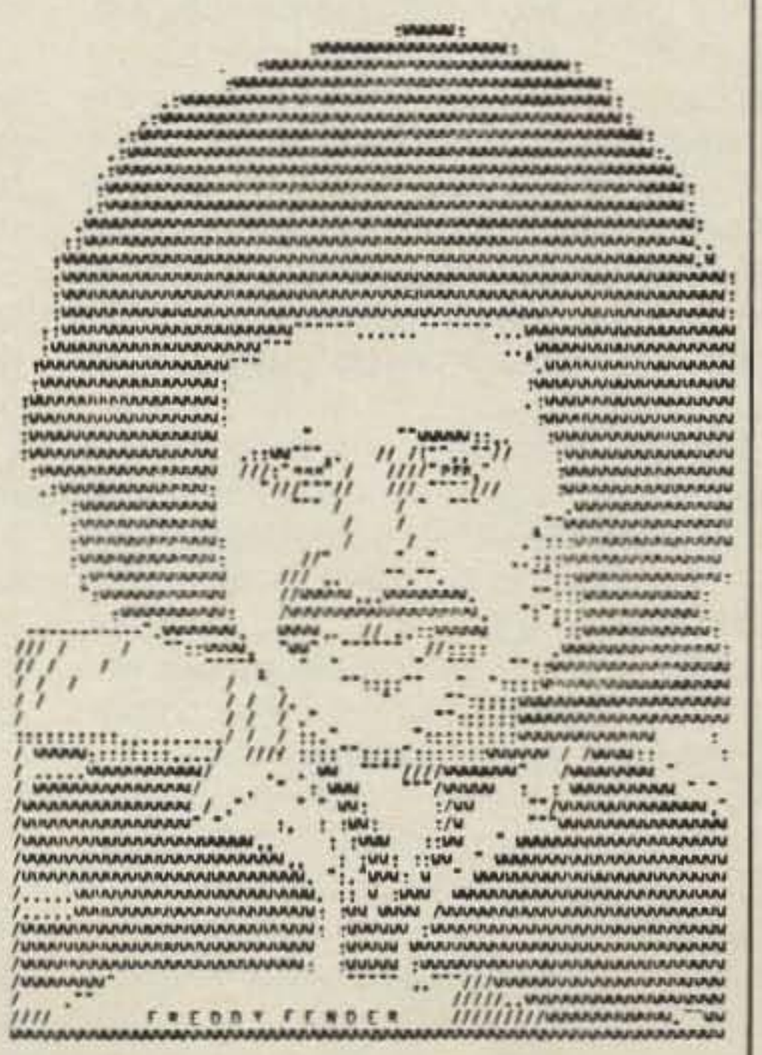


Second place, "A Prize in Every Box," by Alfred La Vorgna, WA2OQJ, Hicksville, NY.

In a tie for Honorable Mention, "The Wild Horse," by Richard Camp, WA7VGN, Las Vegas, NV.

Third place, "What's Up Doc," by Charles L. Pike, K3YUH, Monaca, PA.

Also in a tie for Honorable Mention, "Freddy Fender," by Bent Pedersen, OZ5RT, Copenhagen, Denmark.



Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Antenna Accessories For The Hamshack: Part II

Opening last month with the premise that it takes a great deal more than just the antenna and transmitter to radiate a respectable signal, columnist W8FX continues with Part II of his multiple-column discussion of antenna accessories with several additional items of interest: the wattmeter and the s.w.r. bridge.

—K2EEK

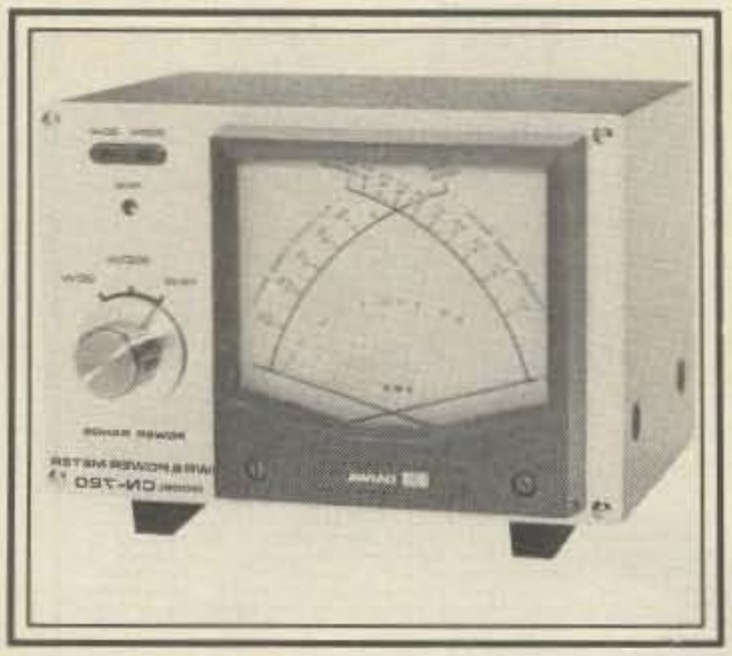
Last month's column was the "opening shot" in a series of columns dealing with the myriad antenna and r.f. accessories available for use in the hamshack. In that column, we covered the dummy load and the r.f. ammeter. In this column, we continue with a discussion of two related, in-line instruments: the wattmeter and the s.w.r. bridge. Let's look at the former instrument first.

The Wattmeter

Practically all amateurs would like to know precisely whether or not their transceiver is "putting out r.f." as it should. The only way to be certain of performance is to *monitor* the transmitter's output: a drop in r.f. power output is a sign that something has gone wrong in the transmitter. The in-line r.f. wattmeter, connected in series with the transmission line feeding the antenna, provides a continuous reading of power output; the wattmeter samples a minute amount of the r.f. energy fed to the antenna system to indicate the transmitter's r.f. output power. Since the antenna provides a load for the wattmeter, changes in antenna characteristics are also indicated by the meter, particularly if the wattmeter is capable of measuring reflected power and/or s.w.r.

Some transmitters provide a built-in indication of *relative* power output. While such a provision is useful, you will undoubtedly want to have a better indication of *actual* power output to detect loss of performance over a period of time. In view of this, a calibrated h.f. wattmeter is a handy accessory. In practice, the forward-power reading type of wattmeter is often combined with a reflected-power reading device, which enables you to check on antenna and transmission line characteristics as well. Going a step further, the s.w.r. bridge is often combined with the r.f. wattmeter in a natural duo. Before getting too far ahead of ourselves, however, let's examine the plain-and-simple wattmeter.

*317 Poplar Drive, Millbrook, AL 36054



One of several of the convenient to use Daiwa "cross-needle" s.w.r. meters is shown here. The 1 kW h.f. unit shown here, the CN-720, has two big advantages over conventional devices: there is no need to calibrate or adjust forward power readings while reading s.w.r., and both forward and reflected power are displayed on the same meter using two different needles. Other units available cover 1.8 MHz to 2.3 GHz. (Photo courtesy J.W. Miller Div. of Bell Industries)

The r.f. wattmeter is a measuring device that indicates the radio frequency power in the transmission line in terms of watts (named after the English scientist James Watt). Most of these devices are, in fact, d.c. voltmeters connected across a known load which is the same as the transmitter's output impedance. Thus, while the meter itself may, in fact, be reading voltage, using the Ohm's Law relationship between the indicated voltage and the load impedance, usually 50 to 75 ohms, the meter may be calibrated to read directly in watts.

The r.f. wattmeter is an exceptionally handy hamshack instrument, since it directly reads the actual transmitter power output without resorting to inconvenient and tiresome calculations. You can readily see if you are getting the proper efficiency from your transmitter by comparing the input power readings of the final amplifier stage (voltage times current) with the r.f. wattmeter output readings. Typically, you'll find that efficiency is around 60 to 75 percent, depending on the type or class of r.f. power amplifier in your equipment and the frequency band used.

This instrument is usually purchased factory made, although it is certainly possible to construct a wattmeter in the hamshack, and there are construction articles and kits available. In selecting a commercial wattmeter, there are several things to look for.

One important selection factor is power handling capacity. Look for a unit that is capable of handling at least 1 kW; you'll often find that such instruments are not much more expensive than lower power units. However, you may wish to consider the use of a low-power device (even a CB-type "cheapie") if you're interested in QRP (low-power) operation, since flea-power r.f. run through a high-power unit may require the use of a magnifying glass to detect meter needle movement! A possible compromise is the purchase of a so-called "adaptable" wattmeter of the type having interchangeable elements or "slugs" capable of handling various power levels. These slugs are available to handle both varying power levels and different frequency bands, thus allowing a single wattmeter to serve on h.f., v.h.f., and u.h.f. bands over a wide range of power levels.

Frequency of operation is an equally important consideration in wattmeter selection, since highly erratic readings are possible if the meter is incapable of operation on a given band or frequency range. For general h.f. work, the wattmeter should have an accuracy rating of plus or minus 5 percent or better, up to 30 MHz; sometimes a little accuracy must be sacrificed for v.h.f. and u.h.f. operation, unless one is willing to pay dearly for a high-precision instrument. As mentioned, interchangeable slugs can allow a single meter to serve all-band requirements. Still, in many instances it is desirable to leave the meter in-line at all times, so it may be wise to purchase a separate v.h.f. or u.h.f. unit to avoid the inconvenience of constantly connecting and disconnecting the all-purpose meter when shifting transmitters and/or bands. Surprisingly, some inexpensive CB wattmeters (and s.w.r. bridges, as well) give good accounts of themselves on the higher bands, at least through 2 meters.

Most wattmeters are designed to measure *average* power. This somewhat limiting feature is of no real consequence if the meter will be used primarily for transmitter and/or antenna tuneup using a steady carrier, or if your primary modes are c.w., RTTY, a.m., or f.m. However, if you wish to measure your transmitter's

Heath IM-4190 bidirectional wattmeter is designed for v.h.f. use. Unit handles up to 300 watts forward power and measures reflected power to 30 watts. Note Type-N connectors on side panels. (Photo courtesy Heath Company)

s.s.b. output, a peak-envelope-power (PEP) reading wattmeter is highly desirable from the standpoint of both accuracy and convenience of reading. A meter so equipped to read PEP has an additional internal "time constant" circuit that can be switched-in by flicking a front-panel knob. This added circuitry allows the instrument to sample the PEP energy from the transmitter by feeding a constant-voltage source to the meter. This latter voltage allows the meter to register and hold for display the maximum power the transmitter is generating on voice peaks. A drawback of the PEP wattmeter, for some, is that this type of meter requires an external power source—either batteries or a.c. power—to run the device, making it somewhat less suitable than simpler wattmeters for continuous output monitoring.

Following current trends, even the r.f. wattmeter has been "digitized." Such digital-display units are impressive in appearance and convenient to use, although the flashing LED displays are annoying to some. These devices have not seen the widespread manufacture and use as have digital-display transmitters and transceivers, however. Cost is a consideration, and most amateurs appreciate the value of digital frequency display on a transmitter or transceiver, but are not willing to pay several times the cost of a common analog-type meter for one which works digitally. However, as the forward push of technology reduces prices, it is likely that digital wattmeters will become much more common. A particularly fruitful area for development would be that of the combination wattmeter/s.w.r. bridge, where both power and s.w.r. would be computed automatically and directly displayed for the operator.

The *dual-reading* wattmeter is a popular variation of the basic wattmeter; it makes sense to be able to measure power in both the forward and reverse directions. Simpler versions make use of a single meter display with a switch being used to convert from forward- to reverse-reading functions. More sophisticated meters ("dual-meter" wattmeters) are particularly useful, in that one meter of the instrument continually displays *forward* power (as does the conventional wattmeter), while the other meter registers *reflected* power, either expressed in watts or as s.w.r. (depending on the particular model meter). In either case, it is now a versatile s.w.r. bridge as well, all in one handy package.

Monitoring transmitter power output with a dual-reading meter is especially attractive for two reasons: (1) a constant check of forward power is provided, with any deterioration in transmitter power output becoming immediately visible; and (2) antenna performance reduction in terms of degraded s.w.r. is readily apparent to the operator.

At this point, we're ready to turn to the s.w.r. bridge.

MFJ Model 825 illustrated here is a flexible, multi-sensor s.w.r./peak reading wattmeter for h.f., v.h.f., or QRP transmitters and transceivers. The three specialized sensors can be plugged in simultaneously; a front-panel switch selects which rig to monitor. H.f. sensor handles 2000 watts to 30 MHz; v.h.f. sensor handles 200 watts to 175 MHz. QRP sensor is for 20-watt (or less) operation to 30 MHz. (Photo courtesy MFJ Enterprises, Inc.)

The S.W.R. Bridge

The s.w.r. bridge is known by a number of names, including the s.w.r. indicator or meter, Monimatch, and Micromatch. Some devices are designed to read forward and reflected power in watts (see previous discussion), while others read the s.w.r. figure directly or merely show when a matched antenna condition is reached by indicating minimum reflected energy on a meter.

While the s.w.r. bridge comes in a variety of styles, sizes, and price classes, each is designed to serve a similar purpose: to help the operator determine the condition of his antenna system, to determine how good or bad the match is be-

tween transmitter, transmission line, and antenna. Without getting buried in the math, the s.w.r. bridge measures the ratio of forward to reflected voltage in the antenna system. This relationship depends upon the impedance of the equipment, transmission line, and antenna. In a perfectly matched system, there is said to exist an s.w.r. of "1 to 1" (sometimes written "1:1"). As an example, when you connect your transmitter to one end of a 75-ohm transmission line and a load exactly equal to the transmission line impedance to the other end, like a known 75-ohm dummy load, there exists a perfect match between the elements of the system, and the s.w.r. is 1:1.

However, if you mismatch the line and load, such as when using a mistuned or nonresonant antenna, part of the power is usually wasted in the mismatch that results. The s.w.r. bridge helps you to know when and to what degree this mismatch is a problem. Factors causing "high" s.w.r. (usually more than 2:1 or 3:1) are many, but they usually relate to the antenna being out of tune, in too close proximity to other objects, or improperly matched to the feedline. In some cases, the problem may be caused by the transmission line itself, as a result of shorts and open circuits or faulty insulation. Regardless of the cause, the s.w.r. meter signals a warning that all is not well with the system, with investigation warranted.

As in the case of the wattmeter, there are several kinds of s.w.r. bridges. For example, there are those which measure *relative* s.w.r. only, so that one must consult a special chart in order to derive the actual s.w.r. on the antenna system. Fortunately, this kind is rapidly disappearing; most meters sold today allow one to *directly* measure s.w.r. as indicated on the meter face itself.

Most modern s.w.r. instruments are high-power units, although not all will handle full amateur power. As with wattmeters, *some* inexpensive CB s.w.r. bridges will handle high power levels and will do a fairly decent job even at 2 meters, so you need not necessarily assume that you must spend a great deal of money for a decent product. However, some early experimenter-type s.w.r. bridges could handle but a few watts, so they had to be carefully protected against regular power levels; this meant that they had to be removed for regular operation and reinstalled in the transmission line whenever it was desired to take s.w.r. readings. Obviously, this type of bridge should be avoided.

The dual-reading wattmeter, either of the dual- or single-meter type, can be put to good effect in s.w.r. measurement, especially for the purposes of antenna tune-up. There is a real advantage to being able to observe *both* forward and reflected power simultaneously when making adjustments in order to be able to note the various interlocking effects of transmitter and antenna or antenna tuner adjustment.

In addition, several new types of s.w.r. display have been introduced in the past few years, such as the "cross-needle" scheme offered by Daiwa, in which forward as well as reflected power, in addition to s.w.r., are displayed simultaneously on a single meter face using two indicator needles. Other novel display presentations include the automatic computing digital s.w.r. meter pioneered by Electronic Research Corp. of Virginia, and the interesting dual light-bar s.w.r. meter by Palomar Engineers, which automatically computes and displays both power and s.w.r. on 2-inch vertical light columns. Also, the special s.w.r.-sensing circuitry contained in the automatic antenna tuners by J.W. Miller and Daiwa provides controlled feedback for motorized tuner control adjustment, greatly minimizing the need for "operator intervention" when changing bands and/or changing frequency within a band.

A few points in using the s.w.r. bridge are in order. Remember that no matter what adjustments you make to the transmitter, they will have no effect on the match as long as you keep the transmit-

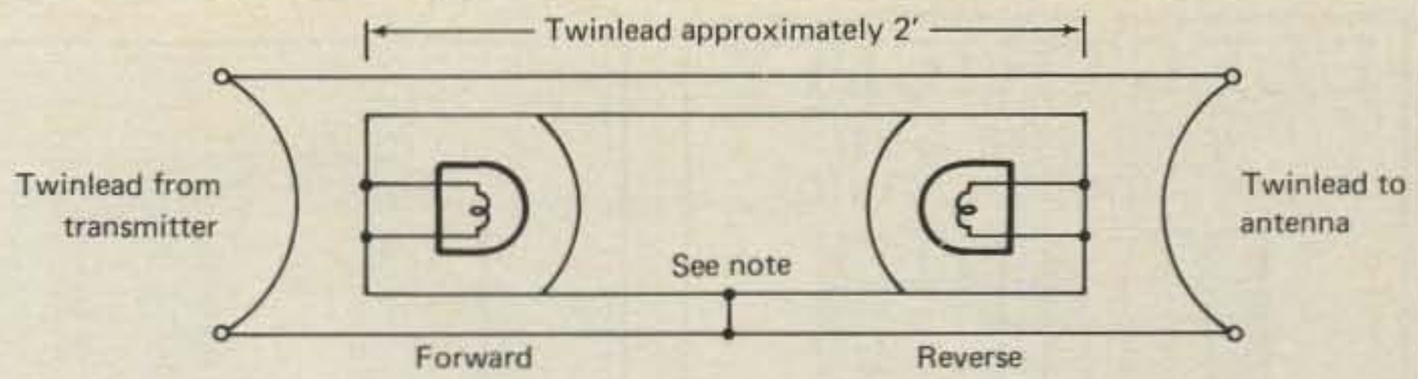
ter frequency constant. And, if you use an antenna coupler or transmatch, no matter what adjustments you make to the coupler, you can't affect the match *at the antenna*. Only adjusting the antenna itself, and not the coupler or the transmission line length, can change this. Having the s.w.r. bridge connected between coupler and transmitter only discloses the s.w.r. existing on *this* link, not on the entire antenna system. It's easy to see that the biggest application for the s.w.r. bridge lies in facilitating initial adjustments to an antenna system. While the physical placement of the s.w.r. bridge in the transmission line may cause some errors or inconsistencies in adjustment accuracy, as can the existence of harmonics in the r.f. presented to the bridge, there is little competition for convenience from other instruments for making these necessary adjustments and for "keeping tabs" on them once made.

To this point, we've assumed that coaxial cable was being used to feed the antenna, and that it is the s.w.r. on the coax that is to be measured. This is the usual case, due to the popularity and convenience of coax over other transmission lines. However, when using a multiband antenna fed with low-loss open wire line or twinlead, or a single-wire antenna, it's a different story. The s.w.r. of the antenna isn't all that important, and it would be the s.w.r. on the coaxial link from the antenna tuner to the transmitter that would normally be measured, in any case. However, if one *does* want to measure s.w.r. on parallel-conductor lines, it is possible to approximately determine the s.w.r. by routing the line through a balun coil transformer and measuring the s.w.r. on a regular coax s.w.r. bridge—an *indirect* procedure, but one which works fairly well. Alternately, a simple "twin-lamp" reflectometer (presented in early handbooks and described in fig. 1) or a parallel-line reflectometer could be constructed.[1]

Another point about the s.w.r. bridge: if you own a high-power unit, leave it in the transmission line at all times in order to provide a quick indication of malfunction in the antenna or a drop in transmitter power output; such problems will show up quickly. The slight, continuous loss of power which occurs in the bridge circuit won't be noticed. Note, too, that for most purposes an s.w.r. of between 2:1 and 3:1 is acceptable. Recognize that it is usually impossible to obtain and maintain a perfect 1:1 across a band; there are plenty of variables that go into antenna construction and adjustment that may preclude attaining a perfectly flat s.w.r. even at antenna resonance—things such as dew, rainfall, ice, and aging of the system can throw s.w.r. off slightly.

Finally, while we have discussed the

[1]*Brown, Fred, W6HPH. "A Reflectometer for Twin-Lead," QST, October 1980.*



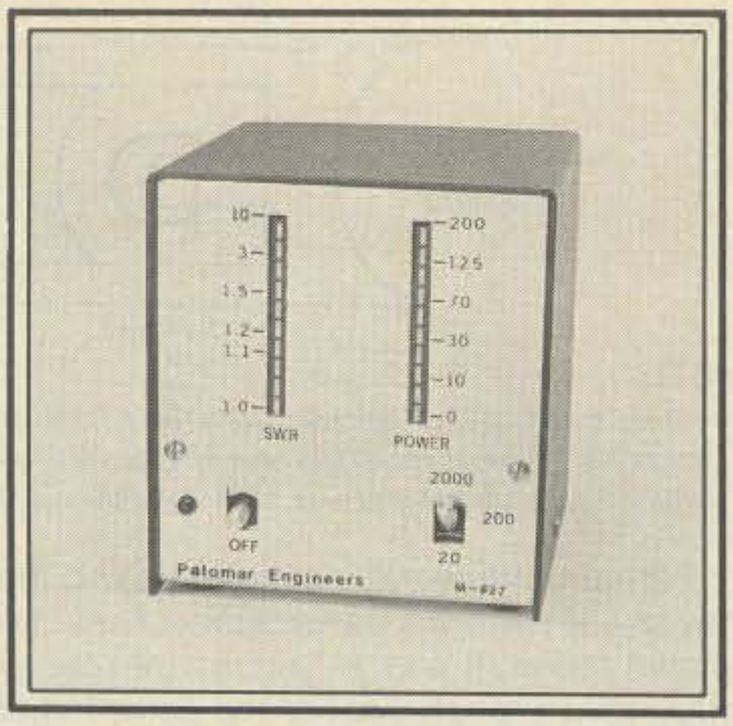
NOTE:
Two-foot length of twinlead, with No. 47 dial lamp terminating each end, and taped to main transmission line. If capacitive coupling causes a "neon-like" glow in the bulbs, a connection between the loop and one wire of the feedline may be required.

Perhaps the world's simplest s.w.r. indicator? A popular device in the 50s, in the heyday of twinlead transmission lines, was the so-called "twin-lamp" reflectometer shown above. It was, in fact, an inexpensive and easily constructed s.w.r. device that could give a rough, seat-of-the-pants indication of standing waves on popular 300-ohm transmission line.

The device was little more than two dial lamps (usually No. 47's), a short piece of twinlead, and a bit of Scotch tape. The two lamps were inductively coupled to the line so that the "forward power" bulb glowed brilliantly, while the antenna was adjusted so that the "reverse power" bulb was dim or fully extinguished. This condition would indicate that reflected waves were nil—in other words, that s.w.r. was at or near 1:1. That was all there was to this early s.w.r. indicator that cost less than $1 to build.

Interestingly, as coaxial cable came into favor in the 1960s, the twin-lamp dimmed out as a major item of hamshack "test equipment." Still, there were several ingenious designs which appeared in the various radio magazines of the era for *coax* twin-lamps. The major problem, of course, was to get *inside* the coax without ruining it. For obvious reasons, the coax-type twin-lamp didn't go over big, but there are probably a few hundred hams still using the twinlead-type indicator with link-coupled final amplifiers and folded dipole antennas who swear by this s.w.r. indicator.

Fig. 1– Twin-lamp reflectometer.



Interesting new meter by Palomar Engineers computes s.w.r. automatically and displays it on a light bar; a second light bar displays power. The M-827 s.w.r. meter has a frequency range of 1–30 MHz; power ranges are 20, 200, and 2000 watts. The s.w.r. scale provided is 10:1 and has a logarithmic response. (Photo courtesy Palomar Engineers)

Interesting multi-function device, originally designed for CB use, can have application in the hamshack. Unit shown here includes a monitor scope, 50 MHz frequency counter, peak-reading wattmeter, and s.w.r. bridge. (Photo courtesy Wawasee Electronics)

wattmeter and the s.w.r. bridge as separate, discrete instruments, it often makes sense to combine these instruments with other multi-purpose r.f. devices, such as dummy loads and antenna couplers or transmatches. The former combination may have limited application (except for test-bench power measurement), but the latter combination is a real help in convenient antenna coupler adjustment in the average hamshack.

This month, the Antennas Column has featured two important in-line instruments: the wattmeter and the s.w.r. bridge. Next month, we will continue with a discussion of other in-line antenna and r.f. accessories. See you then.

73, Karl, W8FX

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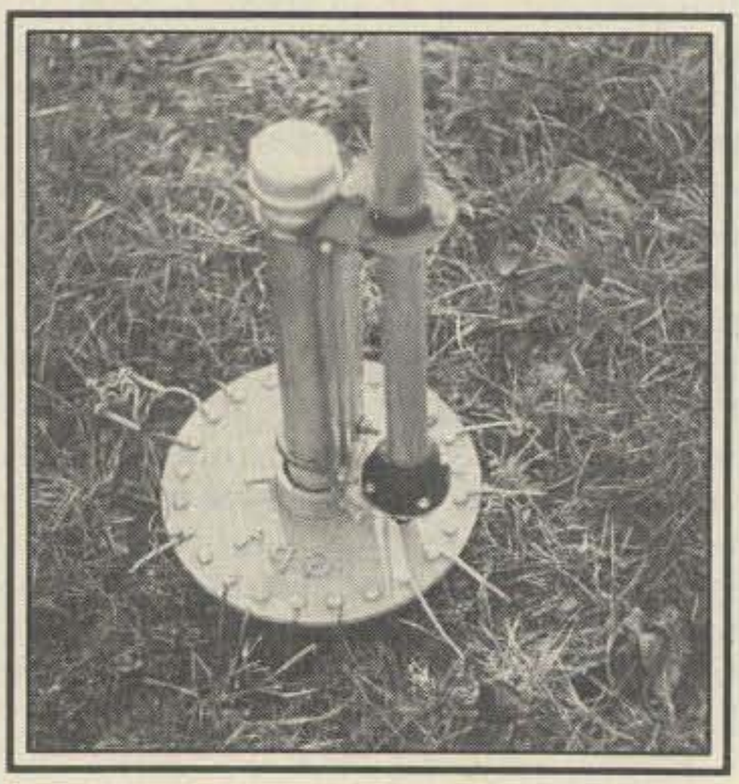
Correction

In the August 1982 Antennas Column, we described the SPC transmatch on page 51. In fig. 2, we showed C1 as a fixed capacitor, while, in fact, it should be a variable capacitor. Our hats are off to W1FB for bringing this to our attention.

Antenna of the Month: The Lance Johnson Engineering GP-1 Ground Plane Buss

It is well known that a good ground radial system is a virtual "must" for efficient operation of a ground-mounted h.f. vertical antenna system. Unfortunately, a problem develops when one attempts to connect a large number of radials to the base of the antenna. The GP-1 (for "groundplane-one") was developed as a convenient, 24-point cast "alumaloy" disk buss that allows one to neatly and efficiently connect a large number of radials to the base of the vertical. The disk attaches by means of three heavy bolts to masts up to 2 inches in diameter and has a large opening for feedline routing. The 10-inch diameter, ¼-inch thick buss will fit inside popular tower sections; 24 large bolts are provided for a radial connection.

Although designed primarily for permanent fixed-station operation, the unit also has possibilities for quick set-up/take-down field day and portable operation.



The Lance Johnson Engineering GP-1 ground plane buss. (Photo courtesy Lance Johnson Engineering, P.O. Box 7363, Kansas City, MO 64116)

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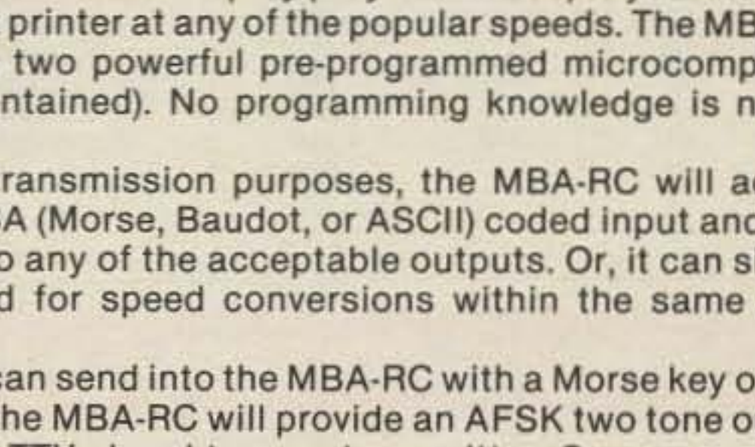

MORSE • BAUDOT • ASCII CODE READER/CONVERTER AEA Model MBA-RC $469.95

For unparalleled flexibility, the MBA-RC offers Morse, Baudot and ASCII code ready and conversion in a manner never before offered.

First, the MBA-RC can act as a stand alone reader with a large 32 character display. You may also output what is being read on the display (Any MBA code) to your ASCII or Baudot printer at any of the popular speeds. The MBA-RC utilizes two powerful pre-programmed microcomputers (self-contained). No programming knowledge is necessary.

For transmission purposes, the MBA-RC will accept any MBA (Morse, Baudot, or ASCII) coded input and convert it to any of the acceptable outputs. Or, it can simply be used for speed conversions within the same code mode.

You can send into the MBA-RC with a Morse key or keyer and the MBA-RC will provide an AFSK two tone output Baudot TTY signal to your transmitter. Or, you can type into the MBA-RC from your Baudot TTY keyboard and the MBA-RC will key your transmitter on CW at any speed between 3 and 99 WPM.

The MBA-RC operates from 12 VDC at approximately 1.2 Amps.

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MORSE PROFICIENCY TRAINER AND KEYER AEA Model KT-2 $99.95

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The MBA-RO operates from 12 VDC at approximately 500 mA. The model AC-1 wall adaptor for the MBA-RO is available for $14.95.

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Results Of The 1982 Spring BARTG RTTY Contest

Single Operator Section

No.	Call Sign	Points	Total QSO's
1.	W3EKT	668,196	373
2.	EA8RU	518,560	343
3.	W3FV	504,648	276
4.	G3HJC	462,870	221
5.	I2OLW	462,384	336
6.	I1TXD	430,560	272
7.	SM6ASD	405,958	261
8.	W4CQI	400,044	242
9.	I2WEG	384,948	252
10.	WB3CCZ	376,516	218
11.	W2IUC	361,460	229
12.	GM3ZXL	358,848	203
13.	GI4AHP	354,106	253
14.	K2UVV	338,800	199
15.	I8JRA	327,600	203
16.	ON5WG	325,908	220
17.	VK2SG	325,240	229
18.	WB5HBR	287,492	233
19.	DK1BX	286,304	196
20.	DJ6JC	264,350	199
21.	YU7AM	261,744	214
22.	N8AKF	238,084	158
23.	W6JOX	234,788	182
24.	YB2BLI	231,616	148
25.	W3KV	231,246	149
26.	YV5BBW	226,576	214
27.	OZ9GA	222,400	158
28.	K6WZ	220,740	165
29.	VO1EE	212,240	204
30.	EI3CN	202,350	165
31.	K@JH/4	202,104	127
32.	KL7HDS	197,208	266
33.	JR2TZL	194,560	140
34.	WB3HAZ	190,568	114
35.	PP7GV	186,024	152
36.	SM6AEN	172,800	122
37.	ZS2AB	172,492	179
38.	VK2NM	155,038	116
39.	I2JIN	148,050	151
40.	PT2BW	139,748	107

Single Operator Section

No.	Call Sign	Points	Total QSO's
41.	SM5FUG	135,998	139
42.	N7AKQ	133,200	152
43.	I6YPK	129,808	115
44.	DL8QP	126,208	96
45.	W@LHS	118,720	104
46.	W7MI	116,208	96
47.	WB2WZX	115,960	100
48.	W@HAH	110,772	98
49.	JR6AG	106,288	92
50.	WA6UFY	106,036	102
51.	DL5MBI	104,728	83
52.	GW3EHN	104,340	102
53.	G4NJW	102,648	79
54.	OK2BJT	102,100	85
55.	K4VDM	101,920	76
56.	YO3AC	98,980	122
57.	KB2VO	98,328	76
58.	PA@KFF	98,120	103
59.	YO2IS	92,460	82
60.	JA2VFW	91,296	95
61.	K@BJ	89,408	84
62.	9M2CR	89,100	78
63.	TI2DO	82,840	98
64.	WA3ZKZ	82,150	79
65.	SV1MO	82,008	142
66.	WA6WGL	79,636	66
67.	VE1AIT	77,400	92
68.	VE7NP	75,850	65
69.	DJ9IR	75,522	65
70.	ON7EU	75,180	63
71.	VE3CYX	70,984	110
72.	GI4KQA	70,522	73
73.	VE2QO	70,110	51
74.	G4IPZ	69,776	88
75.	DF9XI	69,264	80
76.	WB4UBD	69,256	59
77.	Y33UO	68,292	65
78.	AK2H	68,040	62
79.	SM7BGE	67,640	78
80.	SM6AAY	63,376	68

Single Operator Section

No.	Call Sign	Points	Total QSO's
81.	Y55ZF	63,036	67
82.	EA3BLQ	54,932	80
83.	LA2IJ	54,060	39
84.	VE2AXO	52,700	55
85.	Y55ZA	50,560	59
86.	VK2BQS	50,524	51
87.	G4EEV	49,436	49
88.	SL3ZR	49,062	55
89.	K2JN	46,400	40
90.	W4MWP	45,820	38
91.	VE7DLX	45,120	61
92.	I5AZX	42,950	75
93.	WB6BPA	39,474	47
94.	JA1DSI	39,440	36
95.	W7CBY	38,280	52
96.	F9CE	37,700	30
97.	WA7YDP	37,432	34
98.	W2KHQ	36,400	40
99.	DK5WJ	31,350	27
100.	VE3LNT	29,870	43
101.	W6IWO	28,800	40
102.	OZ7XE	26,880	52
103.	VE3BPM	25,200	26
104.	SM2EKN	23,280	37
105.	G3RDG	21,926	37
106.	KD4OM	15,150	21
107.	DL1YBU	13,328	36
108.	Y53VA	11,120	41
109.	SM6CAL	10,920	24
110.	VE4ADQ	10,400	25
111.	HA7TS	7,700	35
112.	G3KQS	6,920	10
113.	JA7ML	5,000	10
114.	VK2EG	4,220	6
115.	WA4LQZ	2,760	6
116.	F3PI	2,220	7
117.	ZS6AOG	1,266	3
118.	W8TCO	1,000	5

Multiple Operator Section

No.	Call Sign	Points	Total QSO's
1.	G3ZRS	513,540	270
2.	LZ1KDP	505,310	321
3.	OH2AA	431,600	314
4.	G3UUP	299,936	216
5.	I4JXE	282,906	193
6.	HA5KBM	206,500	175
7.	GW6GW	191,216	162
8.	OH2TI	188,784	130
9.	PY2QV	180,320	128
10.	KB9DM	176,652	162
11.	OK3KII	130,530	109
12.	OK3RJB	105,000	90
13.	K8ZOA/4	82,062	77
14.	OK3KYR	57,460	49
15.	OK3KGI	56,160	56
16.	PA@NYM	51,680	52
17.	KC4AAA	13,200	28
18.	Y32ZF	7,826	23
19.	OK3RMW	4,312	20

The Contest Manager gratefully acknowledges the receipt of check logs from the following: A4XJL, G8CDW, K7BV, PA@KST, ON4UN, SM6KST, Y25DL, Y56YF, Y61UF, ZS2DD, 9M2MW, and BRS 30694.

SWL Section

No.	Name/Call	Points	QSO's
1.	OK1-12880 (Czech)	282,534	187
2.	Y2-10521/0 (DM)	130,052	98
3.	Y2-6346/K	95,256	76
4.	NL4483 (PAO)	91,276	121
5.	J. Matthews (USA)	63,680	60
6.	Y2-8861/0 (DM)	61,100	57

SWL Section

No.	Name/Call	Points	QSO's
7.	Y2-0742/F (DM)	3,000	10
8.	Y2-12501/I (DM)	1,550	11

The log from NL5184 could not be included due to incomplete logging information.

A total of 158 logs were received for the 1982 Contest, and a total of 20 new Quarter Century Awards will be issued as a direct result of the Contest.

During the Contest period, RTTY activity took place from the following countries: Alaska, Antarctica, Antigua, Argentina, Australia, Austria, Balearic Islands, Belgium, Brazil, Bulgaria, Burundi, Canada, Canary Islands, Cayman Island, Ceylon, Channel Isles, Chile, Czechoslovakia, Denmark, Ecuador, Eire, England, Estonia, Euro-USSR, France, French Guyana, French Morocco, German Democratic Republic, German Federal Republic, Greece, Guantanamo Bay, Hong Kong, Hungary, Iceland, Indonesia, Italy, Ivory Coast, Japan, Kuwait, Latvia, Malaysia, Malta, Mellila (North Africa), Mexico, Netherlands, New Caledonia, Newfoundland, New Zealand, Nicaragua, Norfolk Island, Northern Ireland, Oman, Philippines, Portugal, Romania, Sardinia, Scotland, Singapore, South Africa, Spain, Sweden, Switzerland, United States of America, Vanuatu, Venezuela, Wales, Yugoslavia, Yukon Territory (N.W.T.).

1982 CQ WW WPX C.W. Contest High-Claimed Scores

The following are early-bird C.W. high-claimed scores. These are raw scores subject to WPX Contest Committee verification.

WORLDWIDE SINGLE OPERATOR ALL BAND

HK3A	3,542,401
KC1F	1,711,843
KA1R	1,585,649
JG1ILF	1,347,750
OZ1LO	1,236,492
9J2NO	1,167,805
VC3IY	1,016,785
FR0GGL	1,014,543
AL7H	971,537
6Y5HN	881,300
W3GM	771,096
PY2TXW	728,734
KL7RA	723,840
JH3CXL	639,450
YU7AF	607,012
VE3JTQ	572,904
K9BG	497,688
AB0I	470,239
SM0DJZ	459,378
AI1S	424,710
KB0G	399,112
NE6I	323,408
K4BAI	299,754
KI3C	217,580
N8BJQ	185,449
K6RU	157,815
AG8W	146,700

28 MHz

PY1BOA	218,120
YU2CQ	159,120
G3UKS	97,601
N6MU	13,530
JH0BBA	10,032

21 MHz

5Z4CS	2,015,955
ZY3CFD	1,387,042
ZY5XFR	736,186
WA6DBC	287,280
9K2BE	226,592

14 MHz

KP4EQF	1,189,015
VC3BMV	992,718
YU3VM	946,036
K1XA	594,206
JA5JCC	592,917
N4ZZ	529,968
KU5I	463,752
KK9A	462,430
K5VY	420,389
KC9T	347,574
AI1D	309,150
JJ3KMH	305,064
JH0LFE	271,740
YU3EO	258,093
SM5CMP	245,597

7 MHz

HA9RE	335,920
G3SXW	303,252
W6BIP	285,760
G3TXF	235,662
NC6U	220,584
VC3CRD	195,696
KG4W	159,200
OK1TN	156,480
OZ2JZ	143,560
W8UVZ	124,226
WD9IIX	117,040
AA1M	112,412
NI6G	102,720
KL7AF	101,640

3.5 MHz

YU5FAA	134,190
OH3XS	128,100
OH6EI	37,638
ON5WL	27,456
VC3KZ	25,900
N6PE	15,162
CX8DT	13,860
K4JLD/3	5,824
KJ0I	3,072
WB5DDI	2,430
KO7G	2,380

1.8 MHz

YU4YA	25,488
OK3CWQ	5,632
W8LRL	1,000
K5NA/2	360
K5UR	144

MULTI-SINGLE

NP4A	4,219,007
N4WW	2,386,590
KN5H	1,500,606
K8NZ	1,159,216
K8ND	1,146,495
KY5P	1,074,632
OH1AF	878,494
JA3YKC	865,317
JF1YPF	828,160
LA4O	632,710

MULTI-MULTI

JA3YBF	2,880,400
K4CG	2,677,610
KQ8M	1,831,890
JA2YEF	947,646
WA8TBQ	795,264

QRPp

SM5CCT/7	AB	190,820
EA8ACL	AB	139,965
W5VGX	AB	83,166
JR6LJO	28	6,208
G3VMY	28	2,006
4X6NDE	21	772,304
JA6VZB	21	54,912
WA4FBH	21	23,290
YU3TMJ	14	29,756
JA1NLX	14	12,960
VK2DXP	14	10,530
W8ILC	7	10,240

(NOTE: Queries pertaining to the WPX Contest should be sent to either Bernie Welch, W8IMZ, or Steve Bolia, N8BJQ.)

SWD-1 VIDEO CONVERTER

FOR CABLE TV

The SWD-1 Video Converter is utilized on cable TV systems to remove the KHz's signal from a distorted video (channel 3 in/out) and also pass thru the normal undistorted/detected audio signal. Rocker switch selects operating mode to remove KHz's distortion from the video or pass all other channels normally. Simple to assemble—less than 30 minutes. Pre-tuned. Input/output Channel 3. Impedance 75 ohms. 117VAC.

SWD-1 Video Converter Kit **$69.95**

VTR ACCESSORIES

SIMPLE SIMON VIDEO STABILIZER

Simple Simon Video Stabilizer, Model VS-125, eliminates the vertical roll and jitter from "copy guard" video tapes when playing through large screen projectors or on another VTR. Simple to use, just adjust the lock control for a stable picture. Once the control is set, the tape will play all the way through without further adjustments. Includes 12V power supply.

VS-125 Video Stabilizer, wired **$54.95**

SIMPLE SIMON VIDEO SWITCHING BOX

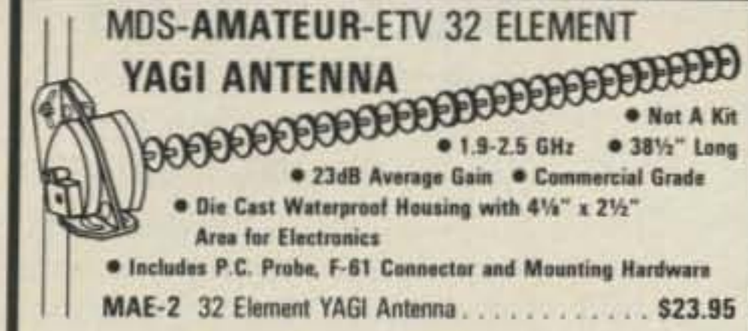
The Affordable Video Control Center

Excellent in isolation and no loss routing system. Simple Simons VSB-300 Video Switching Box enables you to bring a variety of video components together for easy viewing/dubbing. Also you gain the ability to record one channel while viewing another. Unit includes two F-type quick connector ended cables.

VSB-300 Video Switching Box, wired **$19.95**

UHF ANTENNAS and ACCESSORIES

MDS-AMATEUR-ETV 32 ELEMENT YAGI ANTENNA



- Not A Kit
- 1.9-2.5 GHz • 38½" Long
- 23dB Average Gain • Commercial Grade
- Die Cast Waterproof Housing with 4⅛" x 2½" Area for Electronics
- Includes P.C. Probe, F-61 Connector and Mounting Hardware

MAE-2 32 Element YAGI Antenna **$23.95**

Kato Sons' Down Converter Kit ★1.9 - 2.5GHz★

Designed for Simple Simon by former Japanese CQ Amateur Magazine's UHF Editor/Engineer. Unit utilizes new ingenious Printed Circuit Probe for maximum gain. Circuit board fits inside MAE-2 antenna housing. Requires 1 hour assembly. IC and capacitors pre-soldered.

Model KSDC-KIT 1.9 - 2.5GHz Down Converter Kit **$34.95**

Kato Sons' Regulated Varible DC Power Supply

For use with KSDC-KIT 1.9 - 2.5GHz Down Converter. Completely assembled with Attractive Cabinet, TV/Converter Mode Switch, Frequency Control and LED Indicator.

Model KSPS-1A Assembled Power Supply **$23.95**

SPECIAL INTRODUCTORY SAVINGS

ORDER ALL THREE ITEMS
MAE-2, KSDC-KIT and KSPS-1A for Only. **$74.95**
Regular price if ordered separately $82.85
— CO-AX CABLES ARE NOT INCLUDED —

ZYZZX VHF-UHF Wideband Antenna Amplifier

Revolutionary New HYBRID IC Broadband Amplifiers

50 MHz - 900 MHz
Model ALL-1 12dB Gain
Model ALL-2 35dB Gain

These units are not available anywhere else in the world. Each unit will serve many purposes and is available in Kit or Assembled form. Ideal for outdoor or indoor use. I/O impedance is 75 ohms. Amplifiers include separate co-ax feed power supply. Easily assembled in 25 minutes. No coils, capacitors to tune or adjust.

ALL-1 Complete kit w/power supply $24.95 — ALL-1 Wired/Tested w/pwr supply $34.95
ALL-2 Complete kit w/power supply 34.95 — ALL-2 Wired/Tested w/pwr supply 44.95

Our New STVA 14.5dB GAIN, 14 ELEMENT CORNER REFLECTOR YAGI ANTENNA

STVA-3 Yagi Antenna, 14.5dB Gain, Selectable 75 or 300 ohm Channel 60-80 . . . . . **$19.95**

STVA-4 Yagi Antenna, 14.5dB Gain, Selectable 75 or 300 ohm Channel 44-52 . . . . . **$19.95**

RG-59/U 75 ohm Low Loss Coax Cable . . . **$.12p/ft.** **F-59** Coax Connector . . . **$ .39 ea.**
MT-1 Special UHF 75-300 ohm Matching Transformer . . . . . **$1.45 ea.**

Switch to Bambi™!

Electronically

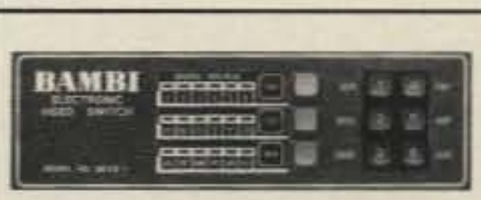
Bambi Electronic Video Switch ... makes switching of your VCR/VTR, Pay TV Decoders, Cable TV, Video Discs, Video Games, Closed Circuit TV, Antennae and Microcomputer as easy as pushing buttons.

The Bambi Electronic Video Switch is an electronic switching network which can accept up to six different sources of video signals and provide the flexibility of directing the inputs to any or all of the three outputs.

Now you can eliminate ... the drudgery of disconnecting and reconnecting your video equipment each time you use it ... the tangled mess of cables which are impossible to trace out ...not being able to use more than one function at a time.

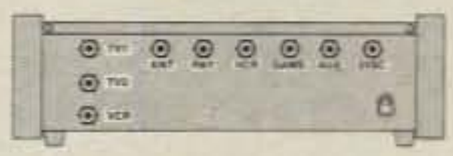
Bambi lets you enjoy using your video equipment the way it should be ... electronically and on line at the push of a button.

Model BEVS-1 Wired **$129.95**



Bambi's front panel was designed with the user in mind. Computer styled construction, with soft-touch keyboard (rated for over 10 million operations), arranged in matrix form allows easy input/output selection without refering to charts. Functions selected through the keyboard are immediately displayed on the 18 LED status indicators.

Check the quality of Bambi against that of much higher priced competition. All solid state electronic switching provides low attenuation (3dB), wide frequency response (40-890 MHz), and excellent isolation between signal sources (each I/O section individually sheilded for 65dB min. isolation).



Bambi's Specifications:

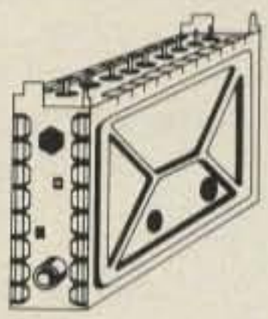
• Input/Output Impedance	75 ohm
• Signal Loss	3dB ±1dB
• Noise	4dB ±1dB
• Input Return Loss	12dB min.
• Isolation	65dB min.
• Power Req.	117VAC 60 Hz, 2W
• Dimensions	10¼ W x 6⅝ D x 3½ H
• Weight	4½ lbs

7+11 SWD PARTS KITS

MITSUMI VARACTOR UHF TUNER

Model UES-A56F

$24.95



Freq. Range UHF470 - 889MHz
Antenna Input 75 ohms
Channels 14-83 Output Channel 3

KIT NO	PART NO	DESCRIPTION	PRICE
1	VT1-SW	Varactor UHF Tuner, Model UES-A56F	$24.95
2	CB1-SW	Printed Circuit Board, Pre-Drilled	18.95
3	TP7-SW	P.C.B. Potentiometers, 1-20K, 1-1K, and 5-10K ohms, 7-pieces	5.95
4	FR35-SW	Resistor Kit, ¼ Watt, 5% Carbon Film, 32-pieces	4.95
5	PT1-SW	Power Transformer, PRI-117VAC, SEC-24VAC, 250ma	6.95
6	PP2-SW	Panel Mount Potentiometers and Knobs, 1-1KBT and 1-5KAT w/Switch	5.95
7	SS14-SW	IC's 7-pcs, Diodes 4-pcs, Regulators 2-pcs Heat Sink 1-piece	29.95
8	CE9-SW	Electrolytic Capacitor Kit, 9-pieces	5.95
9	CC33-SW	Ceramic Disk Capacitor Kit, 50 W.V., 33-pieces	7.95
10	CT-SW	Varible Ceramic Trimmer Capacitor Kit, 5-65pfd, 6-pieces	5.95
11	L4-SW	Coil Kit, 18mhs 2-pieces, .22μhs 1-piece (prewound inductors) and 1 T37-12 Ferrite Torroid Core with 3 ft. of #26 wire	5.00
12	ICS-SW	I.C. Sockets, Tin inlay, 8-pin 5-pieces and 14-pin 2-pieces	1.95
13	SR-SW	Speaker, 4x6" Oval and Prepunched Wood Enclosure	14.95
14	MISC-SW	Misc. Parts Kit Includes Hardware, (6/32, 8/32 Nuts, & Bolts), Hookup Wire, Ant. Terms, DPDT Ant. Switch, Fuse, Fuseholder, etc.	9.95
When Ordering All Items, (1 thru 14), Total Price			139.95

7+11 PWD PARTS KITS

INTRODUCING OUR 7+11 PWD PARTS KITS

NEW

Kit No	PART NO	DESCRIPTION	PRICE
1	1VT1-PWD	Varactor UHF Tuner, Model UES-A56F	$24.95
2	2CB1-PWD	Printed Circuit Board, Pre-drilled	18.95
3	3TP11-PWD	PCB Potentiometers 4-20K, 1-.5K, 2-10K, 2-5K, 1-1K, and 1-50k. (11 pieces)	8.95
4	4FR-31-PWD	Resistor Kit, ¼W, 5% 29-pcs, ½ W 2-pcs	4.95
5	5PT1-PWD	Power Transformer, PRI-117VAC, SEC-24VAC at 500ma.	9.95
6	6PP2-PWD	Panel Mount Potentiometers and Knobs, 1-1KBT and 1-5KAT with switch	5.95
7	7SS17-PWD	IC's 7-pcs, Diodes 4-pcs, Regulators 2-pcs Transistors 2-pcs, Heat Sinks 2-pcs	29.95
8	8CE14-PWD	Electrolytic Capacitor Kit, 14-pieces	6.95
9	9CC20-PWD	Ceramic Disk Capacitor Kit, 50 WV, 20-pcs	7.95
10	10CT5-PWD	Varible Ceramic Trimmer Capacitor, 5-65pfd, 5-pieces	4.95
11	11L5-PWD	Coil Kit, 18mhs 3-pcs, .22μhs 1-piece (prewound inductors) and 2 T37-12 Ferrite Toroid cores with 6 ft. #26 wire	6.00
12	12ICS-PWD	IC Sockets, Tin inlay, 8 pin 4-pcs, 14 pin 1-pc and 16 pin 2-pcs	2.95
13	13SR-PWD	Enclosure with PM Speaker and Pre-drilled Backpanel for mounting PCB and Ant. Terms	14.95
14	14MISC-PWD	Misc. Parts Kit, Includes Hardware, (6/32, 8/32 Nuts & Bolts), Hookup Wire, Solder, Ant. Terms DPDT Ant. Switch, Fuse, Fuseholder, etc.	9.95
15	15MC16-PWD	Mylar Capacitors, 14-pcs and Silver Mica Capacitors 2-pieces	7.95
When Ordering All Items, (1-15), Total Price			159.95

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— VISA and Mastercard Acceptable —
*Check orders will be held 30 days before shipping.

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

I keep stressing the fact that announcements of coming events must be received at least three months prior to the date of the event to be included in the current issue of the Calendar.

The RTTY Art Contest announcement, Sept. 1st to Nov. 30th, was received much too late to include in past issues. The best I can do is to tell you where to send your entries. Those of you who participated last year know what it's all about, or you can write to Mae Washburn, WA6LNH, 5772 Garden Grove Blvd., SP415, Westminster, CA 92683 for details. Entries must be mailed no later than Nov. 30th to RTTY Art Contest, c/o Norm Koch, K6ZDL, P.O. Box 1351, Torrance, CA 90505.

As stated in this month's Calendar under *CQ* WW DX Contest, a new Trophy has been added to this year's C.W. Contest: a memorial plaque for Dick Spenceley, KV4AA. His untimely death on July 30th has left a big void in the c.w. bands during a contest, and especially on 20 meters, where he daily made the Virgin Islands available to stations all over the world.

The first memorial plaque is being donated by a group of his close friends. Future annual awards will be made from a fund established for that purpose. Contributions to this fund can be sent to me, Frank Anzalone (KV4AA Memorial Fund), and they will be deposited in escrow for that purpose. Modest contributions are invited.

At the time of Dick's death, the Guinness people were still procrastinating over whether or not they were going to include Dick's record of 195,000 QSO's in a 6-year period in their *Book of World Records*. It's beyond me how they can exclude a world-established hobby like amateur radio, but include, among others, a record of a guy who stood in line for 55 days to buy the first ticket to a sporting event.

Perhaps a flood of letters (make it QSL cards) as suggested by G3KFE in *Short Wave Magazine* would light the fire to make them aware of amateur radio. Write to Guinness Superlatives Ltd., Att.: Mr. Colin Smith, 2 Cecil Court, London Road, Enfield, England EN2 6DJ. Might I also suggest that other claims of amateur radio records be sent to the above address. They do require documentation with your claim.

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	Nov.	3-4	YLRL Anniv. Phone Party
	Nov.	6-7	ARRL C.W. Sweepstakes
	Nov.	6-7	Int. Police Assn. Contest
†	Nov.	7	Czechoslovakian Contest
	Nov.	7	"Corona" 10 Meter RTTY
	Nov.	13-14	European RTTY Contest
	Nov.	13-14	Delaware QSO Party
	Nov.	13-15	CQ-WE Telco. Contest
	Nov.	13-15	North Carolina QSO Party
	Nov.	20-21	ARRL Phone Sweepstakes
	Nov.	**27-28**	**CQ WW DX C.W. Contest**
	Dec.	3-5	ARRL 160 Meter Contest
	Dec.	4-6	Telco. Pioneers QSO Party
	Dec.	11-12	ARRL 10 Meter Contest
	Jan.	15	WCY Activity Contest
	Jan.	15	Hunting Lions Party
	Jan.	**28-30**	**CQ WW 160 M. C.W. Contest**
	Jan.	29-30	White Rose SWL Contest

* Covered last month.
† *Not official.*

Thanks to K5VWW, we are able to include the results of the 1981 USSR CQ-M Contest in this issue. Must say that I am surprised at the large number of entries from the U.S.

A final reminder: Deadline for material for the February issue is November 15th, and December 15th for the March issue. Again, I request that material be sent to my home address.

73 for this time, Frank, W1WY

ARRL Sweepstakes

C.W.: Nov. 6–8 Phone: Nov. 20–22
Starts: 2100Z Sat. Ends: 0300Z Mon.

This is the 49th running of the Sweepstakes, making it the oldest domestic competition going. It really stirs up a lot of activity.

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

Operation is also 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 suggested 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. will get you the "SS Package" and Operating Aid #6 with enough log and summary sheets for an average outing (37¢ in postage).

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

Stations using 200 watts or less are classed as "A" and over 200 watts as "B." The same station may be worked once only regardless of the band.

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

Awards: The usual certificates will be awarded in each class and mode for single operators in each section, and multi-operator stations in each division.

Logs must be received no later than Dec. 31st and go to: ARRL Communications Dept., 225 Main Street, Newington, CT 06111.

Int. Police Assn. Contest

Sat. Nov. 6 and Sun. Nov. 7
Three UTC periods each day
0000–0300, 0700–1000, 1400–1800

The German section of the International Police Assn. is sponsoring this year's contest. It is open to all: IPA members, non-members, and s.w.l.'s.

Exchange: RS(T) and QSO number. Members will identify by including IPA in their reports. U.S. members will also include a two-letter state identity (57(9)001 IPA VA).

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

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

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

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

Awards: Certificates as well as other special awards, including the Sherlock Holmes Award and Trophy, are available for IPA members, non-members, and s.w.l.'s.

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

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INNOVATORS IN DIGITAL COMMUNICATION

AMATEUR RADIO COMMUNICATION AT ITS FINEST

Both Systems Provide

• SIMPLE DIRECT CONNECTION to your Transceiver. • COMPLETE SYSTEM, built-in Demodulator & AFSK Modulator with keyboard programmable tone pairs. • SPLIT-SCREEN operation with keyboard selectable line location. • LARGE, TYPE AHEAD text buffer. • TEN, programmable message memories, plus ID's WRU & SELCALs. • RANDOM CODE generator & hand key input for practice. • Baudot 60 to 132 WPM. • ASCII 110 & 300 baud. • SYNC-LOCK MODE for improved ASCII operation. • RECORDER INTERFACE FOR "BRAG-TAPE" or recording off-the-air. • CODE CONVERTED Printer output in Baudot or ASCII. • SSTV/GRAPHICS transmit. • FULL 63 KEY Computer grade keyboard.

You won't find as much well thought out programming, circuitry, and features anywhere, at any price! The ATR-6800 combines the best of both worlds, an easy to use video system for CW/RTTY/SSTV with automatic station control **and** a stand-alone computer with expandable memory & full instruction set in Motorola assembly language. Add the BASIC language option package and you'll have the unique combination of an RFI proof computer and ultimate RTTY/CW HAM station. And don't forget "easy to use." All of us at Microlog are RADIO ACTIVE on RTTY, so there's a lot of personal attention to detail and ease of operation. "Stick-on" command listing and video status display will get you on the air quick and sounding like a pro.

There's a certain thrill to using efficient, reliable digital communications equipment on the air. That's the fun of RTTY. Spice up your Amateur Radio operation with the silent video system that does it all, the Microlog ACT-1. Even if you own a home computer and are considering an outboard interface/program, remember, we've put it all in one RFI tight enclosure that's ready to go as soon as you power up. And, with the "Battery-backed" memory option, you won't even lose your pre-programmed messages if there's a "blink" in the A.C. The ACT-1 has features that the competition doesn't even have on the drawing board! Check for yourself, you could spend a lot more and still come up short.

ATR-6800 vs ACT-1

The most often asked question we hear is "What's the difference between the ATR & the ACT-1?" The ACT-1 is a dedicated system for RTTY/CW/SSTV. It provides all the functions and features you need for a multi-mode station. Along with this superior "ON-the-AIR" performance, the ATR-6800 extends your operation into the realm of automatic station control and computer programming. Plug-in applications modules expand the ATR's memory to add new HAM oriented programs which are enabled by simple keyboard commands. By adding the BASIC option package, you'll have pre-programmed full community mailbox, contest dupe sheet, personal station log, message editor, BASIC computer language and 16k of battery-backed (non-volatile) memory. We also provide a subroutine list so that you can write programs to directly control the ATR-6800 in easy to use BASIC language. The ATR-6800 then is the expandable, "do everything" system where your imagination is the only limit! The ACT-1 is designed for the HAM who needs the essentials of a complete video system for digital communications.

TECHNICAL SPECIFICATIONS ATR-6800 & ACT-1

INPUTS

Speaker Audio	100mv min.
Digital	TTL, Keyer, Hand Key
**RS232	± 12V, 330 Ohm Source

OUTPUT TO TRANSMITTER FOR CW/RTTY/SSTV

+ Voltage Keying	+ 40VDC @ 300ma Max.
– Voltage Keying	-150VDC @ 50ma Max.
**Mercury Relay	200VDC or 2 amp (20VA Max.) N.O. & N.C.
T/R Change Over	ATR — Relay ± 30V @ 2 amp N.O. & N.C. ACT-1 — Transistor + 12VDC @ 300 ma. GND on XMT
AFSK Tones, Range	Keyboard Programmable 500 Hz to 3000 Hz
AFSK Tones, Level	Mic Compatible 30-50mv Audio
Slow Scan	Mic Compatible Audio. Sync 1200 Hz, Black-1500 Hz, White-2300 Hz

MISCELLANEOUS CONNECTIONS

RS 232	± 12VDC, 330 Ohm Source Impedance, Negative Mark
Printer Driver	ATR — • Hi-speed RS-232 upto 2400 Baud • Slo-speed Baudot & ASCII Floating Relay for Current Loop Switching ACT-1 — • Slo-speed Baudot & ASCII Transistor Switch + 40VDC @ 100 ma. • Optional Hi-speed ASCII RS232 @ 2400 Baud.
Tape Recorder	Mike ≈ 100 mv Audio
"Brag Tape"	Speaker ≈ 200 mv Audio
Scope	Horizontal and Vertical Outputs to Scope for RTTY Tuning Aid
Morse Speed Tracking	Automatic or Speed Lock

VIDEO OUTPUT

1 Volt Peak to Peak, Negative Sync Composite Video (American Standard)
European standard available upon request.

VIDEO FORMAT

Normal	24 lines, 40 characters per line
Zoom	12 lines, 20 characters per line
Black on White or White on Black	Keyboard selectable
Display Split Screen	Any location Line 0 (Off) to Line 20, Keyboard selectable
SSTV	3 lines, 6 characters per line + graphics

TEST MESSAGES: Quick Brown Fox and RYRY's in Baudot, U*U* in ASCII, VVV in Morse.

SYNC: Transmits "Blank-Fill" in RTTY and BT in Morse when Text Buffer is empty and unit is in transmit. Keyboard command on/off.

UN-SHIFT on Space: Automatically shifts back to "LETTERS" upon receipt or transmission of space. Keyboard command on/off.

REAL-TIME CLOCK: Keyboard set, always on screen display, hours, minutes, seconds. Can also be inserted in transmit text buffer by keyboard command.

WORD WRAP AROUND: Prevents splitting words at the end of a line. Works in receive as well as transmit.

CODE PRACTICE: Random 5 char generator sends at any speed you set via the keyboard. Hand-Key input allows use in code practice oscillator that will also read your sending!

STATUS DISPLAY can be called up to show the condition and control commands for 20 programmable parameters, such as AFSK tone freqs, UNOS, printer, etc. Useful as a "HELP" command in case you misplace the manual. There's also a constant "TOP-LINE" display of Time, Mode, Speed, & Code in use.

DETECTION MODES

Direct	Phase correlation detector with AGC controlled bandpass filter (100 Hz nominal width — 800 Hz center frequency)
Demodulator	Computer program enhanced dual tone demod. Primary tones fixed @ 2125/2295 Hz, Secondary tones variable @ 500 — 3000 Hz.
**Terminal	RS232 compatible half duplex or full duplex up to 9600 Baud

DATA RATES

Morse	5-199 WPM Keyboard selectable in 1 WPM steps. Auto speed tracking or speed on receive
Baudot	All standard 45, 50, 57, 74, 100 Baud (60, 66, 75, 100 and 132 WPM)
ASCII	110 & 300 Baud normal & synclock using internal Modem. ATR adds speeds up to 9600 Baud.
Slow Scan	8 seconds per frame

OUTPUT OPERATING MODES

Symbol	Character ouputs when typed
Word	Words sent after "Space Bar"
Line	Line sent after "Return"
Buffer	Send entire contents of text buffer

TUNING INDICATORS

Audio Ref. Tone	800 Hz Keyed Regenerated
Visual	LED on Mark (Keydown)
Scope	Tuning ellipse for RTTY

PROGRAMMABLE MEMORIES

Here is:	10-40 character messages (400 total) or *10-80 character messages (800 total) battery backed
ID:	15 characters maximum in standard ID and 17 in RTTY ID
WRU:	Up to 15 characters
Selective Call:	ATR — 4 memories, up to 15 characters each. ACT-1 — 2 memories for printer on and printer off

COMPUTER CAPABILITY

Memory	Standard unit has 4000 bytes of RAM for user program. Basic package adds 16K.
Language	Basic or Motorola M6800
Commands	Input; Output; Load; Go with Break Point; or Normal Basic
Tape Interface	Store Programs on Audio Cassette

POWER

115 VAC, 60 Hz 60 VA Max, Act-1, 30 VA Max (230 VAC, 50 Hz optional)
12 volt version available
External input for charging expanded battery backed memory. 6-15VDC @ 10 ma. max.

MECHANICAL

ATR-6800:	
Size	14¾"W x 12¼"D x 4"H
Weight	15 lb.
ACT-1:	
Size	17.8 W x 3H x 9.5D
Weight	7 lb.
ATR-6800 & ACT-1:	
Color	Beige Top, Black Base
Material	AL5052 Aluminum Alloy

*Standard on ATR, Optional on ACT-1
**Standard on ATR, Not available on ACT-1

CIRCLE 12 ON READER SERVICE CARD

MICROLOG CORPORATION —18713 Mooney Drive—Gaithersburg, MD 20879 (301)258-8400

Logs go to: Anton Kohten, DK5JA, P.O. Box 40 01 63, 4152 Kempen 1, West Germany. Mailing deadline is Dec. 31st.

Czechoslovakian Contest

0000Z to 2400Z Sunday, Nov. 7

The Czechs are looking for more stateside participation. A better effort by their publicity department would help. The following rules are a copy of last year's and are not official.

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

Classes: Single operator, both single and all band, 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 "100 OK" and "S6S" awards are available for contest contacts in lieu of QSL cards. Include a written application with your log.

Use a separate log sheet for each band, 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 Dec. 31st to: Central Radio Club, P.O. Box 69, 113 27 Prague 1, Czechoslovakia.

1981 Czech. Contest Results

All Band: W1END 10764, WB2TKD 1417, W2XQ 825.
14 MHz: N4OL 17045.
21 MHz: K2FE 1015, W1OPJ 160.
28 MHz: N2IT 2431, WA3DMH 510, WD8IDD 268.

DARC "Corona" 10 Meter RTTY

1100Z to 1700Z Sunday, Nov. 7

This is the last of a series of contests held by the DARC to increase RTTY activity on the 10 meter band. The other three were held in March, May, and September. Complete rules were given in the May Calendar, and the latest WAE country list is in the August issue.

Mailing deadline for entries is within 30 days after the contest to: Klaus Zielski, DF7FB, P.O. Box 1147, D-6455 Erlensee, West Germany.

CQ-WE Telco. Contest

1400–0500Z, Sat.–Mon., Nov. 13–15

Sponsored by the Bell System Amateur Radio Group, this activity is open to present and retired employees of Bell, Western Electric, AT&T, and subsidiaries of AT&T.

This past June, Bernie, W8IMZ, and I took a trip to Newington and had a most enjoyable and productive afternoon with some of the ARRL Headquarters staff: John Lindholm, W1XX, Don Search, W3ASD, Bill Jennings, K1WJ, and Dave Sumner, K1ZZ, the new General Manager. Dave took time out from his very busy schedule to pose for this photo. That's W8IMZ on the left, K1ZZ, and me, on the right.

This is David Immel, OA8CP, operating OA8V, winner of the World QRPp Trophy in the 1981 WPX C.W. Contest. (The Nevada A.R.A. was the donor of the trophy.)

No details were given, but you can contact your local interwork coordinator for logs and rules, or write to: Steve Wheatley, WN8GUE, c/o Bell Labs., 2525 Shadeland Ave., P.O. Box 1008, Indianapolis, IN 46206.

European RTTY Contest

0000Z Sat. to 2400Z Sun., Nov. 13–14

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 on other continents as well as on 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 lists (see August issue). In addition, each call area in JA, PY, VE/VO, VK, W/K, ZL, ZS, and UA9-Ø will be considered as a multiplier. The multiplier point per band is the same as shown for the c.w. and phone contests, except for countries within one's own continent. These are counted as one per band only, regardless of the band.

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

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

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

Delaware QSO Party

1700Z Sat. to 2300Z Sun., Nov. 13–14

The Delaware A.R.C. 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 each band and each 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 1 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, 3560, 7060, 14060, 21060, 28160. S.S.B.—1815, 3975, 7275, 14325, 21425, 28650. Novice—3710, 7120, 21120, 28160.

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 Dec. 17th to: Charles Sculley, AE3H, 103 E. Van Buren Ave., New Castle, DE 19720. Include an s.a.s.e. for the results.

North Carolina QSO Party

Two Periods GMT
1700 Sat. Nov. 13 to 0200 Sun. Nov. 14
1200 Sun. Nov. 14 to 0100 Mon. Nov. 15

This year's party is again being sponsored by the Alamance A.R.C.

The same station may be contacted once on each band and each mode.

Exchange: Signal report and QTH. County for N.C.; ARRL section for all others.

Scoring: *For N.C.*—One point per QSO. Multiply total by sum of ARRL sections worked.

1981 USSR CQ-M Contest U.S.A. & N. America Results

Single Opr. All Band

K1KI	197,946
K5KLA	66,792
WB4TDH	64,960
K4WJR	37,800
W2FG	36,512
K3FD	33,062
W5RBO	31,728
W9RE	29,800
K1MEM	22,605
KA5W	21,840
N2UN	17,484
N4KG	14,344
K6NA	14,070
N8BJQ	12,502
K2SX	12,218
AA6AA	12,006
W1DA	11,760
WA4OML	10,890
K4CNW	9,576
W4YN	8,584
WA2VUY	7,743
K8EF	6,831
W3ARK	5,850
WA2ECI	5,120
KA7FRS	4,158
K5JG	3,888
K7NW	3,588
WA4QMQ	3,549
W6SWM	3,400
K9TUS	3,249
WD9IIC	3,120
KØCS	2,646
K9TI	2,592
WB9MSV	2,332
WA3DMH	2,208
KS4G	2,160
WB3HAZ	2,142
K8PYD	1,806
N9AAP	1,638
N4KE	1,500
N3RL	1,365
K8AQM	1,241
K8HF	1,215
W1BL	1,188
W1OPJ	1,125
W1FJ	1,125
W6UQF	1,080
AA6EE	594
K5XY	495
WBØUXI	486
KD6EO	378
K8IAI	341
WB5YKD	252
W6PPI	80
WB9OBX	60
WA4CPR/KL7	72

21 MHz

W6BSY	5,628
W3DCN	1,092
WD5JMC	567
K6VL	561
WD9HKQ	460
KQ4M	390
WB9TBU	312
KA3R	288
N5FG	273

14 MHz

W4VQ	42,144
AA4NC	40,293
K5KG	19,142
W8UVZ	11,397
N1EE	8,757
K2LP	4,446
N3KR	2,295
KC4UG	1,716
WA4YUU	1,518
K1KOB	1,440
WB4UBD	1,305
W4KMS	1,092
W5IYR	759
WB4FKM	612
KA1PF	528
WB3DNA	459
WB5MJK	432
WØNB	392
K7LAY	360
WD9AEU	336
WA7JUJ	336
KC8A	252
K5GS	195
W4GIO	180
KB8KW	165
KA6LTJ	99
WD6EWG	90
KB3OQ	90

7 MHz

K1ZZ	13,224
K1BNQ	975

3.5 MHz

WØZV	2

Multi. Opr.

K7SV	199,251
N4OL	155,714
KB5FU	34,320
WD8CRY	17,664
NL7P	43,904

All Band

VO1AW	4,864
VE1EP	2,805
VE3GWM	1,125
VE3EVK	858
J73PP	1,728
XE1OX	14,640

14 MHz

HP1AC	744
XE1TIS	150

21 MHz

VO1AA/1	486

Out of state—Two points for each N.C. contact. Multiply total by N.C. counties worked (maximum of 100). A bonus of 25 points can be added to your score if you work the club station, K4EG.

Frequencies: Phone—3980, 7280, 14280, 21380, 28580. C.W.—60 kHz up from lower band edge. Novice—20 kHz up from lower edge of Novice bands.

Awards: The top scorer in and out of state will receive a 1983 *Call Book* of his choice. Certificates to the winners in each ARRL section.

Include a summary sheet with your log and the usual signed declaration, and a large s.a.s.e. if you want a copy of the results.

Mailing deadline is Dec. 13th to: F.R. Ashley, WB4M, 2731 Blanche Drive, Burlington, NC 27215.

CQ World Wide DX Contest

Phone: Oct. 30–31 C.W.: Nov. 27–28
0000Z Saturday to 2400Z Sunday

As indicated the past two months, there have been no changes made in the rules used in previous years. A few modifications that have no bearing on the scoring were explained last month.

We have, however, added a new and unusual award that was not included in the list of awards: a memorial plaque for Dick Spenceley, KV4AA, to the Single Operator in the C.W. Contest who makes the highest total of QSO's on all bands. This award is being donated by a group of friends who had a schedule with Dick every morning on 14270 kHz. We recognize the fact that our skeds were on s.s.b., but Dick's first love was c.w., and running up a record number of contacts was his operating goal.

Deadline for mailing your phone logs is Dec. 1st, and Jan. 15th for the c.w. entries. An extension will be given if conditions justify. The request for an extension must be made in writing to the respective directors (K3EST for phone and N6AR for c.w.) and reasons for the request must be included.

Phone logs this year should be sent to: Bob Cox, K3EST, 6548 Spring Valley Drive, Alexandria, VA 22312.

C.W. logs go to Larry Brockman, N6AR, 7164 Rock Ridge Terrace, Canoga Park, CA 91307.

Of course, logs can also be sent to the home office: *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801. *Be sure to indicate Phone or C.W. on the envelope.*

1982 B.A.R.T.G. Contest North America Results

W3EKT	668,196	VE2QO	70,110
W3FV	504,648	WB4UBD	69,256
W4CQI	400,044	AK2H	68,040
WB3CCZ	376,516	VE2AXO	52,700
W2IUC	361,460	K2JN	46,400
K2UVV	338,800	W4MWP	45,820
WB5HBR	287,492	VE7DLX	45,120
N8AKF	238,084	WB6BPA	39,474
W6JOX	234,788	W7CBY	38,280
W3KV	231,246	WA7YDP	37,432
K6WZ	220,740	W2KHQ	36,400
VO1EE	212,240	VE3LNT	29,870
KØJH/4	202,104	W6IWO	28,800
KL7HDS	197,208	VE3BPM	25,200
WB3HAZ	190,568	KD4OM	15,150
N7AKQ	133,200	VE4ADQ	10,400
WØLHS	118,720	WA4LQZ	2,760
W7MI	116,208	W8TCO	1,000
WB2WZX	115,960		
WØHAH	110,772		
WA6UFY	106,036	**Multi Opr.**	
K4VDM	101,920	KB9DM	176,652
KB2VO	98,328	K8ZOA/4	82,062
KØBJ	89,408	KC4AAA	13,200
TI2DO	82,840		
WA3ZKZ	82,150		
WA6WGL	79,636		
VE1AIT	77,400		
VE7NP	75,850		
VE3CYX	70,984		

Out of a total of 148 entries, W3EKT and W3FV placed #1 and #3, respectively, worldwide.

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ST-144/UP

ICOM
IC2AT
IC3AT
IC4AT

YAESU
FT-208R
FT-708R

YAESU

FT-ONE, FT-102, FT-101ZD, FT-707, FT-230R, FT-480R, FT-720RU, FT-290R, FRG-7700, FT-625RD

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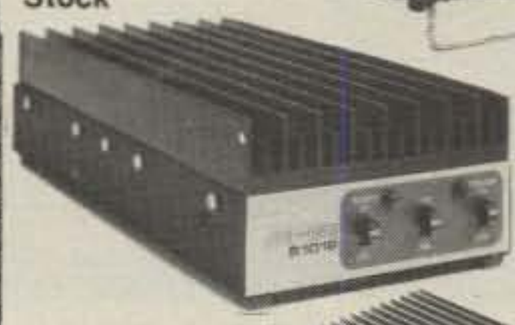

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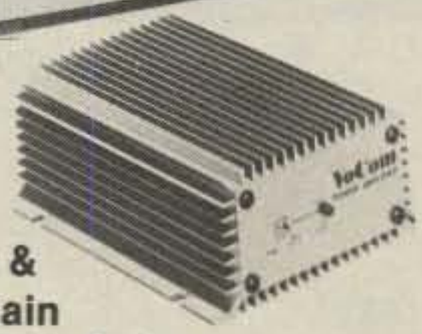

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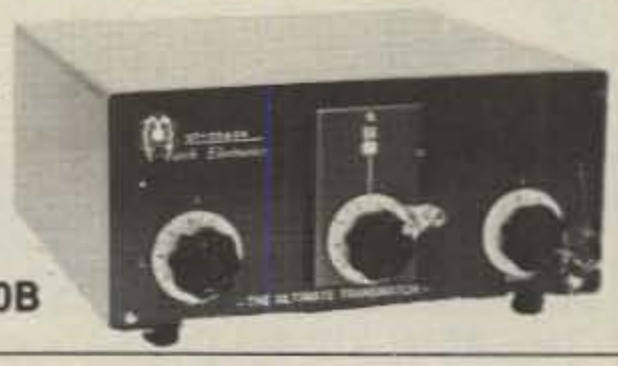

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☐ Life Membership chevron for 5" League Diamond Patch $1.25

☐ Rubber Stamp $2.00

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Total Enclosed (or charge to MC, VISA or Chargex) $ _____

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THE AMERICAN RADIO RELAY LEAGUE
225 MAIN ST., NEWINGTON, CT 06111

CQ-B

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

What To Do When You Hear A Radio Call For Help

The code distress call is SOS. The voice distress call is MAYDAY. MAYDAY is an anglicized derivation of the French word *M'aidez*, which means "help me." Distress calls have absolute worldwide priority over all other types of transmissions. There have been several instances wherein distress calls have been heard on the amateur bands. Twice I have been the initial amateur to answer distress calls, and any active amateur is apt to be such a coordinating station at any time. It is essential that you know what to do if you hear a distress call. I wrote the original version of this article while working at RMCA Coastal Harbor Radio Station WBL (Buffalo, New York) more than three decades ago. There is very little difference between the two articles, of course, since the requirements have not changed much during the intervening 30 years. However, I have deleted references to East Coast telephone numbers and replaced them with ones that are pertinent throughout our country.

If you hear a distress call, assume that it is genuine; there are severe penalties for falsifying such transmissions and it very seldom occurs. In any case, it would be better to be fooled than to take a chance on not helping people in distress. After you get over the initial shock and disbelief, do not panic; the people sending the distress call (from a ship, yacht, tug, airplane, balloon, car, etc.) have enough problems without having to put up with a terror-stricken responding station. I have been the transmitting operator in a few bad situations, and I assure you it was great to have my messages accepted in a professional manner.

The first station acknowledged by the station in distress is in charge of the distress communication in conjunction with the station in distress. If it becomes obvious that some other responding station can handle the distress traffic better (usually due to better reception conditions), control may be transferred if the station in distress agrees to the change. If you are the first station responding to a distress call, obtain the following required information:

(1) Name of vessel.
(2) Civilian or military assigned callsign, or airplane registration number.

2814 Empire Ave., Burbank, CA 91504

Dave Schwertfager, KA8PCS, of Columbus, Ohio, is one of many retread amateurs on the Novice bands, having held KN8AHV and K8AHV more than two decades ago. Dave credits this column with getting him interested in amateur radio again. His station includes a 40 meter dipole and antenna tuner, plus the Heath HX-1680 and HX-1681 pair. Even though this is his second time as a Novice, Dave again suffered first contact jitters. He has gotten over that now and he is working states at a good rate. He recently contacted DK4YJ in West Germany. His code speed is about 13 w.p.m., and Dave expects to be a General by the time this picture is printed. He also expects to have the Worked All States (WAS) award very soon, an accomplishment he missed in the 1950s.

Note that this is not the amateur callsign that is probably in use.

(3) Exact nature of the distress and imminent danger.

(4) Physical description of the vessel (size, color, etc.).

(5) The number of people involved.

(6) Summary of any injuries or deaths.

(7) Geographic location and certainty of that location data (sure or unsure).

(8) Frequencies and modes distressed station can and will use to supplement amateur band communication.

(9) Home port (city and country, or airport city and state).

(10) Exactly what help is required.

(11) Disaster site weather conditions.

(12) Authority for distress traffic (usually the master of a ship or the captain of an airplane).

As soon as you have checked all of the preceding facts with the operator at the station in distress, call the appropriate search and rescue (SAR) organization. Many federal and local agencies participate in American search and rescue efforts, but the two most useful organizations to contact in emergencies are the Air Force and Coast Guard. SAR activities are coordinated throughout the 48 contiguous (adjoining) states by the Air Force from Scott Air Force Base in Illinois, where the toll-free telephone number is 1-800-851-3051. This number is *only* to be used for emergency calls. The Air Force coordinates SAR activities in the inland areas of our country. The Coast Guard coordinates SAR activities along our Atlantic and Pacific coastlines. Both Air Force and Coast Guard can (and will) coordinate SAR efforts among all federal and local facilities concerned with each emergency situation.

The Coast Guard has divided the Atlantic and Pacific regions into sub-regions and sectors, each of which has rescue coordination centers (RCC's) that are responsible for dispatching SAR personnel and equipment. The telephone numbers of the subregions/sectors are as follows:

Inland Region (USAF) 48 continuous states	
Scott AFB, Illinois (emergency only)	1-800-851-3051
Atlantic Maritime Region (USCG)	
Boston Sub-region	617-223-3644
Cleveland Sub-region (Great Lakes)	216-293-3984
Miami Sub-region	305-350-5611
New Orleans Sub-region	504-682-6225
New York Sub-region	212-668-7055
Norfolk Sub-region	804-398-3231
St. Louis Sub-region (Mississippi, Ohio, and Missouri Rivers)	314-425-4614
W. Atlantic Sub-region	212-668-7055
Pacific Maritime Region (USCG)	
Central Pacific Sub-region	808-546-7109
Eastern Pacific Sub-region	415-556-5500
Long Beach Sector	213-590-2225
San Francisco Sector	415-556-5500
Seattle Sector	206-299-5886
Northern Pacific Sub-region	907-586-7340

The preceding SAR centers have excellent communication capabilities between themselves. If you are not sure which group has jurisdiction over an emergency situation, just call the closest group and they will provide help. It is an excellent idea to look up the telephone numbers of Air Force and/or Coast Guard facilities listed in your local telephone directories. Simply look under "U.S. Government" and remember that the Coast Guard is now part of the Department of Transportation. I hope you will make a copy of this article and keep it in your shack for use in the event of an emergency. It is good to add telephone numbers of your local USAF/USCG facilities to this emergency aid.

Donald R. Smith, WD8KQF, lives in Iron River, Michigan, in the upper Michigan peninsula. He has been a Novice about four years and he hopes to upgrade soon. As the picture shows, he operates a Heath HW-16 transceiver. His antenna system includes an 80 meter dipole and an inverted Vee for 40 and 15 meters. Most of his contacts have been made on 15 meters, where he has worked amateurs in 45 states, plus a few foreign countries. Don is an RCC (Rag Chewer's Club) member.

If your telephone is not in your station, it helps to have a dependable person handle the telephone calls while you maintain a careful listening watch for possible additional calls from the station in distress. Pass USCG/USAF responses directly to the station in distress to reassure them that their plight is known and help is on the way.

I live in southern California. In our area, we may hear yachts in need of help. They are usually not in distress, but they are in trouble. Most of their problems can be rectified by dispatching a USCG vessel to the scene. In this area, USCG vessels can be contacted at the following locations using the indicated telephone numbers:

Alamitos Bay	Pt. Evans	213-598-5338
Marina del Rey	Pt. Bridge	213-823-2300
Newport Beach	Pt. Divide	714-673-0420
Oceanside	Pt. Hobart	714-722-3838
Santa Barbara	Pt. Judith	805-966-3093

The USCG telephone numbers in southern California are as follows:

Long Beach	213-590-2225
Oxnard	805-985-9822
San Diego	714-293-5894

Do not interfere with emergency communications in progress. No matter how much one wants to help, interference is still interference. If the emergency traffic is being handled satisfactorily, leave them alone and just listen. Remember that amateurs interfering with distress traffic from the Titanic almost ended the amateur radio service. In addition to knowing how to transmit, good operators know when to listen without transmitting.

It is common to have radio and TV stations, plus newspapers, call requesting information about a disaster. If you have an aide at your station, that person should provide as much help as possible, since distress traffic is not subject to the Secrecy of Communications Act, and amateur radio can use all the good publicity it can get. However, handling possible additional distress traffic is your first responsibility. Do not leave the operating position (or turn receiver output down) to answer such calls. Publicity is far less important than lives.

Captain James H. Costich is the Chief of the Search and Rescue Branch in the Eleventh USCG District. The closing paragraph of a letter he recently sent to me is worth sharing with you. He wrote: "Amateur radio operators are a valuable resource to those of us in the search and rescue business. They have been directly responsible for saving many lives by providing timely and accurate information to rescue facilities. We in the Coast Guard appreciate your interest and continued service."

Nineteen-year-old Sharon Hendricks, KA2NLB, of Milford, New Jersey, is a freshman at Drew University. Sharon's boyfriend, Rob Magro, KA2EGO, helped her get started in amateur radio. Her station includes a Ten-Tec 509 Argonaut transceiver and a vertical antenna. She usually operates on the 10 or 15 meter Novice band, where she has enjoyed about 200 contacts. Sharon's QSL card shows a Koala bear, which is her favorite animal. If she keeps her present callsign when she upgrades her class of license, she intends to use KA2-New-Lady-Broadcaster as her phonetic identification.

Amateur Radio Wall Calendar

Large wall calendars are scarce. Consequently, an amateur radio club has obtained a supply of 13.5" × 19.5" calendars which have room to write in events of importance, such as contests and club meetings. Amateur radio is printed in large letters on the top half of each sheet. Send a self-addressed mailing label and $3.25 to W6LS, 2814 Empire Ave., Burbank, CA 91504 for each calendar you want sent to friends, relatives, and/or yourself. Payment may be in the form of U.S.A. cash/postage, IRC's, money order, or check made payable to W6LS. The price includes U.S.A. mailing costs. Each calendar is sealed in its own mailing wrapper. This is a great surprise gift item!

Amateur Radio Philately Club

Mathias Bjerrang, LA5NM, and Laci Bakos, YU7CB, are starting the Ham-Stamps Club for amateur radio operators and shortwave listeners who are also stamp collectors. The dues rate is $5.00 (or 15 IRC's) per year. Members are assigned numbers which consist of their country prefix followed by a sequential number. As an example, ARRL President Vic Clark, W4KFC, was the first American to join the Ham-Stamps Club and his number is W1. Dues, news, and inquiries should be mailed to Ham-Stamps Club, Box 210, 9401 Harstad, Norway.

Ham-Stamps Magazine will be issued quarterly. The May 1982 issue is reported to include an article called "Amateur Radio Stamps," by Vic Clark. This article includes a list of amateur radio stamps issued up to 1981. A list of members will be published in an issue of *Ham-Stamps.* The club magazine includes an advertising section for the use of members. Ads cost $2.00 (6 IRC's) for up to 20 words, and $1.00 (3 IRC's) more for each additional 5 words (or any part thereof). The magazine is in English, since this is the universally accepted language for radio.

If you decide to join the Ham-Stamps Club, you are asked to include some information about your background and interests in both hobbies, plus information about yourself. My wife (Marie, W6JEP) just submitted her application, and she looks forward to having code contacts with many stamp collectors.

On-the-air contacts between Ham-Stamps Club members are being encouraged, and it is expected that a net (or nets) will be established to provide personal contacts and rapid dissemination of news items. Radio contacts will be supplemented by letters, since stamps and information will also be exchanged.

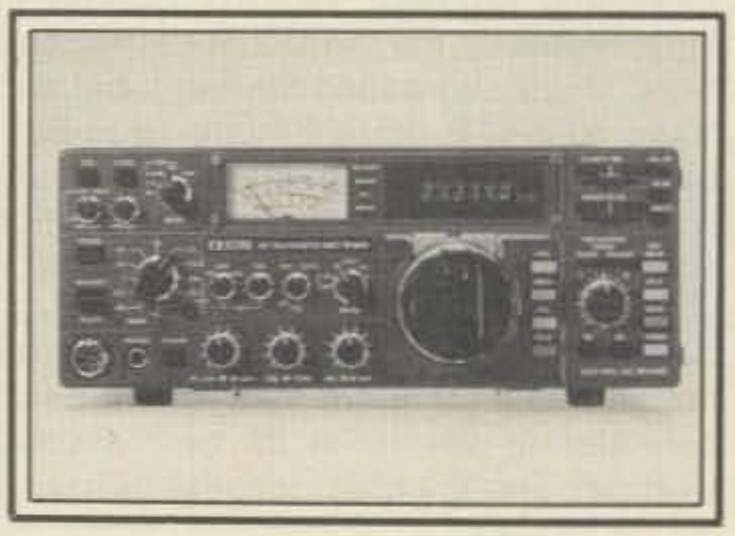
CQ SHOWCASE

Guild Radio Rack

New for hams is the Guild Radio Rack. The Guild Rack comes in beautifully finished solid ash, and no assembly is required. The rack comfortably holds Kenwood's TS830S/VFO230/SP230 or TS820 series, and any similar rigs. Exact measurements are 16⅞"W × 14¾"H × 12½"D, (top compartments) 7½"W × 6"H, (bottom compartment) 15⅝"W × 7"H. It is also fully vented. The Guild Radio Rack has a suggested retail of $59.95. For more information, contact Guild Radio Rack, 225 West Grand St., Elizabeth, NJ 07202, or circle number 103 on the reader service card.

ICOM IC-740

The IC-740 is a versatile transceiver, having the most asked-for features in an h.f. base station. Front panel or top controls allow access to all operating functions. Adjustable receiver parameters are: r.f. preamp, r.f. gain, noise blanker (width and level) i.f. shift, pass band tuning, crystal filter in/out, notch filter, AGC (time constant and on/off), squelch, tone, and audio gain. Transmitter controls are mic gain, VOX, compressor, and power (10–100 watts). The IC-740 includes capability of operating in the f.m. mode.



The frequency synthesis network includes dual VFO's with three tuning rates, split operation, and memory. Analog control of frequency is with the incremental tuning on either TX, RX, or both. There is full metering of receive signal strength, transmit relative r.f. output, compressor level, ALC and collector current plus a built-in s.w.r. meter. For more information, contact Icom America, Inc., 2112 116th Ave. NE, Bellevue, WA 98004, or circle number 102 on the reader service card.

Wayne R&D Antenna Coupler

The Wayne antenna coupler replaces the center insulator of a balanced h.f. antenna system. It contains a high-quality air balun, tapped inductor, and a variable capacitor. The coupler is housed in a durable ABS plastic box with a removable lid for inspection and servicing. The strain insulator is made of tough Delrin plastic.

With the aid of graphs in the instruction booklet and an s.w.r. meter, the user can easily and quickly design a matching network to match the low impedance of his wire beam or the high impedance of his loop antennas. Using the network as a T or an L, the Wayne B-T-L antenna coupler will match a wide range of impedances from 1.8 to 30 MHz. The insertion loss is not more than −0.006 dB, 1.8–25 MHz, and minimal through 30 MHz. The introductory price is $49.95. For more information, contact Wayne Research & Development, P.O. Box 75144, Houston, TX 77234, or circle number 105 on the reader service card.

DGM Electronics RT-1100 Receive Terminal

DGM Electronics has just introduced the RT-1100 Receive Terminal for Baudot, ASCII, and Morse. The RT-1100 converts the audio from your receiver, decodes it, and displays the words on a video monitor or TV set (using r.f. modulator). The RT-1100 incorporates an active filter demodulator with scope tuning outputs. It will copy 170, 425, 850 Hz shift RTTY signals at speeds of 60, 66, 75, 100 w.p.m. on Baudot and 110 baud on ASCII. The unit will copy 6–60 wpm Morse sig-

nals using automatic or manual speed tracking. The RT-1100 has a parallel ASCII printer output for hard copy. The video output provides 16 lines of 32 characters per line with 2 pages. The second page is stored in memory and can be recalled by using the page 1-2 switch on the front panel.

The unit has a built-in 110 VAC power supply and is housed in an attractive 3″ × 10″ × 10″ case with brushed, anodized front and rear panels. The cover is a gray wrinkle finish. The unit comes with a one year warranty on parts and labor. For more information, contact DGM Electronics, Inc., 787 Briar Lane, Beloit, WI 53511, or circle number 106 on the reader service card.

lect another function. The letters for the functions are shown in Table I and should all be relatively self-explanatory. The **CLEAR** function in **PIX** will restore the program to fresh status after any of the PIX routines have been used, and will re-initiate everything.

While the program is running, hitting a shift @ will begin sending both received and transmitted text to the printer. Hitting the shift @ again will stop the process. You must be sure that your parallel port printer is both on and ready to accept text when you initiate this function, since if the program finds that the printer is unavailable, it will begin storing text in a small buffer area. If the printer never comes on line, then the program will begin chewing itself up while saving text.

I have found the program to be reasonably glitch-free. As with any TRS-80 Model I program running in an r.f. environment, strange things will sometimes occur. When something does happen, it is probably best to turn the computer off, then on again, and start from scratch. I should also mention that the routines which send text that has been loaded from disk or tape ignore line feeds and send a **CR** and an **LF** whenever a **CR** is encountered in the text. Thus, the routines as written will not work with pictures that expect overline printing. It should not be terribly difficult to change this if desired, but as you will see, this program just kept growing and growing, and I had to stop somewhere! I hope anyone who uses the system will enjoy it as much as I do. I'm always interested in comments.

I owe a special thanks to Dave, WB8TMR, who gave me the idea that this task could be done, provided drawings of the interface and clock mods that he was using, and shared some of his own software. Many of the good ideas in this system are his. Thanks also to Pat, W8GRG, who always seems to have good solutions to my insoluble hardware problems.

a regular feature by

THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

CQ Interviews Edward J. Minkel, Managing Director, FCC

Elsewhere in this issue, readers will find an in-depth interview with the Managing Director of the Federal Communications Commission, Mr. Edward J. Minkel. In the interview, *CQ* explores the job of the Managing Director, the relationship of the Director to other key officials within the Commission, and the Director's perceptions of the amateur service. Also presented are the Director's views on topics such as WARC-79 ratification, amateur access to the new 10 MHz band, and interference from the Russian "woodpeckers."

For an inside view of a relatively unknown, but important, position within the Commission—and of the man who serves in this position—don't miss this month's exclusive interview with Edward J. Minkel.

RFI Complaints to Commission Continue to Run High

According to Jeffrey Young, Field Operations Bureau, FCC, RFI complaints to the Commission in the period April–June 1982, inclusive, totaled 17,306. This is down from the 21,073 complaints reported during the same period a year earlier, but is still high enough to cause the Commission concern. The possibility exists that closure of several FCC field offices around the country earlier this year may have made it more difficult for people with complaints to contact the Commission directly and to acquire information on the Commission's reporting procedures. However, this is only conjecture at this point.

As in previous reports of this type, so-called television interference (TVI) accounted for 13,722 RFI cases (or 79% of the cases reported!). For the most part, TVI was related to CB operations (9516 cases), although amateurs were apparently involved in 614 cases.

Amateurs, in all, were cited in 901 RFI cases during the quarter, while CB operations accounted for ten times as many complaints (10,739 reported cases).

Finally, complaints from amateurs about interference caused by other amateurs totaled 255. This number indicates that such interference is still a serious problem and one which must be addressed by the amateur service.

8603 Conover Place, Alexandria, VA 22308

ARRL Pursues Abandonment of Amateur Frequencies by Cable Operators

Pursuant to Minute 73 of the July 1982 ARRL Board Meeting, your Washington Editor predicts that the ARRL will seek a prohibition on cable operations in frequency bands assigned to the amateur service.

In Minute 73, the Board unanimously voted to go on record as viewing "with deep concern the serious and growing incidence of unresolved cases of radio frequency interference arising to and from cable television systems operating in non-compliance with Federal regulations . . ." The Board went on to instruct the RFI Task Group, together with the ARRL's staff and its legal counsel " . . . to press for development of appropriate corrective measures by CATV interests at both the national and local levels . . ."

In response to Board Minute 73, it is anticipated that the League, in the matter of RM-4040 (Amendments of Part 76 of the Commission's Rules to Preclude Cable Television [CATV] Operation on Frequencies Assigned to the Amateur Radio Service), will argue that current systems do not employ sufficient means to ensure system integrity. In addition, the ARRL will note that while the National Cable Television Association (NCTA) has mounted a strong effort to resolve unilaterally CATV RFI problems involving amateur operations, the Association cannot require its members to take action.

Of greatest concern to the amateur community are leaky cable systems operating on cable channels "E" (144 MHz amateur band) and "K" (220 MHz amateur band). This is so because operations on both of these bands by amateurs represent a substantial investment in the type of equipment and training needed to respond in times of civil emergencies. And unlike the CATV industry—which can easily move its channel "E" and "K" operations to 30 or more other channels—amateurs must continue to operate in the bands now assigned to them.

Comments on RM-4040 were due 1 September 1982. Reviews of these comments, and on reply comments, should be taking place as this is read.

Nongovernment Spread-Spectrum Radiolocation Authorized in 420–435 MHz Band

The Commission has authorized radiolocation activities by nongovernment stations in both coastal and inland areas of the 48 contiguous states and Alaska in the 420–435 MHz band. Stations will be authorized to use spread-spectrum technology, with a minimum bandwidth of 10 MHz and a maximum bandwidth of 15 MHz specified. Transmitter power will be limited to 50 watts.

The FCC's action expands the authorization of nongovernment radiolocation operations to the interior of the U.S. so as to permit the use of such systems for agriculture, forestry, aerial surveying, and other activities. (Previously, these operations were limited to continental shoreline areas.)

Licensed operations, which will be authorized on a case-by-case basis, will be on a secondary basis. This means that the radiolocation operations must not cause interference to the priority users of the frequency segment used. In the 420–435 MHz band, government radiolocation operations and operations in the amateur service are considered "priority uses."

Stations authorized to use spread-spectrum radiolocation systems will be required to transmit a built-in manufacturer's identifier as part of their signal. In most cases, this identifier will be the initials of the manufacturer. This scheme will allow government users, amateurs, and the Commission to readily identify spread-spectrum operations which may be causing harmful interference to priority users of the 420–435 MHz band. However, theoretical and experimental data acquired by the Commission suggest that the potential for interference is low.

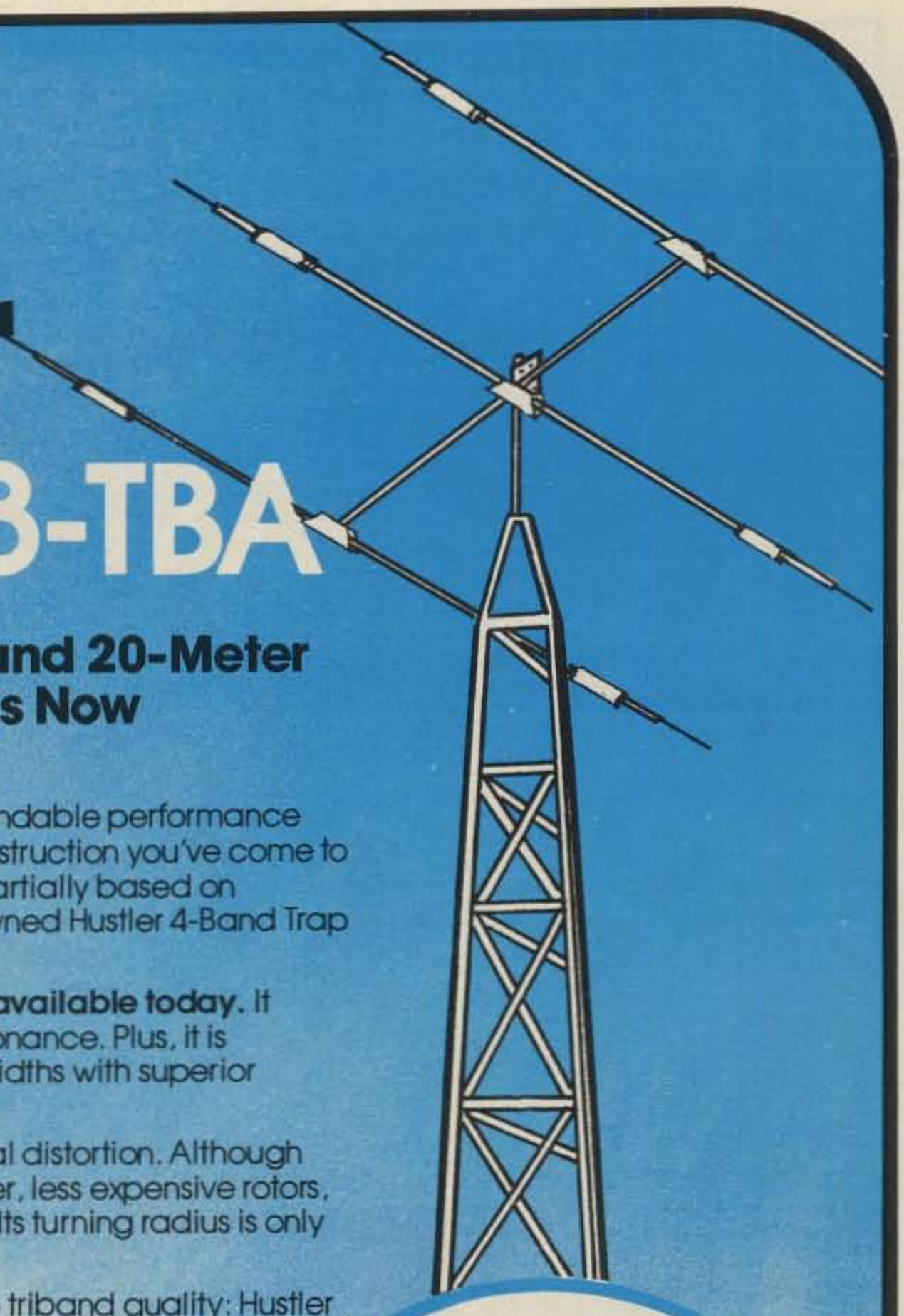
For more information on this action, readers are encouraged to contact Sam Tropea, FCC, 1919 M St. N.W., Washington, D.C. 20554 (telephone 202-653-8167).

U.S. Amateur Service Experiencing Significant Growth

A recent study by John Johnston, Chief, Personal Radio Branch, Private Radio Bureau, FCC, indicates that the U.S. amateur service is in the midst of the biggest growth period ever experienced.

No-103-104

Hustler
Tribander 3-TBA



The Rugged, Reliable 10, 15, and 20-Meter Yagi You've Been Waiting for Is Now Available.

This exciting new tribander sets the pace for dependable performance with its two in one trap design — and the solid construction you've come to expect from Hustler. In fact, its durable design is partially based on concepts used in the time-tested and world-renowned Hustler 4-Band Trap Vertical.

The 3-TBA is the smallest full-featured tribander available today. It offers excellent front to back ratio and SWR at resonance. Plus, it is engineered to provide the widest possible bandwidths with superior power handling capacity.

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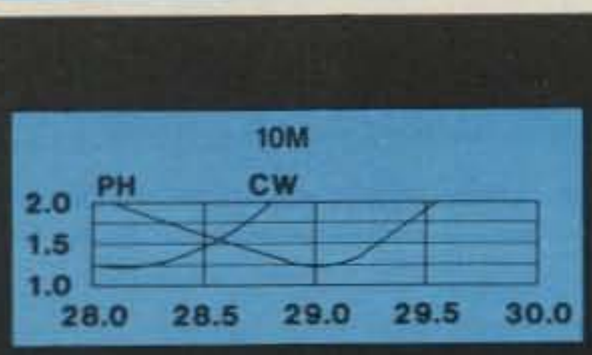
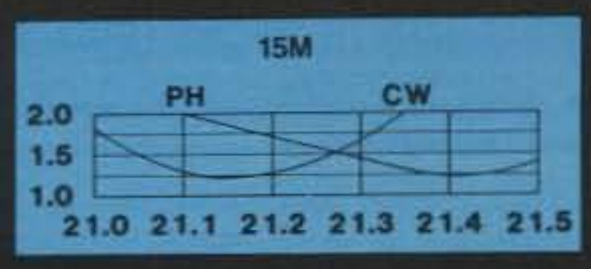
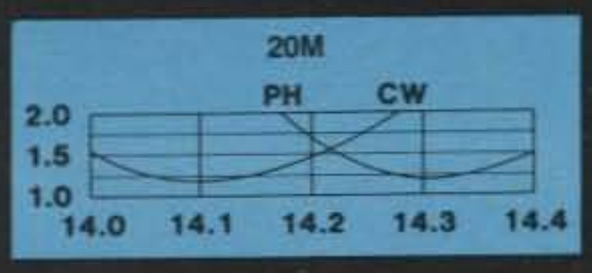
All in all, you can't surpass the Hustler 3-TBA for top triband quality: Hustler — still the standard of performance.







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CIRCLE 3 ON READER SERVICE CARD

The growth, which began in mid 1974, has brought the total nurnber of amateurs in this country to over 403,000.

According to Johnston, U.S. amateurs numbered about 87,000 in 1950. With the introduction of the Novice class license and with growth in the number of amateurs holding Technician and General class licenses, the service experienced steady growth throughout the '50s and early '60s, reaching a level of about 260,000 licensees in 1963. For 10 or 12 years thereafter, the U.S. amateur service remained relatively steady, reaching a peak of 264,374 licensees in 1971. Some have attributed the lack of growth during the '60s to the creation of "incentive licensing." Others cite the imposition of license fees by the FCC as the cause.

Regardless, following a decline to 253,357 amateurs in 1973, the service launched into the greatest period of growth ever experienced. Today, U.S. amateurs number 403,295! And the number is still going up.

Growth in the '70s is attributed to the availability of 2 meter equipment and repeaters, and to the "conversion" of CBers to amateurs. However, with the popularity of CB now on the decline, it is difficult to explain the continued growth we are experiencing.

Whatever the reasons for the growth, however, it is obvious that reports of amateur radio's impending death are greatly exaggerated.

Likelihood of Additional Cuts in FCC Staff Considered Low

According to statements made by the FCC's Managing Director, Edward Minkel, at the 28 July 1982 meeting of the Commissioners, the likelihood of further reductions in force (RIFs) in FY83 (beginning 1 October 1982) is "low." While the Budget for FY83 which the President submitted to Congress late last year recommended severe cuts in FCC funds, it does not appear that such cuts will go through. Rather, the Commission now anticipates receiving $79.6 million, about $2.5 million less than what it currently needs to maintain its operations. Regardless, Commission personnel believe that cost-cutting measures should eliminate the need for further RIFs.

The situation also looks "tight" for FY84. In the Commission's FY84 Budget, which went to the Office of Management and Budget (OMB) in September 1982, the Commission requested that some of the positions it had anticipated losing in FY83 be restored. If the positions are not lost in FY83, however, there is little likelihood that an increase in staff would be approved for FY84. And if no positions are eliminated in FY84, then staff levels would remain close to FY83 levels.

A spokesman for the Commission was quick to note, however, that even if staff levels remain about the same over the next two years, there is no assurance that the number of personnel assigned to any given bureau would remain unchanged. New programs having high priority within the Commission (e.g., low-power TV and cellular radio) may require reallocation of internal resources so as to meet Commission needs.

Initial SRI-UoSAT Effort Fails to Correct Satellite's Problems

According to a recent AMSAT Satellite Report, the UO-9 satellite did not respond to commands directed to it from the SRI transmitter. However, several good tracking runs were made with SRI's 46 meter (150 foot) dish, indicating that system "bugs" have been eliminated.

The negative results in correcting the satellite's control problem using 70 cm signals are thought to be partially attributable to the fact that UoSAT's 2 meter command receiver has precedence over the 70 cm command receiver. Readers will recall that both command receivers are being desensitized by the simultaneous operation of UO-9's 2 meter and 70 cm transmitters. As such, the 2 meter control receiver is "locked up," and it is overriding any commands received by the 70 cm control receiver.

The next major effort will involve command attempts on 2 meters. Accordingly, the SRI installation was, at this writing, being reconfigured to use on 2 meters.

House Approves "Radio Marti" for Cuba Broadcasts

As reported in *The Washington Post*, the House voted to build a government radio station in Florida to broadcast what Rep. Edward J. Derwinski (R-IL) called "a message of truth to the people of Cuba."

The bill to create the station, which will operate as "Radio Marti," passed despite the possibility that Cuba will retaliate by jamming the broadcasts. If this occurs, it is possible that the Cuban jamming signals will interfere with commercial broadcast station operation in the U.S.

The new station would be located in the Florida Keys, and its operation would be overseen by the Board for International Broadcasting. The Board is also responsible for the operation of Radio Free Europe and Radio Liberty.

The House rejected several amendments to the bill creating Radio Marti. One would have required the station to broadcast in the shortwave band rather than the a.m. band. During debate, however, it was noted that operation in the shortwave band would preclude a significant portion of Cuba's population from receiving the station's signals.

The Radio Marti bill has now been sent to the Senate.

The CQ staff joins your Washington Editor in extending congratulations to Dr. William Schneider, K2TT, who was nominated for the position of Under Secretary of State for Security Assistance, Science and Technology, Department of State.

Your Washington Editor extends his appreciation to Dr. Michael J. Marcus, Technical Analyist, Office of Science and Technology, FCC, for his contributions to this month's column.

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

November's sky is chill and drear,
November's leaf is red and sere,
November brings DX to cheer,
The *CQ* World-Wide Test is near.

After awhile most DXers realize that the world of DX is not solid and unchanging, but rather is a scene whose perspective is constantly shifting. The values, the needs, and the DXers themselves change. Last week one of the locals was up the hill to sit and talk of the year coming to an end. He wanted to talk of things that perhaps we often think of but seldom speak.

We had been staying indoors because of gray skies and a bit of early rain. There had been enough rain in the last couple of weeks to turn the hillsides from their summer brown to a vivid green. The first thought was that the local was coming by to check on the upcoming C.W. Test, he being loud over the years in his judgment that the only good amateur was one who worked c.w. exclusively. His thinking was one thing that never changed.

However, he had come to talk of other things. "Maybe I never stopped to think of it before," he said, "but it does seem that during this last year we lost a lot of good DXers—fellows who really have stood out over the years. And somehow I have to wonder if DXing will ever be the same."

We had also thought about the changes. We had talked with Jesse Bieberman, W3KT, at Visalia in May, and a couple of months later he was gone. Though there had been a number of years in between, Jesse was still not reconciled to comments made about cross-mode contacts for the C.W. DXCC Award. Along about that time we also learned about General Kam Chotikul, HS1WR, who was known to just about every DXer who tarried in Bangkok in recent years. Back in the 70's Kam hosted a SEANET Convention in Bangkok, and some who attended have never been the same.

We had to sit for awhile and think of what the years have changed. It always happens. Then the local picked up the talk again. "It's Dick Spenceley that I was thinking about," he told us. "I remember him back in the early 50's when he took over the *CQ* DX Column from Herb Becker. For a long time I followed KV4AA's advice, and I still remember him from that picture with his pipe in his mouth at the head of the column. Back in those days it seemed that almost all DXers sat around smoking pipes. What was it? I was just getting started seriously then, and a DXer in those days always seemed to be eight feet tall."

77 Coleman Dr., San Rafael, CA 94901

Here are a couple of the DX types at the California International this spring. On the left, Hugh Cassidy, WA6AUD, sometimes remembered for the West Coast DX Bulletin, *sometimes found in CQ. On the right is Albert Mueller, HB9BGN, who edits the* DX Bulletin *for the HB9 amateurs. (Photo via HB9MX)*

Some time back we had gained the feeling that all newly minted DX types tend to consider those who were there before as giants to wonder at and their DXCC totals as almost unattainable. But times change. Even DX changes.

It has been said elsewhere that DXers, perhaps as no others, tend to revere all who came before them and to scorn any who came after. But the years bring changes, and new giants will come to carry on for those who fade into memories of the past. But we thought of Dave Baker, W6WX, one of our own DX giants of other decades, and how we still remember him so vividly. A DXer, a gentleman, intelligent, considerate, and one we always will remember. Even years after he was gone, we only had to mention his name in print to get a note from some distant QTH from another who remembered "Red." We mentioned this to the local.

"What is it?" the local asked. "Is DXing a memory of the other days? I remember Jim Lawson, W2PV, with his always-good signal. And way back when I made a little two-tube radio receiver from a diagram in Hugo Gernsbach's *Short Wave Radio* book, I found W2EQS on 160. Later, when I got a license, he was my first contact." The local stopped, staring out a window at the clouds. "Tell me something," he continued. "After all these years have amateur radio and DXing turned to formless echoes and faded laughter?"

We had no answer for that. The local spoke of the days of DX giants, but we also knew that there are giants with us today, and though we may miss and regret those who are no longer with us, there are still those of mighty accomplishments whose calls and names will long be noted and remembered. We remember when once in a contest an operator at a club station in downtown Moscow came back to us by name. Work DX long enough and you will have memories. Know DXers and you will know the best. Every man sees his own kind of beauty; every DXer knows his own giants.

"It has been a long year," we agreed with the local, "and a year marked by the loss of many prominent ones we knew in other years. But let us look not with an old man's jealousy, but with some pride that we knew some of the best DXers to come down the pike. And there are others about us and more to come."

We got agreement on that and soon turned to talk of the coming *CQ* DX Test. Finally he rose to go. In a final comment he said: "Years ago I was told that you live as long as someone remembers you, and that you are dead when you are forgotten. I think that is right, and we will long be remembering KV4AA, W3KT, W2PV, and W2EQS. A long time!"

"And W6WX," we added, "and HS1WR and W8HMI. And always a lot more, but DXing goes on. It always has."

Phone Band Expansion

There has been some attention directed at the expansion of the U.S. phone sub-bands for some time. At the July meeting of the ARRL Board, recommendations were made on phone allocation changes in the 10–80 meter bands.

Currently, the matter is being studied at the FCC level in a docket. The recommended changes coming from the ARRL Board meeting are as follows, these being proposals for changes in the current U.S. phone sub-bands.

80 meters

3750 to 3775 kHz	Extra Class only
3775 to 3850 kHz	Extra and Advanced Class
3850 to 4000 kHz	Extra, Advanced, and General Class

40 meters

No changes proposed by ARRL

20 meters

14150 to 14175 kHz	Extra Class only
14175 to 14225 kHz	Extra, Advanced Class
14225 to 14350 kHz	Extra, Advanced, and General Class

15 meters

21200 to 21225 kHz	Extra Classs only
21225 to 21300 kHz	Extra, Advanced Class
21300 to 21450 kHz	Extra, Advanced, and General Class

The WPX Program

Mixed

994	WA6COW	997	G3ZRH
995	DL2VK/ST3	998	DF6AT
996	DLØIB		

S.S.B.

1515	EA3BOX	1517	YBØACL
1516	KA8JHD	1518	WA4VSL

C. W.

2159	OZ6KS	2161	VP2VFI
2160	G3YMC	2162	YU3TVQ

WPNX

210	KA6HTC	211	KA1HJK

Endorsements

Mixed: 450 VE2PD, DLØIB, G3ZRH. 500 DLØIB, G3ZRH. 550 DLØIB, G3ZRH. 600 DK6FT, DLØIB, G3ZRH, K8HF. 650 G3ZRH. 700 G3ZRH. 750 G2ZRH. 850 WB4RUA. 900 WB4RUA. 1600 N6AF. 2050 W2NC.

S.S.B.: 350 EA3BOX, YBØACL. 400 G3UKH, G4GED, VE2PD, YBØACL. 450 VE2PD, YBØACL. 500 YBØACL. 650 VK6YL. 700 VK6YL. 750 XE1XF, W3GXK. 950 W7KOI. 1000 W7KOI. 1250 K9BG.

C.W.: 350 WB4FKM, DL-G27/1830850, G3YMC, K2BLA, YU3TVQ. 400 YU3TVQ, DL-G27/1830850. 450 DL-G27/1830850, SM5DAC, YU3TVQ. 500 VY3TVQ. 550 YU3TVQ. 600 WA3GNW, YU3TVQ. 750 O6ICD, W8ILC. 800 W8ILC. 850 UB5WK, W8ILC. 900 SM6AYM, W8ILC. 950 W8ILC. 1000 W8ILC. 1050 SM5CMP. 1100 SM5CMP. 1150 SM5CMP. 1200 SM5CMP. 1650 WA2HZR.

10 meters:	VE2PD, G3ZRH, W8ILC.
15 meters:	G3ZRH, K8HF, W8ILC.
20 meters:	W8ILC.
40 meters:	G3ZRH, W8ILC.
80 meters:	G3ZRH, W8ILC.
160 meters:	K8HF, G3YMC, G3ZRH.
Asia:	XE1XF, G3ZRH, W8ILC.
Africa:	VK6YL, W4ZYQ, W8ILC.
Europe:	SM5DAC, WA2CNF, G3ZRH, W8ILC.
No. America:	VE2PD, VP2VFI, W8ILC.
So. America:	W8ILC.
Oceania:	VK6YL, W8ILC.

Award of Excellence: W8ILC

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

10 meters
28300 to 29700 kHz Extra, Advanced, and General Class

All of these are matters already being directed to the FCC's attention. FCC Docket 82-83 is directed towards the expansion of the h.f. phone sub-bands. The last significant changes in the phone sub-bands came over a decade ago when there was some expansion due to the adoption of the "Incentive Licensing" proposal. Over the years, back almost a half-century when U.S. sub-bands were established in an effort to bring some order to the modes used in various parts of the amateur frequencies, the trend has been for the U.S. to open up the phone portions of the bands. Some feel that this trend is likely to continue in Docket 82-83.

Heard Island

With Christmas and the New Year starting to loom closer and closer, the long-patient and Deserving DXer is looking beyond these holidays to the expected Great Days of Heard Island. It should not be long.

Heard Island is located at 53°10'S and 73°23'E. All things being relative, Amsterdam is located at 52°22'N and Berlin at 52°30'N. Here in the States, Juneau and Fairbanks are closer to the pole than Heard, Juneau being more than 58°N and Fairbanks over 64°N. But as Heard Island hardly qualifies as an outpost for Club Mediterranean, one has to look at other factors for the weather.

Cape Agulas at the tip of Africa is 34°S; Cape Horn at the tip of South America is 56°S. Thus, the winds in the Great Southern Ocean have little to slow them as they roar out of the west and into the east—no land mass to slow or warm them. The northerly limit of drift ice out of Antarctica is about 35°S in the Heard area. It is hardly a hospitable area.

The Heard expedition will depart Freemantle in western Australia in early January. Stops will be made at Amsterdam and St. Paul Island heading west, then southerly for a stop at Kerguelen Island, 200 miles from Heard.

The first amateur operation from Heard Island came in 1947 when Alan Campbell-Drury signed VK3ACD/Heard. Still active as VK3CD, Alan was on Heard for 15 months with the Australian Antarctic Research Expedition. Working c.w., he put out 4 watts. Rather than filling the demand for Heard Island, it stimulated the demand for what has been a consistently rare DXCC counter.

While the Northern California DX Foundation and the International DX Foundation have both pledged assistance, the costs of the effort are far from covered, and the VK6 DX Chasers Club is anxiously looking for some voluntary assistance from DXers who want to see a successful effort. Three DX operators are in the crew aimed at Heard Island, and the six-week stay should clean up much, if not all, of the demand for this one. Gordon Nichols, VK6XI, is the Radio Component Liaison for the effort, and communications can be directed to him at VK6 DX Chasers, 6 Briar Place, Ferndale 6155, West Australia. As the date for departure nears, their knuckles get a bit whiter each day as they work on their financing problems.

Licenses have been issued for the expedition. WKØHI and VKØCW are already on hand, with a third callsign expected. There should be little doubt as to what callsign will be heard on A1. The Wireless Institute of Australia (WIA) is acting as the trustee for all monies received.

Like Christmas, Heard Island is coming. And as a majority of the Deserving DXers already know, if you wait long enough almost everything you want or need will come by. The only trouble with that thinking is that sometimes it is an unending wait. But Heard is near! Listen from the housetops in the dawn!

World Communication Year 1983

As every right-thinking DXer knows, a year ago the United Nations General Assembly adopted a resolution proclaiming 1983 "World Communications Year—

The WAZ Program

10 Meter Phone

211	OE2SXL	213	W3FDP
212	YB0WR		

15 Meter Phone

138	N4PN	140	JA1DCO
139	JH1GZV	141	JA4GDN

20 Meter Phone

416	YS1GMV	418	VE3KIK
417	W8KBZ		

10 Meter C.W.

39	JH8IVO	40	N8II

15 Meter C.W.

73	GM3YTS	75	N6AW
74	WA0TKJ	76	N8II

20 Meter C.W.

175	K9PQG	176	K2OB

All Band WAZ

S.S.B.

2493	KQ8O	2499	F6FGW
2494	N6ZL	2500	DF7QD
2495	A4XIY	2501	KB2QN
2496	EA7LM	2502	VE7BSM
2497	H44SH	2503	F6FGW
2498	JF1VST		

C.W. and Phone

5410	JH8CZB	5418	HB9ARL
5411	EA3CTI	5419	ON4SH
5412	AF2L	5420	PY1DUB
5413	JA7JT	5421	JA7BWT
5414	W4XC	5422	DL8PY
5415	WB2MMB	5423	CE0AE
5416	WB6QPG	5424	OK1NL
5417	DK5AD		

All Phone

581	W5ERY

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

Development of Communications Infrastructures." The Potomac Valley Radio Club is moving to make sure no kilocycle is left untuned in the amateur bands during this WCY-1983, and they have announced an "amateur radio operating activity" (contest) during the 24-hour period starting at 0001 UTC Saturday, January 15, 1983.

All licensed radio amateurs worldwide are eligible to participate. Amateur bands from 1.8 MHz to 276 GHz can be used, but the new bands at 10, 18, and 24 MHz are excluded. There will be single and multi-op categories. Both categories are mixed-mode, but only stations using one transmitter will be eligible for an award.

Scoring will require knowledge of the three ITU Regions as well as the 75 ITU Zones for Broadcasting. The first is easy to learn; the latter is a bit difficult. As the exchange is a combination of the Zone and Region (W1AAA would be 208 in an exchange), having the full table of Zone/Region by callsign prefix will be an invaluable aid. You can get this easily. All you do is send an s.a.s.e. or s.a.e. and IRC to Potomac Valley Radio Club, PB 337, Crownsville, Maryland 21032, and ask for their Amateur Radio Activity Package, Dept. WCY-83. As this is looking like a worldwide 24-hour DX effort, get all the rules and information sheets early.

Slide Shows

As there is sometimes a feeling that a true-blue DXer lives for little else than DX and DXing, the International DX Foundation has something that may help feed the inner man found deep within any of the Deserving—slide shows of past DXpeditions! They have available 1978, Campbell Island, ZL4LR/A; 1980, Sabah/East Malaysia, 9M6MU; 1980, Brunei, VS500/VS5GM/VS5KV; and 1981, Desecheo, KP2A/D.

Drop them a line if you would like to know more about any of these. Specify the date needed plus a couple of alternates. Send your query to IDXF, Box 117, Manahawkin, New Jersey 08050. There will be more shows available in the future, so it may be timely to get into their circuit.

VP2-Montserrat

One of the joys of being a DXer in a DX spot is to have a chance to talk with visiting DX types. Even more exhilarating is to visit the local post office and note how the incoming QSLs have accumulated for past operations but are seldom, if ever, picked up. Alex Kasevich, VP2MM, worries about this condition, more so because Montserrat does not have a QSL Bureau. The Montserrat Radio Club would like to make arrangements to have the cards forwarded. One problem is, however, that in most instances it is not known where the cards can be sent, nor is there postage available to handle the forwarding. Currently there are cards on hand for:

VP2MH	VP2MCK	VP2MFM
VP2MAI	VP2MDB	MP2MGT
VP2MAJ	VP2MEV	VP2MSW
VP2MCL	VP2MP	VP2MNQ
VP2MDK	VP2MAY	VP2MFW
VP2ML	VP2MBU	VP2MGS
VP2MAK	VP2MDG	VP2MSG
VP2MBA	VP2MFC	VP2MMP
VP2MCW	VP2MFL	VP2MFZ
VP2MDS	VP2MGQ	VP2MJW
VP2MS	VP2MKV	VP2MPV
VP2MAP	VP2MPB	VP2MMR

Drop a line to the Montserrat Radio Society, POB 448, Plymouth, Montserrat, West Indies (Leeward), and if your call is listed above for a past VP2M operation, they will advise how much it will cost for postage to clear their decks. Also, any advice on how you want them shipped and how postage will be remitted will be appreciated.

Looking over the above list might also explain to some why they have not received a sought-after VP2M QSL. There is always an answer to every question. The problem usually is how to get it together.

Some Club Notes

Some have expressed the opinion from time to time that things are not like they used to be. Sometimes they even say that they are better in the local DX Club. And what makes the change for the better? Club officers—those who give time and effort and worry to making things go. Often unrecognized and unnoted, we note a few here.

The total amateur population on Mellish Reef in May 1982. From the left: Franz Langer, DJ9ZB; EA8AK; D. Mead, VK2BJL; VK3DHJ; and KB7NW. Should you be curious, the rest of Mellish looks just like this but without the tent and tourists.

In deepest Ohio there is a new DX club at Canton. The Stark DX Club came into existence when all the DXers got to talking about how nice it would be if the local DXers got together and found out what each knows and needs. So they organized. Bob Fain, KC8PX, is the President; John Schaffner, KB8LH, the Vice-President; Howard Koelble, N8BKB, the Secretary; Richard Princehorn, N8BBB, the Treasurer; and Thomas Stratton, WD8PCG, the Public Relations and Membership Director. Doing things right,they are even publishing a monthly bulletin. Any needy DXer in the Canton area can get more information by dropping a line to Tom Stratton, 3865 Westview NW, Canton, Ohio 44709.

In EI-land the Irish Society celebrated their Silver Jubilee Year with a large gathering at the Burlington Hotel in Dublin. Tom O'Connor, EI9U, is the current society President; Paul Martin, EI2CA, the Vice-President; Sean Nolan, EU7CD, the Secretary; and Sean Cooney, EI355, the Treasurer. The site of Marconi's transmitter at Clifden in Connemara was where EI1MFT was on the air. MFT was the callsign of the original transmitter.

San Hutson, K5YY

In his recent trip to St. Lucia and St. Vincent, San rolled up over 7K QSOs, his logs now showing 73,000 DX QSOs since he started looking at the far horizons back in 1969. During this trip 20 meters was given only small attention, c.w. being the mode used 55% of the time at the stops at J6 and J8. Actually, it was used 68% of the time at St. Vincents, as there was a much bigger need for that mode from that spot. During the trip San worked 146 DXCC countries, this being his

5 Band WAZ

Standings as of August 1, 1982

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. W0SD, Edward Gray (U.S.A.)
13. K0ZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)
15. OK3TCA, E. Melcer (Czech.)
16. K6SSS, Fred Capossela (U.S.A.)
17. ZL3GQ, Peter W. Watson (New Zealand)
18. OK3CGP, Stefan Melcer (Czech.)
19. SM0AJU, Leif Lundin (Sweden)
20. OZ3PZ, Preben Thomsen (Denmark)
21. I3MAU, Reno Mauri (Italy)
22. I2ZGC, Gianni Zillio (Italy)
23. 4Z4DX, Dov Gavish (Israel)
24. N4KE, Ron Blake (U.S.A.)
25. K5UR, Rick Roderick (U.S.A.)
26. K9AJ, Michael McGirr (U.S.A.)
27. SM3EVR, Tord E. Julander (Sweden)
28. LA5YJ, Bjorn Hugo Ark (Norway)
29. DL3RK, Walter Geyrhalter (W. Germany)
30. N4WJ, Frank McCormick (U.S.A.)
31. G3MCS, W.R. Hawthorne (England)
32. SM5AQD, Hakan "Hawk" Eriksson (Sweden)
33. W0MLY, George McKercher (U.S.A.)
34. I0RIZ, Gianni Rizzi (Italy)
35. ON5NT, Ghislain Penny (Belgium)
36. OH6JW, Antti Kiviuoma (Finland)
37. OK1AWZ, Milan Dlabac (Czech.)
38. IV3PRK, Pierluigi "Luis" Mansutti (Italy)
39. DJ6RX, Klaus Heintzenberg (W. Germany)
40. OH3YI, Ossi Lehvas (Finland)
41. I4RYC, Relli Claudio (Italy)
42. ZL1BIL, Mike Edwards (New Zealand)

The top contenders for 5 Band WAZ:

1. JA3EMU, 199
2. F5VU, 199
3. CT1FL, 198
4. N4RR, 198
5. DL3RX, 198
6. TG9NX, 198
7. EA8QL, 197
8. K1MEN, 197
9. K7UR, 196

169 Stations have attained the 150 zone level

ninth DXpedition to various places, including some very rare ones in Africa. K5YY is back on the DXAC again for a third term.

CQ WW C.W. Test

Perhaps this issue will show about the time of the WW S.S.B. Test, but keep in mind that the C.W. go-round is looming close, and November 27–28th, the last week in November, is almost at sighting distance.

To send you out somewhat prepared, we have some of the planned efforts you can listen for. Keep in mind that those listed are traveling far from the familiar skies so they can work a few thousand or so of the Deserving. Some figure on working that many in an hour. Mark your calendar and be prepared to help those who have gone to so much trouble.

The DXpedition to Monaco (3A) for the CQ WW DX Contest (C.W.) in November has been cancelled because the only hotel in Monte Carlo tolerating amateur radio activity (including big antennas on their roof and r.f.i. problems) has holidays at that time. In addition, the DXpedition to the Isle of Man (GD), including participation in the CW WW DX Contest S.S.B. will be made as announced. (Information via Stefan, DF7FH.)

Curacao. A full-bore magnum effort is being aimed at this spot in the Netherland Antilles, this group saying that they will set a new contest score in the multi-multi category. The callsign will be P42E, and they may show early—possibly as early as the weekend before the contest. They are going loaded for QSOs.

They will work 10 through 160. Beams will be up for 40/20/15/10 meters. One might even find multi-operation going on several bands at the same time. The goal of the group is to work every DXer on every band, and they will have a good handful of experienced operators, possibly as many as 14.

Those in on the operation will be John Kanode, N4MM, Wally Eckles, W8LRL, Jeff Hartley, N8II, Jack Reicherts, N4RV, Mike Colesante, KC8C, John Laney, K4BAI, Bob Cox, K3EST, Ronald Bailey, AA4S, Joe Krone, WA2SPL, and Dave Hodger, AA6RX. That list only has ten calls and more are possible. While a good number of the group are out of the Potomac Valley Radio Club, there are obviously some top DXers from other areas. QSLs go to WA2SPL.

Western Samoa. A group from the central coastal area of California will be in 5W1-land for the C.W.Test, arriving a week or so ahead to work both s.s.b. and c.w., but sticking to the c.w. only when the big C.W. Test bursts upon us.

Included in the crew are Jessie Billon, WA6OET, Larry Miller, W7CB, Peter Billon, K6JG, and Jim Robb, W6OUL. They not only expect to be active a week before the test, but also about a week afterward. They are planning for 10 through 160 operation and are going loaded with quads, beams, and similar essentials. Callsigns will be 5W1EE, 5W1EF, 5W1EG, and 5W1GH. These were the calls used in the early planning, but the group is seeking special 5W7 calls for the contest. QSLs for any of the group will be handled by Jim Robb, W6OUL, 501 North Poppy, Lompoc, Calif. 93436. S.a.s.e. or s.a.e./IRC is needed. If you are looking for them outside the contest period, check the YL s.s.b. frequencies.

St. Kitts. Mike, KC0FW, and possibly one other operator, will be on St. Kitts for the CW WW C.W. Test. They will be on the air before the contest working both s.s.b.

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. 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. The basic award fee is now $4 for *CQ* subscribers and $10.00 for non-subscribers. Please attach your latest *CQ* mailing label to qualify for the $4.00 rate.

C.W.

W6PT	318	K9MM	313	W2GT	304	K9QVB	298	N5DX	280
DL7AA	317	K4CEB	313	DL3RK	303	WA8DXA	294	W4BV	280
ON4QX	316	K6JG	313	K3FN	301	W6SN	291	WB4RUA	279
W3GRS	316	W4BQY	310	DJ7CX	300	JA1GTF	285	K4SE	278
W9DWQ	316	N6CW	310	OK1MP	300	WØSR	285	SM6CST	277
K6EC	315	K4XO	306	N4MM	300	WØIZ	285	W1WLW	276
N4PN	315	W4OEL	306	K1MEM	300	SM3EVR	284	I3OBO	276
W6ID	314	W1NG	305	N6FX	298	JH1VRQ	281	K9IW	275
N6AV	313								

S.S.B.

K2FL	318	K4MQG	314	WA4WTG	305	WA4DAN	294	VE3IUE	280
W6EUF	318	N4WF	314	VK3JF	305	VE3IPR	294	WDØBNC	280
K6WR	318	I8YRK	313	W1NG	304	WD8MGQ	293	KB8O	280
W3GRS	318	EA4LH	313	G4CHP	304	W2FGY	293	I8KCI	280
W3NKM	318	OE2EGL	313	VE3FJE	304	YU1DZ	293	XE1OX	280
DL9OH	318	DK2BL	313	WB4NDX	304	JA5PUL	292	KP4EQF	280
W9DWQ	317	WØSD	313	WA4JTI	303	WB1DQC	292	N2AQH	280
IØAMU	317	K9RF	313	9H4G	303	W7FP	291	K1VHS	280
K8DYZ	317	WØSFU	313	W8JXM	302	I3OBO	291	ACØA	280
F9RM	317	N4MM	313	LA7JO	302	KØGT	291	WD8MOV	279
VE3MR	317	I5WT	312	AI8S	302	AB9E	290	WB4UBD	279
I8AA	317	OE2WWB	312	K8PYD	302	XE1NI	289	WA2VEE	279
VE3MJ	317	K5OVC	311	N5FG	302	W4BQY	289	K8HV	278
W4UG	316	VE7WJ	311	VE3MRS	302	YU2RTW	288	IØRIZ	278
XE1AE	316	K4XO	311	W6FET	301	K9UAA	288	K3MWN	277
I4ZSQ	316	I3LLD	311	K9SM	301	WD9IIX	288	I8INW	277
I8KDB	316	N5AW	311	K9BWQ	301	K4CXY	287	KB5RF	277
W9KRU	316	YV5AIP	310	I8LEL	301	WB3HAZ	286	JH4PRU	277
ZL3NS	316	K6XP	310	W2CC	300	WB6GFJ	286	WA6TOO	276
VE3GMT	316	W9SS	310	HP1JC	300	VP9CP	286	K1WJ	276
YV1KZ	316	WØYDB	310	DJ7CX	300	AE5B	285	WA4TLI	276
ZS6LW	315	N2SS	310	IØMBX	300	CT1UA	285	XE1CI	276
W3AZD	315	N4KE	309	K5DUT	300	WB3DNA	285	KB8KW	276
VE2WY	315	N6AV	309	JH1VRQ	300	TG9EP	284	KB8DB	276
K6JG	315	DL6KG	309	W6DN	300	K9HQM	284	WØKU	276
DJ9ZB	315	W2SUA	309	K8CMO	300	KB5FU	284	K9QVB	276
IØZV	315	VK4VC	309	W7OM	298	SM4CTT	284	W8ILC/QRPp	276
K6YRA	315	YV5DFI	308	I8ACB	298	I2MQP	283	WAØTKJ	276
F2MO	315	WØSR	307	IV3YRN	298	KB3OQ	283	AI9R	276
K9MM	315	OK1MP	307	VE3GCO	297	W8IMZ	282	VE4AT	275
W3GG	315	XE1J	306	W1LQO	297	KKØC	282	K8VFV	275
ZL1AGO	315	4Z4DX	306	K4SE	296	KC8JH	282	IØSSW	275
W4DPS	315	K1UO	306	K9IW	296	KA8T	282	W6MFC	275
K6EC	314	ZL1BIL	306	I6PLN	295	I5BDE	282	KB9KD	275
W4SSU	314	N4PN	306	WA4LOF	295	AI8M	281	I5EFO	275
K9LKA	314	XE1KS	305	AI5I	295	N3RL	281	NN4Q	275
OZ3SK	314	LU1BAR/W3	305	W9RY	294	N9AMF	281		

and c.w., and will hang around until the following weekend for the ARRL 160 meter Test.

Port Cartier, Quebec, Canada. VE2HQ will be operating in both the S.S.B and C.W. sections of the *CQ* WW DX Contest, multi-operator, single transmitter, portable from Zone 2. Operators are VE2FU, VE2EZU, and VE2HQ, and the call used will be VE2HQ. QSL's should go to VE2EZU via the *Call Book* address.

Some Odd Notes

Word from ex-7Q7RM is that there has been but one station in Malawi since 1976 when almost all amateur gear was impounded except for 7Q7LW, who happens to be a policeman. The prohibition on amateur radio is supposed to have been a "temporary" measure, but it has lasted close to seven years. Any 7Q7-type leaving the country can retrieve his gear; others cannot.

Dick Wurster, S79ARB, was stateside in mid-summer, but should be back in Mahe now. He indicated that he plans to be active regularly. If you heard EY6F in the recent *CQ* WW S.S.B. Test, it was Georgia with a crew from UK5MAF making the trip for the Test.

The DX Advisory Committee has been changed from catch-as-catch can to an ARRL Division format. Your local DXAC rep might be

Atlantic, K3KA	New England, W1DA
Canada, VE3QA	Northwestern, K7LAY
Central, N9MM	Roanoke, W4FRU
Pacific, K6SSJ	Rocky Mtn, NØRR
Dakota, WØSFU	Southeastern, N4VQ
Great Lakes, K8DB	Southwestern, N6RJ
Hudson, W2QM	West Gulf, K5DB
Midwest, WØSR	Delta, K5YY

Among the more encouraging items is the report that Don Riebhoff, K7ZZ, is stationed at the U.S. Embassy in Baghdad. In other years Don was a signal out of SEASIA, was in on the Spratly effort way back then, and was signing XV5/XU1 and a few other calls in those years. Back then, for awhile, it was easy to work Viet-

nam and Cambodia, but it didn't last. Perhaps he might be able to figure a way to make YI available in a contest, or something similar.

5B WAZ No. 39

Well known to California DXers is Klaus Heintzenberg, DJ6RX. Klaus was a member of the Northern California DX Club while with IBM in the San Jose area.

Winner of 5B WAZ #39, Klaus is now with IBM as an engineer there in Germany. He was first licensed in 1960. His German license is the counterpart of the U.S. Extra Class license. Forty-one years old, he is married with one son.

Other major awards gained along the way are DXCC #332 for mixed modes, 5B DXCC #175, and 5B WAS #672. There are also a good handful, perhaps a bit more, of other awards.

Klaus mostly uses c.w., but he is not reluctant to go s.s.b. when a new country might be gained in that mode. He uses a Drake R4C with Sherwood modifications and filters, and Drake T4XC plus either an SB-200 or a 2K4. All of this on the W3RJ QSK system was in *CQ* in July 1976 and March 1980.

For v.h.f. Klaus uses an FT221R with a homemade 4CX250 amplifier. For u.h.f. it is the FT780R. From DL-land, Klaus says it is easiest to make the QSO's for 5B DXCC, next for 5B WAZ, while 5B WAS is hardest of all. Getting the QSL in hand is another story. The least difficult is getting cards for 5B WAS. A little harder are the cards for 5B DXCC, while it can be a long wait for cards for 5B WAZ. The last two cards needed came via Y22JD, and he helped get confirmations for Zone 23 on 80 and Zone 19 on 15. These were for QSO's made two years before.

Klaus is a member of the Bad Kreuznach Radio Club, the Northern California DX Club, and the FOC. He is a life member of the ARRL. The local club has about 45 members, and Klaus also belongs to the DARC. About 95% of his 5B WAZ was worked on c.w.

Antennas include a 16-element Yagi on 7 meters, a 19-element Yagi plus a 10-element circular Yagi on 2 meters, a 3-element Yagi on 10, 3 elements on 15, 4 elements on 20, an 18HT with extra 10 MHz radiator on 30, the 18HT on inverted Vees on 40 and 80, and the 18HT on 160.

5B WAZ No. 41

For those who have grown tired thinking of things that should have been done but were never gotten around to, here is Claudio Relli, I4RYC. First licensed in 1976, he already holds 5B DXCC, recently has gained 5B WAZ #41, and thinks he will be after 5B WAS next.

A resident of Bologna, Claudio is 24 years old, an electrician, unmarried, and only operates s.s.b.

Gear includes a Drake R4B and T4XB with a Henry 2KD5 amplifier. Antennas include 6 elements on 10, 4 on 15, 4 on 20, and 6 on 40 fixed on the states. He also has a couple of verticals and dipoles, two verticals being used on 80 meters.

Waiting for the QSL card from Zone 19 was the last anxious moment. Claudio was waiting for cards for 10 and 20 meter contacts. He started waiting for these last two in December 1981 and had to wait six months.

A member of the Monte Capra DX Group, he finds himself with a lot of active DXers who score well, members of the club taking a 1st European in 1978, a 1st World in 1980 from San Marino, and Claudio himself taking a 1st World in 1980.

What does he think about DX Nets? Nothing much! He suspects they'll be the end of amateur radio. In short, he does not like nets.

How long might it take him to get his 5B WAS? Claudio thinks it won't be long, as he is already well on the way to the next award he expects to attain. Look for him in contests anytime.

Part of the antenna crew from the Bad Kreuznach Radio Club working on DJ6RX's antennas. There were a dozen more behind the camera. High technical ability, a multitude of antennas, and a lot of DXing brought Klaus Heintzenberg, DJ6RX, 5B WAZ #39.

First licensed in 1976, Claudio Relli, I4RYC, has gathered most of the major DXing awards, including a 1st World trophy which he won in 1980. All his antennas are home-brew h.f. monobanders all over the Bologna landscape.

CQ DX Awards Program

S.S.B.

1160	WA8CAE	1163	N4PN
1161	AF7T	1164	NL7H
1162	A4XIY		

C.W.

548	W6SN	550	G3KMQ
549	PY2FK		

S.S.B. Endorsements

310	ZL1AGO/314	275	AB9E/290
310	N4MM/313	275	VP9CP/286
310	OE3WWB/312	275	KB3OQ/283
310	N6AW/311	200	WA8CAE/236
300	N4PN/306	200	G3XTT/216
300	K1UO/306	150	K4KYI/150
300	K8CMO/300	150	NL7H/179
275	VE3IPR/294		

C.W. Endorsements

310	K6JG/313	250	WD9IIC/250
300	N4MM/300	250	N6UH/229
275	W6SN/291	200	G3XTT/202
275	SM6CST/277	200	KA3R/200
275	K9IW/275	150	AF2L/150
250	WA2ORX/254		

The number of active countries is now 318. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply.

QSL Information

Anyone know anything about FG7AR/FS7? Active in October 1981, QSL routes via W1XK, W1KX, and K8OCL have drawn blanks. KI8B is looking, and it looks more hopeless everyday.

EP QSLs are not as common as they once were, but if you worked EP2EJ during the period from 1972 to 1977, you can still get one. Eber Diehl, who was EP2EJ back then, is now at 549 Phillips Dr., Sierra Vista, Ariz. 85635. On the same route, Eber has just received the call of PY2ZFO, and you already have the QSL route.

C30LM to EA3BKZ
C30MS to EA3MS
C30MK to EA3WZ
C30LG to EA3BDW
C53CC to WA4VDE
FO8GM to WB6GFJ
FO0OJ to W6GO
FO0JO to K6HHD
KH6AC to WP2ACL
KK7K/I7 to KJ7N
OX5RO to N9BEM
PY2ZFO to W7AMM
W4MNG/3B8 to WA4VDE
8U5JM to WA4VDE
CS5SRL to Box 2763, 1119 Lisboa, Codex, Portugal
F8AGC to Box 1757, Blantyre, Malawi
FR8AGC to Box 1757, Blantyre, Malawi
OA4DW to Box 35, Bristol, Virginia 24203
ON8XI to Box 1757, Blantyre, Malawi
ZS5SP to Box 1757, Blantyre, Malawi

Volunteers! Alan Davis, KB7HM, 3917 Burgess Rd., Salt Lake City, Utah 84118, is available as a QSL Manager for DX stations.

73, Cass, WA6AUD

Bo-117-118

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QSL CARDS: $12.50/500, ppd. 400-illustration catalogue free. Bowman, 743 Harvard, St. Louis, MO 63130.

INTERNATIONAL DIRECTORY OF AWARDS listing over 1000 certificates, some applications, $8.00. W5IJU, 2618 McGregor Blvd., Fernandina Beach, FL 32034.

AMP-LETTER: Devoted to designing, building, and operating Amateur Radio Amplifiers. Sample $2.00. AMP-LETTER, RR2, Box 39A, Thompsonville, IL 62890.

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WANTED: MS connectors used or new, synchros, tubes, etc. Send list. Bill Williams, PO #7057, Norfolk, VA 23509.

3CX/4CX POWER TUBES and microwave tubes wanted. P.O. Box 4755, Mesa, AZ 85201.

HAM-AD-FEST™: Next 6 issues $2.00. WA4OSR, Box 973-C, Mobile, AL 36601.

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402BAS 2el 40m	$195.00
205BAS 5el 20m	$295.00
204BAS 4el 20m	$226.00
203BAS 3el 20m	$132.00
155BAS 5el 15m	$176.00
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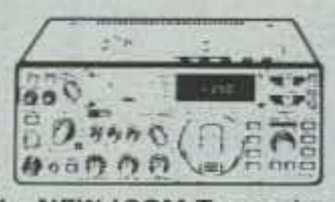

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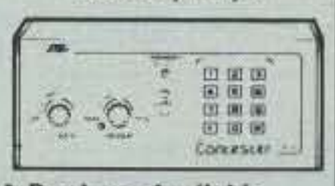

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20m436 4el 20m beam	108lb.	12.0
This is a custom antenna.		
20m536 5el 20m beam	113lb.	13.5
20m546 5el 20m beam	n/a	n/a
This is a custom antenna.		
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Our BX series towers include the base stubs. Beware those who charge extra for them. Also, freight collect from Dallas may save over freight pre-paid because of varying distances and routing. Drop ship or factory pick-up prices may be higher due to factory pricing policies. West Coast/Rocky Mountain prices may be 10% higher depending upon shipping point. Call for firm quote before ordering.

ROHN FOLD-OVER TOWERS

FK2548 48 ft. 25G foldover	$699.00
FK2568 68 ft. 25G foldover	$869.00
FK4544 44 ft. 45G foldover	$981.00
FK4564 64 ft. 45G foldover	$1170.00

Freight prepaid on foldover towers. Sales tax may be applicable in some areas. West Coast/Rocky Mountain prices 10% higher.

HY-GAIN CRANK-UP TOWER

HG-52 SS 52 ft. self support	$874.00
HG-54-HD 54 foot self support	$1414.00
HG-70 HD 70 foot self support	$2187.50

Above shipped from Lincoln, NE. Sales tax required in some areas, freight paid on shipments in 48 states. Call for details on these and other Hy-Gain items.

PHILYSTRAN GUY CABLE

This is RF transparent, sun resistant, guy cable. Avoid those hours of putting insulators into steel cable. Enjoy the advantages of freedom from unwanted resonances that can soak up your radiated RF energy.

HPTG 4000 4000 lb. test cable	$.44/ft.
HPTG 6700 6700 lb. test cable	$.60/ft.
9901LD potting head	$4.99
9902LD potting head for 6700 lb.	$5.49
Socketfast potting compound	$9.00/pt.

TOWER HARDWARE

3/16" EHS steel guywire	$.12/ft.
1/4" EHS steel guywire	$.15/ft.
3/16" ccm cable clamp	$.29 ea.
1/4" ccm cable clamp	$.39 ea.
3/8 x 6" TBE&E turnbuckle	$5.39
1/4" th thimble	$.24 ea.
3/16" preformed guy grip	$1.75
GAS604 screw anchor	$12.00
GAR604 concrete guy anchor	$12.00
M200H 2" x 10' steel mast	$37.00
500D guy insulator	$.85
502 large guy insulator	$1.80

Note: Some items too large for UPS shipment. Call before ordering to check shipment mode.

HY-GAIN PACKAGE #1

TH7DX	7el Tribander
HG 52SS	Self Supporting Tower
Ham IV	Rotor
COA	Coax Arms (3 Furnished)
HG-10	10 ft. steel mast
HG-TBT	Thrust Bearing

Your Price!!! $1,533.00

FREIGHT PRE-PAID!!!

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HY-GAIN PACKAGE #2

HG-52-SS	52 Ft. Crank-Up
HG-10	10 Ft. Mast
HG-TBT	Thrust Bearing
HG-COA	(3) Coax Arms
Ham IV	Rotor

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CABLE

Saxton RG213 50 ohm coax	$.31/ft.
RG 11/U 75 ohm coax	$.31/ft.
LDF4-50 Andrews HELIAX®	$1.48/ft.
8 cond. rotor cable	$.18/ft.
8 condHD rotor cable (for 150+ft.)	$.36/ft.
Mini 8 52 ohm small coax	$.16/ft.

Heliax® cannot be shipped by UPS as it cannot be coiled tightly enough to conform to size restrictions without damage.

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Amphenol PL259 (Silver Plated)	$1.25 ea
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Andrews L44U UHF female	$17.00 ea.
Andrews L44PUHF male	$17.00 ea.

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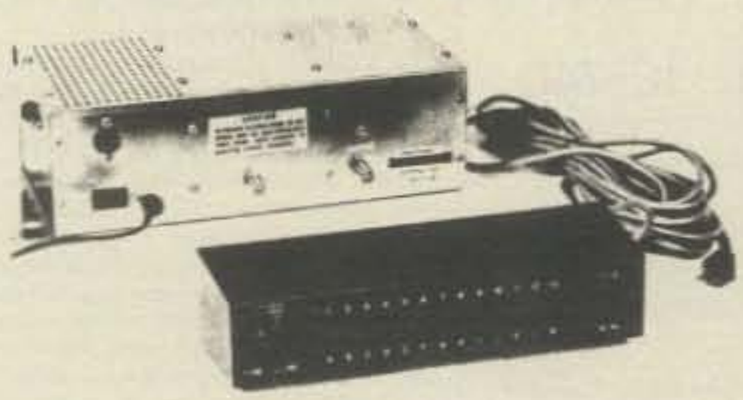

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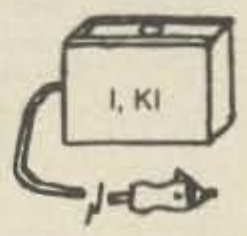

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COLLINS 30S1 Amplifier $1595, PM2 $75, DL1 $95, 312B4 $175, CP-1 $150, 30L1 in Rack Mount $495. Schaaf, 807 Sunbeam, Oneida, WI 54155, phone 1-414-434-2938.

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COLLINS, 30S1 Linear, excellent condition, round emblem, $1695. Schaaf, 807 Sunbeam, Oneida, WI 54155. Phone 1-414-434-2938.

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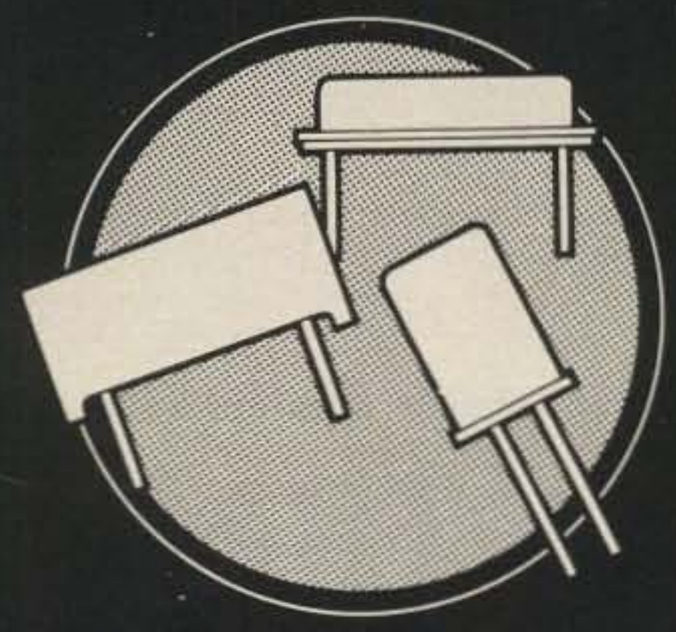

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.YOU'VE got it MADE...WE did it FOR you!!!

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.Compatible with our 'DISP' LED readout ($25).
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"We put the care in to take your worries out"

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CIRCLE 13 ON READER SERVICE CARD

FREQUENCY METERS: TS-186D 100 mc-10gc $100; Lampkin 105-A $25; Amphenol Mod 870 AC/DC voltmeter $50. SASE for list. K6KZT, 2255 Alexander, Los Osos, CA 93402.

PICKERING KB-1 keyboard keyer $100. Clem Duval, 33727 Brownlea, Sterling Heights, MI 48077. Phone 313-268-2467.

NEW GE BROADCAST TUBE 4-125A in original carton. Tested excellent, $25. Will ship in USA. Peter Suszczynski, 27 John St., Struthers, OH 44471.

WANT TO BUY at reasonable price: SM-220 with BS-8. Atlas 200-PS. Atlas RX-110/TX-110-L. Shure 414-A. Daiwa Meter TL-922. KØWTM, 532 N. Doris, Wichita, KS 67212.

FOR SALE: BC-733-D RCVR, R-28/ARC-5 RCVR, T-23/ARC-5 Trans. All in good condition. Call after 7 pm (203) 255-6344. Ask for Andy.

QUIETUS CASSETTE NET! Recording Radio amateur anecdotes weekends 0300Z, (612) 874-9561.

HELP! DEL, ME, and RI needed on 80 CW for 5BWAS. K6ARE, 1263 Lakehurst, Livermore, CA 94550.

WANTED: Back issues of CQ mag. July '66, March and April '72, also Nov. '78 thru Nov '81. Also Dec '81 Ham Radio. KØTVY, 6503 Lafayette Rd., Raymond, Iowa 50667.

SELL: Bird Model 72R Transfer Switch type N conn, $35. B&W 850A with band plate, $48. All unused plus ship. W4LRR, 234 Elden Drive N.E., Atlanta, GA 30342.

FOR SALE: Tempo I 10-80 HF rig (blk. face), KDK 2-meter with T.T. Send s.a.s.e. to P.O. Box 518, Whitehouse, FL 32220.

ANYBODY WILLING TO DONATE some printed QSLs? Will pay postage. QSL Mgrs. are a pain and do they have fun? They spend a fortune! Gary Mitchell, P.O. Box 509, Marsh Harbor, Bahamas.

DRAKE R-4B, T-4XB, MS-4, AC-4, $525. John, K8LJG, 1-313-736-0026.

FOR SALE: Azden PCS-2800 10-meter transceiver, in good condition, installed in mobile slide mount. With lithium battery memory backup. W8FX, Karl Thurber, 317 Poplar Drive, Millbrook, AL 36054.

FOR SALE: 3 new 23 ch. CB XCVR'S $35. ea. Also Robot Model 70, 80, and CQ, 73, HR, QST. W4PRC (305) 434-4245.

The Jacksonville Atari & Pet Society (JAPS) has available a number of program for Amateur Radio for Atari, PET, and VIC computers. Send SASE for 'Ham list' and please specify computer. JAPS, 401 Monument Rd. #171, Jacksonville, FL 32211.

NEWS BULLETIN

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CIRCLE 123 ON READER SERVICE CARD

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Model TB5EM/4KWP

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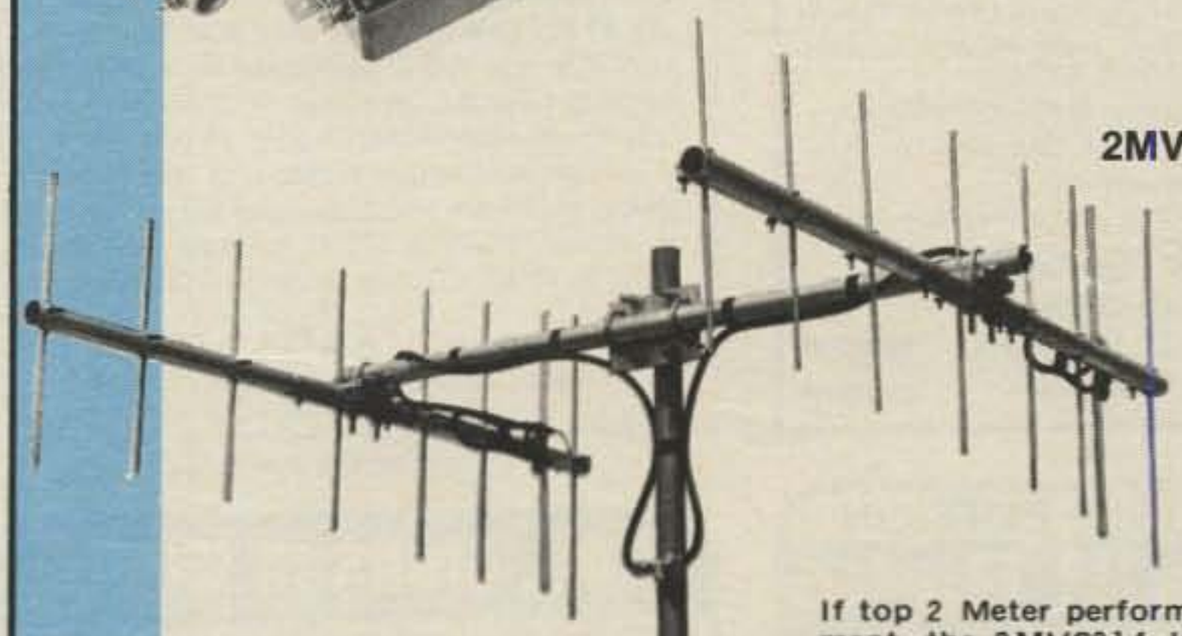
Better than optimum full sized Dipole performance in an antenna which can be set up within the hour, needing a minimal support structure. (existing tower, house tree etc.) The "Inverted-Vee" produces a low-angle "Balanced" Omni-Directional pattern, which increases the signal to noise, and signal to interferance ratios. Complete simplified instructions are provided.

NO TUNERS NEEDED!

2MVS814 kit



Special N-type coaxial connectors, solid rod elements (driven thru the boom), tinned connecting lugs, and s/s electrical hardware provide you with peace of mind for many years!

If top 2 Meter performance is your requirement, the 2MVS814 kit consisting of 2 ea. phased 2 Meter "Balun" fed precision tuned 8 element Arrays outperform even quad stacked antennas of other makes.

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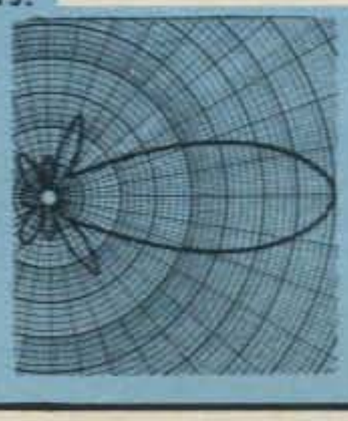

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CIRCLE 15 ON READER SERVICE CARD

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CIRCLE 83 ON READER SERVICE CARD

NEW! IIX EQUIPMENT

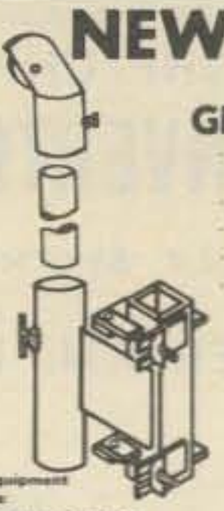
GINPOLE GP-81

Consists of 3 major parts:

Pulley Assembly

Aluminum Pole Assembly 10 ft. long 2" O.D.

Clamp Assembly



Two methods of purchasing the IIX Equipment GINPOLE are available:

Method (1) Purchase GP 81- Kit: GINPOLE includes pulley and clamp assemblies which can easily be shipped U.P.S.

The customer purchases the pipe locally to save shipping cost. Recommended pipe is aluminum 1-½" (2" O.D.) electrical mechanical tubing; also referred to as 1-½" E.M.T. however, a suitable substitute may be used.

GP 81-Kit $129.50

Method (2) Purchase GP 81-1 GINPOLE Assembly Entire GINPOLE shipped Motor Freight F.O.B. Oak Lawn, IL $159.50

GP-81 GINPOLE

- Fits all popular towers 1-½ O.D. to 1-½ O.D. legs
- Strong welded steel construction
- Hot dipped plated
- Dead lift tested at 120 lbs.
- Will last a lifetime

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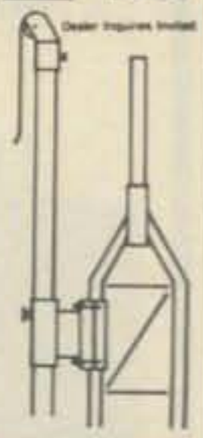
Dealer Inquiries Invited



CIRCLE 14 ON READER SERVICE CARD

ROSS $$$$ New Special Kenwood R600 $300.00, TR2500 $287.90, Icom 2AT $234.90, 4AT $249.90, Yaesu FT-102 $989.90, FRG-7 $239.90, NC-2 $59.90. Send SASE for more new specials. Closed Monday at 2:00. ROSS DISTRIBUTING CO., PRESTON, ID 83263, phone (208) 852-0830.

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WANTED: National variable ratio dial for SW3 receiver. Pse airmail, Jock, ZL2GX, 152 Lytton Road, Gisborne, New Zealand.

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CUSTOMIZED DX BEAM HEADING PRINTOUT FOR YOUR QTH: Send call, name, address. $5.00 ppd. RAK Electronics, Box 1585, Orange Park, Florida 32073.

FREE AD with subscription. Ham Buy, Sell, Trade, Want ADS. One year $4.00, 2 years $7.00. WA4OSR's RIGS & STUFF, Box 973-C, Mobile, AL 36601.

WANTED: Main tuning dial for Hallicrafters SX110 or source of supply. Contact WA8DJY 1-513-288-2424.

WANTED: EICO vfo #722 and transmitter #723. Write John Barolet, W3BUD, 108 Elliott Court, California, MD 20619.

FOR SALE: Heathkit MT-1 "Cheyenne" transmitter and National NC-109 communications receiver. Both good condition. Both $150. KL7QI, 536 Dunbar, Fairbanks, AK 99201. Phone (907) 456-5974.

WANTED: Kenwood R-599 in good condition. Mac, W4OFS, RT. 1, Box 57-A, Beaverdam, VA 23015. Phone 804-449-6605.

WANTED: Vibroplex Blue Racer (narrow one) any Vibroplex with ship's name on base. John White, Box 147, Mabel, MN 55954.

R-4C+SHERWOOD CRYSTAL FILTERS
STILL THE FINEST COMBINATION

600 HZ LOW-LOSS 1st-IF CW FILTER. Improve early-stage selectivity. Eliminate high-pitched leakage around 2nd-IF filters. Improve ultimate rejection to 140 dB. Eliminate strong signals overloading 2nd mixer, causing intermod and desensitization. CF-600/6: $80.00. New PC board relay switch kit: $45.00.

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PC Board mod. and switching kits. Special AM filters/detector.

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FOR ALL MAKES AMATEUR TRANSCEIVERS! GUARANTEED FOR 2000 WATTS SSB INPUT FOR NOVICE AND ALL CLASS AMATEURS!

COMPLETE with 90 ft. RG58U-52 ohm feedline, and PL259 connector, insulators, 30 ft. 300 lb. test dacron end supports, center connector with built in lightning arrester and static discharge. Low SWR over all bands -Tuners usually NOT NEEDED! Can be used as inverted V's - slopers - in attics, on building tops or narrow lots. The ONLY ANTENNA YOU WILL EVER NEED FOR ALL BANDS! NO BALUNS NEEDED!

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Dec. 1, 1982 through May 31, 1983
a New TR7A (1 each category)
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Plus separate awards at end of year
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- VOLT & AMP METER ON MODELS RS-12M, RS-20M & RS-35M.
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- RIPPLE Less than 5mv peak to peak (full load & low line)
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MODELS	Continuous Duty (amps)	ICS* (amps)	Size (in.) HXWXD	Shipping Wt. (lbs.)
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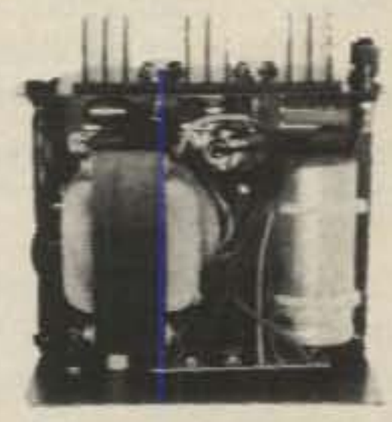
RS-35A, RS-35M, VS-35M	25	35	5x11x11	27
RS-20A, RS-20M, RS-20S, VS-20M	16	20	5x9x10¾	18
RS-12A, RS-12M, RS-12S	9	12	4¾x8x9	13
RS-10A	7.5	11	4x7½x10¾	11
RS-7A RS-7B	5	7	3¾x6½x9 4x7½x10¾	9
RS-4A	3	4	3¾x6½x9	5

*ICS – Intermittent Communication Service (50% Duty Cycle)



Inside View – RS-12A

ASTRON CORPORATION

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CIRCLE 41 ON READER SERVICE CARD

Introducing

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12 Hour (972A)
Oscillator: 32.768kHz Quartz Crystal
Accuracy: 15 sec/month Max Error
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312-459-5760

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A unique, intelligently designed dial simplifies the clock face and helps eliminate the interpretation errors often associated with 24 hour clocks. Battery operation eliminates the need for an unsightly power cord and, more importantly, provides immunity to power line failures.

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300 Watt Tuner

- **Continuous coverage 160 through 10 meters - even new WARC bands.**
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- **Ceramic insulation on all switches, capacitors and feed-through insulators.**
- **Tap switch for fast band change.**

Are solid state finals giving you trouble? Here is a tuner that will match your dipole, inverted Vee, random wire, vertical, mobile whip, yagi, quad, or balanced-line-fed antenna. Quickly and easily.

Easy to operate. The front panel function switch selects the auxiliary coax connector (use it for an antenna or for your dummy load), coax fed antenna direct, coax fed antenna through the tuner, single wire, and balanced wire antennas. Wide range "T" network gives low SWR and maximum radiation.

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- **Power ranges 20/200/2000 watts.**
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Automatic. No "set" or "sensitivity" control. Computer sets full scale so SWR reading is always right. Complete hands-off operation.

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Logarithmic SWR display. Computer expands the display where you need it so it's easier to see, easy to use.

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