Amateur Radio

SERVING AMATEUR RADIO SINCE 1945

NOVEMBER 1983 $2.00

CQ

RTTY SPECIAL

THE RADIO AMATEUR'S JOURNAL

0 74820 08241 11

TM-201A/TM-401A

Ultra-compact and lightweight, priority, memory and band scan, 25 watts/TM-201A & 12 watts/TM-401A.

The KENWOOD TM-201A 2- meter and TM-401A 70-cm FM mobile transceivers are the smallest and lightest units available, allowing maximum flexibility in automotive installation.

TM-201A/TM-401A FEATURES:

- **Ultra compact and lightweight**
  Measures 5.6 (141)W x 1.6 (39.5)H x 7.2 (183)D, inch(mm). weighs 2.8 lbs., (1.25 kg.).
- **25-watt output, with HI/LO power switch**
  Produces a powerful 25 watts RF output from a surprisingly compact design (TM-201A).
- **Dual digital VFO's built-in**
- **5 memories plus "COM" channel, with lithium battery back-up (est. 5 yr. life)**
- **Memory scan/programmable band scan**
- **Priority alert scan**
- **Highly visible yellow LED frequency display**
- **High performance receive/transmit**
  GaAs FET RF amplifier for high sensitivity with wide dynamic range. Transmit modulation characteristics selected for best sound and minimum distortion.
- **External high quality speaker supplied** (No internal speaker)
- **16-key autopatch UP/DOWN microphone**

Optional FC-10 frequency controller
May be easily connected to the TM-201A or TM-401A. Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel). A green, easy-to-read, back-lighted LCD display indicates transmit/receive frequencies, memory channel number, ALERT, and SCAN (with blinking MHz decimal). Size: 4.4 (112)W x 1.4 (35)H x 0.9 (22)D, inch(mm). Weight: 3.5 oz. (100 g).

- **Repeater offset switch (±600-kHz/TM-201A; ±5 MHz/TM-401A; and simplex) and reverse switch**
- **Audible "BEEPER" confirms operation**
- **Easy-to-install mobile mount**

TM-201A/TM-401A accessories:

- **TU-3** programmable two-frequency CTCSS encoder
- **KPS-7A** fixed station power supply

TM-401A subject to FCC approval

TW-4000A

FM "Dual-Bander"... 2-m & 70-cm in single compact package, LCD, 25 W, optional voice synthesizer.

KENWOOD's TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2-m and 70-cm FM functions in a single compact package.

TW-4000A FEATURES:

- **2-m and 70-cm FM in a Compact Package**
  Covers the 2-m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70-cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).
- **Large, Easy-to-Read LCD Display**
- **25 Watts RF Power on 2-m/70-cm.**
- **Opt. "Voice Synthesizer Unit"**
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Front Panel Illumination**
- **10 Memories with Offset Recall and Lithium Battery Backup**
- **Programmable Memory Scan**
- **Band Scan in Selected 1-MHz Segments**
- **Priority Watch Function**
- **Common Channel Scan**
- **Dual Digital VFO's**
- **16-Key Autopatch UP/DOWN Microphone**
- **Repeater Reverse Switch**
- **High Performance Receiver/Transmitter**
  GaAs FET RF amplifiers on both 2-m and 70-cm, high performance MCF's in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Rugged Die-cast Chassis**
- **"BEEPER" sounds through speaker.**
- **Easy-to-Install mobile mount**

TW-4000A accessories:

- **VS-1** voice synthesizer
- **TU-4C** programmable two-frequency CTCSS encoder
- **KPS-7A** fixed station power supply
- **SP-40** compact mobile speaker
- **SP-50** high quality mobile speaker
- **MA-4000** dual-band mobile antenna with duplexor

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.

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Effective noise blanker.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130SE).
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

KENWOOD

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

WELZ

SP-600

SP-600 Select 1 of 3 sensors by soft touch switch. Three wide bandwidth sensors cover 1.6-500MHz. **$159.00**
RS-1: 1.6-60MHz 0-2kW
RS-2: 1.6-150MHz 0-200W
RS-3: 130-500MHz 0-200W

SP-200 Two position antenna switch and indicators. Three power ranges to 1kW, 1.8-160MHz. **$107.00**

SP-400 Three band sensors (2m, 220, 450MHz), 10 percent accuracy, 0-150W CW, LED power range indicators. **$109.00**

Distributed by
Encomm, Inc.
2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 TLX 79-4783 ENCOMM DAL

WELZ

SP-250

SWR & POWER METERS

SP-250 Low-profile, economy 2kW wattmeter. 1.6-60MHz bandwidth. 3W SWR sensitivity. Three ranges. A Best Buy! **$75.00**

SP-15M 1.8-150MHz, 200 watt, low-profile wattmeter. VSWR, FWD PWR, REF PWR, 1.5W SWR sensitivity. Great for mobile HF. **$60.00**

SP-45M VHF-UHF to 100 watts. 3W sensitivity for SWR, 10 percent accuracy. All metal shielded construction. **$85.00**

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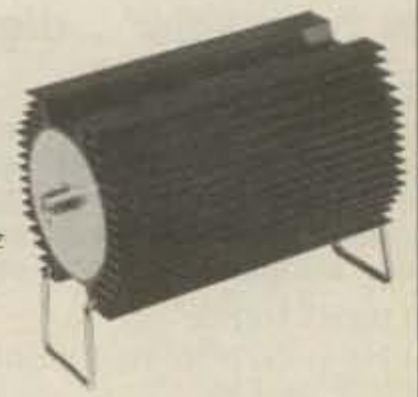
CIRCLE 4 ON READER SERVICE CARD

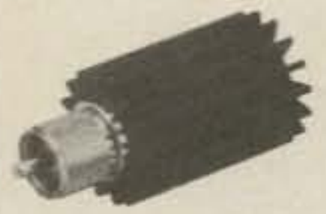
WELZ

DUMMY LOADS

CT-300
Oil-less aircooled,
1kW peak for 3 min.,
300W avg. DC-250MHz
$68.00



CT-150
Oil-less aircooled,
400W peak for 3 min.,
150W avg. DC-250MHz
$46.00



CT-15A
50W peak, 15W avg.
SO-239 Screw-on dummy
DC-500MHz, VSWR<1:1.2
$12.00

CT-15N
50W peak, 15W avg.,
Type N Dummy Load.
DC-500MHz, VSWR <1:1.1
$21.00

SURGE SUPPRESSOR

CA-35A
Contains replaceable,
chip-type surge
voltage protector.
Low loss, low VSWR.
DC-500MHz, 350V breakdown.
$22.00

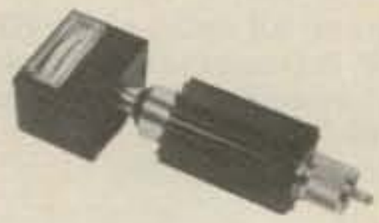
COAXIAL SWITCH

CH-20N
Two-way coaxial switch.
SO-239 type connector.
DC-900MHz, 1kW power.
$54.00

TERMINATION POWER METERS

TP-05X
BNC connector.
5W talkie checker.
Field calibratable,
3W avg. Dummy Load,
1W center. 50-500MHz.
$21.00

TP-25A
25 watt version of
TP-05X for mobile use.
Larger Dummy Load.
50-500MHz
$40.00



All prices are suggested retail and subject to change.

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Offices: 76 North Broadway, Hicksville, NY 11801 Telephone: 516 681-2922. CQ (ISSN 0007-893X) is published monthly by CQ Publishing Inc. Second Class postage paid at Hicksville, NY and additional offices. Subscription prices: Domestic—one year $16.00, two years $29.00, three years $42.00; Canada/Mexico—one year $18.00, two years $33.00, three years $48.00; Foreign—one year $20.00, two years $37.00, three years $54.00; Foreign Air Mail—one year $73.00, two years $143.00, three years $213.00. Entire contents copyrighted CQ Publishing Inc. 1983. 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: RTTY comes alive on this month's cover shot of Mike Crisler, N4IFD, and his shack in Miami, FL. Photo by Larry Mulvehill, WB2ZPI *(and I don't know how he did it either—ed.).*

NOVEMBER 1983 **VOL. 39, NO. 11**

FEATURES

DEPARTMENTS

Zero Bias AN EDITORIAL

Green, beige, white, etc. The keys to RTTY come in all kinds of colors these days, and for each color there seems to be another way of getting there. Our RTTY Special this year has been an exciting challenge which was greatly supported by some highly talented and well-known people in the industry. What originally was posed to these people was the request to explain something, a concept or piece of gear or even a little project, in simple layman's terms. I'm glad to say that they all came through with flying colors.

The object of this year's RTTY Special is to inform and to invite as many amateurs as possible to get in on the fun. RTTY by itself can tend to be confusing, but couple it with computers, and the buzz words abound. Sometimes the same buzz word has different meanings when used with RTTY and then used with a computer application. What is AMTOR all about? What do TU's really do, and what is the difference among them? How do you tune in an RTTY signal? Can I still get some mileage out of those "treasures" I see at fleamarkets? As you can tell, all of this adds up to some basic information.

I did stipulate one proviso when I asked for the material. I didn't want any of the pieces to be a sales brochure extolling the virtues of the products these people represent. The article was to be written not necessarily from a highly technical point of view, but rather from a hands-on perspective. Starting with these guidelines, including the proviso, I think we've achieved our goal.

Travels With CQ

In early September I flew out to California for the Southwest Division Hamfest in Anaheim. Lew McCoy, W1ICP, and his wife, Martha, met me out there for a wonderful California weekend. I say wonderful, because it was cooler there than back home in New York.

It was a great chance to meet two *CQ* staffers, Larry Brockman, N6AR, and Norm Koch, K6ZDL. Although we've worked together for many years, we had never met. I'd seen pictures of Larry, so I recognized him right away. In between discussing contest business, Larry was pressed into booth duty. Norm didn't look at all like the last picture I'd seen of him. His beard and about 50 pounds were gone. It turns out that he is a transplanted New Yorker, too. Norm shared my plight when I found out that there would be no fleamarket at this event, and he even volunteered to bring in some vintage junk from his basement for me to peruse. Now that's hospitality. Larry and I were talking about his prop-pitch motor "going south," when several locals volunteered the possible solution and even offered help in rebuilding it—again, a display of amateur cooperation. By now Larry's beam should be turning smoothly via prop-pitch, or a local distributor has sold him a giant rotator.

A former *CQ* staffer, Hugh Paul, W6POK, showed up to say hello. Hugh now mainly spends his time in the Orient setting up broadcast stations. He was responsible for many fine product reviews in *CQ*. Lew, Martha, and I took turns at booth duty. There was a lot to see and at which to marvel. Since it was the LA area, it was reasonably close for ICOM, Kenwood, and Yaesu to bring in all the goodies to show and demonstrate.

Next year the hamfest will be held further north in Santa Maria, California, and I'm told that they will have a fleamarket. I'll let you know later on if that's confirmed.

The following Sunday I got up early and drove to the Hall of Science Radio Club annual fleamarket. This event takes place in the borough of Queens and uses a large multi-tiered municipal parking lot. When I got there, there were two club members waiting to direct people to another spot. It seems that at the last moment the city of New York decided not to allow the club to use the parking lot. There seems to be no clear cut reason for this change of heart on the part of the city, but it happened, and typically at the worst possible time. They were lucky to get an alternative spot in a church playground a mile or so away. Although it was not nearly as big, a lot of people turned out on what was the hottest day on record. I have to offer *CQ*'s apologies to the club. They sent in an announcement for the annual event which apparently arrived in plenty of time and then promptly disappeared. We can't figure out what happened to it, but needless to say, it wasn't printed and for that we are sorry. I guarantee that we'll take better care of it next year.

Another mix up with publicity seems to have occurred with the LIMARC group on Long Island. The only reference to this one caught my eye in a classified ad in *QST* the Friday before the event. This biggie is usually well covered with advance publicity, but somehow the classified ad was all there was. It was too late for me to change plans and go to this one, so I'll have to wait until next year.

We have some heavy traveling coming up in the next few weeks. Dick, Jack, and I will be off to Radio-Expo in Mundelein, Illinois (just north of Chicago). Mundelein is also the home of Awards columnist Dorothy Johnson, WB9RCY. The day after we get back, Dick will be off to Barcelona, Spain, to help celebrate the first issue of our Spanish edition coming off the press and going on display. When he gets back, Jack and I will prop up him for the trip down to the National in Houston, Texas. Arnie and Herb will be leaving at the same time to man the *CQ* booth in Virginia Beach, Virginia, at the Tidewater Hamfest and Computer Convention.

This year I am going to try to attend the annual banquet of the Radio Club of America (RCA). This one is the Diamond Jubilee Anniversary, celebrating the club's 75-year proud history. Besides numerous awards and medals being presented to outstanding members, 30 members, including *CQ* author and friend, Ulrich Rohde, DJ2LR, will be elected to the prestigious status of Fellow. The Radio Club of America is the world's first radio communications society.

Stocking Stuffer

If you're looking for that "extra" little gift for someone or even for yourself, check out a book called *The Word Processing Book, A Short Course in Computer Literacy,* written by Peter A. McWilliams. It's a very easy-to-read, humorous approach to learning about computers. The light approach at first might seem deceptive, but make no mistake, you do come away having learned about word processing in a painless, positive manner. The book is published by Prelude Press and is distributed by the Ballantine Books division of Random House.

CQ Space

The long awaited lift off of STS-9 should have occurred by now. The following information on STS-9 was supplied through the courtesy of *Westlink Report* from data supplied by Roy Neal, K6DUE, at the Johnson Spaceflight Center. We at *CQ* wish Dr. Owen Garriott, W5LFL, and the entire crew of the *Columbia* good luck on this historic milestone flight.

73, Alan, K2EEK

"*Initial Orbital Times for STS-9.* Any given orbit begins as the spacecraft crosses the equator, traveling west to east. The following orbital operating times are based on an 11:30 AM launch EDT on October 28th. If the launch is delayed for any reason, you must add the amount of the delay to the times stated here to obtain new orbital track timing for an operating pass. Also, what we are listing here are only the "official operating periods" scheduled as of September 8th. Dr. Garriott says he will attempt to provide other "unofficial" operating periods as well, but these will have little advance notification. Whenever possible, advance notice of these extra operating times will be made available over W1AW, in bulletins issued by NASA affiliated radio clubs (such as W5RRR in Houston) and on the daily updates of the Westlink Radio Network Hollywood newsline: (213) 465-5550. All North American passes are listed in local time, while those for foreign contacts with the spacecraft are in GTC. All times are approximate for the start of a given pass. You may calculate the specific time over your QTH by adding the speed of the space vehicle, which is 17,000 miles per hour. All data is approximate and subject to change and update."

Orbital Data

Orbit#	Date	Ground Track	AOS Time
39	10/30	Spokane, Denver, Dallas, Houston, New Orleans, S. America	2000 CDT
40	10/30	N. California, down Pacific coast E. of San Francisco & L.A., Mexico	1930 PDT
47	10/31	W. Australia, S. America, Europe NOTE: Standard time begins this date	1430 UTC
63	11/1	S. America, USSR, India, Australia	1330 UTC
64	11/1	Iran, Scandinavia, USSR	1555 UTC
77	11/2	N.W. Africa, E. Europe, Poland, China	0850 UTC
79	11/2	N. tip of S. America, Caribbean, N. Europe, USSR, India	1250 UTC
80	11/2	Caribbean, all E. Coast states, Newfoundland, U.K., central Europe	0815 EST

ICOM IC-25H

45 Watts of Compact Power

IC-25H
2 Meter Mobile
45 Watts

45 watts / green LED readout / compact size / touchtone® scanning microphone / 2"H x 5½"W x 8¾"D / 2 VFO's / 5 memories make the IC-25H the best 2 meter mobile value on the market.

New Green LED. Easier to read in bright sunlight, and not glaring at night, the IC-25A's new readout provides good visibility under all conditions.

Dual VFO's. Dual VFO's give an extra stored frequency for scanning (memory scan scans 5 memories plus 2 VFO's) and each VFO has a different tuning rate for easy QSY.

5 Memories. Instant access to most frequencies: VFO A information is transferred to the selected memory by pushing the write button.

Priority Channel. Any memory channel may be monitored for activity on a sample basis, every 5 seconds, without disruption of a QSO conducted on a VFO frequency.

HM14 Microphone. Smaller and lighter . . . the HM14 microphone provides a 16 button touchtone® pad as well as up and down scan buttons, adding easy frequency control of the radio and repeater access tones.

IC-25A
25 Watts / 2 meters

The IC-25A is a very compact 2 meter FM mobile. Only 2"H x 5½"W x 7"D, the IC-25A features a green LED readout which is visible in any lighting condition, a touchtone® / scanning microphone and 25 watts of output.

These standard features have made the IC-25A the most popular 2 meter mobile on the market.

Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies. With the mode switch in a VFO position, the unit will scan the entire band or the portion of the band defined by memories 1 and 2.

CIRCLE 144 ON READER SERVICE CARD

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780**

 25H883

Announcing

• **Special-Event Station K4MJN -** On Nov. 5 K4MJN will operate as a Special-Event station from Blythewood, SC, to commemorate the birthplace of J. Gordon Coogler, acclaimed by critics as the worst practicing poet in the U.S. K4MJN will operate on or around 14.270 MHz from 0900 to 1300 EST and 21.320 MHz from 1300 to 1700 EST. A QSL and large s.a.s.e. will bring a certificate and radio confirmation. QSL via K4MJN, Route 3 Box 154, Blythewood, SC 29016.

• **Radio Central ARC Special Event -** The Radio Central ARC will operate WA2UEC from the former RCA HF Radio Station on Nov. 5 and 6 to commemorate the 62nd anniversary of the now silent station. Operations will be on 2–160 meters, up 10 kHz from the edge of the general band, and on 2 meters on 146.52 and 144.550/145.150 repeater. Novice will be on 7.110 kHz. For a special QSL send your QSL with large s.a.s.e. to Radio Central ARC, P.O. Box 680, Miller Place, NY 11764, or QSL to the Call Book address.

• **W6LIE to Operate on Weekend of STS-9 Landing -** Amateurs of the Kern County (CA) Radio Club will operate on Nov. 5 and 6 to commemorate the landing of the Space Shuttle carrying W5LFL. Frequencies and modes are as follows: s.s.b. 7275–7285 kHz, 14.295 MHz, and 21.375 MHz; c.w. 21.150 MHz, all frequencies ± QRM. Stations wishing to work them exchange call, signal report, and location. Operation will be from 0100–1300Z Nov. 5 and from 2300Z on the 6th. Send QSL and s.a.s.e. to W6LIE, The Kern County Radio Club, P.O. Box 743, Bakersfield, CA 93307 for a certificate.

• **Veteran's Day Special Event -** The Armored Forces Amateur Radio Nationwide Emergency Team will commemorate Veteran's Day by operating on Nov. 11, 12, and 13 from 1200–2400 UTC each day. Operation will be in the 40 meter band between 7280–7290 kHz; 20 meters between 14.320 and 14,330 kHz; and 15 meters between 21,370–21,380. Those making contact with any member station can obtain a certificate by sending $1.00 to Harry B. Thomsen, W2PJH, 348 Jefferson Ave., Apt. 15, Canadaigua, NY 14424 (indicate call sign of station contacted).

• **Amateur Radio Satellite Symposium -** AMSAT will hold this symposium in conjunction with its annual meeting on Nov. 12 at the Johns Hopkins University Applied Physics Laboratory off I-95 between Baltimore and Washington. Planned programs include Oscar 10, reports of the W5LFL Space Shuttle operation, PACSAT, and more. Admission is free, but advance reservations are required. For more information and reservations contact AMSAT, P.O. Box 27, Washington, D.C., or call 301-589-6062.

• **CQWE Contest -** Sponsored by the Bell System Amateur Radio fraternity, the CQWE contest contains sessions from 1900Z Nov. 12 until 0500Z Nov. 14. The contest is open to present and retired employees of Bell, Western Electric, and AT&T and its subsidiaries. Contact the local interworks coordinator for logs and rules, or write to Phil Pearson, WA1LXY, Bell Telephone Laboratories, 1600 Osgood St., Rm. 3E-46, N. Andover, MA 01845. Telephone 617-681-6179 (work), or 603-362-4297 (home).

• **Plimoth Plantation Special Event -** The Whitman ARC will sponsor this event on Thanksgiving Day, Nov. 24, from Plymouth, MA, using the call WA1NPO from 1300–2000 GMT. For a list of frequencies and more information call KA1CZS at 617-826-4772, or WB1CNM at 617-586-7524. For a certificate send proof of contact and $1.00 (4 IRC's, foreign) to Whitman ARC, P.O. Box 48, Whitman, MA 02382.

• **Grenada, West Indies, QSO Party/Special Event Station -** This event will run from 0001Z Nov. 26 to 2359Z Nov. 27 in commemoration of World Communications Year. J39AA, the call of the Grenada ARC, will be operating on all bands 160–10 meters on s.s.b. and c.w. QSL manager for the station is WB2LCH (P.O. Box 64, Gloucester, NJ 08030-0064). All cards must be accompanied by an s.a.s.e. or IRC's for return of a commemorative QSL. This is the first time this station has been on the air.

• **Christmas Special Event**—W1FHP and the Hen House Gang of Bethlehem, CT, will hold their annual Christmas Special Event from Nov. 26 to Jan. 7 on 10 through 40 meters to bring Christmas cheer to children of all ages. Messages for St. Nick will be relayed by Santa's helpers. QSL to the Call Book address (include 20¢ stamp).

***The following hamfests, etc., are slated for Nov.:**

Nov. 5, **Foothills ARC 15th Annual Hamfest,** South Greensburg, PA. Contact WA3HOL, or write to FARC, P.O. Box 236, Greensburg, PA 15601.

Nov. 5–6, **Alford Memorial Radio Club Hamvention,** Stone Mountain, GA. Contact Lew Howard, W4LHH, 4132 Creek Stone Court, Stone Mountain, GA 30083 (s.a.s.e.), or call 404-292-5469.

Nov. 12, **Twin City Ham Club Hamfest,** West Monroe, LA. Contact Benson Scott, AE5V, 107 Contempo, West Monroe, LA 71291.

Nov. 13, **Mt. Prospect ARC RA-COM 83,** Mt. Prospect, IL. Contact RA-COM, P.O. Box 452, Mt. Prospect, IL 60056 (s.a.s.e.).

Nov. 13, **Massillon ARC Auctionfest 83,** Massillon, OH. Contact MARC, 920 Tremont Ave. SW, Massillon, OH 44646 (s.a.s.e.).

Nov. 13, **Fort Wayne Hamfest,** Fort Wayne, IN. Contact Hamfest Chairman, AC-ARTS, Inc., P.O. Box 10342, Fort Wayne, IN 46851.

Nov. 13, **R.F. Hill ARC Winterfest,** Sellersville, PA. Contact R.F. Hill ARC, P.O. Box 29, Colmar, PA 18915.

Nov. 18–20, **13th Annual Seanet Convention,** Singapore. Contact Singapore Amateur Radio Transmitting Society, P.O. Box 2728, Singapore 9047.

Nov. 19, **Treasure Coast Hamfest,** Vero Beach, FL. Contact Hamfest, P.O. Box 3088, Beach Station, Vero Beach, FL 32961.

Nov. 26–27, **Guilford ARC Hamfest/Computerfest,** Greensboro, NC. Contact GARC, P.O. Box 7007, Greensboro, NC 27407 (s.a.s.e.).

Nov. 27, **Radio Central ARC "Ham-Central,"** Stony Brook, LI, NY. Contact Scotty Policastro, KA2EQW, 80 7th St., Bohemia, NY 11716 (tele. 516-589-2557); or Bob Yarmus, K2RGZ, 3 Haven Court, Lake Grove, NY 11755 (tele. 516-981-2709).

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If your space or budget was too limited for a long boom tribander, chances are the Explorer 14 will fit both. The boom is only 14' (4.3 m) long and the turning radius requires only 17'3" (5.3 m). The compactness of the Explorer 14 reduces its overall weight and windload surface so you can mount it on a roof tripod, a mast or a tower. For Example, the Hy-Gain CD-45II rotator and HG52 tower are a perfect match for the Explorer 14. This saves you the cost of an extra heavy duty rotator and tower.

Superior Construction

The Explorer 14 includes passivated stainless steel hardware and heavy gauge, pre-formed element and mast brackets. High grade 6063-T832 thick wall swaged aluminum tubing is used throughout. A BN86 balun is included and a new Beta Multi-Match provides DC ground to reduce lightning hazard and precipitation static. It's a rugged, easily assembled antenna that survives winds to 100 mph (160 km/h).

Quad Band Option

You can add a fourth band, either 30 meters or 40 meters to the Explorer 14 with the QK-710 kit. A kit that attaches to the central dipole and is easily adjusted for either 30 meters (WARC) or 40 meters at minimal extra cost.

Lew McCoy, W1ICP, is among the most authoritative writers in amateur radio. For over 30 years he served on the ARRL technical staff with his last position as assistant senior technical editor. Presently he is the technical writer for CQ magazine. Here is what he had to say about the Explorer 14:

"In my opinion, with Explorer 14, Hy-Gain produced a truly high gain, high performance antenna in a small package. The "para-sleeve" design provides the amateur a whole new ball game, particularly in the area of broadbanding. I was really surprised when I actually verified the gain, front-to-back and bandwidth during my recent visit to the Hy-Gain labs and antenna range in Lincoln, Nebraska. The Explorer 14 is a winner."

Feed point and balun

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Frequencies of operation:	20M	15M	10M
	Electrical		
Under 2:1 VSWR (MHz)	14.0-14.35	21.0-21.45	28.0-29.7
Maximum F/B Radio (dB)	27	27	21
Maximum Gain (dB)	7.5	8.0	8.0
Maximum Power		Maximum Legal DC Ground	

Mechanical

Boom Length	14'1½" (4.3 m)
Turning Radius	17'3" (5.3 m)
Net Weight	43 lbs. (19.5 kg)
Wind Surface Area	7.5 sq. ft. (.69m²)

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Our Readers Say:

The Golden Rule Applies

Editor, *CQ:*

Having been involved very seriously in contesting for the last several years and having served a term on the ARRL Contest Advisory Committee, I continue to get a lot of input from fellow amateurs about contests and contesting. Probably the two most frequent subjects brought up are band crowding from contest operations and the inability of the "average" amateur to compete with the super stations. Another frequent subject that was brought up in correspondence to the CAC while I was a member was the difficulty that many operators had in operating a full 48 hours in some of the major contests that do not limit operating time.

Addressing the subject of band crowding during contests, the entire democratic system has always been based on the premise of majority rule. The same holds true for the use of the amateur bands. When 90% of the amateurs on a given band, by numeric ratio, are involved in a contest, it stands to reason that they are entitled to occupy 90% of the band spectrum available. In actual fact, the contests usually occupy far less than the proportionate share of the band. A typical case in point is 20 meters. Very little s.s.b. contest operation ever takes place above 14.3 MHz. Similarly, in c.w. contests, the band above 7.050 is practically vacant. Of course, in an s.s.b. contest the whole c.w. band remains free, with the opposite holding true for a c.w. contest.

Most "serious" contest operators take great pains to avoid standard net frequencies and to check if a frequency is clear before they call CQ. What sometimes happens when a "super station" checks a frequency is that he is heard loud and clear by someone on the frequency, while he is totally unable to hear that station in return. This is simply the difference between a kilowatt and a high multi-element array and 60 watts and a dipole. Of course, not hearing a return to his query, he will go ahead and use the frequency. It is unfortunate that this should be so, because it invariably leads to the charge that "the big fellows act like they own the band." The only solution is for the "little fellows" to improve their stations so they can be heard.

This leads to the next subject of the "super stations" always winning. The best comparison here would be to consider someone who wants to enter the Indianapolis 500 race but only owns a Volkswagen Rabbit. He might consider it unfair that the "big guys" with their $500,000 race cars can run circles around him and there is no chance for him to win. It's true, of course. He has no chance of winning top place in a major event, but there are lesser races where he can compete on an equal footing with other people who are in similar circumstances as he. Those "super stations" didn't start out all that big. Every one of them began with a small station and kept building onto it. There are vast amounts of time, effort, and, yes, money invested in them, just as there is in the Indy car mentioned above. Very few can ever expect to be able to achieve the success, fame, and glory that are attached to "winning it big" in any field of endeavor. However, anyone can try to be the best in his own level of competition.

Even the third realm of concern mentioned above can be directly compared to competitive events outside amateur radio. Consider the person who wants to run in the Boston Marathon and win. He spends endless hours jogging, performing exercises, and carefully regulating his diet. His preparations can hardly be considered fun or exciting, but to him, the ability to compete is all important. Unfortunately, no matter how hard a 45-year-old person trains, there is no chance of his being competitive with a 25-year-old. We were all young and in the prime of life once, but there simply is no way to regain that lost youth. Instead, we have to recognize that there is a new generation of young operators who will take the place of us "old-fogies" who simply don't have it in us to go the whole distance anymore. Fortunately, there are still activities that those of us approaching senior-citizen status can compete in with varying degrees of success. Even here, though, we must realize that winning requires dedication and, not infrequently, sacrifices.

Amateur radio contesting has probably done more to advance the art of communications than any other single aspect of the hobby. The FCC has long recognized this fact. Why else would they permit it?

More developmental work in the fields of antennas, receiver sensitivity and selectivity, and every other aspect of communications technology has been performed in the quest of ever better contest results than for any other reason. In fact, where else is it better to test the success of a new antenna or rig than in a contest?

There are certainly many more aspects of amateur radio than contesting, and each has its place and is every bit as important to those who concentrate on it. No one should put down their fellow amateur just because he doesn't place the same emphasis on a particular field of interest as you do.

If we can only keep this in mind and simply follow the Golden Rule and "do unto others as we would have them do unto us," keeping in mind that there will always be those better than we and those worse than we in any field of endeavor, then our hobby can be a more enjoyable activity and we can all benefit from each other's accomplishments.

Larry Strain, N7DF
Holton, KS

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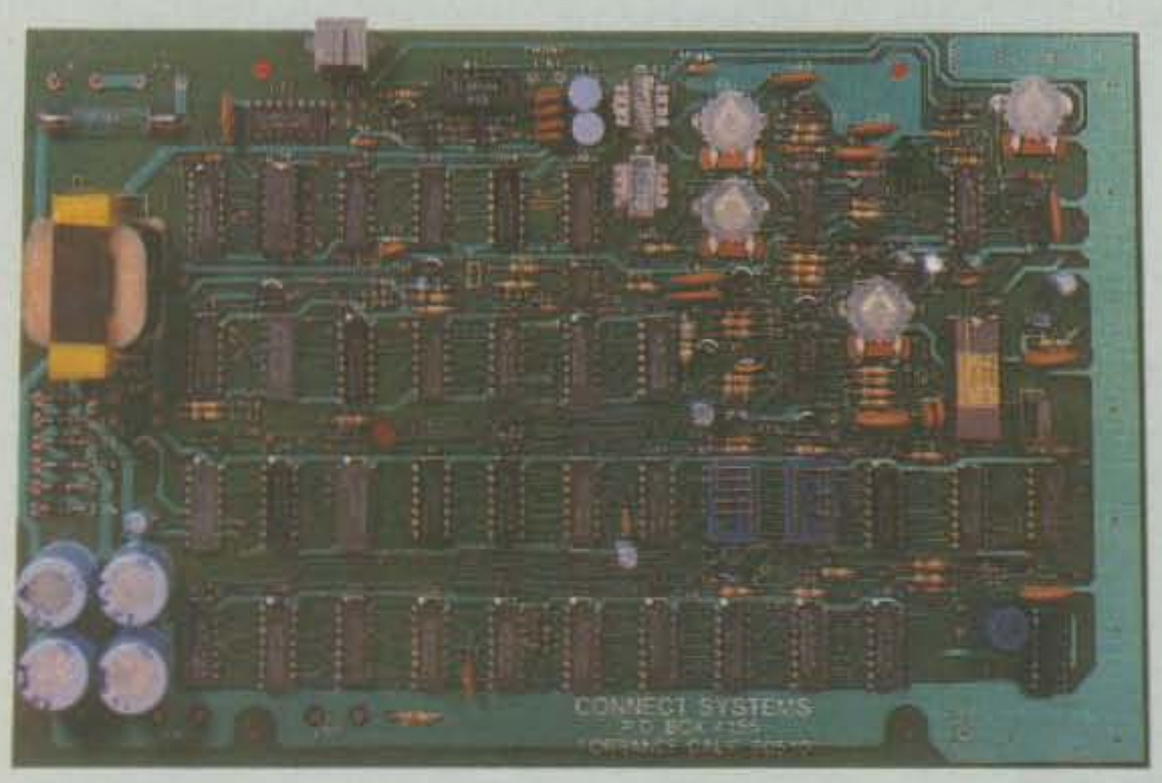

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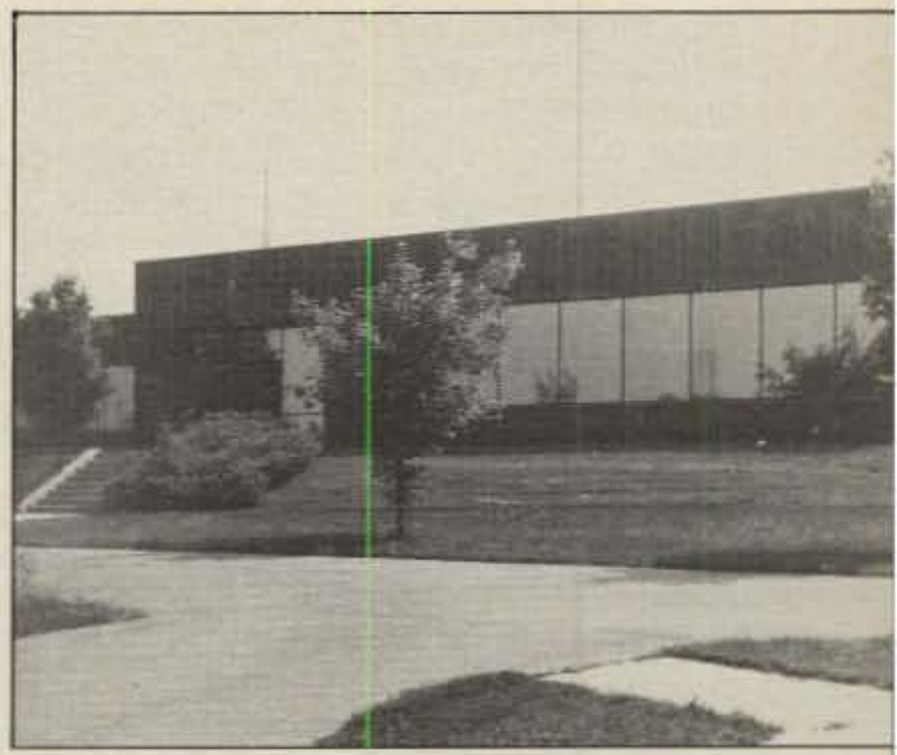
Ralph A. Haller, Chief, Experimental Engineering Branch, FCC.



FCC Laboratory, Columbia, Maryland.

A CQ EXCLUSIVE

CQ Interviews:

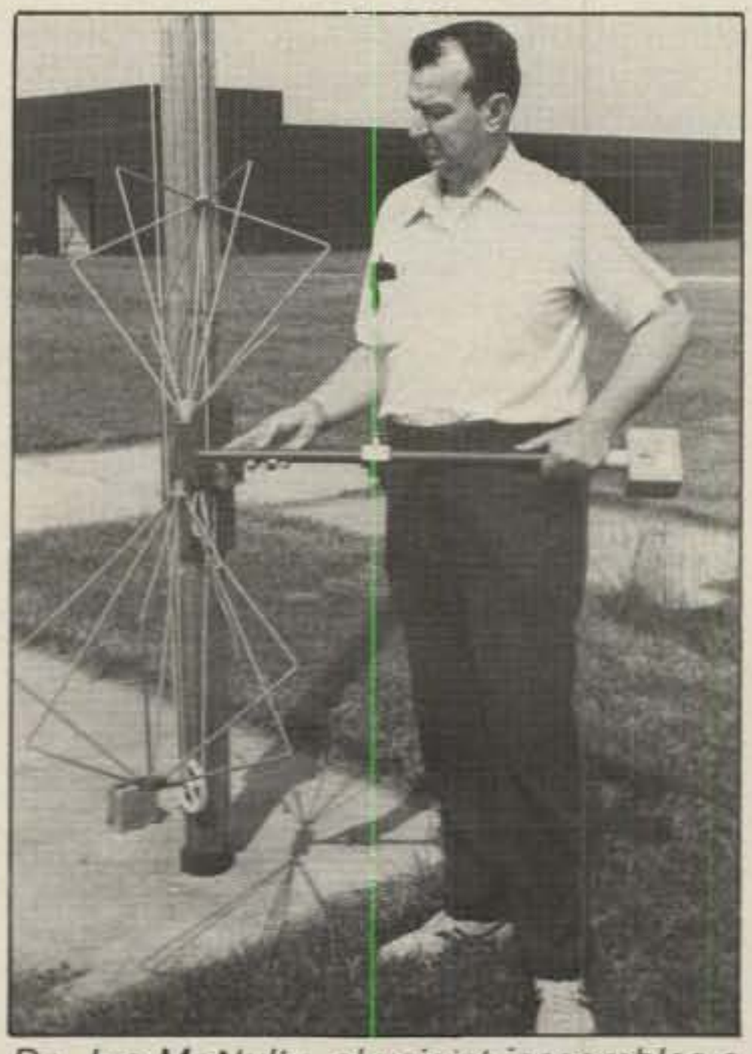
Mr. Ralph A. Haller*, N4RH

Chief, Experimental Engineering Branch
Office of Science and Technology
FCC Laboratory, Columbia, Maryland

BY DR. THEODORE J. COHEN†, N4XX

Mr. Ralph A. Haller, N4RH, currently holds the position of Chief of the Federal Communications Commission's (FCC) Experimental Engineering Branch in Columbia, Maryland. Ralph has also served as chief of the FCC's enforcement monitoring network and as a field radio inspector in the Los Angeles District Office. Prior to joining the FCC in 1971, he worked as a broadcast engineering consultant to over 150 AM, FM, and TV stations in the Midwest. He began his communications career working as an engineer and disc jockey at a radio station in Topeka, Kansas. Some of his more major accomplishments include developing a plan to automate the FCC's 13 fixed, radio direction finders, changing the tone of FCC monitoring enforcement to be more helpful to licensees, eliminating violation notices for petty violations, and developing numerous electromagnetic measurement techniques.

Ralph holds a Bachelor of Science degree from the University of Kansas, and is active in several professional communications organizations. Ralph has held an amateur radio license for over 25 years, and credits amateur radio for helping him choose a career. He is also a licensed, instrument-rated pilot and owns his own aircraft. He counts amateur radio and flying as his two primary hobbies. Together with his wife Mary, WD4GSK, Ralph makes his home in Manassas, Virginia.



Dr. Joe McNulty, physicist, assembles a broadband antenna for spread-spectrum measurements.

*The views expressed are those of the interviewee, and they do not necessarily reflect the views of the Commission.

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CQ: Before we chat about your work at the FCC laboratory, Ralph, could we find out a little about you? How long have you been interested in amateur radio?
Haller: Almost longer than I can remember. I started studying for my Novice license when I was eight and was first licensed at age nine. I guess I have always had a fascination with radio.

CQ: Did amateur radio influence your career path?
Haller: Definitely. The amateur license led to obtaining a First-Class Radiotelephone license and a Second-Class Radiotelegraph license, which, in turn, led to engineering work in broadcast stations. While working as a chief engineer for a couple of broadcast stations, I earned a degree in Electrical Engineering from the University of Kansas. Upon graduation I worked as a broadcast consultant for some time, and later, in 1971, I joined the FCC. If it had not been for amateur radio, I might be digging ditches today! Seriously, the knowledge obtained from my involvement in amateur radio has assisted me throughout my career.

CQ: Ralph, what caused you to decide to go to work for the FCC?
Haller: That's not a simple question. I had always had a healthy respect for the FCC. In fact, my first two contacts as a Novice were with the FCC monitoring stations for excessive second harmonic radiation. In broadcasting I also had numerous, less traumatic, dealings with the FCC. When the circumstances fell into place for me to join the FCC team, I jumped at the opportunity—a decision I have never regretted. I believe the work of the FCC is more important than ever in the communications explosion of today.

CQ: Just one more question about you. What positions have you held with the FCC?
Haller: I started as an engineer in the Los Angeles District Office. Most of that work was enforcement oriented. For example, I inspected stations to assure compliance with the Rules, tracked down interference sources, and gave several hundred amateur examinations. In 1976 I moved to the Washington, DC, office as an investigative specialist for a brief time. I was then put in charge of the FCC's enforcement monitoring network for the country. One of the things I really tried to change was the image of FCC enforcement. I felt that in most cases there was no need for an adversary relationship between the FCC and our enforcement "clients." Most people do not intentionally break the rules; they just make mistakes. Outcomes of that effort were more phone calls to offenders and advisory notices that did not require replies to the FCC, instead of Official Notices of Violation. This was beneficial to the licensees as well as to the FCC by cutting down on paperwork.

Engineer Hank Van Deursen adjusts ACSB equipment for testing of its effect on FM two-way radio.

In 1981 I left enforcement work and assumed my present duties as Chief of the Experimental Engineering Branch at the FCC Laboratory in Columbia, Maryland.

CQ: That brings us to the next question. How does your work fit into the FCC?
Haller: Perhaps before answering that, Ted, I should explain a little about the structure of the FCC. The staff of the FCC is divided into several bureaus and offices that advise the Commissioners on rule-making items and carry out the day-to-day functions of the agency. Most amateurs are familiar with the Field Operations Bureau because that bureau gives the amateur exams. Most amateurs are also familiar with our Gettysburg licensing operation, which is part of the Private Radio Bureau. Other bureaus and offices deal with, for example, broadcasting, cable television, telephones, and long-range agency planning. The laboratory operations fall under the Office of Science and Technology. That office is involved in spectrum planning, authorizing radio equipment for use, and keeping track of new technology.

There are two groups at the laboratory. Will McGibbon heads up a group that sets standards and certifies equipment for sale in the United States. They authorize several devices in addition to transmitters. For example, they may examine microwave ovens, video games, clock radios, or home computers. Any device that uses radio frequency energy or emits radio frequency energy may come under their scrutiny.

CQ: And your branch?
Haller: My branch, the Experimental Engineering Branch, differs from the other units at the laboratory in that we actually set up laboratory models to determine answers to technical questions or controversies. Often we are called on to provide practical solutions to problems that may have multiple theoretical solutions. We are not involved in the certification of equipment, and therefore, independently report to the Washington headquarters office.

CQ: What types of experiments do you conduct?
Haller: There are three basic types of work in the branch. First, we provide technical answers to the Commission in technological rule-making matters. Right now, for example, we are studying how Amplitude Compandored Single Sideband, known as ACSB, might be intermixed with FM in the various two-way services. We are also looking at civilian use of spread-spectrum communications. A couple of years ago we studied a spread-spectrum navigation system that operates in the 420–450 MHz band. Our primary concern in that study was that the spread-spectrum signals not cause interference to amateurs.

Second, the branch assists in resolving technical questions. One current study looks into the susceptibility of television receivers to interference. Also in this element, we develop new procedures to help standardize measurement techniques. Because manufacturers all over the world must submit electronic equipment to the FCC before it can be

Hector Davis, Assistant Branch Chief, prepares equipment to study the interference immunity of a typical television receiver.

Technician Paul Schueler makes final checks on ACSB and FM equipment prior to some field tests.

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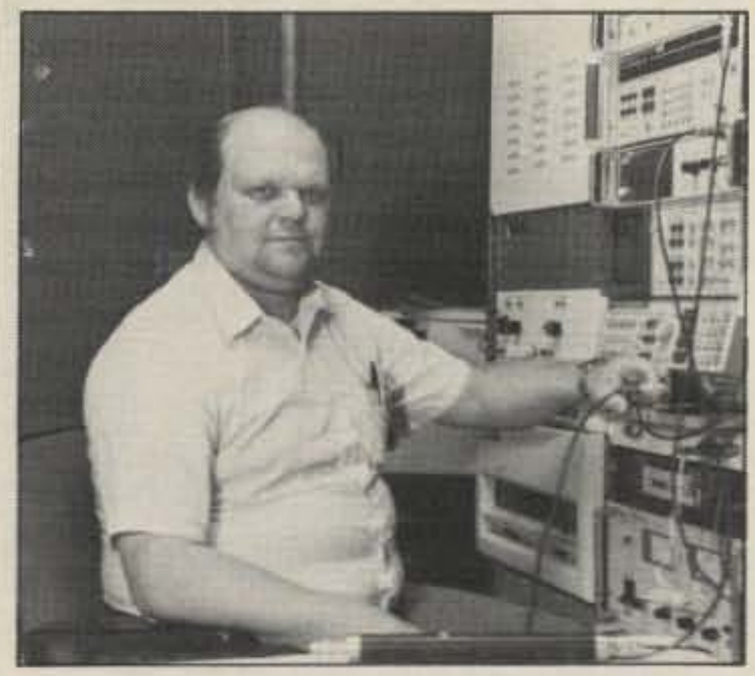


Engineer Dan Stanks uses a spectrum analyzer to measure the response of an interference filter.

sold, uniform methods of measurement are necessary. Things such as energy-saving light bulbs and home computers must pass FCC tests to ensure that they do not cause harmful interference. Even cable television systems must pass certain leakage tests to prevent interfering with over-the-air services. Each device requires a uniform measurement procedure.

Finally, the branch provides a technical consulting service to other elements of the agency. For example, we have developed specialized equipment to be used by the Field Operations Bureau in its enforcement work.

CQ: Well, you certainly have touched on a number of areas that are of interest to amateurs. Perhaps we could talk in more detail about at least a few of those areas. You mentioned ACSB. What is that?
Haller: Amplitude Compandored Single Sideband, or ACSB, has its roots deep within amateur radio. Early experiments with ACSB were conducted by amateurs about ten years ago. In simple terms, ACSB provides two-way radio communications which may be equivalent to the quality of existing FM. This is accomplished by transmitting single sideband and reducing the dynamic range of the transmitted signal so that the average power remains high. The receiver then expands the dynamic range to return recovered audio to normal. This expansion process improves the received noise floor by as much as 40 dB.

Any amateur familiar with single sideband knows the difficulty of tuning in the receiver. ACSB provides automatic perfect tuning by locking the receiver's frequency to a transmitted pilot tone. This allows ACSB to be used at VHF and UHF without requiring crystals of extreme accuracy.

ACSB technology uses only about one-sixth the bandwidth of conventional FM two-way systems, so you easily can see why we are so interested in it. A major concern, however, is how to assure that the introduction of narrow-band systems like ACSB does not excessively degrade existing FM systems because of increased interference. Our job is to sort out manufacturers' claims for the equipment, study techniques to integrate the new technology into existing spectrum, and then advise the Commission of our findings.

CQ: Ralph, television interference and the susceptibility of home electronic entertainment equipment have been long-standing problems in the amateur community. Public Law 97-259 gave the FCC the authority to set interference immunity standards. What are you doing in that area?
Haller: Interference is a two-sided question. It can be caused either by a radio frequency emitter or by the affected device. Some years ago I wrote the basic text of an FCC booklet entitled "How to Identify and Resolve Radio and Television Interference Problems." I suspect many amateurs have a copy of the booklet. The booklet was a strong attempt to help people understand and eliminate interference. Obviously, the first step in resolving an interference problem is to determine the interference mechanism. The booklet provides many tips on how to proceed in an orderly manner to eliminate interference.

Once the amateur has determined proper operation of his or her transmitting equipment, the question of susceptibility of home entertainment equipment becomes crucial. The FCC has traditionally held that if an amateur could operate in his or her own house with no interference, then the problem became one of decreasing the susceptibility of the affected equipment in neighbors' homes—a task that is not necessarily the amateur's.

"Right now, the FCC is hoping that industry will develop voluntary [RFI] standards that would make federal regulations unnecessary."

CQ: But what about Public Law 97-259?
Haller: Right now, the FCC is hoping that industry will develop voluntary standards that would make federal regulations unnecessary. My staff currently participates in industry working groups that are looking into voluntary standards. Whether the standards are voluntary or mandatory, don't expect them too soon. The idea of susceptibility standards is new, and no one has experience in how to set those standards. I expect first to see standards for television sets to appear. Standards for other home entertainment devices then will follow. At this point, the FCC's primary function is to continue encouraging the development of voluntary standards in a timely manner.

CQ: Why are voluntary, industry susceptibility standards preferable to standards set by the government?
Haller: Government regulations tend to be developed very slowly. Also, they generally can't be changed quickly enough to keep up with technological advances. Voluntary standards can be far more adaptable, and for that reason will probably be more effective over time.

CQ: I understand that the FCC recently sponsored development of a high-technology television receiver. Will the technology employed in that receiver help to reduce interference problems?
Haller: The receiver was developed primarily to study its performance in the UHF television spectrum. Right now, for a given city, UHF television stations can be stacked no closer than every six channels. Various minimum transmitter distances also exist for the five intermediate channels. These distance requirements are known as "UHF taboos." This channel scheme exists primarily because of the characteristics of today's television receivers. Intermodulation products could cause objectionable interference if the six-channel spacing was not observed.

Now with respect to the new receiver, it uses a Surface Acoustic Wave (SAW) filter to provide greater selectivity and rejection of adjacent-channel signals. It uses an intermediate frequency of about 450 MHz, rather than 45 MHz, to eliminate receiver image responses in the UHF television band. It also employs a pseudo-synchronous detector to further reduce responses to signals from adjacent channels.

CQ: Does the new receiver reject amateur HF signals?
Haller: None of the design features specifically relate to rejection of HF amateur radio signals; however, the better the selectivity of a receiver, the less likelihood that the receiver will respond to anything other than the channel to which it is tuned. We hope, as technology advances in the area of on-channel television performance, that we will see corresponding increases in interference immunity.

CQ: A few years ago, the FCC banned the manufacture and sale of linear amplifiers capable of operation between 24 and 35 MHz. That cut out 10 meter use for amateurs. Now that Citizens Band radio has lost its popularity, do you see capabilities for the 10 meter band being restored to amateur linears?
Haller: The linear amplifier ban was a tough decision, Ted. On the surface, innocent bystanders were paying the price for another radio service that was almost out of control. The situation was bad. We were receiving around 100,000 complaints of television interference per year. A study showed that probably ten people experienced interference for every one person who complained. I can assure you that those 1,000,000 people

didn't care if it was amateur or Citizens Band interference; they just wanted the problem fixed. "Hams" were being blamed. Another study showed linears to be a significant factor in the interference problem.

The solution represented a compromise between halting linear use in the Citizens Band service and retaining linears for amateurs. Along with the ban, type acceptance of amplifiers was required to let the FCC staff look at the designs before sale. Once the linear amplifier market dried up for the CBers, interference complaints began decreasing. However, I don't see the rule on linear amplifiers being revisited in the near future. It has been effective. Perhaps at some point the Commission may be able to relax the rule; however, since licensed amateurs have been allowed to modify linears for 10 meters, the rule does not seem to have been a great burden on the service.

"I don't see the rule on linear amplifiers being revisited in the near future."

CQ: Interference between cable television systems and amateur operations on 2 meters seems to be a growing problem. What's being done about that?
Haller: Cable television operations should be closed systems. Operated properly, a cable system should not cause interference to amateurs; conversely, amateurs should not interfere with cable systems. Since we live in a less than ideal world, interference problems do exist—in both directions.

Some years ago I chaired an advisory committee that studied cable leakage in the band from 108 to 136 MHz. The aviation community, and specifically the FAA, had similar concerns about cable television's use of frequencies that were used for safety-of-aircraft operations. The results showed that cable systems could be monitored effectively and leaks corrected promptly.

Additionally, let's look at the economic incentives for cable systems to operate tight systems. Leakage is a two-way street. In general, the so-called mid-band channels on a cable system are used for the transmission of premium services that are not available over the air. Too many leaks in a cable system and the premium services suddenly become equivalent to over-the-air services. Why should someone pay to receive something that is available free? So cable systems have a real incentive for finding and patching leaks.

CQ: But what about older cable systems with distribution networks that have deteriorated over time?
Haller: Some systems that were built several years ago may have so many leaks that repair is almost impossible without

Lynne Higgins, secretary, enters lab data into a computer for processing.

rebuilding the cable plant. These are the difficult cases; however, the FCC Rules and Regulations provide for strict leakage limits. If a system cannot operate within those parameters, then some enforcement actions may be necessary. The main point here is that I don't see a strong push on the part of amateurs to get cable systems off the 144 to 148 MHz band as being useful. Cooperative efforts among all parties, followed by enforcement, if necessary, provides the only road to a long-term solution.

"I don't see a strong push on the part of the amateurs to get cable systems off the 144 to 148 MHz band as being useful. Cooperative efforts among all parties, followed by enforcement, if necessary, provides the only road to a long-term solution."

CQ: More and more devices that cause interference to amateur communications, especially in the HF spectrum, are being marketed. Is your branch doing anything to reduce that interference?
Haller: Radio frequency energy finds new uses every day. Radio frequency now clocks computers, excites some types of light bulbs, detects intruders, destroys cancer cells, opens garage doors, removes hair, keeps time, seals plastic bags, cooks, and operates remote switches through the house wiring. The list goes on and on. To limit interference, most devices that use radio frequency energy around the home are required to comply with Part 15 of the FCC Rules and Regulations.

One problem nowadays is that devices using radio frequency energy are proliferating at a rate faster than we know how to test them. The result is that our Rules all now have complex and diverse types of measurements on a case-by-case basis. Wireless telephones are a prime example of the difficulty. These devices use 49 MHz to transmit from the handset to the base. Generally, that path poses no prob-

lems, except that the frequency is close to the television intermediate frequency, and direct IF pickup can occur. The base transmits back to the handset on 1.7 MHz. There exists no specific provision in the FCC Rules for these devices. Yet they exist and can be made and sold legally. Now companies are asking the Commission to change the frequencies of operation to clearer channels. Every proposal for a major change requires considerable effort to study the interference potential and to develop new test procedures to detect interference potentials.

"Devices [that use] radio frequency energy are proliferating at a rate faster than we know how to test them."

CQ: What is your relationship to the Commission's Authorization and Standards Division in this regard?

Haller: We are working closely with the Authorization and Standards Division in the certification process. One current project is a program to provide a means to certify test sites to ensure that manufacturers anywhere in the world can make measurements identical to those at the FCC test site. Through this continuing process of studying new devices and standardizing test procedures, we hope to maintain a usable radio environment in the home.

CQ: Amateurs often have views relative to Commission rule-making actions. What is the best way for them to let the Commission know their views?

Haller: Except for scme emergency actions, rule-making items follow a general format as prescribed in the Administrative Procedures Act. Without going into great detail, there are either two or three opportunities to comment on items. Many items start as a Notice of Inquiry (NOI). At this stage, rules are not proposed; only questions are asked. Items may also start as a Notice of Proposed Rulemaking (NPRM) or NOI's may become NPRM's. At this stage, specific rules are proposed and public comments are requested. After the initial comments, a reply comment period provides an opportunity for the public to respond to other commentors. After all of the comments have been received, the Commission reviews and considers the comments. The proposed rules are appropriately modified, and a final Report and Order is issued with new rules. Sometimes no new rules are issued if the comments have convinced the Commission that the existing rules need not be changed.

CQ: Is it important for amateurs to respond to the Commission on an individual basis?

Haller: Yes! I cannot stress too strongly that interested parties should comment on Agenda Items. Through those comments, the staff learns the views of the affected parties. However, if one decides to comment, he or she should respond to the actual items addressed in the docket. Someone responding to an item should read the item and not base the response on what he or she thinks the item says. Most libraries have copies of the Federal Register, so it is possible to read the actual text. Also, an emotional comment such as "I don't like the item" serves little use, since sound reasons for disapproval are not provided. Finally, don't consider a comment that is filed to be equivalent to a vote in the matter. Items do not pass or fail based on a tally of the views of the commentors. Items are decided on their potential to serve the public interest, convenience, and necessity, not by popular vote of those responding to the items.

"[Commission] items do not pass or fail based on a tally of the views of the commentors."

CQ: Ralph, I think we've just about run out of time. Thank you very much for being with us today.

Haller: Ted, it's been a pleasure. CQ

The basic building block of an RTTY station is the demodulator. Demodulators come in all shapes and sizes with all kinds of complexities and obviously in all price ranges. K9GWT gives us a demodulator overview, explaining the various types and what we can and should expect.

RTTY Demodulators

You Can't Work 'em If You Can't Hear 'em

old amateur radio proverb

BY BILL HENRY*, K9GWT

The popularity of RTTY in amateur radio has increased greatly in the past 10 years. This growth is due both to the availability of commercial equipment for RTTY and, more recently, to the interest of many of us in hobby or personal computing. The RTTY hobby no longer requires that the beginner be mechanically inclined and willing to wrestle with and maintain the old monster teleprinter machines. These machines are still around for those of us who like mechanical gadgets, but it is usually far easier and more attractive for the beginner to start out immediately with a video terminal and not have to fight gear ratios, deafening noise levels, and drops of oil everywhere!

The typical RTTY station used to be an electro-mechanical "nightmare" of machines, paper tape, and wires—millions of wires (or so it seemed). All self-respecting RTTY operators had two or three printers, tape machines, strip printers, loop supplies too heavy to lift, and, of course, several demodulators. It was often said that an RTTYer's favorite winter sport was rebuilding the demodulator. We all had several "ultimate' units in the works, and even finished some of them!

The typical RTTY station of 1983 is something entirely different. The "modern" station is unbelievably compact by 1960 standards and may even take up less room (and power) than the transmitter and receiver. Gone are the stacks of mechanical gadgets and maze of wires we all recognized as the mark of the "true" RTTY devotee. Printer paper has been replaced by a video screen (usually green, if you're "cool"); paper tape has been replaced by a few plastic parts called RAM integrated circuits. Our keyboards are now "educated" so that we no longer have to remember to always type LTRS and FIGS keys. A slightly different type of integrated circuit allows us to call-up and send our call sign and that of the other station at the press of a key. Other "memories" store our "bragtape" (still called that). We even have "electronic mailboxes" (sometimes called "MSO's") that will store and replay whole messages upon command. RTTY has come a long way, and these features certainly have made it more enjoyable.

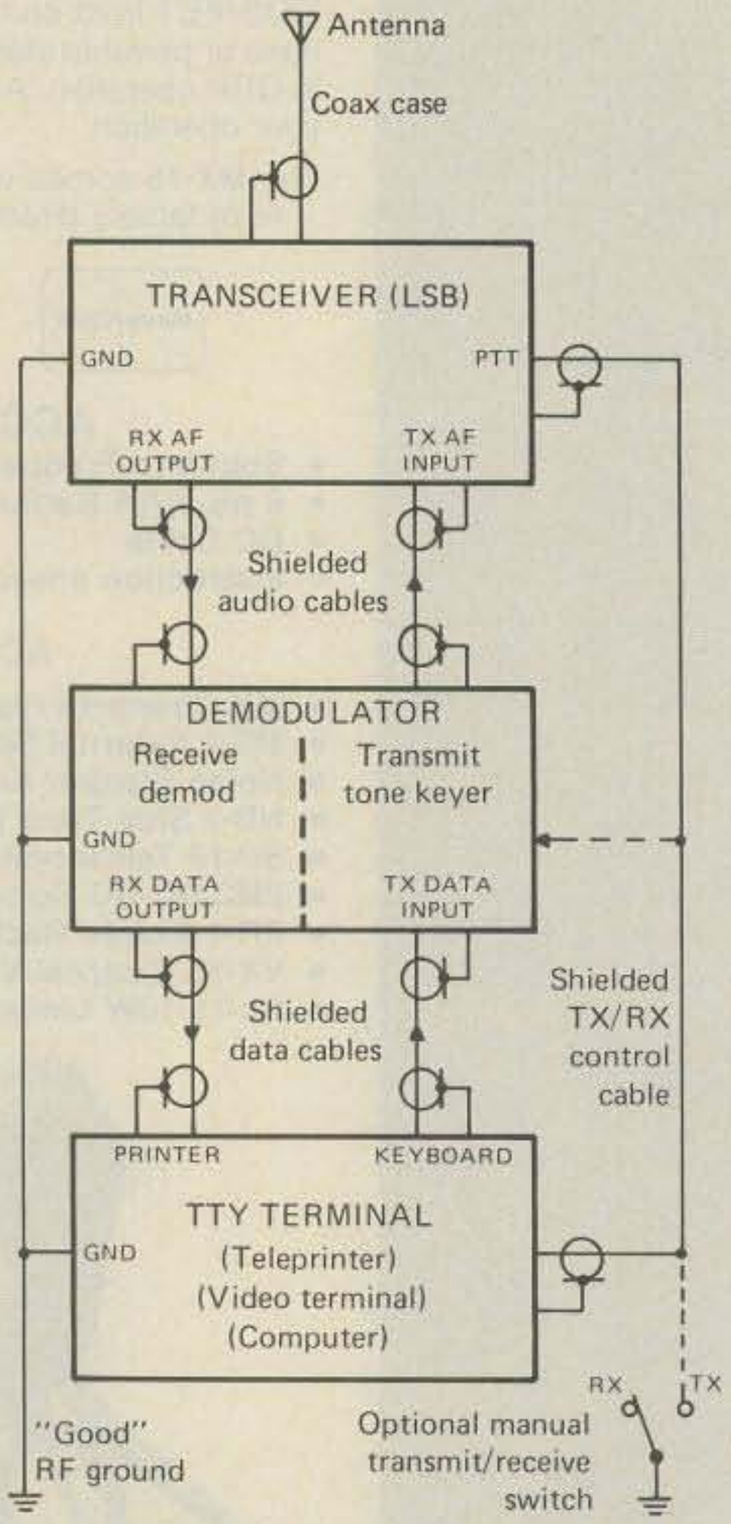


Fig. 1– Typical RTTY station.

One part of the RTTY station that has not necessarily improved is the demodulator section, sometimes called the **Terminal Unit,** or **TU.** As the revolution in electronics was applied to improved electronic replacements for the old keyboard and printers, it became more and more attractive to put the entire RTTY system in just one cabinet and eliminate all those messy and confusing wires. Also, it was noticed that solid state terminals really don't need the big, heavy loop power supplies and motor control relays. So, the RTTY demodulator was simplified, combined with the video terminal circuitry, and put in one attractive cabinet. With this new equipment, the only cables you need to work RTTY are a few simple ones to hook to the transceiver.

Unfortunately, in the rush to miniaturize and simplify the demodulator, we lost some very important demodulator features and performance. Some of the one-package units have continued to include a high-performance demodulator. However, other units include only the most basic circuit for RTTY demodulation. The RTTY beginner is the one who suffers the most from this problem; he has never operated RTTY before. He therefore must assume that RTTY only works with no QRM and on signals that are S9 or stronger, or that the speaker volume

**Box 365, Urbana, IL 61801*

must be turned up to just short of the threshold of pain. These handicaps are just not true, and we proved it 10 to 20 years ago! If your RTTY system suffers from bad print in QRM and you can't tune your transceiver to the other guy's signal, *read on!*

The RTTY demodulator is part of our receiver. It takes the tones from the receiver, separates them from the noise and interference, and then reconstructs the digital signal to drive our printer or video screen. I am sure we have all heard the old saying about receivers: "If you can't hear 'em, you can't work 'em." This is even more true of RTTY. Just like the old timers used to advise us beginners to "put our money in a receiver," the newcomer to RTTY will get more benefit from a good demodulator than from any other section of the RTTY station. This is particularly important when operating on the h.f. bands (80–10 meters).

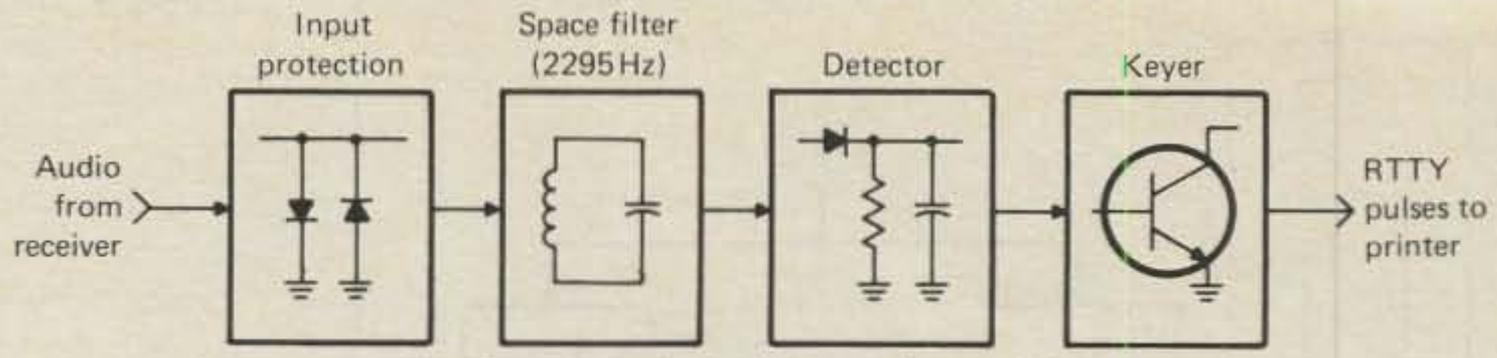


Fig. 2– Typical single-tone demodulator.

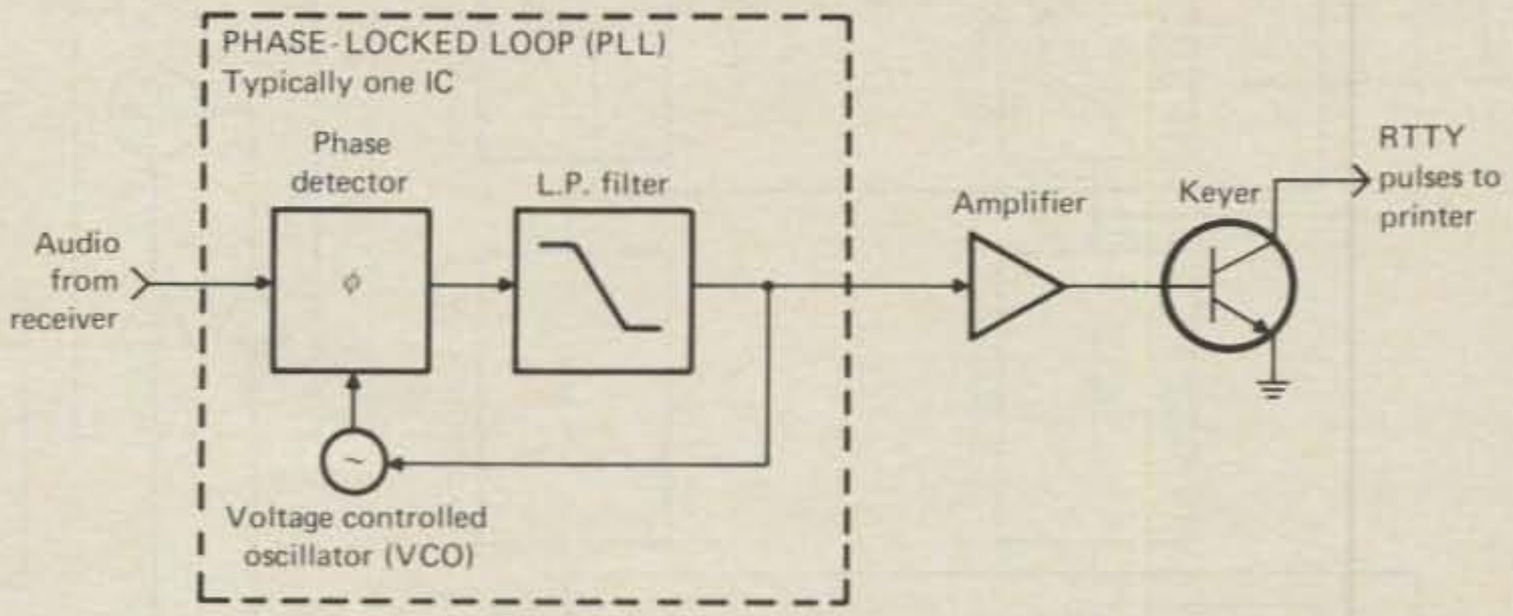


Fig. 3– Typical phase-locked-loop demodulator.

Single-Tone Demodulators

We transmit RTTY on h.f. using **FSK** (**F**requency **S**hift **K**eying) to send out one of two radio frequencies: one for the MARK pulse condition, and the other for the SPACE condition. To take *full* advantage of the signal we receive, we should be capable of detecting *both* signals and using *all* of the information transmitted. However, there are, in fact, many circuits that only include the capability for reception of just one of the two tones, usually the SPACE tone. This circuit uses a simple one-tone filter and detector and works well on v.h.f.-f.m. or when the h.f. signals are 20 over 9 and there is no QRM. They do fall apart, though, when signals fade or when QRM is present. The circuit is, however, very simple and takes only a few parts to build; for a manufacturer, it is very cheap. You also do not get an output for a good tuning indicator, so it can be next to impossible to accurately set your transceiver to the other guy's frequency. This causes the "frequency-walking" we have all observed as each station in turn "tweaks" the frequency on each transmission.

Phase-Locked-Loop Demodulators

Another simple circuit that has gained a lot of popularity is the phase-lock-loop **(PLL)** demodulator. Because the entire circuit is contained in one or two integrated circuits, this circuit is also quite simple and low cost. It also works considerably better than the single-tone, SPACE-only demodulator.

The PLL demodulator works by using a *phase detector* and *voltage-controlled oscillator* **(VCO)** in a feed-back circuit. The feedback connection is arranged so that the difference in frequency between the received audio signal and the VCO produces a d.c. voltage which then adjusts the VCO to be nearly the same frequency as that received. The d.c. voltage therefore will vary somewhat as the input audio frequency changes between MARK and SPACE conditions. This voltage is then filtered and amplified to produce the required MARK and SPACE pulses to drive the printer or video terminal.

Phase-lock loops, however, have a very nasty characteristic that makes for less than ideal RTTY detection. Phase-lock loops, by nature, will lock on *any* signal that is within their "lock-range." Moreover, they will lock on the *strongest* signal in this range. If your desired RTTY signal is, in fact, the strongest signal in the PLL's lock range, you will get excellent copy of the received signal. However, if the RTTY signal fades or a strong signal (such as c.w.) comes on anywhere near the RTTY signal, the PLL very happily locks onto it, ignoring the RTTY signal. Often, many RTTY characters are lost while the PLL either tracks interference or attempts to switch back and forth between an RTTY signal and an interfering c.w. signal. Phase-lock loops do, of course, work very well on v.h.f.-f.m. RTTY where there are no interfering signals. They leave a lot to be desired when used on our crowded h.f. bands. The PLL also has *no* tuning indicator output, and this leads to the same problems discussed above in regard to the single-tone demodulator.

High-Performance Demodulators

There are, however, two similar, but different demodulator systems that give superior performance in detecting and demodulating RTTY signals. These two are: (1) the **FM** or *"hard-limiting"* demodulator and (2) the **AM** or *non-limiting"* demodulator. The two circuits are similar in that they both include the basic requirement of *separate* filters and detection circuits for both the MARK and SPACE pulses. Both types of demodulators also generally will include a good post-detection filter followed by a high-gain slicer (circuits often omitted from the simple one-tone and PLL demodulators). Both demodulators have outputs that may be used for very accurate tuning of the RTTY signal.

F.M. (Hard-limiting) Demodulators

The f.m. demodulator works on the principle that the received RTTY information is contained only in the frequency variation between MARK and SPACE tones; RTTY is an f.m. mode. Therefore, the f.m. demodulator circuitry will closely resemble that used in an f.m. receiver. In an f.m. demodulator, the RTTY audio tone signals from the receiver are first passed through a very high-gain amplifier so that all amplitude variations in the signals are removed. The constant amplitude, square-wave type of signal is then processed in a discriminator, producing opposite polarities for MARK and SPACE tone frequencies. In practice, f.m. RTTY demodulators rarely try to achieve the straight-line discriminator response we want in an f.m. receiver. Rather, since we know what frequencies the MARK and SPACE tones should be, sharply tuned filters are used in separate MARK and SPACE detectors. However, great care must be taken to assure that these filters are wide enough to pass all of the RTTY information and that both filters have the same bandwidth so that noise in both of them will then cancel when the two detector outputs are summed. The f.m. demodulator works very well and will often give perfect copy on very weak signals you can hardly hear.

The f.m. mode does, however, have one inherent weakness. Just as your f.m. receiver limiter stage will be "captured" by the strongest signal within its passband, so can the limiter stage of an f.m. RTTY demodulator. This disadvantage is,

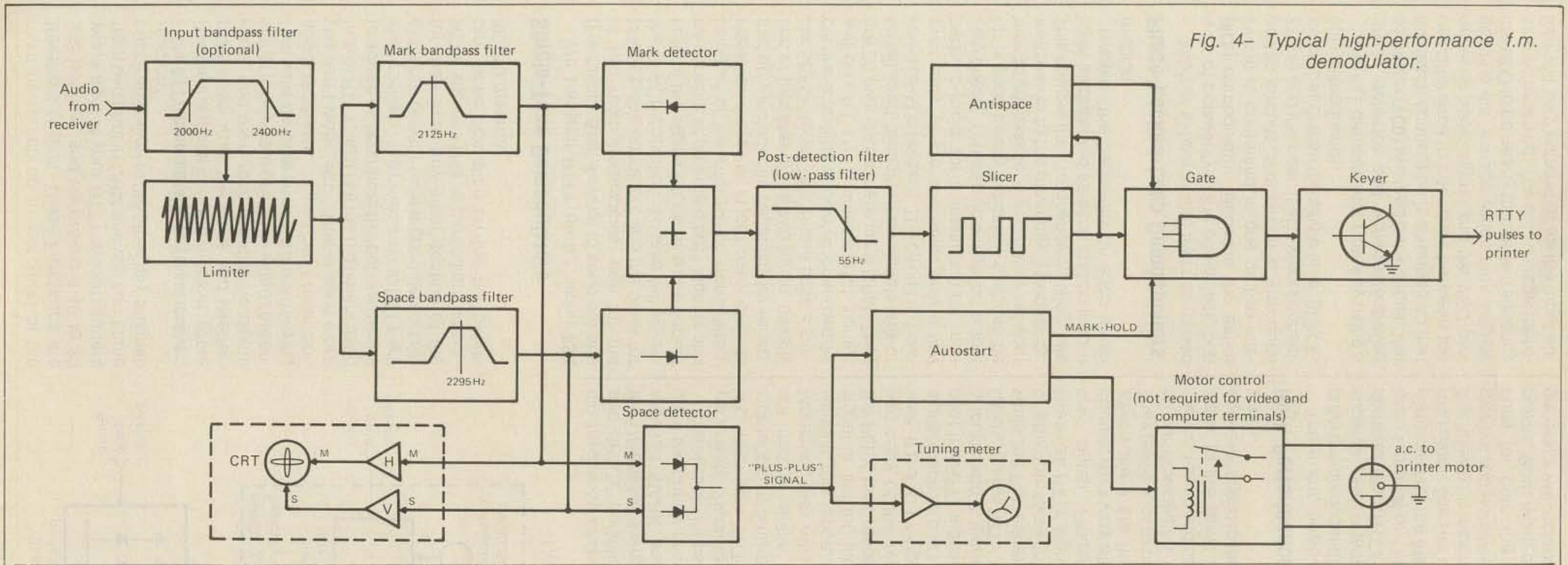


Fig. 4– Typical high-performance f.m. demodulator.

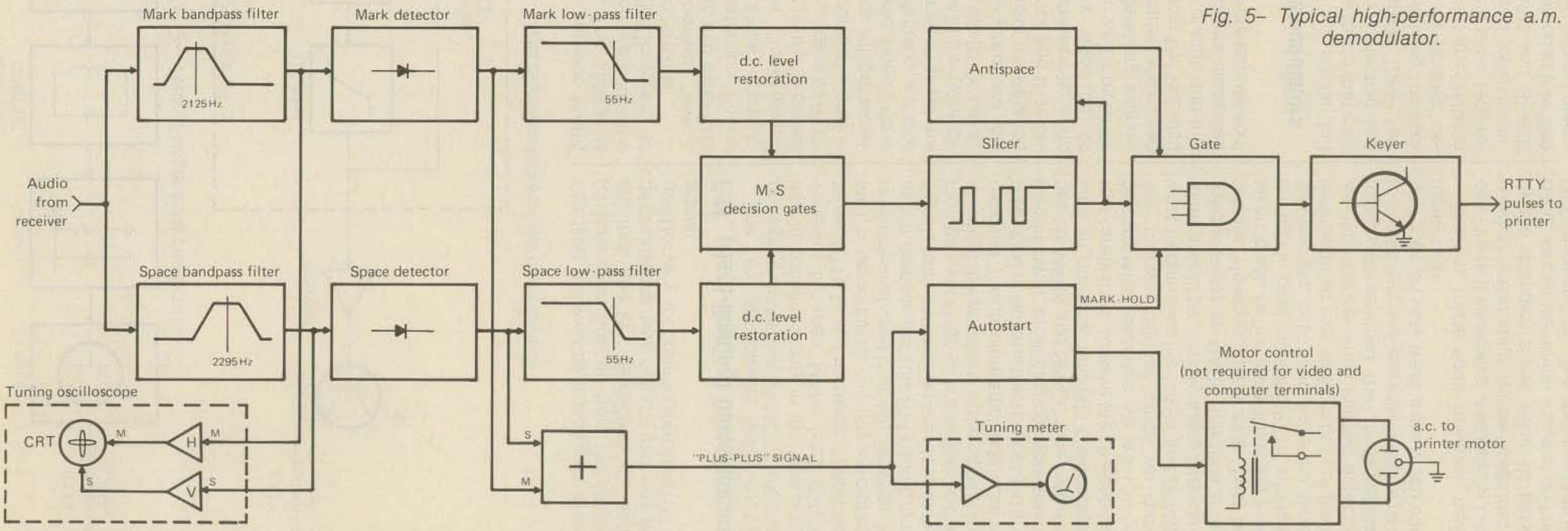


Fig. 5– Typical high-performance a.m. demodulator.

however, greatly reduced when bandpass filter circuits precede the limiter stage. Some f.m. demodulators include such audio filters; others work much better if you use the c.w. filter in the receiver itself. When such filters are used, the "capture" effect is rarely a serious problem. Moreover, the f.m. demodulator tends to be simple to use with few adjustments, is not amplitude sensitive, and will give good results on a very weak audio signal. F.m. demodulators do produce an excellent tuning indicator output.

A.M. (Non-Limiting) Demodulators

The a.m., or non-limiting, demodulator also uses sharply tuned filters before the MARK and SPACE detectors and usually employs a good post-detection filter and slicer stage. However, the amplitude of the input audio signal is not limited, and special circuits, often using a.g.c. and d.c. level restoration, are required to balance amplitude variations between the MARK and SPACE receive tones. The a.m. demodulator can be designed to perform every bit as well as the f.m. system. It also does not have the problem of limiter "capture" on strong signals. The a.m. circuit does, however, tend to be much more critical as to the amplitude of the received tone. This usually means that the receiver audio gain must be set louder for good copy and that the operator must keep close track of the audio level to prevent overloading the input stages with too strong an input. In practice, modern receivers have good, wide dynamic-range a.g.c. systems that take much of the adjustment burden off the operator. However, the a.m. system will rarely give good copy of a signal that has faded below the a.g.c. adjustment range of the receiver, a situation at which the f.m. system excels. The a.m. demodulator also has an excellent tuning indicator output.

As to "which is better—a.m. or f.m.?" there can be no hard and fast answer. High-performance demodulators using a.m. and f.m. techniques can be connected to the same receiver, and the results certainly will be different with one unit giving better print in some conditions and the other unit giving better print in other conditions.

Post-Detection Filter

Finally, when considering good demodulator circuits, don't just stop at the detector stages. The stage following the detector is often said to be the most important of all in the demodulator. This stage is the **post-detection filter**, often called simply the **low-pass filter stage.** The output signal from the MARK and SPACE detectors includes *all* signal components that pass through these stages. However, because we know the speed or rate at which the RTTY signal is transmitted, we know the bandwidth of our desired signal. The bandwidth of the RTTY pulse signal is approximately one half the baud rate of that signal. Therefore, a 45 baud (60 w.p.m.) pulse signal has a bandwidth of only 22.5 Hz. We can eliminate much of the noise from the detectors by using a filter that is tailored to the bandwidth of the expected signal. For 45 baud reception, 25 Hz is often used as the post-detection low-pass cut-off frequency. However, if the filter is set to this narrow value, *only* 45 baud (60 w.p.m.) signals may be received. The bandwidth should be 29 Hz for 57 baud, 37 Hz for 74 baud, and 55 Hz for 110 baud signals. The TTL

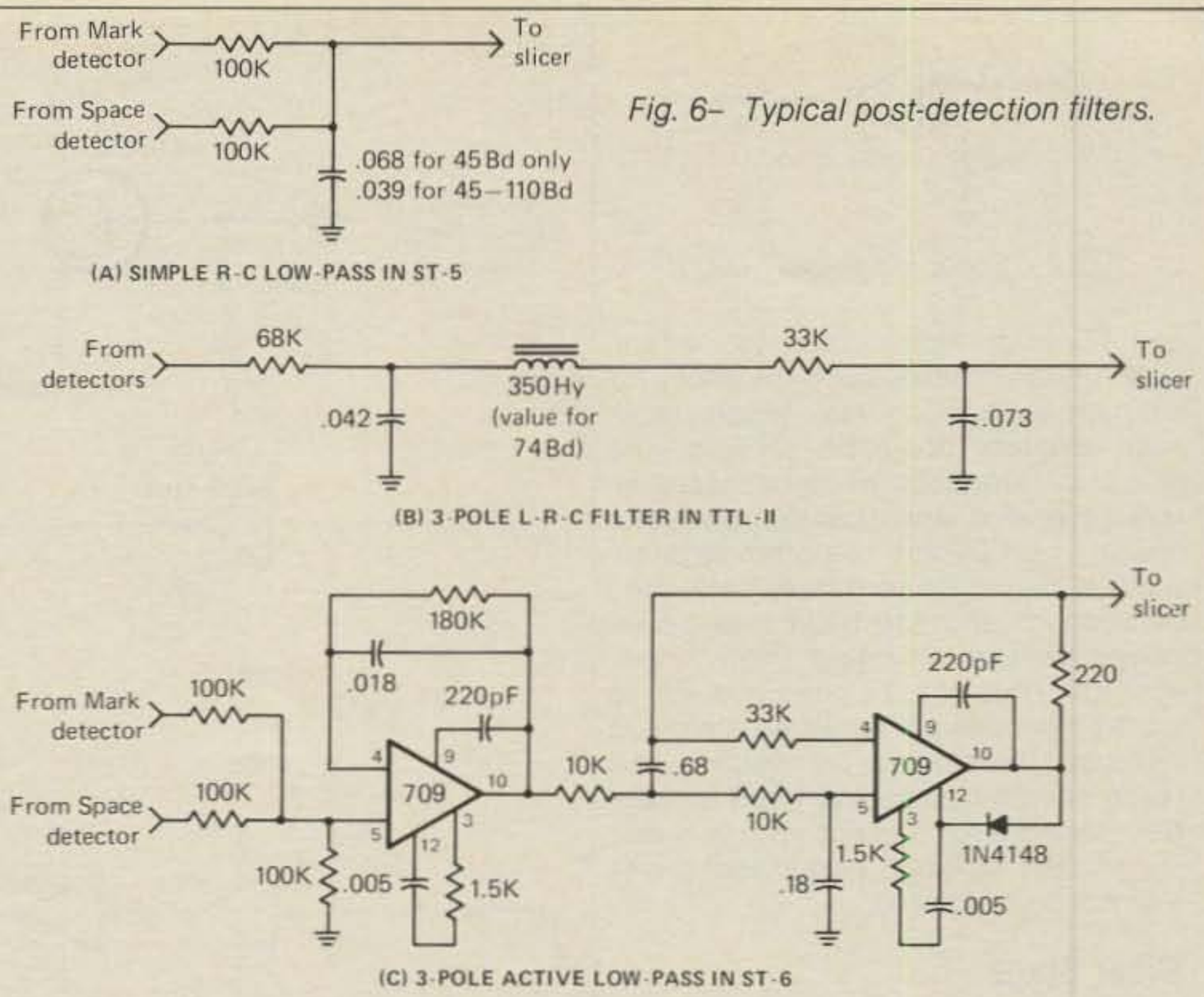


Fig. 6– Typical post-detection filters.

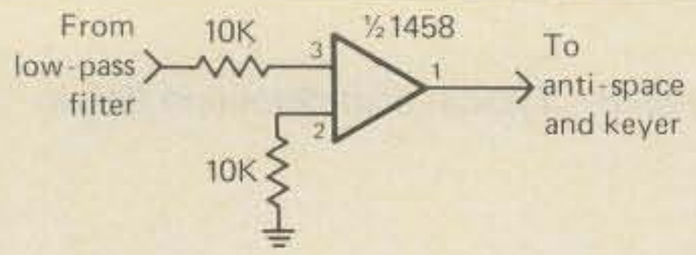


Fig. 7– Slicer stage in ST-6000.

and TTL-II demodulators were, in fact, built with switchable low-pass filters for different speeds for this reason. However, amateur operation showed little gain in performance when optimized filters were used, and most demodulators now are built using a compromise bandwidth of 50–60 Hz so that all data rates between 45 and 110 baud may be received without changing filters. However, this "rule" can be stretched only so far, as has been proven when amateurs increased the low-pass bandwidth to 150 Hz to accommodate 300 baud signals. Not only did 300 baud not work very well on h.f., but 45 baud performance was also noticeably worse.

Slicer Stage

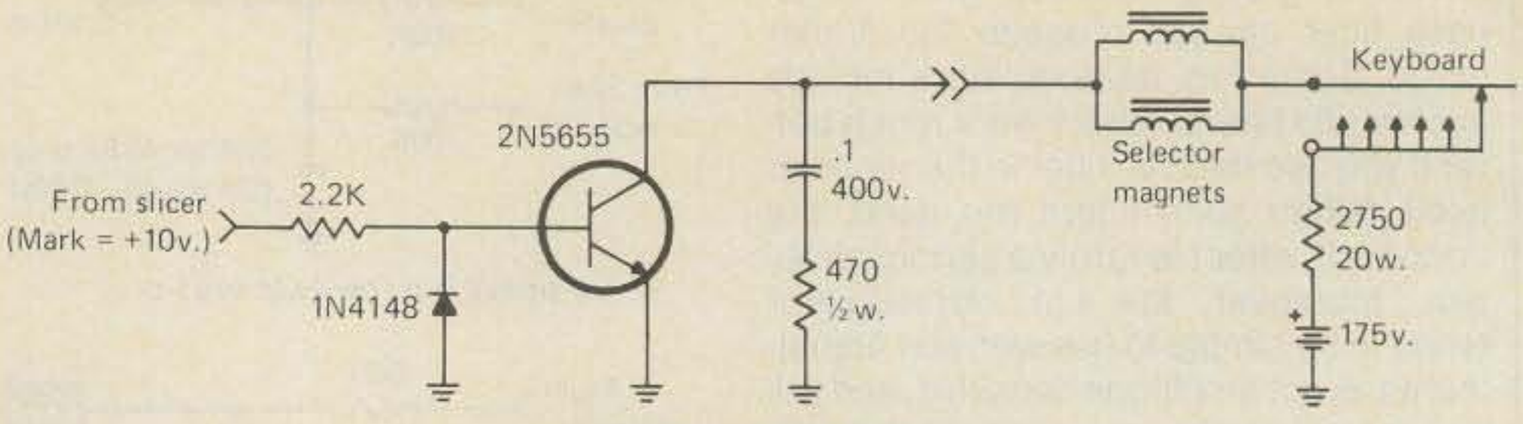
After the pulse signal has been bandwidth-limited in the post-detection filter, the pulses will have very rounded rise and fall times when viewed on an oscilloscope. While this signal does contain all of the information to be received, the rounded pulses will not be treated kindly by a teleprinter's selector magnets or by the input UART (**U**niversal **A**synchronous **R**eceiver Transmitter) of the video terminal. Therefore, a high-gain wide-bandwidth "slicer" stage is used after the low-pass filter to regain the clean, square-edged pulses we need. This stage is also critical. It must give absolutely "equal treatment" to both the MARK and SPACE signal polarities or distortion will be introduced and the print may be garbled.

Level Correction Circuits

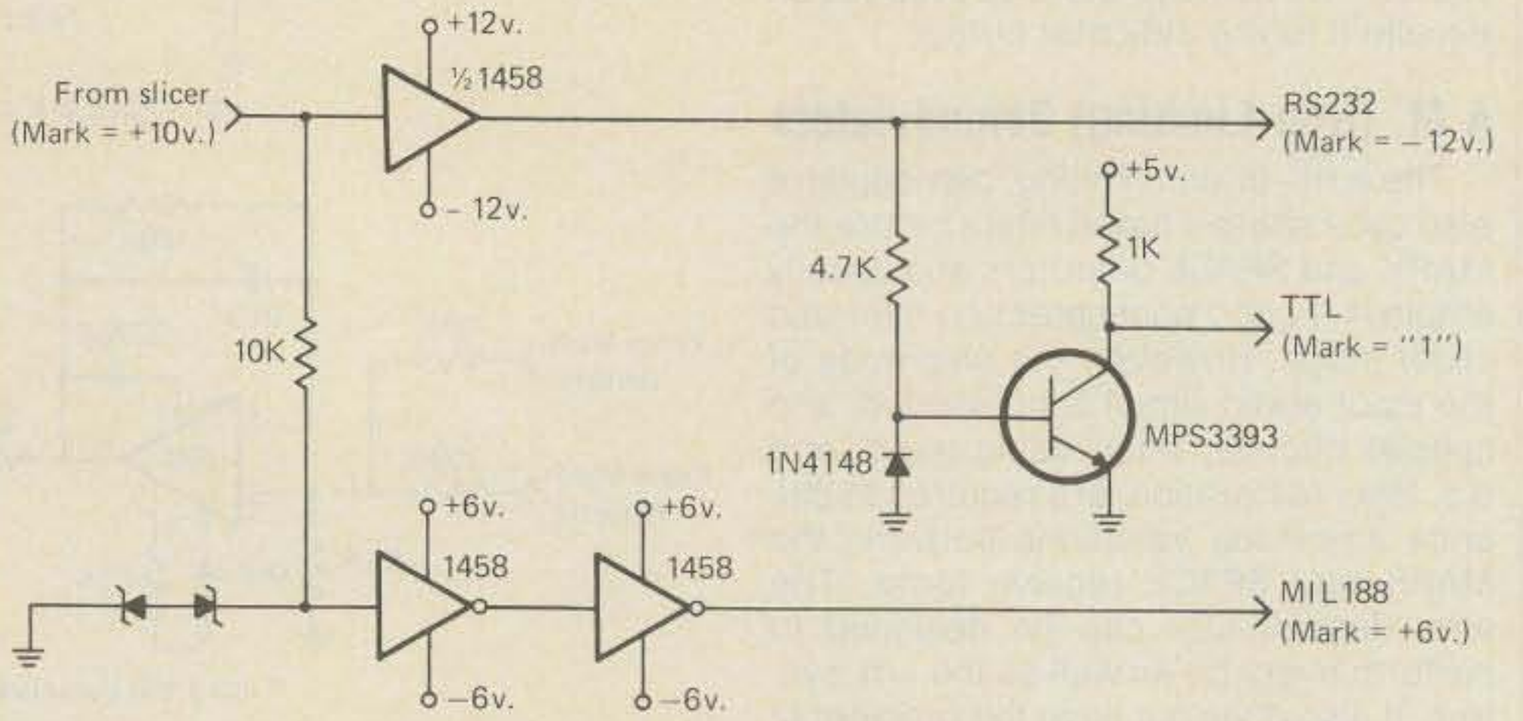
Often, a special circuit is used with the "slicer" to assure pulse symmetry, even when one or the other tone fades in selective fading. Such circuits are often called **DTC** (**D**ecision **T**hreshold **C**ontrol) or **ATC** (**A**utomatic **T**hreshold **C**ontrol). These circuits will provide compensation and d.c. level restoration for fading signals, but they may also contribute a noticeable amount of distortion of their own if the signal is not sent at the expected data rate. Such a case occurs with ATC when receiving hand-typed text; turn ATC off in this case!

Output Interface Circuits

After the slicer, the RTTY signal is a clean pulse, and it only remains to change the polarity and/or level so that it is compatible with the teleprinter or video terminal. Most amateur teleprinters use a high-voltage series current-loop circuit. A high-voltage transistor generally is used to switch the current on and off (**ON = MARK**). Video terminals usually require an RS232C voltage data input. In this case, special line driver IC's are used to give the required output ($-V$ = MARK, $+V$ = SPACE; $-25 < V < +25$). Computers, used as terminals, may use either RS232C or TTL data inputs (TTL MARK = "1" > 3.5V; SPACE = "0" < 1.5V). Some demodulators also include an MIL188 output for connection to military equipment (MARK = +6V; SPACE = −6V). Which of these outputs are included in a demodulator varies from unit to unit and manufacturer to manufacturer.



(A) LOOP INTERFACE



(B) RS232, TTL, MIL188 INTERFACE

Fig. 8– I/O interfaces.

Conclusions

In summary, consider that the RTTY demodulator is the single most important section of your RTTY station. The simple single-tone and PLL demodulators will receive RTTY signals. But, much improved reception will be available if a high-performance demodulator is used. The difference is often astounding. High-performance demodulators come in two basic forms: f.m. and a.m. Both systems have their advantages and drawbacks, and both systems can work extremely well. Unfortunately, the better the performance of the demodulator, the more complicated its circuitry and the higher its cost. This is probably still another example of "you get what you pay for."

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RTTY and the IBM Personal Computer

BY JACK BOTNER*, VE3LNY

This photo provided by IBM shows their PC XT. This system combined with an optional expansion unit provides for a maximum storage capacity of nearly 22 megabytes or almost 11,000 double-spaced typewritten pages. The color display features a 12½ inch screen capable of displaying 25 lines of text or 256 characters in a choice of 16 colors against one of 8 color backgrounds.

Many amateur radio operators consider the purchase of a microcomputer with the idea of using it on RTTY. Most microcomputers on the market today are enormously powerful and well suited for applications such as RTTY. Yet actually getting that microcomputer on the air on RTTY can be a difficult and frustrating experience. It is not that the technical requirements are beyond the ability of the average amateur. The trouble is that the microcomputer is a new and strange beast to most amateurs. Many find new concepts ("digital") and jargon (software, interfacing, etc.) intimidating.

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In this article I will attempt to provide some insight into the implementation of RTTY on a microcomputer, specifically the IBM Personal Computer. The reader must have some knowledge of RTTY and an idea of what programming a microcomputer is about. Computer stores abound with introductory books on microcomputers, and an excellent introduction to RTTY may be found in reference 1.

What Do You Need? An Overview

Fig. 1 shows the basic components required to build an RTTY station around the PC. The PC is connected to the terminal unit (TU) through the device labeled **ACA**, for **A**synchronous **C**ommunications **A**dapter. The TU is in turn connected to your transceiver. If you operate s.s.b., the

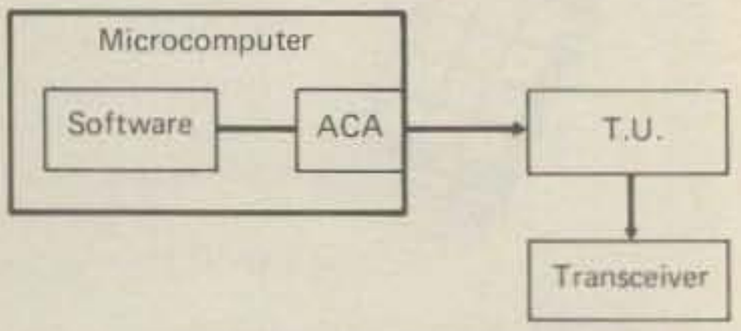

Fig. 1– Block diagram of an RTTY system.

emission is F1; if f.m., the emission is F2. Inside the PC is a program which you provide, which tells the computer what to do.

Each of these components must be carefully designed to work with each other. For example, if the terminal unit presents the wrong signal levels to the ACA, the system simply will be inoperative, and there will be no indication of what is wrong. Therefore, you must *know* ahead of time what you are designing towards to avoid incompatibilities and guesswork. When everything is "right," the system will work like a charm!

The PC may be ordered with a variety of options. The only item which is indispensable is the *asynchronous communications adapter* (IBM part number 1502074) or the equivalent. Many vendors sell equivalent adapters for the PC, and they should work equally well. This adapter is also referred to as a "serial" adapter or RS232 adapter. The amount of diskette storage and memory available will determine the richness of function which you can program into your RTTY software. For example, if you have a diskette drive, you can log your activity to a file for later reference. I strongly recommend the PC technical reference manual (reference 2), since it contains details of how the ACA is programmed and interfaced with the modem (TU). (In computer terms the communications interface is called a modem, whereas the same device is called a terminal unit in RTTY.)

The terminal unit can be either bought or built. If you decide to buy one, you must make sure that it is compatible with both the ACA and with your transceiver. The

beauty of building your own TU is that it connects perfectly with your other gear, because you designed it to! Otherwise, you must depend on the manufacturer to assure you that the equipment is compatible. The PC's ACA is unusually flexible, giving you the choice between 20 ma loop current and RS232 voltage levels, but beware! TTL levels available in many commercial TUs will not function with the PC's ACA. At the other end, the TU supplies audio to the mic input of the transceiver, and takes audio from the speaker (or other) output. The audio levels must match both ways or you will have difficulties. Check the manufacturer's specifications carefully.

Your h.f. transceiver need not have an RTTY mode position, but it makes RTTY operation much more convenient if you do. If not, operate the transceiver in the l.s.b. mode. You should be aware that RTTY operation is continuous duty and may over-stress your transmitter. Consult your operator's guide for advice on how to run RTTY safely. (I use the Drake TR7, which is designed for RTTY, but the optional cooling fan must be installed for RTTY operation.) To connect the TU to your transceiver, you will need an extra microphone plug and a suitable audio takeoff from the speaker or other audio source.

Finally, you will need a program to run in the PC. This is the most difficult requirement, because in spite of being designed for communications applications, the PC does not take kindly to the types of communications parameters used in most amateur RTTY. (BIOS, the read-only-memory system software in the PC, only provides support for speeds of 110 baud and above; in order to use 45 or 75 baud, you have to program it yourself.) The best programs must be written in assembler language, because some important hardware features simply are not supported by the Basic language available in the PC. Of course, it should be possible to purchase an RTTY program for the PC rather than write it yourself, which may be the best option for most amateurs.

How Does the System Work?

Let us assume the following conditions:
Narrow-shift (170 Hz) RTTY
Space frequency is 2295 Hz
Mark frequency is 2125 Hz
5-level Baudot or 8-level ASCII code
RS232 levels between ACA and TU

First, you want to transmit a character. During transmit, your RTTY program must be constantly scanning the keyboard, waiting for you to press a key. When you do so, the character is read in by the program. The character is then written to the ACA, at which point the program has done its job and can resume scanning the keyboard for the next character to be typed. If Baudot code were being used, the program would have the extra burden of translating the character from ASCII to Baudot before writing it to the ACA.

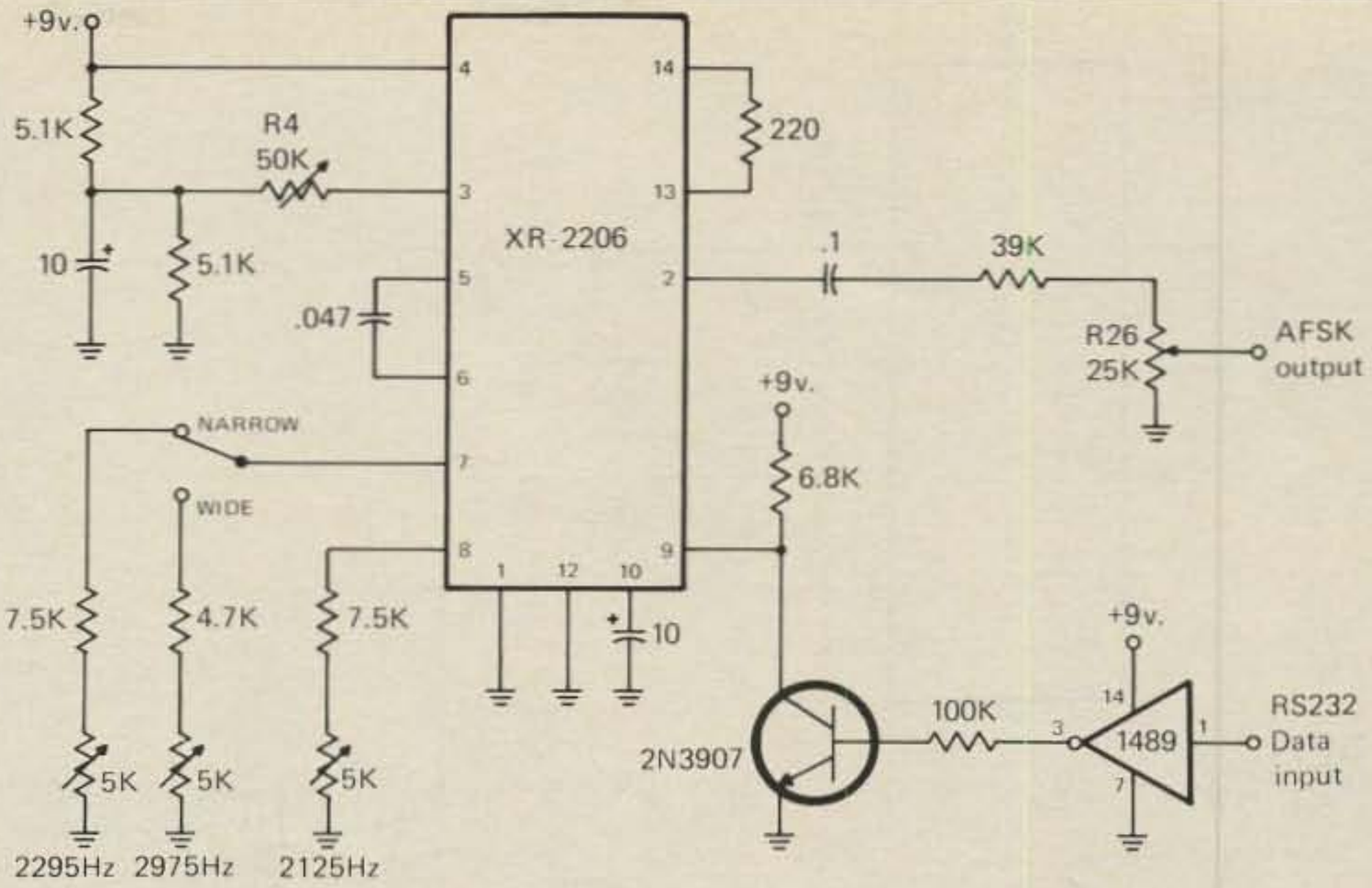

Fig. 2– An AFSK transmitter. See text and reference 4 for details.

The ACA is a small microcomputer in its own right, and when it gets a character from the computer to transmit, it disassembles it into a number of bits and sends each bit out to the modem at a predetermined speed. Since "asynchronous" communication is being used, the ACA inserts a start bit at the beginning of each character, and a stop bit at the end. What comes out of the ACA is an RS232 voltage, either + 11 v. (or so) for the space, or − 11 v. for the mark. Normally, the line is held at mark between characters. The start bit shifts the line to space, and then the data bits are sent, shifting the line to mark for a "1" and to space for a "0." Finally, the stop bit returns the line to the mark level, and the transmission of the character is complete as far as the computer is concerned.

The terminal unit has a simple job to perform: when the input is mark, it generates a 2125 Hz tone, and when it is space, a 2295 Hz tone. So, normally the 2125 Hz tone is generated, until the character begins to be sent, at which time the tone shifts periodically to 2295 Hz. These tones are used to modulate your transmitter, and they are what is received when the receiver is properly tuned.

On receive, the audio tones are fed from your receiver to the TU, this time into a demodulator circuit which attempts to distinguish between the two tones. Since the tones are very close in frequency, and are often accompanied by noise, the job is not a simple one and explains why some TUs are quite expensive and the receiver is difficult to tune. The output of the TU is an RS232 voltage corresponding to the occurrence of the mark and space, as with transmit. The RS232 voltages are connected to the ACA, which detects the start bit, assembles each bit of the character as it is received, and presents the assembled character to the computer program.

Since you are now receiving, your RTTY program is scanning the ACA rather than the keyboard. When a character arrives, the program reads it and writes it on the computer's display screen. If the character is in Baudot, the program must translate it to ASCII first.

That, briefly, is what happens in the RTTY system. In effect, the microcomputer, software, and ACA are taking the place of the traditional mechanical teletype machine.

The Key to Your System— The Terminal Unit

The terminal unit is crucial to the success of your system, from the hardware point of view. It is the device which connects between your microcomputer and your amateur radio gear. It must present and accept the right signals at both the computer and radio to function properly.

An excellent example of a terminal unit you can build is in reference 4. The circuit has been reproduced in figs. 2 and 3, with some variations of my own. This TU is simple and inexpensive to build and works quite satisfactorily in most RTTY installations. It does not have the noise immunity and tuning aids of the more expensive TUs, but you can design the interfaces to suit yourself.

Interface to the Transceiver

First, you need to take audio from your receiver to apply to the input of the XR2211 (fig. 3). This interface is very flexible, since the XR2211 has a built-in preamp and limiter. You do not have to provide your own limiter circuit as you do with the 567 tone decoder chip. Simply tapping off the speaker or headphone connector should be sufficient in most cases. The input of the XR2211 is rated as

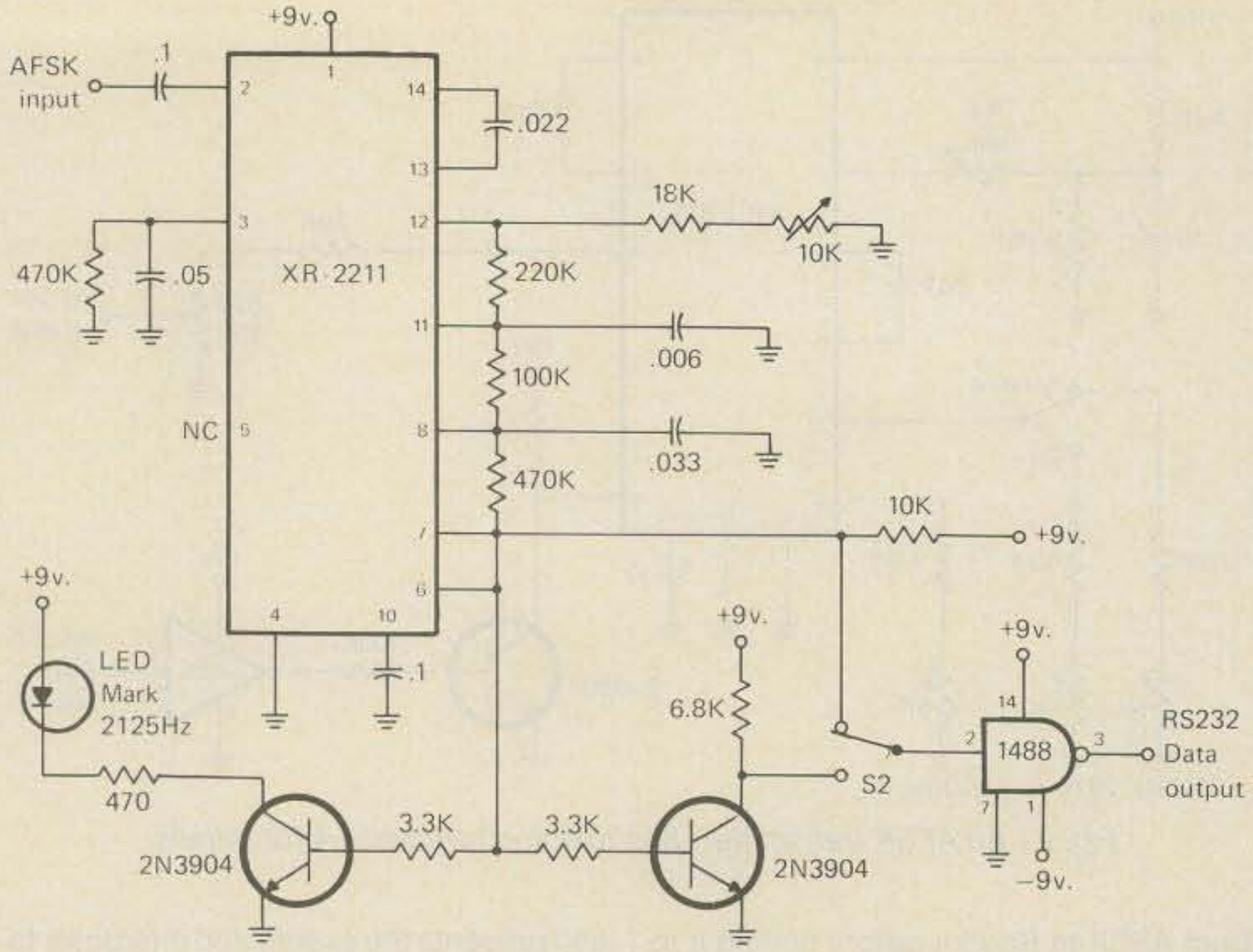

Fig. 3– An AFSK demodulator. See text and reference 4 for details.

20K ohms impedance, requiring a minimum of 10 mv rms for full limiting with the weakest signal. For the sake of the 2211, I would advise using a voltage divider to reduce the input level if your audio source exceeds 3 v rms.

The second connection is to the microphone input. The XR2206 function generator (fig. 2) is capable of producing a signal up to the supply voltage peak-to-peak. This may be adjusted to a degree with R4. This signal is often too large for most transceivers, so pin 2 of the 2206 chip is taken through an additional adjustable divider. This was necessary for both my h.f. rig and my 2 meter transceiver to bring the audio level down to the millivolt range required by the rigs. (Interestingly, both of my rigs operate satisfactorily with the same signal level.)

This extra voltage divider may not be necessary, depending on the input requirements of your rig. If you use a high-output microphone, you should not need it; otherwise it comes in very handy. Adjusting R4 and R26, select the output level that modulates your rig close to 100% when the **Mic Gain** control on your rig is set to the same position as it normally is when operating with the microphone. *(Do not use any compression or speech processing on RTTY.)*

Finally, there is a third connection to your transceiver that may not be obvious. It is a nice feature to be able to switch your rig from receive to transmt and back under control of your computer. This is because you already have to tell your RTTY program running in the computer when to transmit and when to receive. Your computer can then tell your rig when to switch over. This feature is surprisingly easy to implement by adding a simple circuit and an extra input/output lead to the TU. Therefore, you may want to add an extra lead from the TU to the microphone connection in your rig (PTT) for this purpose.

Those are the three connections required from the TU to your transceiver. You can make up a cable which plugs into a 4-pin socket in the TU, and the mic socket and the speaker connection at the rig. If you plan to operate RTTY with more than one rig, a cable can be made up for each rig (unless you are the only amateur in the world who has two rigs which use the same type of mic connector!).

Interface to the Computer

At this point, things get more interesting. The TU in reference 4 was clearly designed to operate on a current loop, probably with a mechanical TTY machine. Those of us who are not familiar with such beasts find the interface circuits somewhat strange. Can this be connected to my microcomputer?

This brings up another point concerning the ACA in the PC. The ACA has a jumper built in which allows the user to select either RS232 or 20 ma current loop connection to the modem. You might think that this is ideal, and the two interfaces were made for each other. While it is true that the ACA-TU interface can be made to operate on current-loop levels, there are compelling reasons why you should chose RS232 levels instead.

First of all, you must consider the signals available at the ACA connector (fig. 6 and reference 2). Of course, there is receive data and transmit data. In addition, there are a number of other signal lines available. You will note that only receive/transmit data lines are available at current loop levels; the other signals continue to operate at RS232 levels, even when current loop is selected using the jumper on the ACA board. If you want to use any of these other signals, you still have to allow for RS232 levels. Therefore, for consistency it is better to use the same levels for all the signals.

Secondly, once equipped with a PC and an ACA, you may want to use it for purposes other than RTTY. You might purchase a regular modem and access data services through your telephone. Chances are, the modem you get will be designed for RS232 levels. To switch from RS232 to current loop requires that you open up the PC, remove the ACA card, reverse the jumper, and put it all back together again. This is not the kind of operation you would want to do frequently.

RS232 does have one disadvantage—the requirement of a negative supply for the RS232 line driver. However, this disadvantage is small by comparison to the advantages to be gained. In the circuits in figs. 2 and 3, the entire computer interface has been replaced with RS232 drivers and receivers. The devices used are the 1488 Quad Line Driver and the 1489 Quad Line Receiver. These are industry standard devices for converting TTL levels to RS232 and vice-versa, and are inexpensive and widely available.

In fig. 2, the RS232 transmit data signal received from the ACA is connected to the input of one of the four receivers in the 1489 chip. The output levels are either ground or the supply voltage. Since the 1489 receiver inverts the logic levels, it is followed by a simple one-transistor inverter to restore the logic to be compatible with the original XR2206 generator circuit. This is all that is needed to interface the transmit data line to the TU.

In fig. 3, the output of the XR2211 decoder is connected to the input of a 1488 driver. The switch allows you to select an optional one-transistor inverter stage, in case the station you are receiving has inverted the mark and space on his transmission. (This is unusual but happens sometimes.) The 1488 driver presents the required RS232 levels to the receive data line at the ACA.

The result of these modifications is the elimination of the opto-isolator and the diode ring, and one transistor. The transmit circuit is now independent of the receive circuit, so the restriction of operating S2 in reverse position to transmit no longer applies. (You may notice that the mark indicating LED driver has been moved from pin 5 to pin 6 of the 2211 chip. This was done to correct an error in the originally published circuit, and to eliminate one transistor in the process. The LED comes in very handy as a tuning indicator, since it lights up only when a mark is being received.)

Finally, a circuit can be added to your TU to permit the computer to control the PTT line to your transceiver. One of the

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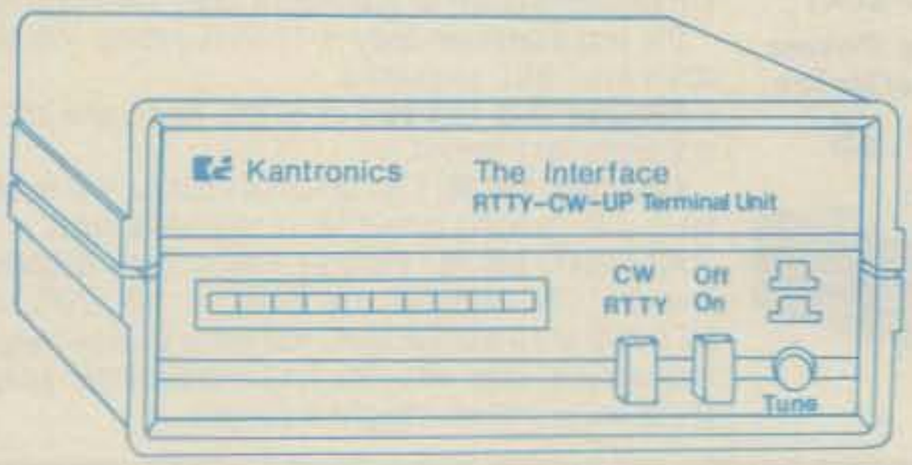

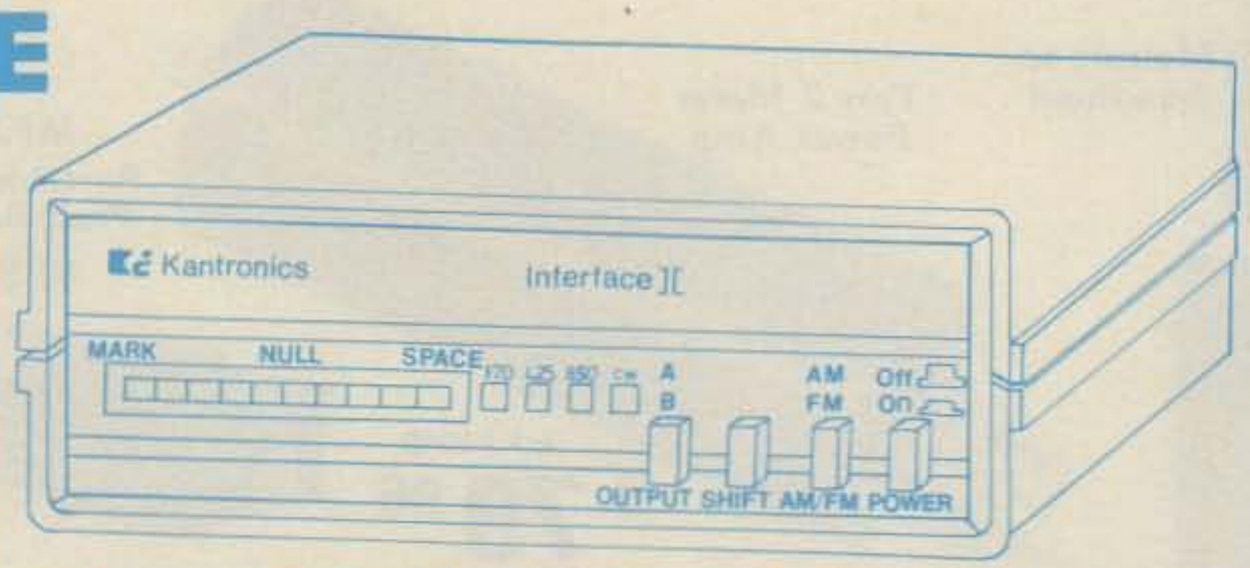

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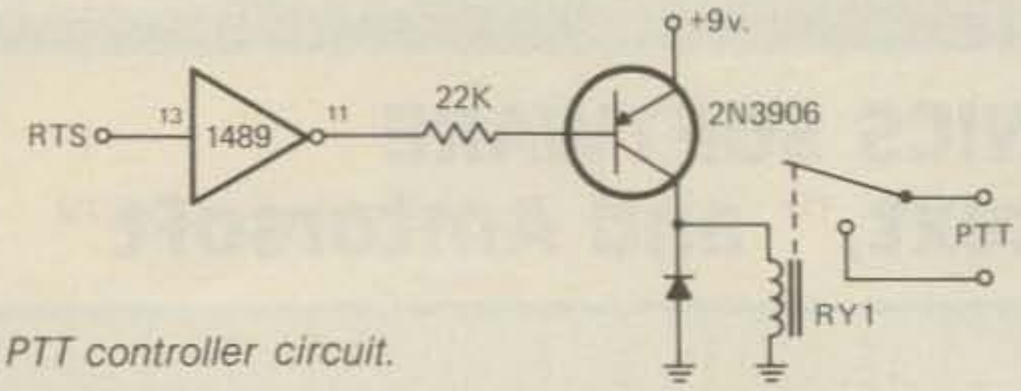

Fig. 4– A PTT controller circuit.

ACA signal lines is used for this purpose: the **RTS**, or **R**equest-**T**o-**S**end. This signal can be asserted under control of your RTTY program. In fig. 4, the RTS signal is fed to the input of another of the RS232 receivers. Note that for signal lines, positive RS232 voltages means on and negative mean off. The output of the RS232 receiver drives a transistor which in turn controls a relay. The switched contacts on the relay may be applied to the PTT line of the transceiver. This type of circuit should work with almost any transceiver.

There is nothing special about my choices of the 2N3904 (NPN) and 2N3906 (PNP) transistors; they are my favorites. Most general-purpose silicon transistors, such as the 2N2222 (NPN) and the 2N2907 (PNP), should work satisfactorily.

Programming the PC for RTTY

Microcomputers are a fascinating marriage of hardware and software. Without suitable programming, the most expensive computer system in the world is useless. There are two sources of software for your microcomputer: you can buy it (or otherwise acquire someone else's software), or you can write it. Writing complex software is not for everyone, which is why the marketplace abounds with program products of all shapes and sizes for computers. However, if computer programming interests you, read on. (Otherwise, see my free offer at the end of this article.)

In an article like this it is hard to generalize about how to write a program for RTTY. Most microcomputer users are familiar with Basic. Much of the RTTY function can be programmed in Basic, but its inability to provide full control over the ACA makes it undesirable for this application. Better results would be obtained using a programming language such as **Pascal**. In any case, implementation of a full range of functions would require the use of subroutines written in **Assembler** language. For the remainder of the article I will discuss various aspects of programming for RTTY in general terms, which could be implemented in any language (at least with a few assembler subroutines). Where a function can be implemented only using assembler language, specific examples of the code will be given.

Programming Environment

Each personal computer comes equipped with a **R**ead-**O**nly-**M**emory **(ROM)** containing routines which manage the computer's devices. This level of software is called **BIOS**, for **B**asic **I**nput/**O**utput **S**ystems. Access to these routines is difficult except in assembler language programs or subroutines. The complete BIOS listing can be found in reference 2, which includes the ACA I/O routines.

Another level of system software is available in the form of a **D**isk **O**perating **S**ystem, or just **DOS** (reference 3). DOS provides the software to communicate with the outside world, including program execution and diskette file management. DOS also provides some service routines, called function calls (Appendix D in the manual), which include simple ACA input and output routines. Again, access to these routines is intended for programs written in assembler language.

Other languages, such as Basic, provide indirect access to these system functions through the various programming statements available in the language. When the language does not provide the required function, a call to an assembler language subroutine may be the solution.

What Does the Program Do?

The program must take data you type at the keyboard and write it out to the ACA (transmit), then read data from the ACA and write it out to the computer's display screen (receive). Unfortunately, this simple-sounding requirement is not simple to implement on the PC, one of the main reasons being that the Basic language does not support some of the RTTY communications parameters required by amateur radio.

What are the communications parameters? They are described in reference 1, but I will outline them here.

1. **Baud rate.** This is the speed at which the characters are sent and received. You may also hear the term "words per minute" used, but baud rate is more precise (at least as far as computers are concerned). Amateurs like to use 45 baud Baudot on RTTY, and unfortunately PC Basic does not provide you with the option of selecting 45 baud.

2. **Data bits.** This is a count of the number of bits used to represent one character. Five bits are used in Baudot, and seven bits in ASCII. This parameter is closely associated with parity.

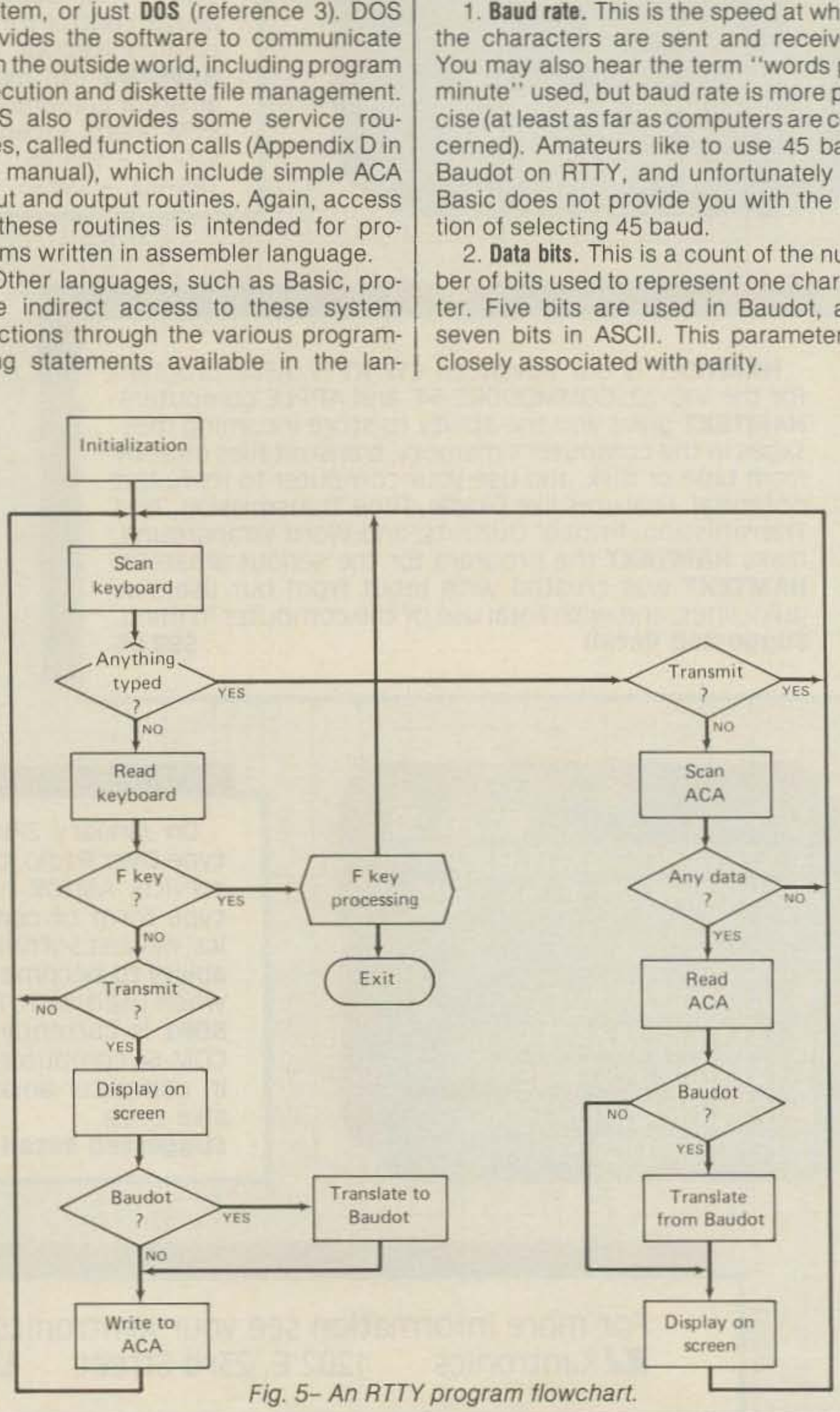

Fig. 5– An RTTY program flowchart.

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```
;
;  Initialize Communications Environment
;
;  Write 1 into Divisor Latch Access Bit of Line Control Register
;  to allow access to Divisor Latches (Baud Rate Generator).
        MOV   DX,03FBH          ;Point to ACA control register
        MOV   AL,80H
        OUT   DX,AL             ;Set DLAB=1 (divisor latch access bit)
;
;  Write high-order byte of baud rate divisor to Divisor Latch
        MOV   DX,03F9H          ;Divisor Latch Most Sig. Bits
        MOV   AL,09H            ;45 Baud divisor=09E7H
        OUT   DX,AL             ;Set baud rate Most Significant Bits
;
;  Write low-order byte of baud rate divisor to Divisor Latch
        MOV   DX,03F8H          ;Divisor Latch Least Sig. Bits
        MOV   AL,0E7H           ;45 Baud divisor=09E7H
        OUT   DX,AL             ;Set Baud Rate Least Significant Bits
;
;  Write Line Control Register to set Data Bits, Stop Bits, Parity,
;  and reset Divisor Latch Access Bit.
        MOV   DX,03FBH          ;Point to ACA control reg.
        MOV   AL,00000100B      ;Parity=N, Bits: stop=2, data=5
        OUT   DX,AL             ;Send Line Control Register Data
;
```

Table I

3. **Parity.** One bit may be sent as a parity bit if desired. In Baudot code, no parity bit is defined. In ASCII, one bit is defined as the parity bit (for a total of eight bits). For amateur radio purposes, the parity bit is always sent as a space, and no error detection is done.

A flowchart of a possible RTTY program is shown in fig. 5. It would be fairly easy to implement this logic in Basic, as long as 110 baud ASCII were used. If you want to use 45 baud Baudot, you will have two problems with Basic: you will have to code all the ACA initialization parameters in assembler language, and you will have to be very careful that the ASCII/Baudot translation routines are fast enough. (It might be possible to perform the required ACA programming functions in Basic using the **INP** and **OUT** statements.) A language such as Pascal would be better for the program base, with calls to an assembler subroutine to do the ACA initialization and I/O.

Looking at fig. 5, the initialization routine would be used to program the communications parameters into the ACA. Written in assembler language, a routine (in part) might look like that shown in Table I.

Table II lists all the values you are likely to need for this routine. The values were taken from the *PC Technical Reference Manual*. The lines marked with an asterisk are the three most commonly used codes/speeds on the amateur bands.

Near the top of the flowchart is the function of scanning the keyboard. This scan is not a read, which would stop the program until something was typed in. It is a test to see if anything had been typed at the keyboard. This is important, because in receive you need to spend most of your time scanning the ACA for incoming data. If nothing was typed at the keyboard, control is transferred to a test to see if you are in transmit or receive. If in transmit, control is returned to the key-

Code	Baud rate	Data bits	Stop bits	Parity	DLAB -MSB	DLAB -LSB	LCR
*Baudot	45	5	2	N	009H	0E7H	004H
Baudot	50	5	2	N	009H	000H	004H
Baudot	57	5	2	N	007H	0E8H	004H
*Baudot	74	5	2	N	006H	011H	004H
ASCII	45	7	2	S	009H	0E7H	03EH
ASCII	74	7	2	S	006H	011H	03EH
*ASCII	110	7	2	S	004H	017H	03EH
ASCII	150	7	2	S	003H	000H	03EH
ASCII	300	7	1	S	001H	080H	03AH

Table II

```
;
;  Read the Line Status Register to see if a character has
;  been received.
        MOV   DX,03FDH          ;Address the ACA Line Status Register
        IN    AL,DX             ;Read Line Status Register
        TEST  AL,00000001B      ;Test Data Ready bit
        JNZ   ......            ;One means data is available in receive
;
```

Table III

```
;
; Update Modem Control Register to turn on RTS flag
        MOV   DX,03FCH          ;Point to ACA modem control register
        IN    AL,DX             ;Get current contents of register
        OR    AL,00000010B      ;Turn bit 1 ON  (RTS line)
        OUT   DX,AL             ;Rewrite MCR register
;
;
; Update Modem Control Register to turn off RTS flag
        MOV   DX,03FCH          ;Point to ACA modem control register
        IN    AL,DX             ;Get current contents of register
        AND   AL,11111101B      ;Turn bit 1 OFF (RTS line)
        OUT   DX,AL             ;Rewrite MCR register
;
```

Table IV

```
;
;  Activate BREAK signal in ACA
        MOV   DX,03FBH          ;Address of ACA line control register
        IN    AL,DX             ;Read current setting of LCR
        OR    AL,01000000B      ;Turn the break bit on
        OUT   DX,AL             ;Write new LCR register contents
;
;  a short delay
;
;  DE-Activate BREAK signal in ACA
        IN    AL,DX             ;Read current setting of LCR
        AND   AL,10111111B      ;Turn the break bit off
        OUT   DX,AL             ;Write new LCR register contents
```

Table V

board routine again, since there is nothing to do until a key is pressed at the keyboard. If in receive, control is passed to the routine which scans the ACA for incoming data.

When a key has been typed at the keyboard, you must determine whether the key is a data key or a control key. If a data key was selected, the action depends on whether you are transmitting or receiving. If in transmit, you would go to the routine which processes the character to write to the ACA. If in receive, the keystroke is probably invalid, and control is passed either back to the keyboard routine or to the ACA scan routine.

If the key is a control key (such as **F1-F10**), control is passed to a routine to analyze the request. What is programmed in this routine is pretty much up to you, but you must have a function to switch from transmit to receive and back, and a function to terminate the program.

In transmit, when a data character has been typed at the keyboard, the character is usually displayed on the screen. Then, the character is written to the ACA. If Baudot code is being used, the character must be translated. The translation process may result in two characters being written to the ACA, such as when a character from the **FIGS** set follows one from the **LTRS** set (or vice-versa). In assembler language, you could use either the DOS Auxiliary (ACA) output service (DOS function call 4), or the PC's BIOS I/O service (described in the *Technical Reference* handbook, Appendix A) to write a character to the ACA. Alternately, you could write the character directly to

```
;
        XOR   CX,CX
PAUSE:  LOOP  PAUSE
;
```

Table VI

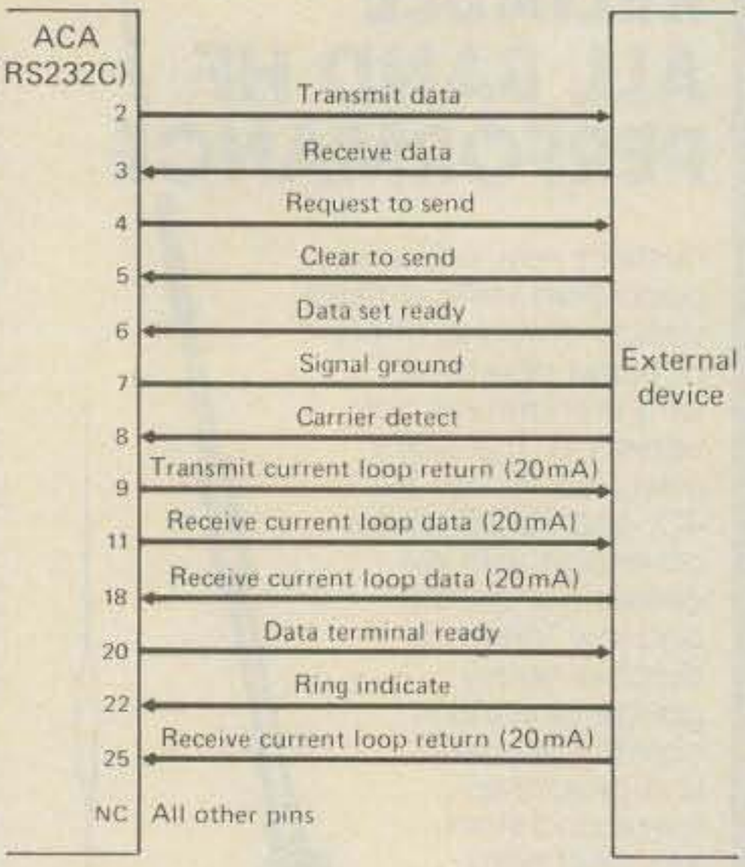

Fig. 6– ACA connector interface pinouts.

the ACA transmit buffer. When the character has been written to the ACA, control returns to the keyboard scan routine.

In receive, when a keyboard scan indicates nothing was typed, control is given to the routine which scans the ACA for incoming data. The ACA line status register may be read, which will tell you if a byte is available in the receive buffer. The code to do this in assembler might be as shown in Table III.

If the data ready flag is off, processing should return to the keyboard scan routine. If the flag is on, you must read the character immediately. If you do not and another character arrives, the previous one is lost. Basic will help you in this regard, since it buffers the data coming in and you do not have to worry about missing something. In assembler, and perhaps other compiled languages, the program executes fast enough so that there is no danger of missing incoming data. Once the character has been read, it must be translated to ASCII if it is in Baudot, and then displayed on the screen. At this point, control can be returned to the keyboard scan routine, or the ACA scan routine. The latter might be safer if there is any danger of missing incoming data due to slow program execution.

Additional Program Features

One very useful feature if you use Baudot is to program a function key to shift the receive translate routine from **FIGS** to **LTRS** and vice-versa. Often, noise causes a false shift, or a correct shift to be missed, resulting in incorrect data on the screen. This key could allow you to correct such an occurrence manually.

If you wish to control the PTT line of your transceiver, it can be done by turning the Request to Send (RTS) signal on and off. The assembler code shown in Table IV is an example of how to do this. You will notice that in the routines in Table IV, the modem control register is not simply written out with the desired value, but the existing value is read in first and the desired bit turned on or off. This ensures that any other flags which may be in use are not changed.

Similarly, you can use the **BREAK** status of the ACA to send your station call in Morse code. By writing a one (1) into the Set Break bit of the Line Control Register, the transmit data line is forced into the space state and stays there until you reset the bit. The code to do this might be that shown in Table V.

Sending Morse code by this technique is simply a matter of turning on the Break signal, waiting awhile, turning it off, and waiting awhile. The length of the waits determines whether you send a dot or a dash, or a pause between letters or words. You can code a table of numbers, where each number represents a relative wait time. You will also need a wait routine. The code shown in Table VI is one way to make the PC wait.

In this case, the **CX** register is cycled through the maximum possible values until it returns to zero, about 64K cycles. This results in a delay of about ¼ second. What you need is to determine the value to load in CX that will cause the shortest delay you need, which is the length of the dot. Then, the loop can be executed once for a dot, three times for the dash, etc., under control of your table.

It is impossible to go into the details of all the other features possible for a program of this type. Briefly, here is a list of some other possibilities:

- Logging transmitted and received data to diskette;
- Selection of different communications parameters by function key;
- Full-screen display with Fkey descriptions and status messages;
- Type-ahead capability;
- Transmit a file capability.

Conclusion

Building an RTTY installation around my PC was one of the most interesting and satisfying projects that I have undertaken. With the exception of the software, the components of the system are relatively simple. To encourage the use of RTTY among amateurs who are PC owners, I am making a simple but functional RTTY program available to any *CQ* reader for the cost of the postage.

The program is written in PC assembler language, and it contains an interrupt-driven receive routine, which is necessary if a log-to-diskette routine is to be included. To get the program, send me a formatted diskette (single-sided) and self-addressed mailer that I can use to return the diskette. Special envelopes called mailers are available at stationery stores for this purpose, and they will protect your diskette from damage. Include $1.00 or 3 IRCs for return postage. Please do not send U.S. stamps. Also, I will endeavor to answer any questions you might have, but please include a self-addressed envelope and one IRC.

73's, and enjoy your PC!

References

1. "ASCII, Baudot and the Radio Amateur," *QST*, September 1980.
2. *Technical Reference*, Personal Computer Hardware Reference Library, IBM part number 6025008.
3. *Disk Operating System*, Personal Computer Computer Language Series, IBM part number 6172220.
4. "A State-of-the-Art Terminal Unit for RTTY," *QST*, December 1980.
5. *XR-2211 FSK Demodulator/Tone Decoder; XR-2206 Monolithic Function Generator*, EXAR Integrated Systems, Inc., 750 Palomar Ave., P.O. Box 62229, Sunnyvale, CA 94088.

The concept of AMTOR and its associated buzzwords and symbols may tend to frighten off many amateurs needlessly. N7ML gets us into AMTOR painlessly and most importantly in simple language. Read on. It's fun and not that hard to get into.

AMTOR
A Hands-On Primer

BY MIKE LAMB*, N7ML

The AEA AMT-1 AMTOR terminal unit. As you read the text, check the control functions in the picture and it will all begin to come together.

There have already been articles written on the technical aspects of AMTOR. This article will deal only with the hands-on operation of AMTOR.

Background

For the first 25 years of my amateur radio activity I concentrated my operations mainly in the c.w. bands. The original reason was rather simple—c.w. would get through when all other modes failed. But not anymore! I have since personally enjoyed error-free contacts on AMTOR under conditions that would have been difficult, if not impossible, for c.w. It is hard to believe until you experience it for yourself.

F.E.C. and A.R.Q.

AMTOR (**A**mateur **T**eleprinting **O**ver **R**adio) is a general term for two subset modes, namely F.E.C. (**F**orward **E**rror **C**orrecting) and A.R.Q. (**A**utomatic **R**e-**Q**uest). Most, if not all, AMTOR terminal units have been designed to include capabilities for both modes. Each mode has its own advantages and disadvantages. The F.E.C. mode will enable far less communication error than normal Baudot or ASCII RTTY, but the A.R.Q. mode is even more accurate. F.E.C. mode is similar to normal Baudot or ASCII RTTY in that the **I**nformation **S**ending **S**tation (I.S.S.) does not receive until his message transmission is completed. F.E.C. mode is useful for traffic nets, CQ's, and QST bulletins which are not easily adapted to A.R.Q. mode. F.E.C. mode involves a repeat of each character sent. The repeat character is always sent several characters later so that a long static burst or fading does not destroy both the original and repeat characters.

A.R.Q. mode involves a handshake operation between the I.S.S. and the **I**nformation **R**eceiving **S**tation (I.R.S.). This mode results in the familiar "*chirp-chirp*" sound that is so commonly associated with AMTOR. In A.R.Q. mode the two stations in contact must establish precise phase lock between their signals, or contact will not be made. This is, of course, all handled automatically by the computerized AMTOR controller, which of necessity contains some very sophisticated real-time operating software. Other stations may monitor A.R.Q. QSO's, but they will not be able to break easily or join in a three-way contact.

In A.R.Q. mode the I.S.S. will transmit his message in three character blocks. The I.R.S. computer analyzes the three characters to confirm that they conform to an expected 4:3 mathematical ratio of mark and space bits. The 4:3 ratio represents 4 pulses of one polarity and 3 pulses of the opposite polarity. If they do conform, one character will be sent by the I.R.S. to request that the next block of three characters be transmitted by the I.S.S. If an error is detected, a request for repeat **(RQ)** will be sent to the I.S.S. until a correct bit ratio is received.

Obviously, if the signals fade below the noise level or are obliterated for a time by QRM, the data rate (message transmission speed) will slow down. However, the important thing is that the message will get through! (What good is it to have a high data rate if it turns into garble at the receiving station?)

Getting On Amtor

The first obvious step to getting on this exciting new mode is to get some AMTOR equipment. At present there are at least three commercially available units on the market. These units are all built by reputable manufacturers, and I am sure that detailed product reviews will be appearing in many of the amateur radio journals in future months.

What Transceiver Will Work?

Most people have been overly concerned about whether or not their particular transceiver will work on AMTOR. First, virtually *any s.s.b.* transceiver will operate on F.E.C. mode. Because of the timing requirements of A.R.Q. mode, it is necessary that your transceiver have reasonably fast transmit-receive switching time and receive recovery time. Ideally, the switching-recovery time should be less than 20 ms to be able to work your

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antipodes (the other side of earth). In a practical sense, you will find that if your transceiver is not quite this fast, it is nothing to become alarmed about. You simply will not be able to work stations that are too close or stations beyond a certain distance (determined by how slow your transceiver really is). In this event you have two alternative solutions:

1. Work the close-in or far-off stations on F.E.C. and enjoy A.R.Q. with all the others in between;

2. Modify your rig (usually a matter of changing a few resistors and/or capacitors).

Keying relays have not been found to be the cause of insufficient switching speed. In fact, I use my Drake L4B with no modifications with an AEA AMT-1 which pulls the PTT (Push-to-Talk) line low before r.f. is applied. VK2SG reports that he has been using his Henry 1KD5 on A.R.Q. mode for two years without any relay problems. If anything, the contacts may be enhanced by self-cleaning.

Regardless of the transceiver (or receiver) used for A.R.Q. communications, always be sure to switch your **AGC** to **FAST,** or if necessary, **OFF.** (In the case of the Collins S-line, be sure your transmitter drive is backed off so that you draw **NO ALC** current).

For a partial list of popular rigs that have been found to operate on A.R.Q. (and F.E.C.) with no modifications, and for an abbreviated list of transceivers requiring simple modifications, write to the author at the address given at the beginning of this article.

Operating

After you have made your selection of an AMTOR terminal unit and have checked it out with your transceiver in accordance with the instruction manual, you are no doubt ready to make that first exciting AMTOR QSO. Presently, most AMTOR activity is on 20 meters, with the international calling frequency being 14,075 kHz. For most North American AMTOR terminal units, Lower Sideband AFSK will be used, which means you will tune your synthesized v.f.o. to a digital display 14,0772 *(high tone straddle tuning).* European terminal units are normally set up for low tones and Upper Sideband AFSK operation. Thus, they would tune for a dial reading of 14,0738 MHz, and both stations would be on the same frequency (14,075).

Before trying to transmit, always monitor the frequency for activity. If you hear a station that is transmitting continuously, but does not sound quite like normal RTTY, chances are it's F.E.C. AMTOR. Make sure your AMTOR terminal unit is in F.E.C. receive mode and try to tune in the signal. It is possible the station is calling CQ; if so, he will give his "SELCALL" (Selective Call), which is made up from four of the letters in his call sign (no numbers). As an example, W1ABC's selcall would be WABC, whereas N7ML's selcall would be NNML, following the convention of repeating the first letter if the call does not have four letters.

When the F.E.C. station calling CQ stands by for a response, you may choose to answer him in F.E.C. mode if you have not yet checked out your system. This will allow you to alert him that you would like his patience and guidance until you feel safe on new ground. Generally, you will find most AMTOR users only too willing to help another break easily into the AMTOR ranks.

If you are feeling adventurous, go ahead and initiate your contact with the station by going direct to A.R.Q. mode. To do this, you will become the Master station by selecting the "ARQ CALL' mode on your keyboard (or panel button of the terminal unit) and then type in his four letter selcall. All of a sudden your transmitter should start chirping away (providing you were properly tuned in on receive), and soon you should hear his transmitter start chirping back at you between your transmissions. Now try hitting the return button (carriage-return/line-feed) on your keyboard.

Your AMTOR Terminal Unit should have an echo feature, which means that your keyboard inputs will not appear on the screen until they have been received correctly by the I.R.S. When you see the data on your CRT scroll up a couple of lines in response to your RETURN commands, you know the other station is copying. Now you should identify with his call and your call followed by +? (which will automatically turn the transmission over to the I.R.S. so that he now becomes the I.S.S. and you the I.R.S.). You should immediately make plans to QSY up or down frequency to the nearest clear channel in order to clear the AMTOR international calling frequency. It is standard practice (to make tuning easier) to always QSY up or down into one kHz increment from 14,075. The cleanest way to QSY is for the I.S.S. to pull his tone/PTT cable connector out of the transceiver microphone input jack (or simply turn the r.f. power level down to zero) and quickly tune up and find a clear channel, and then come back to the original frequency and plug in the cable connector (or increase the power level). If you are fast enough, the two stations should still have phase lock. Now the I.S.S. can report to the other station that he will QSY so many kHz up (or down). Each operator should then quickly twist his v.f.o. dial to that frequency (so as not to cause any harmful interference to other stations operating between your original frequency and the new frequency to which you QSY). With

practice, you will find this to be a simple maneuver that will only take a few seconds with absolutely no loss of data.

Now you are ready to take part in some real fun—namely, tasting of the sweet AMTOR nectar.

The first thing most newcomers like to do is reduce power levels to see what the lowest power requirements are for supporting good copy. You will no doubt be amazed at the low signal levels that will support error-free copy, especially if you have been on RTTY for very long!

If any QRM shows up on frequency, notice how it may slow down transmission (as indicated by the front-panel **ERROR** light being more active), but that no information is lost. If you allow signals to go below the noise level for an extended period of time so that the two respective computers totally lose lock with each other, the master station (the one which initialized contact by calling the other's SELCALL) will automatically start calling the slave station's selcall until lock is reestablished. At that point, if the slave station was the I.S.S. at the time contact was previously lost, the master station automatically will transfer control back to the slave station. Assuming both stations are operating properly, the first missing letter from the point of broken transmission will be picked up without so much as an added space within a word. This operation never ceases to amaze me. The first time I encountered it, I was the master station and I lost the other station into QSB for what seemed like three minutes before he finally came back to a copyable level and not a single letter was lost. As in normal Baudot or ASCII RTTY, it is always good practice to touch up your receive tuning frequency (during a QSO) with the RIT control, never the main tuning dial.

After trying the marginal signal-path experiments, go back to normal power levels. Then pull your tone/PTT cable out of the transceiver for a few seconds and see what happens. When you plug it back in, you should re-establish lock quickly (if it is even lost) and *no data should be lost.*

Break-In Feature

The long-time RTTY user will really see some utilitarian value in the AMTOR break-in feature that is equalled only by QSK (high-speed break-in) c.w.

When the other station is the I.S.S., choose a convenient point between his sentences and then do an AMTOR break-in command (consult your operator's manual). This feature has the same effect as the I.S.S. hitting + ? on his keyboard (i.e., it transfers control back to you and makes him the I.R.S. and you the I.S.S.).

So there you have it. Don't blame me if you find the rest of amateur radio blase by comparison after your first exposure to AMTOR. If you are like me, after about six months you will once again start going out "slumming" on the old modes, but only occasionally.

Future

I would like to make a bold prediction that a majority of h.f. amateur RTTY communications will someday be on AMTOR. I see AMTOR today being in the same relative stage of development that single sideband was in 1957. (I suspect that some of those fellows with the foresight to buy a Collins S-line in 1957 are still using them 25 years later.)

AMTOR offers the potential for error-free exchange of non-copyrighted computer programs on the h.f. bands under conditions never before thought possible. Also, mailbox operation on AMTOR makes much more sense because the sending station knows instantly that his message is being received properly. There are already several European AMTOR stations operating unattended (under computer control) that are providing bulletin-board service that is vastly superior to any ASCII or Baudot system. With anticipated relaxation of FCC regulations in the future, our possibilities are only limited by our imagination.

Credit

At this point I would like to publicly extend my personal thanks to Peter Martinez, G3PLX, for his selfless efforts in making AMTOR a reality by adapting CCIR 476.2 (SITOR) specifications to a compatible mode for amateur radio and in developing the first hardware systems to prove this adaptation. I am sure that AMTOR would still be waiting in our future had it not been for Peter's work.

AMTOR Glossary

AMTOR—**AM**ateur **T**eleprinting **O**ver **R**adio
A.R.Q.—(ARQ) **A**utomatic **Re**Quest
Data Rate—the message transmission rate
F.E.C.—(FEC) **F**orward **E**rror **C**orrecting
I.R.S.—(IRS) **I**nformation **R**eceiving **S**tation
I.S.S.—(ISS) **I**nformation **S**ending **S**tation
(RQ)—the signal sent "asking for repetition.
SELCALL—**SEL**ective **CALL**
+ ?—(also "?) the signal sent for "over."

1983 CQ WW WPX C.W. Contest High-Claimed Scores

The following are early-bird high-claimed scores as of mid July 1983. These are raw scores subject to verification.

U.S.A. SINGLE OPERATOR ALL BAND

N4WW	2,620,962
KZ2S	2,000,588
K5MR	1,943,109
NI6W	1,749,212
KQ8M	1,688,544
W3GM	1,657,704
AB0I	1,541,400
NQ4I	1,534,720
AF5K	1,191,014
W1IHN	992,250
N0TT	914,760
K9BG	822,268

21 MHz

KZ5M	647,276
W6BIP	262,058
AI3Q	237,900
AK1B	158,478
N0BSH	114,375

14 MHz

N8II	1,546,762
N5RZ	1,470,672
KI6P	1,422,390
KA1R	1,210,090
K1XA	1,082,949

7 MHz

N6QR	693,594
KS4Q	567,164
KR2Q	372,420
KM3T	349,002
AG8P	229,152

3.5 MHz

NE6W	105,968
K5UR	13,176
KJ0D	11,008
KA3R	6,466
N5TV	5,040

1.8 MHz

W8LRL	1,482

MULTI-SINGLE

NA5R	3,985,324
K4CQ	3,147,760
KJ9D	2,623,826
AC8W	2,015,726
KY0S	1,732,588
AD1O	1,633,932
K9MFI	1,534,950
KY2P	1,215,968

MULTI-MULTI

K0UK	2,111,100

QRP/p

N3RS	(AB)	495,191
W8ILC	(AB)	237,915
NN6O	(21)	88,624
NN4Q	(14)	120,003
AA2U	(7)	31,744

DX SINGLE OPERATOR ALL BAND

HH2VP	2,685,725
CY6OU	2,563,081
CY3IY	2,463,531
OK1DWA	1,318,688
JI1QPU	2,017,400
5Z4MX	1,804,572
I2UBI	1,738,932
6Y5HN	1,438,650
G4CP	1,388,852
HZ1HZ	1,309,716
OH3RF	1,270,269
CY3JTQ	1,173,105

28 MHz

YU2CQ	1,171,600
JH7UJU	96,450
JR1KSK	23,403
JH1RNZ	21,244
JA1GO	19,418

21 MHz

KP4EQF	1,816,416
N6HR/NH6	1,203,552
YU7AV	1,118,651
IO9VDQ	1,002,560
9K2BE	813,131

14 MHz

CY3BMV	2,341,680
OH6DX	1,777,314
OH3IQ	1,156,628
JF3HKY/9	589,280
VP2MIU	418,728

7 MHz

YU7BCD	872,358
YO3CD	276,300
KG4CD	263,160
CY7CQK	159,048
VK2AYD	119,595

3.5 MHz

YU3VM	177,160
YU2WV	174,168
4N3X	169,128
OH3AA	155,760
4M3AZC	144,692

1.8 MHz

LA2GV	10,450
OK1JDX	4,956
OH3TQ	1,380
CY3INQ	1,200
VE3ABG	912

MULTI-SINGLE

XE2MX	4,089,888
VE1DXA	3,752,691
KL7RA	3,577,178
JA9YBA	3,470,256
SK6RR	2,390,271
JA3YKC	1,682,545
DF0EB	1,496,400
OH2AQ	1,440,747

MULTI-MULTI

YZ1EXY	9,862,020
CY3PCA	4,987,800
JA3YBF	4,324,138

QRP/p

PA0PUR	(AB)	160,896
JA1YWX	(28)	25,947
G3VMY	(21)	63,114
JH7IMX/2	(14)	101,574
YO3CDN	(7)	8,700
SP6EIY	(3.5)	13,580

NOTE: Queries pertaining to the WPX Contest should be sent to Steve Bolia, N8BJQ.

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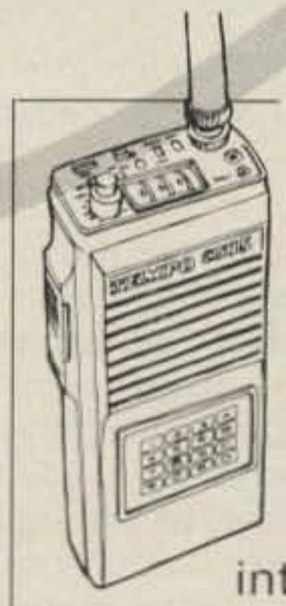

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Three components don't really add up to a one evening project, but you can have many, many evenings of enjoyable use of W0XI's simple scope attachment.

How to Build an X-Y Display for C.W. and Single-Ended RTTY TU Signals

BY PHIL ANDERSON*, W0XI

X-Y displays have long been popular with the old radioteletype units that used both mark and space filtering. However, X-Y has not been used on c.w. by many because only one tone is available. Peak meters, S-meters, and LEDs or other types of indicators have been used primarily.

I've found, however, that one can use an X-Y scope with c.w. by attaching a transformer between the speaker leads of the transceiver and the X-Y scope. In effect, the transformer is used to convert the single-ended output from your speaker into a floating or double-ended input for the scope. This is similar to using a balun to convert coax (which is unbalanced) to twin lead or a dipole antenna (which is balanced). When we say balanced, we mean the circuit has symmetry.

A c.w. (Morse), RTTY, or ASCII system that could use this tuning aid is shown in fig. 1. The transceiver is shown at left, the TU (Interface) at center with the X-Y scope above it, and the computer at the right. We, of course, are assuming that the radioteletype or Morse system is computer based. This is appropriate here because most of the TUs used with the computer-based amateur systems are also single-ended. That is, they use one filter not only for c.w. demodulation, but also for RTTY and ASCII decoding. Hence, our tuning-aid circuit is usable by all systems.

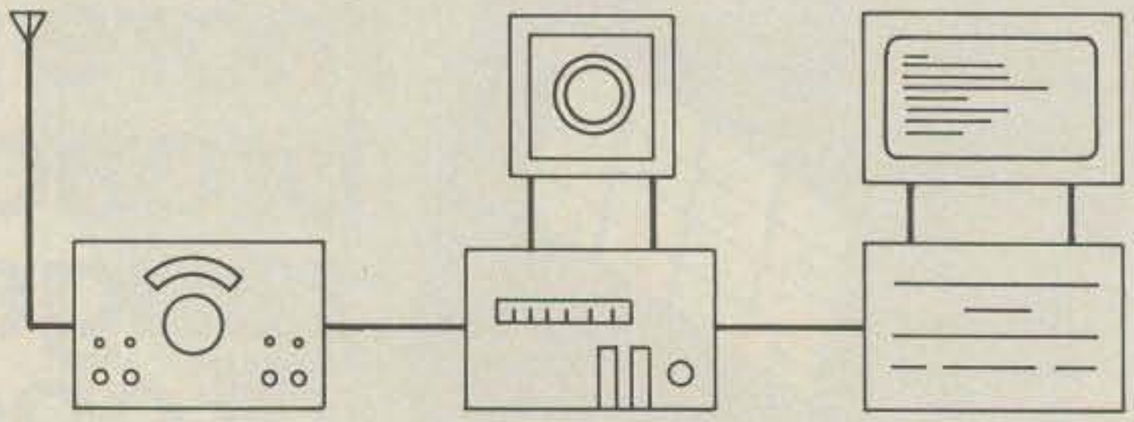

Fig. 1– Diagram of a computer-based RTTY/c.w. station. The transceiver is on the left, the TU is at the center with the scope above it, and the computer itself is on the right.

The Circuit Schematic and Plans

The X-Y display circuit driven from a single audio source is shown in fig. 2. Only three parts are necessary; all three can be purchased at your Radio Shack store. The transformer is the small audio type, 8 ohm input and about 2,000 to 10,000 ohms output. Even an 8 to 600 or 8 to 1000 will work OK. In addition, you'll need a 10K resistor and a .02 uFd capacitor. Here we recommend that you combine a fixed resistor with a variable pot for tuning the circuit in place of the one 10K resistor. Also, you can use two .01 uFd caps wired in parallel in place of the .02. These components can be mounted easily on a small piece of vector board.

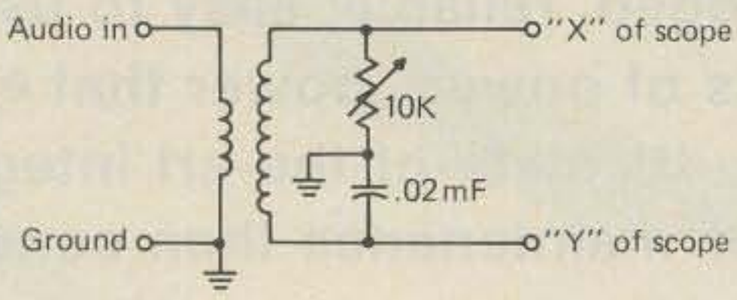

Fig. 2– The three component scope adapter described in the text.

Circuit Installation and Tuning

To install the circuit in your system or one like that in fig. 1, just attach the audio leads from your speaker to the "audio in" side of the transformer shown at the left in fig. 2. Then connect the "X" output of the circuit to the "X" input of your scope, and in a similar manner attach the "Y"s. Once you've done this, the circuit must be tuned to the c.w. or Morse tone that you like to listen to and that is compatible with the c.w. filters in your rig. My guess is that you listen at about 700 to 750 Hertz tones.

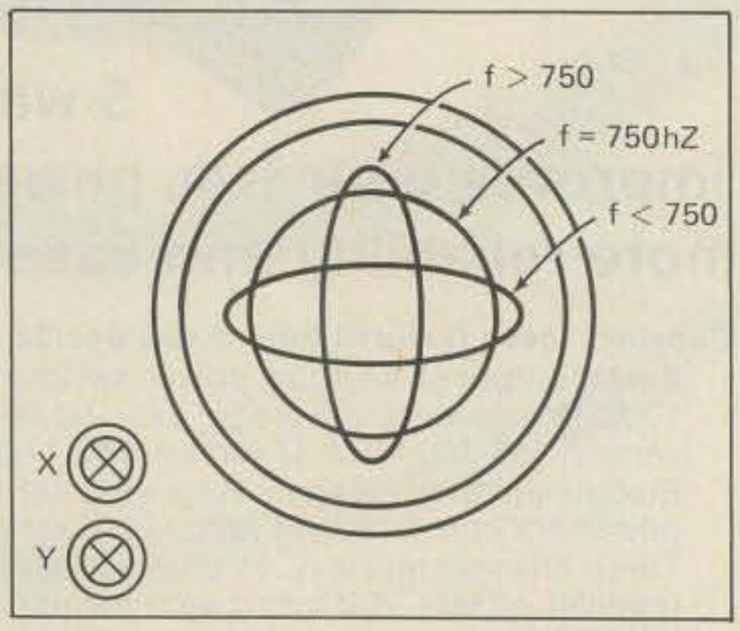

Fig. 3– A composite view of three tones and how they should appear on your scope.

Now, tune to a c.w. signal so that the pitch or tone is right and set the volume where you like it. At this point, leave the dials and knobs on the radio alone, and adjust the pot in the X-Y circuit until a circle appears on the scope. The circle denotes that the circuit is tuned to the same frequency as the signal that you are listening to.

Next leave the circuit alone and tune the v.f.o. dial so that your receive frequency is lower. What happened on the scope? As shown in fig. 3, the circle

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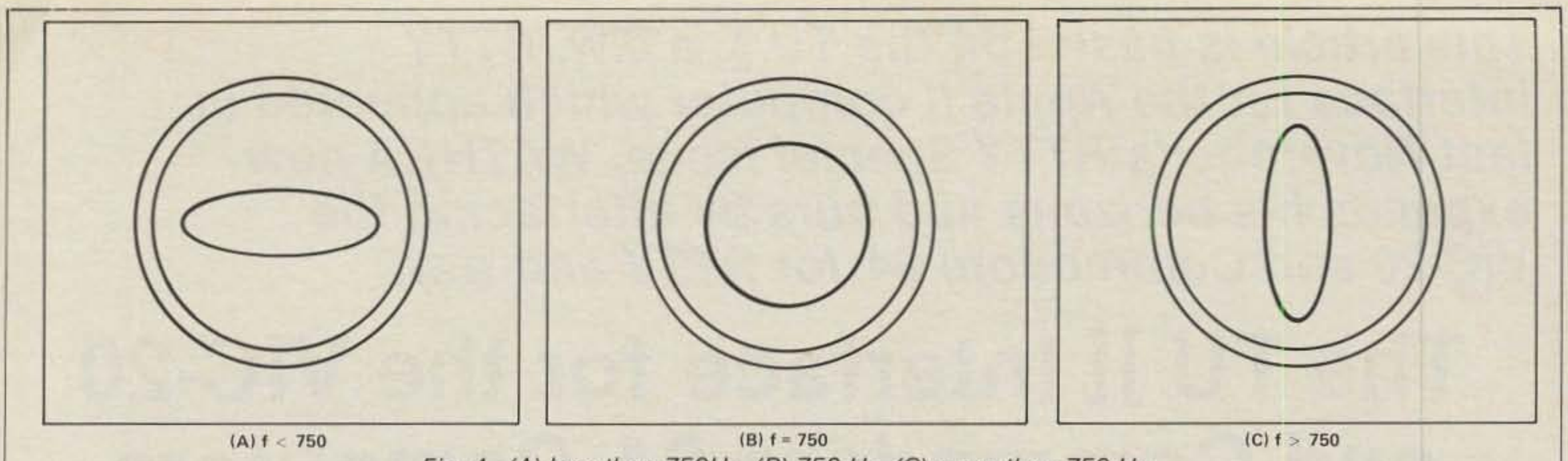

Fig. 4– (A) less than 750Hz, (B) 750 Hz, (C) more than 750 Hz.

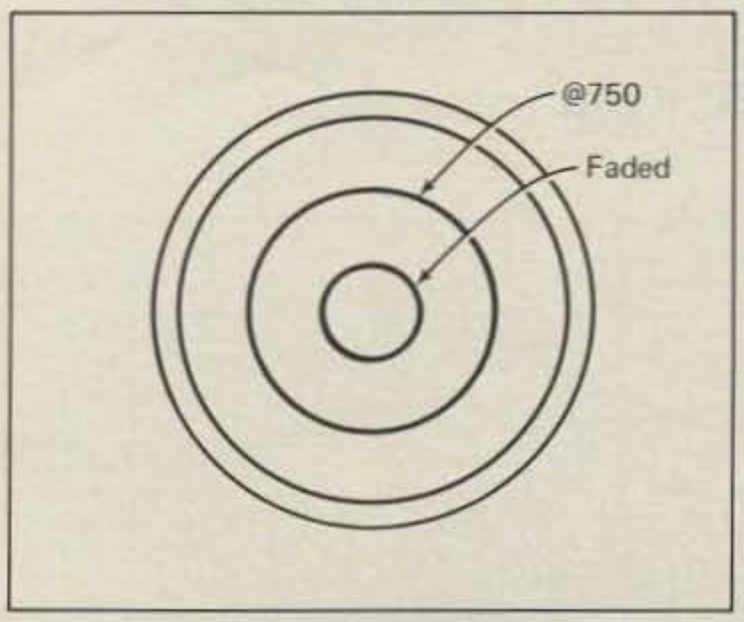

Fig. 5– A display of c.w. fading. The faded signal gets smaller.

should now be an ellipse that is lying on its side like an egg on a table. Now tune the v.f.o. higher in frequency; the ellipse should now stand on end! This sequence is also shown in fig. 4 (A, B, C). In A the frequency is below 750 Hz, in B the frequency is at 750 (a circle!), and in C the frequency is tuned higher than 750 Hz.

Fading and Interference Displayed, Too

Fading has been a term usually associated with RTTY. Amateurs talk about the mark fading separately from the space. But with c.w., the signal can fade, too! You just lose it (usually in the middle of the QSO—Hi Hi). Fading displays nicely on the X-Y display as shown in fig. 5. Here the weaker signal just appears as a smaller circle. As ionospheric conditions vary, the c.w. signal volume goes up and down. As this happens, the circle on the display gets bigger and then smaller. Signal variation is very evident!

Interference is also fun to watch; an example is shown in fig. 6. Assume that in this case we are listening to a c.w. signal that produces a circle on the screen of the scope. Then, an interfering signal of about half amplitude shows up and is slightly higher or lower in frequency. It will cause the display to have a flower-like pattern as shown. Lots of interesting figures appear if you experiment.

The X-Y Display Applied To RTTY

The circuit can also be used to tune single-ended or dual RTTY demod units. Fig. 7 shows this final example. With the circuit tuned to 2295 Hz instead of 700, one can use it for tuning to the "space" of the RTTY signal. When you are on frequency, the circle will then indicate that you are tuned to the "space." Then the "mark" will be lower in frequency and will be indicated as an ellipse on its side as indicated in the figure. Interfering signals show interesting patterns, too.

In summary, it is amazing how much fun one can have with such a simple circuit. We played with it for a whole evening. For the first time, I found that interfering patterns were the most interesting!

For the circuit buff who wants to know the why of things, the circuit works by making the "X" and "Y" outputs 180 degrees out of phase at the tuned frequency. Most introductory circuit theory texts will cover this circuit or a similar one. CQ

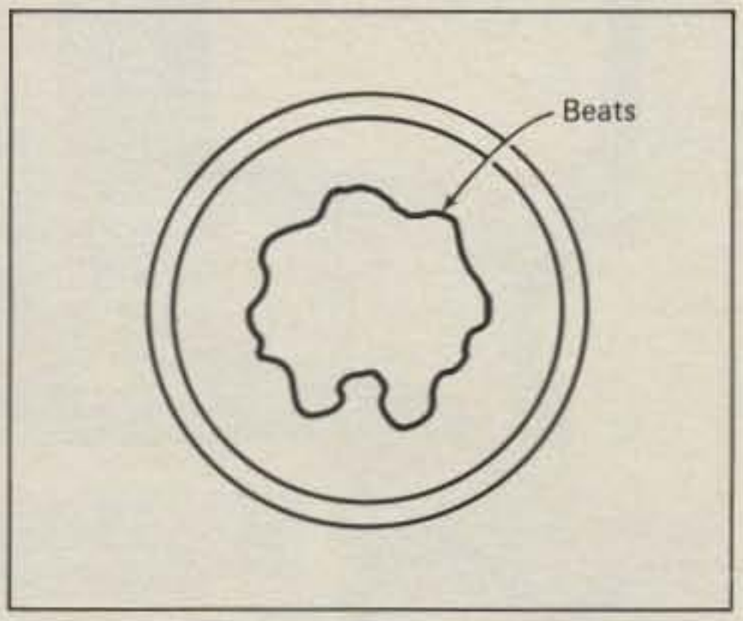

Fig. 6– An interfering signal on c.w. will produce a "flowered" pattern on the screen.

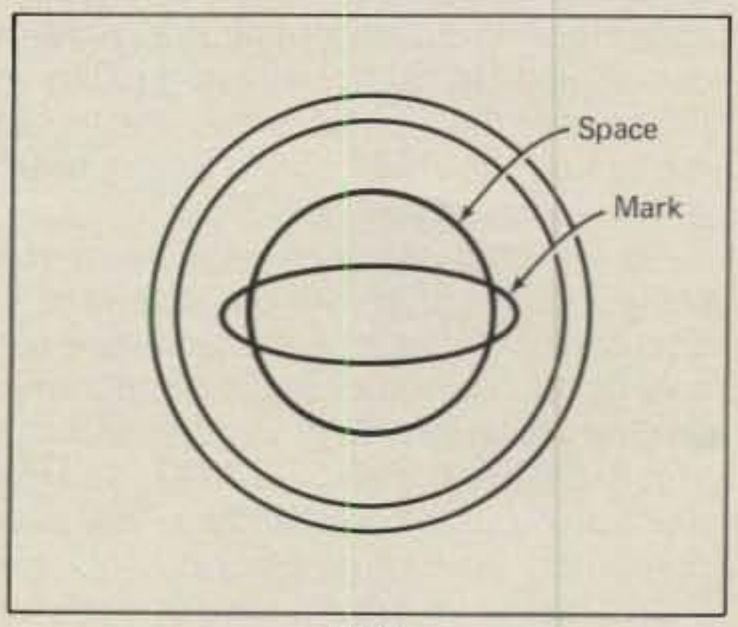

Fig. 7– How the mark and space signals will appear.

This article is based on the TU][, a c.w./RTTY interface for the Apple II computer which appeared in last November's RTTY Special issue. WA7HRA now expands his horizons and ours by interfacing the VIC-20 and Commodore 64 for RTTY and c.w.

The TU][Interface for the VIC-20 and Commodore 64 Computers

BY BOB HART*, WA7HRA, AND BOB BURNS†, K1RB

Price and availability of the Vic-20 and Commodore 64 personal computers have created as much of a stir in amateur radio as the proposal for a code-free license. Amateurs across the land are rationalizing that they need these fine little units to manage the family budget, educate the children, and, of course, play an occasional game. However, lurking in the back of their minds is the urge to join the fun on the RTTY bands and operate some keyboard c.w.

As all computer neophytes learn in a hurry, a computer without software is about as useful as an automobile without an engine. Visions of writing one's own program for RTTY rapidly vanish with the first exposure to **FOR . . . . NEXT**, and the myriad of other commands in the new computer language. Fortunately, the Vic-20 has been around long enough for commercial programs to become available to the user.

Two such programs are the Kantronics "Hamsoft" program board (firmware) and the RAK Electronics "Vic RTTY/CW II" cassette (software). Both programs have their pros and cons.

The Kantronics program comes on a board that plugs into the memory expansion port. It costs $49.95. The major advantage of this program is that it requires no additional memory beyond that which comes with the basic Vic-20. Whenever the card is in place, it is instantly available to the user. Newer versions have the option of storing user-programmed messages on tape via the cassette recorder. Although Kantronics in no way guarantees the performance of the program with any hardware other than their own, it worked great with the TU][.

The RAK Electronics cassette costs $29.95. It requires the Vic-20, 8K memory expansion board. For those who already have the memory expansion, there is the obvious desirability of the price. It retains the user-programmed messages on the tape and offers the distinct advantage of your being able to make whatever program changes you may desire, which is a real plus for individualized operation. For those who have a disk drive, the program can easily be down-loaded to a disk.

The TU at work in the shack of K1RB.

The TU][CW/RTTY Apple II Interface described in November 1982 *CQ* can be used to tie the computer to your amateur transceiver. The unit can be used with minor modification (see fig. 1). The only other requirement is a "patch" cable. A technical description of how the terminal unit works can be found beginning on page 18 of the above issue. Pin numbers listed for Apple are, of course, different for the Vic-20.

TU][was originally designed to take all its power from the computer. Vic can and should supply the required +5 v.d.c. in order to maitain TTL voltage compatibility. However, there is no convenient source of +12 v.d.c. Vic can supply an unregulated +9 v.d.c., but the performance of the XR-2211 tone decoder is significantly degraded for weak signal decoding when +9 v. is used in place of +12 v. Therefore, an external power supply is required. One of the inexpensive power supply cubes such as those used to power cassette recorders and calculators can be used. Install a jack on the TU][cabinet with the positive conductor running to the +12 v. supply side of switch, **S4**. Be certain the shell of the jack is grounded to the cabinet and the pc board. During alignment of the TU, listen to the output of **U2** at **J2** with an earphone. Some power cubes have quite a bit of a.c. hum. If you do not have a pure tone output, you will not be very popular on the air.

The patch cable can be made from ribbon cable or multiconductor cable, such as antenna rotator control cable. If r.f.i. becomes a problem, shielded cable (grounded at both ends) will be required. Use some care when selecting cable

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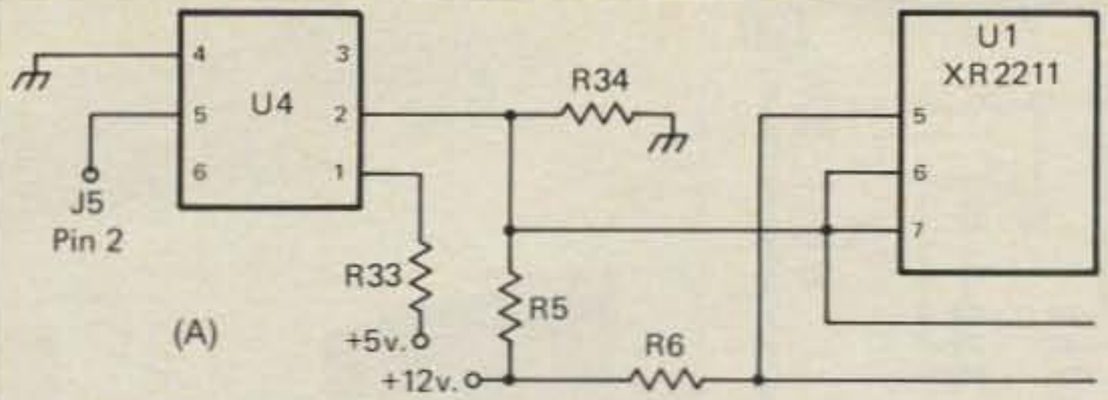
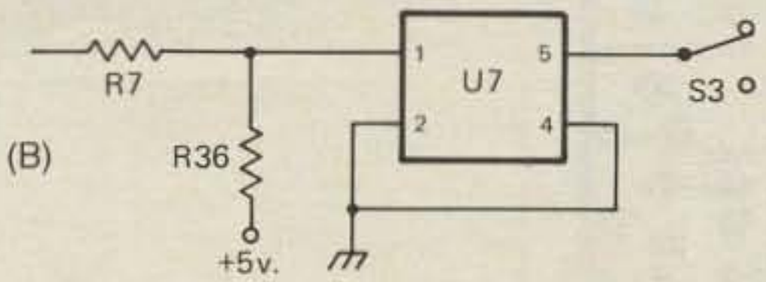
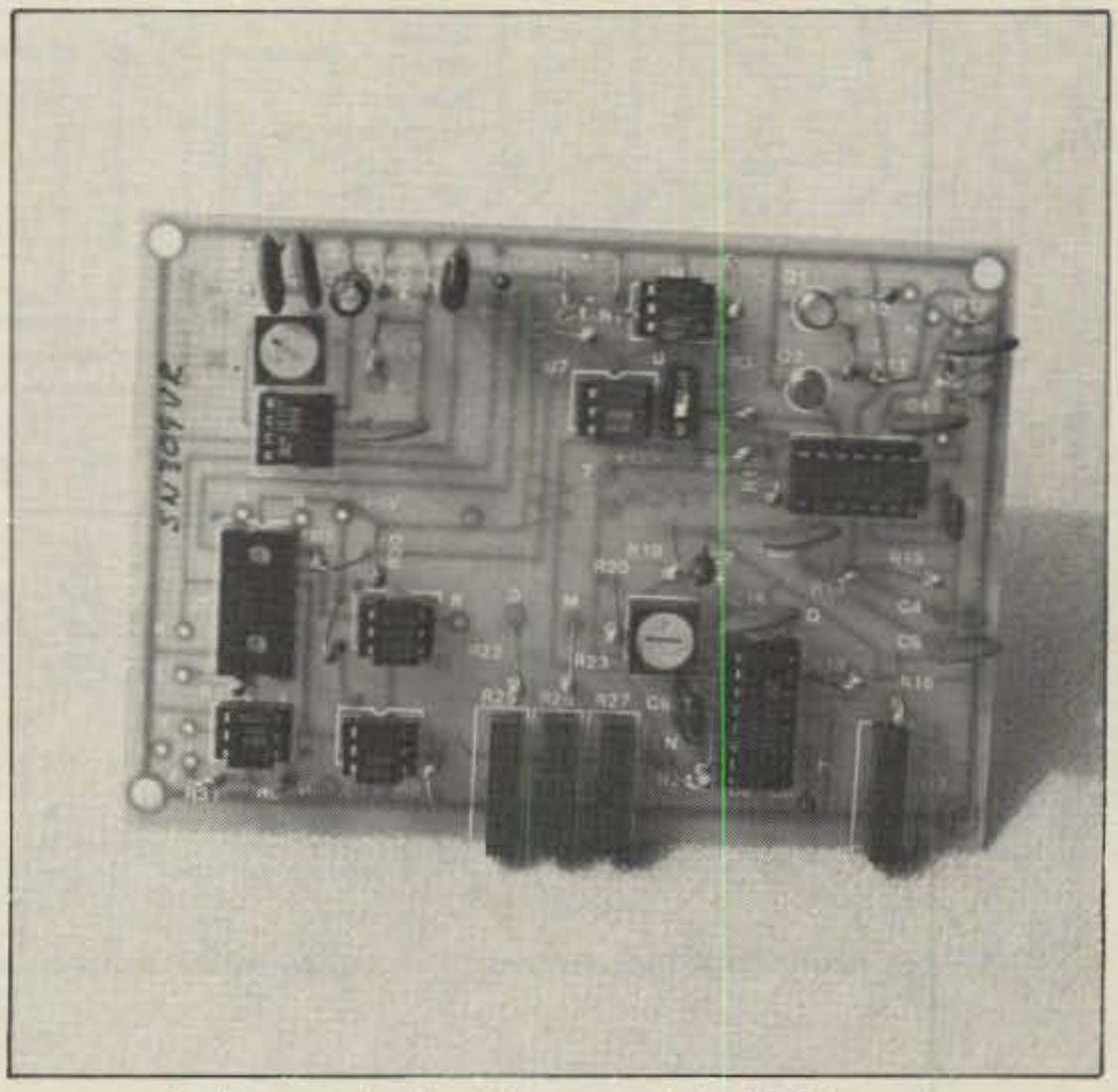


(A) Vic-20 is normally high during "mark." When the mark tone at pin 6/7 of U1 goes low on space, U4 turns on, which drives the RTTY demodulator line to Vic to the low state. Component changes for Vic-20 version are: R1, R3, C1 are deleted; U4 changes to 4N33; U5, U8 change to 4N33. The following are added: R33—470 ohm; R34—6.8K ohm.



(B) A pull-up resistor is required on the key line to U7 to ensure positive action with the Kantronics program. The RAK program will function with or without the resistor. The following are added: R36—2.2K ohm, R7—value changed to 220 ohms.

Fig. 1– Modifications to the original diagram which appeared in last November's issue (page 19).



A close-up look at the completed PC board.

lengths. Multiples of 12 and 18 inches make excellent antennas on 220 MHz and 2 meters. If you plan to operate on these bands, you can really frustrate Vic's efforts by introducing r.f. to the "innards." Tests at WA7HRA indicated no problem up to 90 watts output on c.w. in the h.f. bands. At that point the computer was swamped with radiation from the transmitter. RTTY at 100 watts did not cause a problem. A connector to match the Vic is required on one end, and a 16 pin dip connector is required on the other. Fig. 2 contains a chart of the pin-outs for the cables. Note that the cable for Kantronics requires some additional switching.

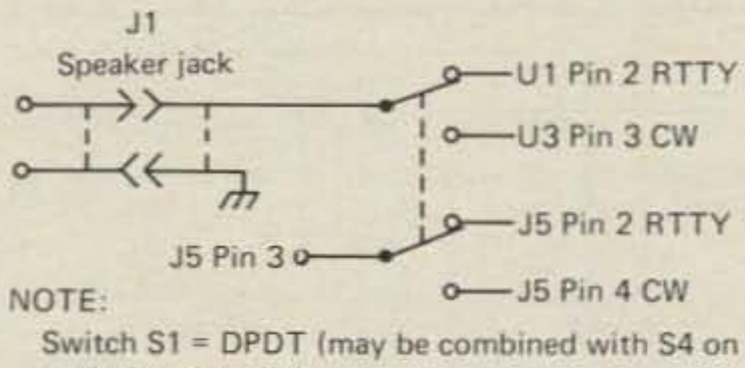
When installing the dip connector in the TU][, be certain to get pin 1 in its proper position. An error in installation will put +12 v. to ground. To avoid this unhappy event, you can cut pin 9 off the dip connector and put a drop of glue in socket 9 of J5. Pin 9 is unused, and the simple modification may prevent a disaster. Also, the edge connector can be installed upside down with disastrous results. Identify the top.

Adjustment of the TU is much the same as in the referenced article except for the lack of a tuning indicator on the screen. Preliminary adjustment of the c.w. decoder, **U3**, can best be accomplished by using your receiver to generate a tone that falls within the pass band of the c.w. filter or at the frequency to which you normally listen. To generate a tone, turn on your crystal calibrator or tune for a broadcast heterodyne on 40 meters. Feed the signal to the audio input, **J1**. Adjust **R28** to light **D1**.

Adjust R17, R21, R25, R26, and R27 as in the referenced article. Since the carrier detect output from the XR-2211 RTTY tone decoder (which lights D2) and the phase-locked-loop in the chip (which activates U4) are not always in exact synchronization, it is a good idea to make a tape recording of a string of RY's at the output of J2, and then play the recording back into J1. While watching the printout on the screen, slowly adjust R17 until per-

Use	TU][J5	Kantronics Game I/O	Kantronics User I/O	RAK Elect. User I/O
+5v.d.c.**	1	7	2	2
RTTY in	2	*	*	B & C
Switch S1	3	6	7	—
C.W. in	4	*	*	D
Ground	8	8	1	1
C.W. out	13	3	6	K
Push-to-talk	14	1	4	J
RTTY out	15	2	5	M

**Combine pins 2 and 4 on J5 with S1B to give a single switchable input to pin 3 of J5 to be fed to pin 6 of the Game I/O or pin 7 of the User I/O.*
***Connect a .01 disc capacitor to ground at the Vic end to bypass r.f. from the computer.*



NOTE:
Switch S1 = DPDT (may be combined with S4 on a 4PDT center off)

Cable "pin-outs" are shown for Kantronic's "Hamsoft" using either the Vic Game I/O or the User I/O. RAK's "Vic RTTY/CW II" uses only the User I/O. The Game I/O requires a 9-pin D-sub-miniature female connector (CW Industries CA-09-97 or equivalent). The User I/O requires a 24 pin edge connector (TRW 251-12-30-160 or equivalent).

Note: A User I/O cable kit is available from WA7HRA for $10. Also available are drilled and silk-screened pc boards, $10, and a complete set of pc board components and switches (not including the board), $50. Send check, money order, or Visa/MC (including expiration date) to: HRA-Vic, P.O. Box 571, Hoodsport, WA 98548. Washington residents include sales tax. Add 5% for shipping to U.S. and Canada; others add 10%.

Fig. 2– Pinouts for the interconnecting cables.

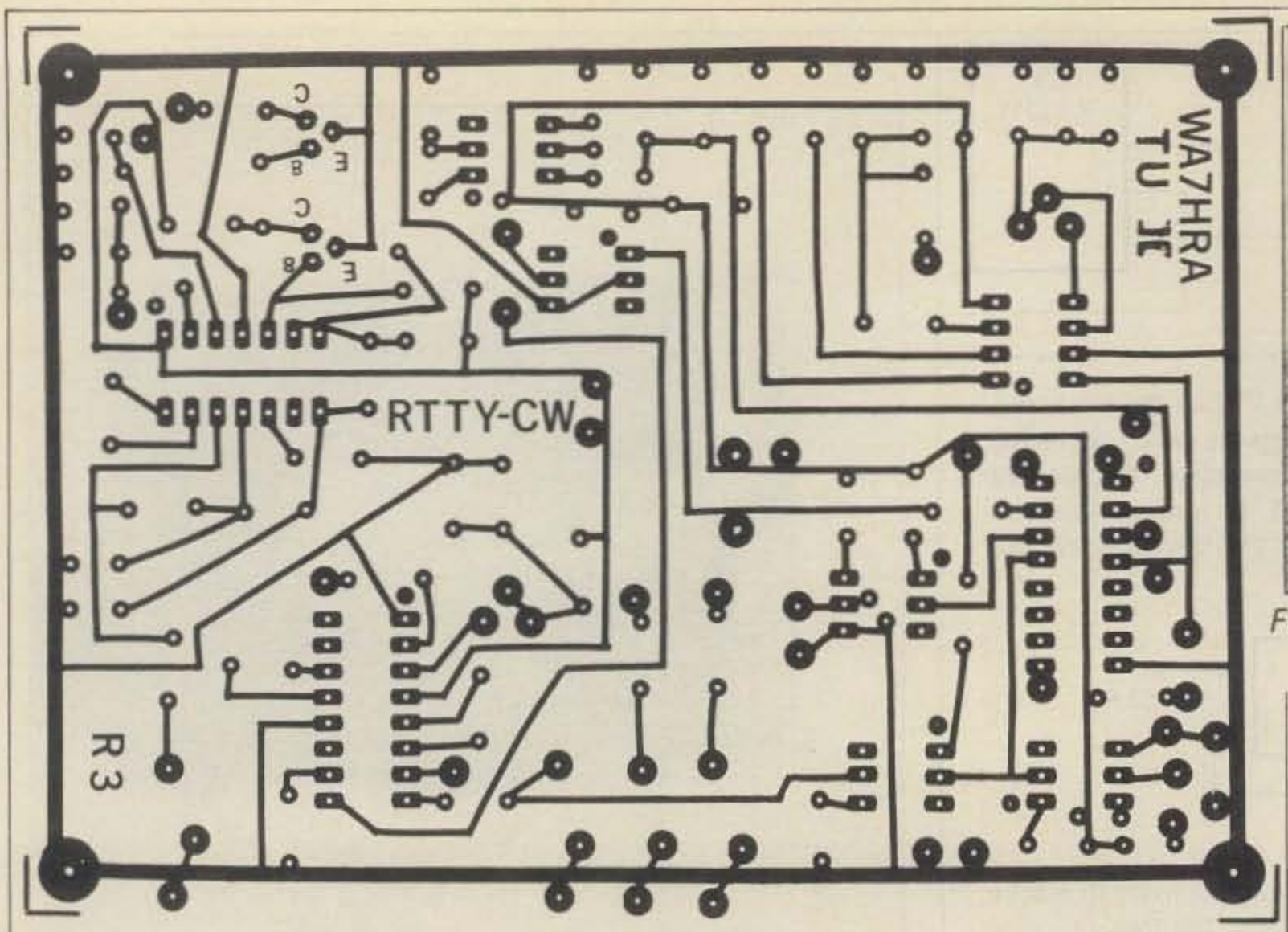
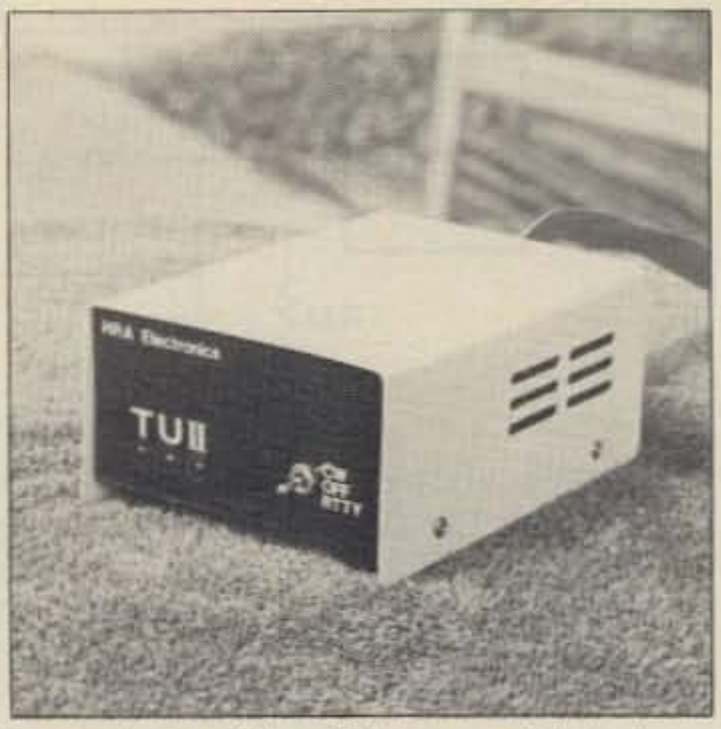


Fig. 3– Full-size PC board artwork for the interface.



Front view of the TU as available from HRA Electronics.

Rear view of connectors on the completed HRA unit.

fect copy is achieved. Note the position of the screwdriver. Continue turning until you do not get perfect copy. Reverse the direction until you again print perfectly. Again, note the position of the screwdriver. Now, set R17 halfway between the two points. This procedure will assure that the mark tone generated by the XR-2206 and the mark tone detect in the XR-2211 are both on the same frequency.

If you are operating on a v.h.f./u.h.f. f.m. repeater, you may have to fine tune **R17** to get on the exact repeater output.

You are now ready to complete the interface. Refer again to the referenced article for the simple hookup to your radio, and soon will find yourself in one of the fastest growing modes of amateur operation. Be careful, though. Don't get bitten by "the quick brown fox." CQ

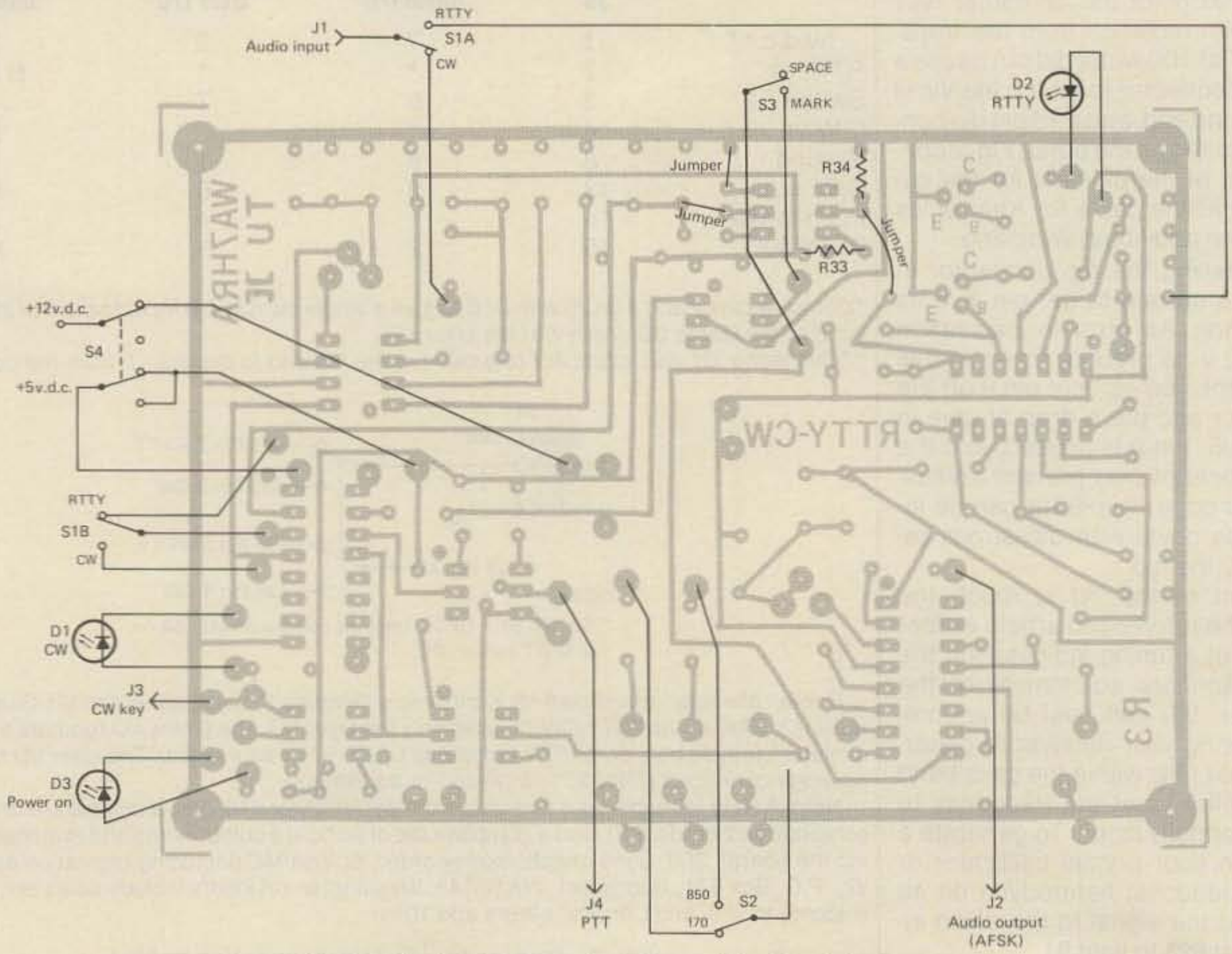
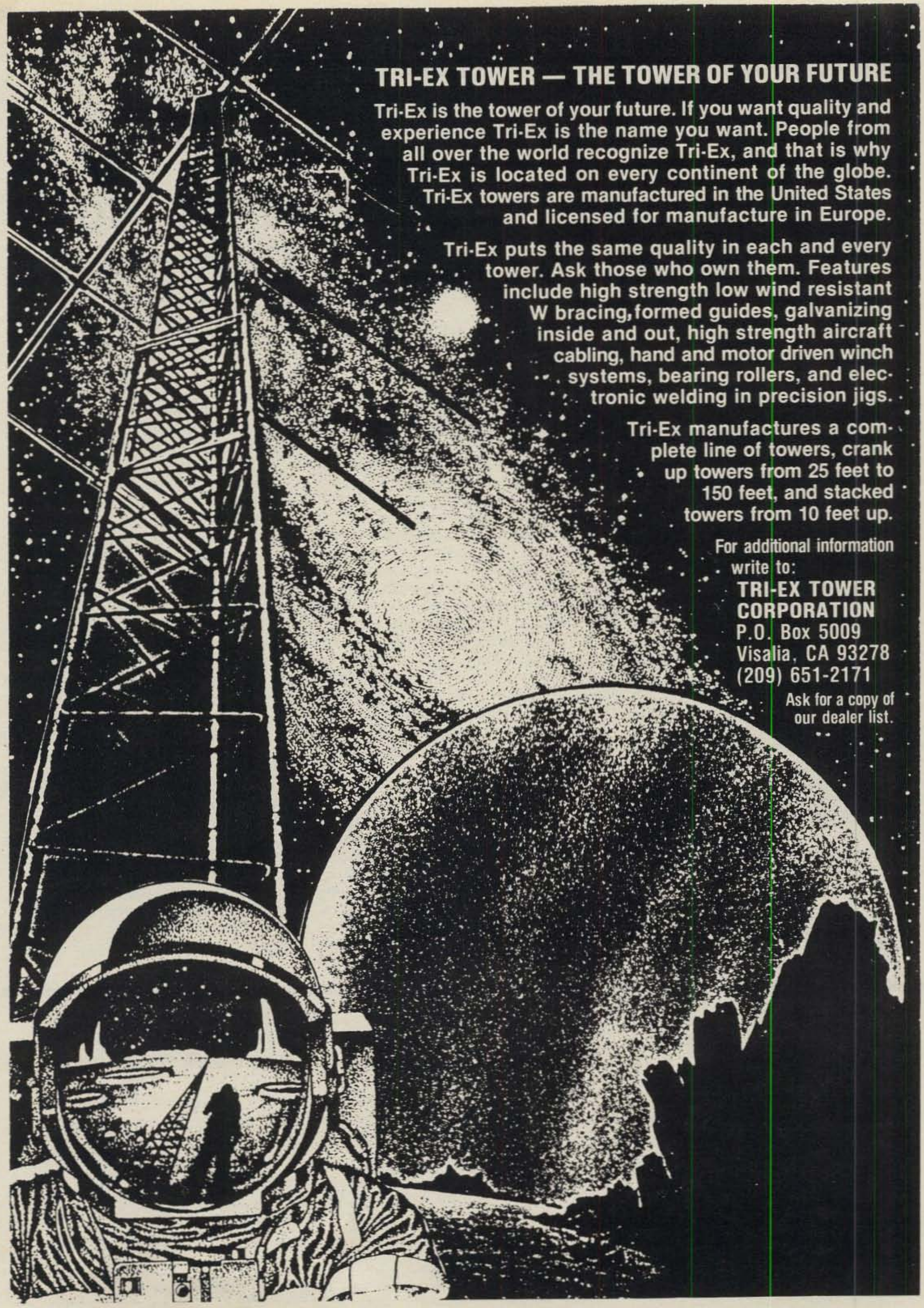


Fig. 4– Parts placement and layout for the interface.



CIRCLE 29 ON READER SERVICE CARD

Sometimes the simplest answers are the best. K0WVN provides some simple answers and practical suggestions on how to get more mileage from your older RTTY gear and your newer computer.

Interfacing Those Existing Old RTTY Terminal Units To Computers

BY JOE A. ELLIOT*, K0WVN

The saying *"experience is the best teacher"* can be a label for most everything I know in amateur radio today. I am not an EE (electrical engineer) and most of what I have learned over the years has been accomplished by reading books, getting information from other amateurs, or just plain watching things smoke in my shop. This kind of experience not only makes an everlasting impression, but it can also be a very sad and expensive proposition. There have been many days in my past when my wife yelled down at me from the top of the basement stairs "Joe, are you burning something down there?" Of course, when I'm sitting there watching something go up in smoke that I've spent many hours working on, this kind of question can be very aggravating to say the least, even though she is looking for the source of the fire! As I wipe the tears from my eyes, most of the time the project will be continued from a different approach, and most likely one that works. When working with high-priced equipment such as computers, mistakes are seldom forgiving or cheap to correct. So, we must proceed with caution, take our time, and have as much patience as possible to do the job properly.

The following information is for those readers who have already been using an RTTY terminal unit for some time, or for those who have acquired a new or used one and are wondering what to do about connecting it to a computer. Due to the number of different computers available on the market, your computer may not be directly mentioned in the following information. However, this information should give you a variety of interesting methods with which to make this connection.

Before we go too far into this subject of interfacing, I want you to know that I do recommend some type of driver IC to be used on the computer I/O (input/output). Although this is not necessary for most computers, it does ensure a certain amount of protection for them. At least one computer I am aware of has CMOS I/O, and it may or may not work for some TTL compatible interfaces. This same computer uses a chip designed by the manufacturer that has combined many functions within one chip. Needless to say, this chip is *only* available from the manufacturer and could cost a pretty penny or sit in a shop waiting to be repaired. RS-232C should not be a problem when interfacing directly to a terminal unit supplied with the proper levels and should not require a driver.

What I have used in fig. 1 is a fairly common IC (74LS04), and it is used quite a lot in computer applications. This IC is an inverter with six sections, allowing us to use any combination necessary to accomplish our interfacing to the outside world. The example shows an inverting and a non-inverting I/O. As you can see, the non-inverting I/O will use the most sections of the IC. Even though this is true, there are still two sections left over for a possible "PTT" output. I have stayed away from using other types of drivers IC's that are common in computers but harder for the builder to get. A 7404 can be a direct replacement for the 74LS04, the only difference being that the "LS" has a lower power drain than the standard chip and could mean a speed difference. The standard chip would be fast enough for this application if your 5 volt power supply can stand another TTL IC connected to it.

Okay, let's talk about interfacing the terminal unit you have been using on the mechanical machine to a computer. There are several ways of going about this, and I will try to cover what is most common on terminal units of the past. Most of them will surely have one thing in

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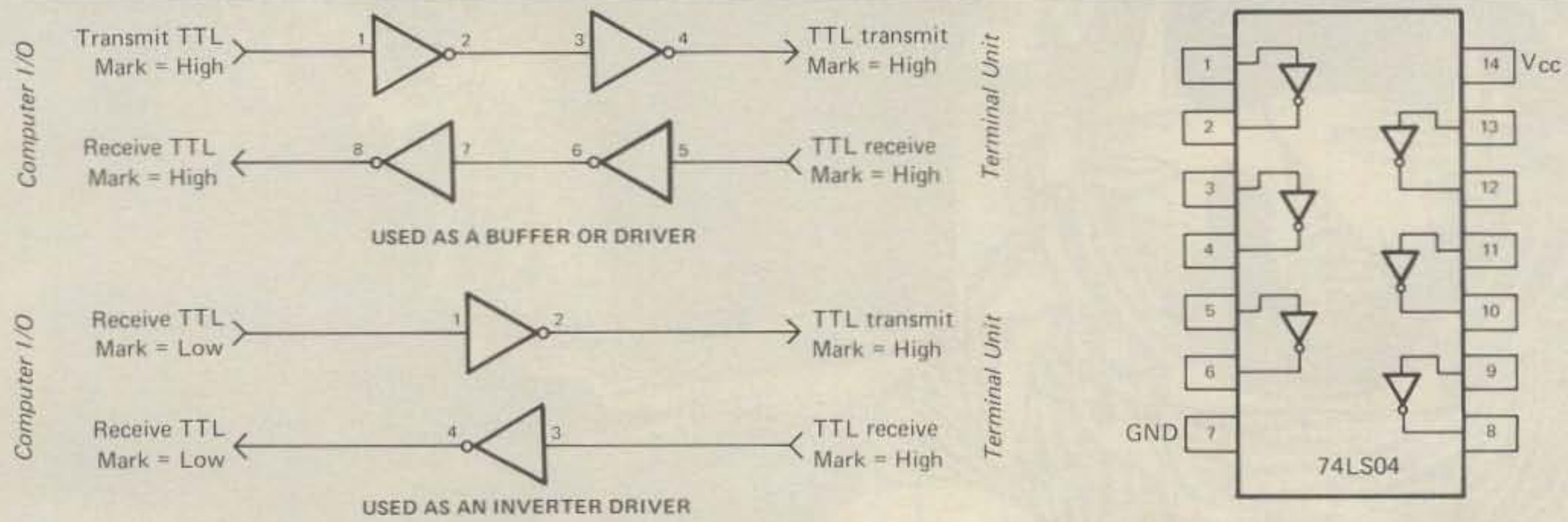

Fig. 1– The 74LS04 driver circuitry. Two variations are shown, inverting and non-inverting.

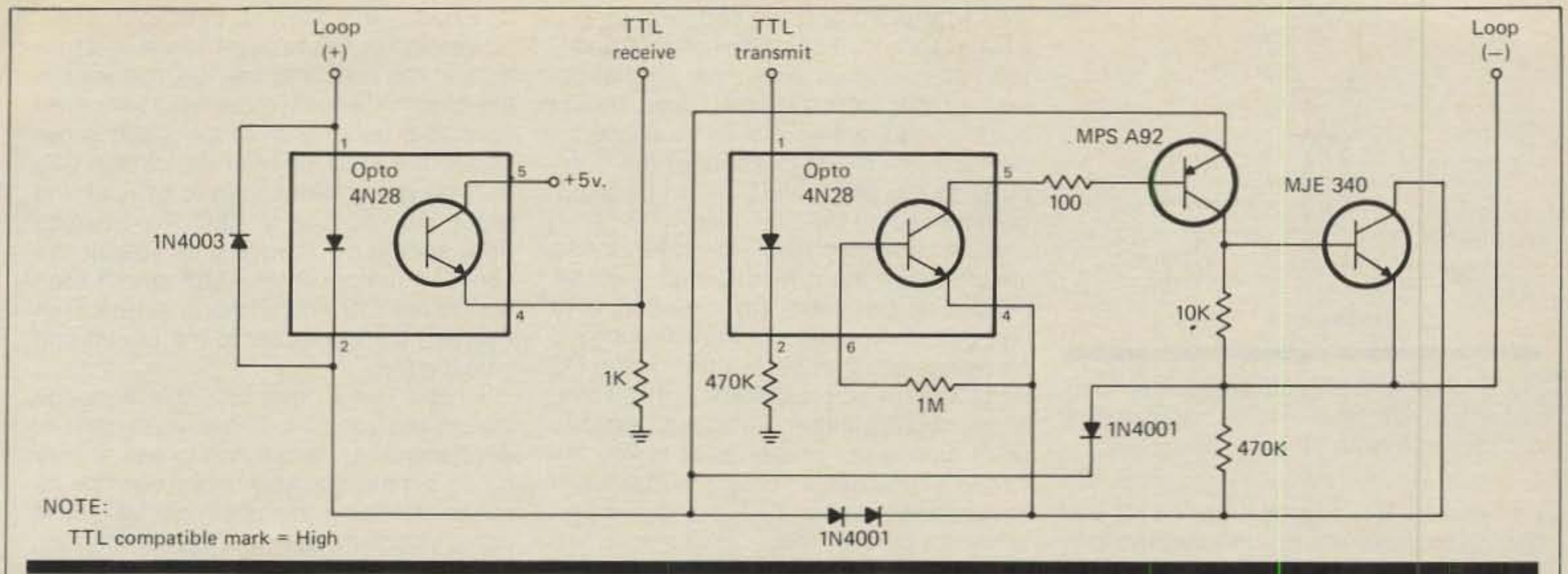

Fig. 2– An opto-isolation circuit (MARK = HIGH).

common, and that is the **loop supply**. Now it will make a lot of people nervous to use a loop supply that has somewhere in the neighborhood of 150 v.d.c. at 60 ma near any TTL, RS-232C, or CMOS I/O (input/output) levels the computer requires for communications. However, a safe method of interfacing to the loop supply can be done by using "opto-isolation." This method not only allows the computer to be interfaced, but also allows the machine to remain in the loop for hard copy when needed. When using a computer for RTTY, I have found that having hard copy is not necessary in most QSO's in which the subject is just chit-chat.

There have been times when an exchange of information does require a printer to keep a record for later digesting. Therefore, you may find it desirable to have both the machine and the computer in the loop at all times. One of the main advantages is that the computer and the machine keyboards will be active. This is handy when you have the computer tied up with other tasks and you don't want to load the RTTY program just to answer a call. Another feature when using this type of interfacing is that both the machine and the computer are able to copy each other locally, if they are set up at the same speed and for the same mode (ASCII or Baudot). For those who have been sending and receiving RTTY art, this would be a good way to preserve the pictures on disk or cassette tape in the computer. There is a definite advantage in using this type of interfacing to the computer with your present equipment.

The isolation circuit shown in fig. 2 uses a 4N28 (Motorola), but other opto's such as the G.E. HD11D1 can be used as long as they are rated to handle over 60 ma. Fig. 2 requires TTL keying from the computer with MARK = TTL HIGH. Some of you probably just said a few bad words when that last line was read, because your computer TTL I/O is MARK = LOW. Don't get excited. Remember our inverter IC discussion. We can get it right side up with no problem at all. When the RTTY program is loaded, and in the standby mode (just sitting and doing nothing), the required TTL REC and TTL XMIT levels should be TTL HIGH. It is normal for most software packages to recognize this I/O condition, and some RTTY software packages give you the choice of inverting if necessary. If this is the case, you would select MARK = TTL HIGH, and SPACE = TTL LOW.

This circuit (fig. 2) will require a 5 v.d.c. regulated supply, and I do not recommend taking advantage of the supply within the computer. I have found a lot of computers running very close to their limits if fully loaded. One touch of the regulator made me back off of the idea of even attempting to tap onto the computer power supply. My favorite trick is to use the 12 v.d.c. regulated supply of the terminal unit using a 7805 IC regulator, an electrolytic cap at about 10 mFd, 10 v.d.c. on the 5 volt output, and then to heat-sink it to the case. This circuit draws very little current, and it should not affect the 12 v.d.c. supply enough to notice any difference in performance of the terminal unit or supply voltages. If you do not feel your supply can handle any additional drain, then it would be wise to build a 5 volt power supply externally. This would be handy for other projects you may want to build in the future that require 5 volts to power them. The 7805 IC regulator is rated at 1 amp, way more than any of these circuits require. However, this regulator is very popular, easy to find, and cheap in price.

Before you hook everything together, make sure you have the circuit assembled correctly. The very *last* thing we want to connect is the computer. Take a milliampere meter and set it for 100 ma to determine which are the positive and negative leads of the RTTY terminal unit (TU) loop supply output. If the milliampere meter tends to give you a reverse reading, or a –60 ma, then reverse your leads. When you get the proper reading, the loop wire you have connected to the red lead of the milliampere meter will then be your positive side of the loop, and the black will be the negative side of the loop. Once you have determined which is which, mark them accordingly and set them aside for later connecting.

The next step is to check to see if the 5 volt supply is okay. Apply power and read the output of the 5 volt supply with a d.c. volt meter. If the supply voltage is near 5 volts, then turn the power supply off and

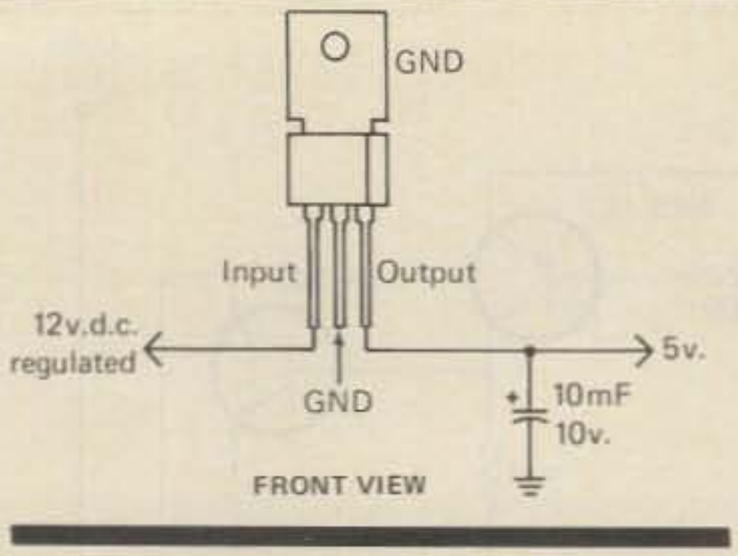

Fig. 3– The simple 7805 IC regulator and capacitor will give you a regulated 5 v.d.c. from a 12 v.d.c. source.

proceed on. It is a good practice for you always to make the ground connections before anything else, and then the supply leads, or signal leads. Connect the 5 volt supply ground lead and then the positive lead to the circuit. Apply power to the 5 volt power supply and check the board with a d.c. volt meter to make sure you have the supply voltage where it belongs, according to fig. 2.

If you have gotten this far without any problems, then make sure the loop supply and the 5 volt supply are turned off. Connect the positive and negative side of the loop as indicated in the drawing. With this all connected, turn the loop supply and 5 volt supply on. Referring to fig. 2, you will use a clip lead jumper from the TTL XMIT to the 5 volt supply in order to close the loop for further testing. If you have a mechanical machine connected in the loop and turned on, you will notice that the selector magnets run open until the 5 volts are applied to the TTL XMIT connection. This is a good indication that the TTL XMIT is working, and every time you press a key on the mechanical machine, it should print normally. With this connection made, take a d.c. volt meter set for 10 volts, and connect the black lead to ground and the red lead to TTL REC. It should indicate between 4 and 5 volts at this point. When you lift the clip lead jumper from TTL XMIT, you should see the voltage drop low. If this all checks out, you are ready to connect the computer to the proper TTL I/O to be used, common being the first lead.

If the computer is not able to key these circuits, then the driver IC (fig. 1) will be needed. It has been my experience to find three computers of the same brand name not equal to each other on the I/O ports. Where a circuit would work on one, it may not on another. A driver IC assures us of having the proper level to key the circuit. If you have a program that has a keyboard-controlled PTT, the driver certainly will be a big help.

There is probably a fellow out there saying "What about me? I have RS-232C." Well this is just a bit different from the TTL I/O, but not a whole lot of problems will occur with the following circuit (fig. 4) if you are using something similar to the Radio Shack Color Computer. I use this computer, for example, because I hear more people using it on RTTY than any other using RS-232C I/O. Like a lot of other computers, the RS-232C input of the computer couldn't care less about a – 12 v.d.c. It is looking for the plus side of the RS-232C keying only, so we do not have to see anything below .0 volts. In fig. 4, we are not using a TTL power supply for our circuit, but rather a + 12 v.d.c. that should be a very popular supply voltage with most RTTY terminal units.

To check out the circuit in fig. 4, you would connect the 12 v.d.c. supply to the proper points, make sure all the ground connections are made, and then connect the loop to the positive and negative points. Make sure you have determined which loop connection is positive and which is negative before connecting to the points by using a milliampere meter as explained in the TTL checkout. Apply power and check to see if 12 v.d.c. is present at the 2.7K and the 10K resistors in the circuit. Connect a clip-lead jumper to chassis-ground and connect the other end to the XMIT point of the circuit. Clip the volt meter black lead to ground and touch the red lead to REC. The reading here should be .0 volts until you lift the clip-lead jumper from XMIT, and it then should read 12 v.d.c. If this is all true, then connect the computer to the circuit and give it a try.

I hope that I have kept the language simple enough so that everyone can understand what I am trying to say. It may be so simple that you might even be insulted. Keeping things simple usually is not a problem with me, but something could slip out occasionally. As was said in *The First English Dictionary* compiled by Dr. Samuel Johnson in 1747, and I quote: "In promulgating your esoteric cogitations and articulating your superficial sentimentalities and amicable, philosophical and psychological observations, beware of platitudinous ponderosity. Eschew all conglomerations of flatulent garrulity. Dejeune babblement and asinine affectations. Let your extemporaneous decantings and unpremeditated expatiations have intelligibility and voracious vivacity without rhodomontade or phrasmical bombast. Sedulously avoid all polysyllabic profundity, sittacious vacuity and ventriloqual vapidity." In other words, speak plainly, briefly, and purely, say what you mean, mean what you say, and don't use big words! Thanks to a dear friend, Bill Eccles, K7MJC, for passing this one on to me, and let me know if I stray from this course! I also hope this has given you some answers to lingering questions on how to use that old terminal unit with the new or old computer. Just remember to *take your time, have patience, and then have a lot of fun!* CQ

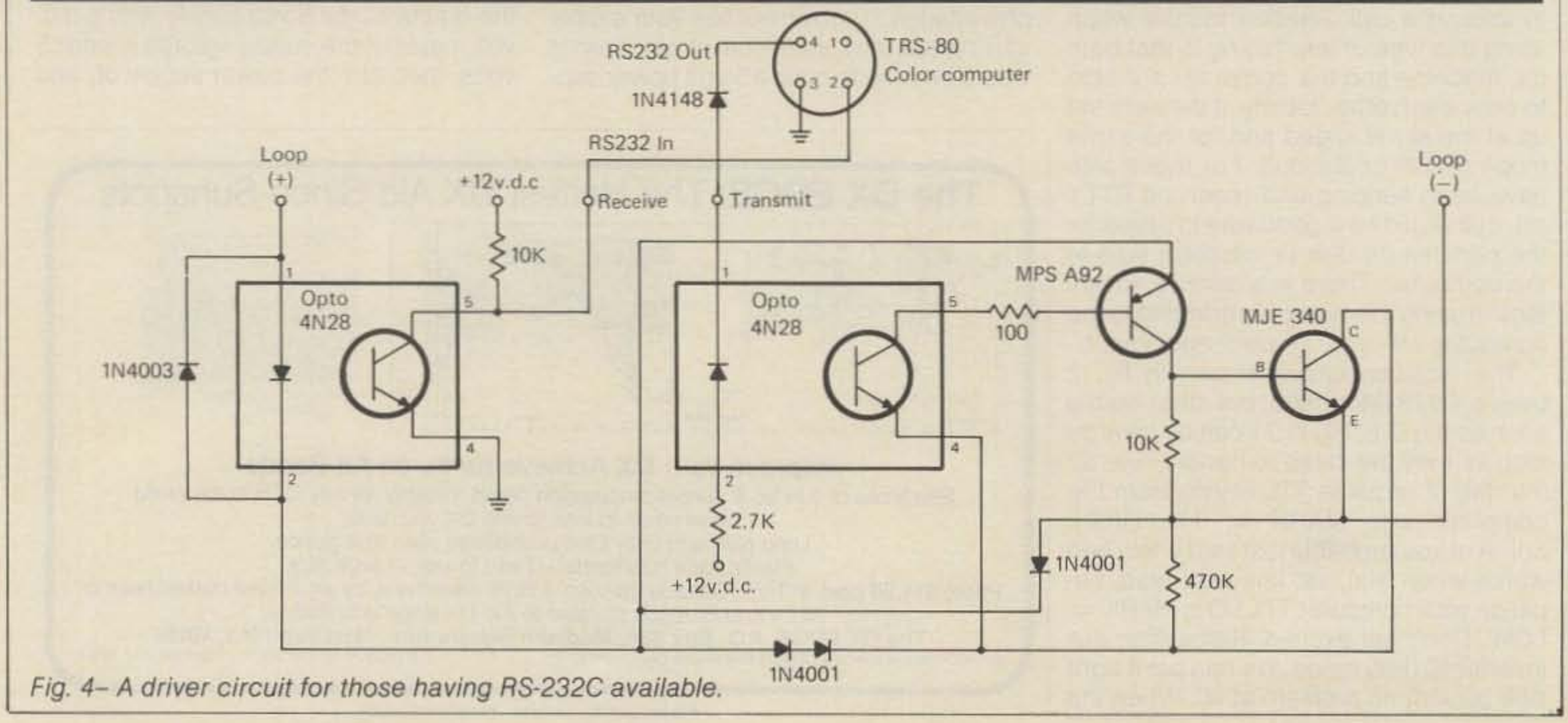

Fig. 4– A driver circuit for those having RS-232C available.

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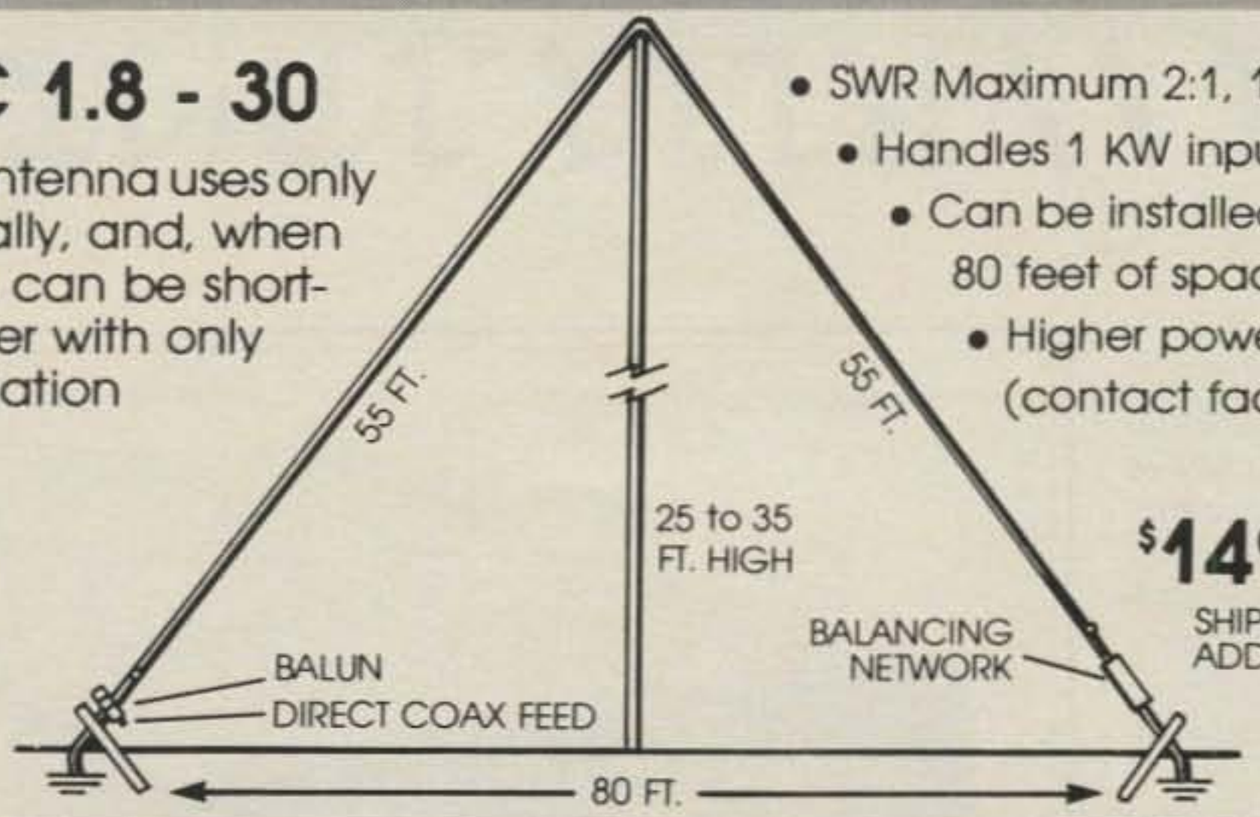

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CQ REVIEWS:

BY DAVE INGRAM*, K4TWJ

THE TIMEKIT BLINKY SSTV/RTTY TUNER

Accurate frequency tuning of SSTV transmissions or RTTY signals on amateur and/or international shortwave bands can often be a perplexing situation. With SSTV, the variables include not only receiving correct sync, black-and-white frequencies, but also setting gear for displaying the mating video format: 8, 12, 16, 24 second, black-and-white high resolution, frame sequential color, etc. In the case of RTTY, there are three popular mark/space tone shifts (170, 425, and 850 Hz) either normal or inverted tone polarity and speeds of 60, 67, 75, and 100 words per minute. The ability to reduce the number of variables to an easily handled quantity thus proves to be a significant advantage!

Enter the TimeKit Blinky: a grand little operating aid which indicates both received audio range frequencies and their shifts on a calibrated and easy-to-read, analog-type scale. The Blinky can be used with any existing RTTY or SSTV setup, and it provides noticeably easier off-the-air tuning.

The Timekit Blinky is a very functional accessory for any RTTY or SSTV setup. Connection is quick and easy, and audio frequency readout is very accurate.

The Blinky

The Blinky itself is a small unit housed in a black plastic case with a gray front and measuring 2″ H × 3″ W × 5½″ D. The readout area is "semi-frosted red" with rear-mounted LED's which provide illuminated frequency marks according to received tones. Contrary to the manufacturer's name of TimeKit, the Blinky is supplied fully assembled, tested, and tuned. Interconnecting the unit to one's setup is quick and easy. The receiver's audio output is directed to the Blinky's input via a popular ⅛ inch barrel plug. Another ⅛ plug is connected to a conventional 10 to 16 v.d.c. "wall adapter" (available from numerous sources, including TimeKit itself), and you're ready for action.

How It Works

The Blinky is comprised of an amplifier/limiter stage which drives six sharply tuned and temperature-stabilized op-amp filters (see figs. 1 and 2). The filters' outputs feed an LED driver which energizes the appropriate frequency LED(s), thus accurately illuminating the appropriate front-panel display area. Simple but quite effective! Since employed op-amps use +9 and −9 volts, a unique d.c. to d.c. negative voltage converter is included in the Blinky to permit using a single 12 volt external power source (wall adapter, battery, etc.). We also tried a common 9 volt battery with the Blinky, and it worked great. I also might add that using the Blinky gave a creditably higher "reception ratio" of RTTY signals, especially those spotted on international shortwave frequencies.

Using the Blinky

As luck would have it, we received the Blinky on the same day we were doing a cross comparison on several of the popular home-computer-type RTTY systems. This kaleidoscope of gear included the AEA CP-1, the MFJ 1224, and the Kantronics "Interface," along with several Commodore, Atari, and Radio Shack computers (plus associated RTTY software packages). The Blinky was quickly unpackaged and added to the receiver's audio output line via an extra cable (all of the previously mentioned RTTY converters include audio "normal through" jacks, making connections a snap). In every case and test setup tried, signal tuning was substantially improved and noticeably easier with the Blinky. In fact, I quickly got a feeling of "tuning blind" if the Blinky was not used with a setup. It's easy to see how RTTY or SSTV newcomers could lose time trying to tune signals "by ear."

As the receiver was tuned across an RTTY signal, the Blinky would indicate employed frequencies and shifts. First, 1200 and 1500 Hz "winks," and no copy, then 1700 and 1900 Hz "winks," and no copy. Next, 2100 and 2300 Hz "winks." Bingo—smooth copy!

Tuning the international shortwave bands, we would get "winks" on 1500

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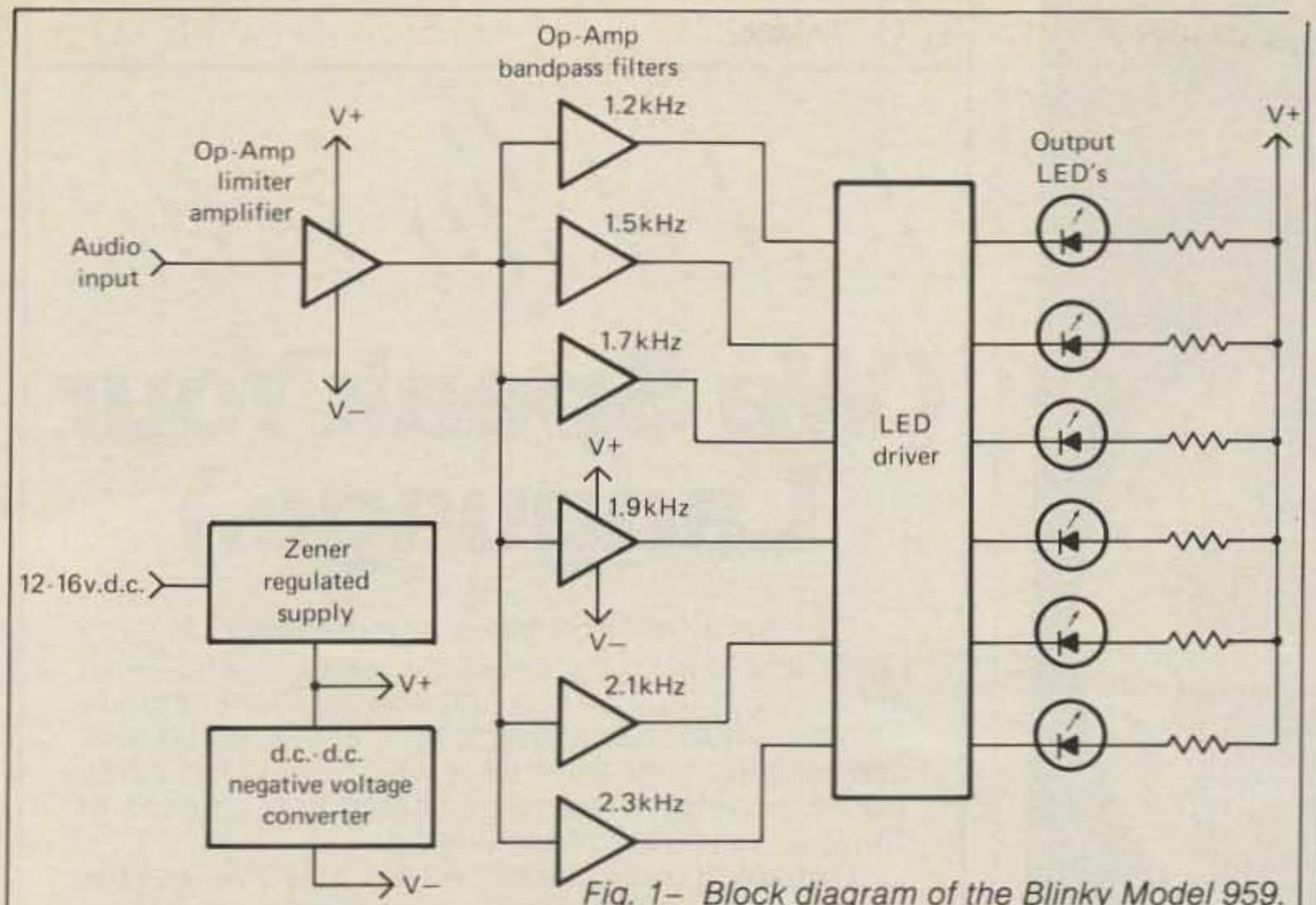

Fig. 1– Block diagram of the Blinky Model 959.

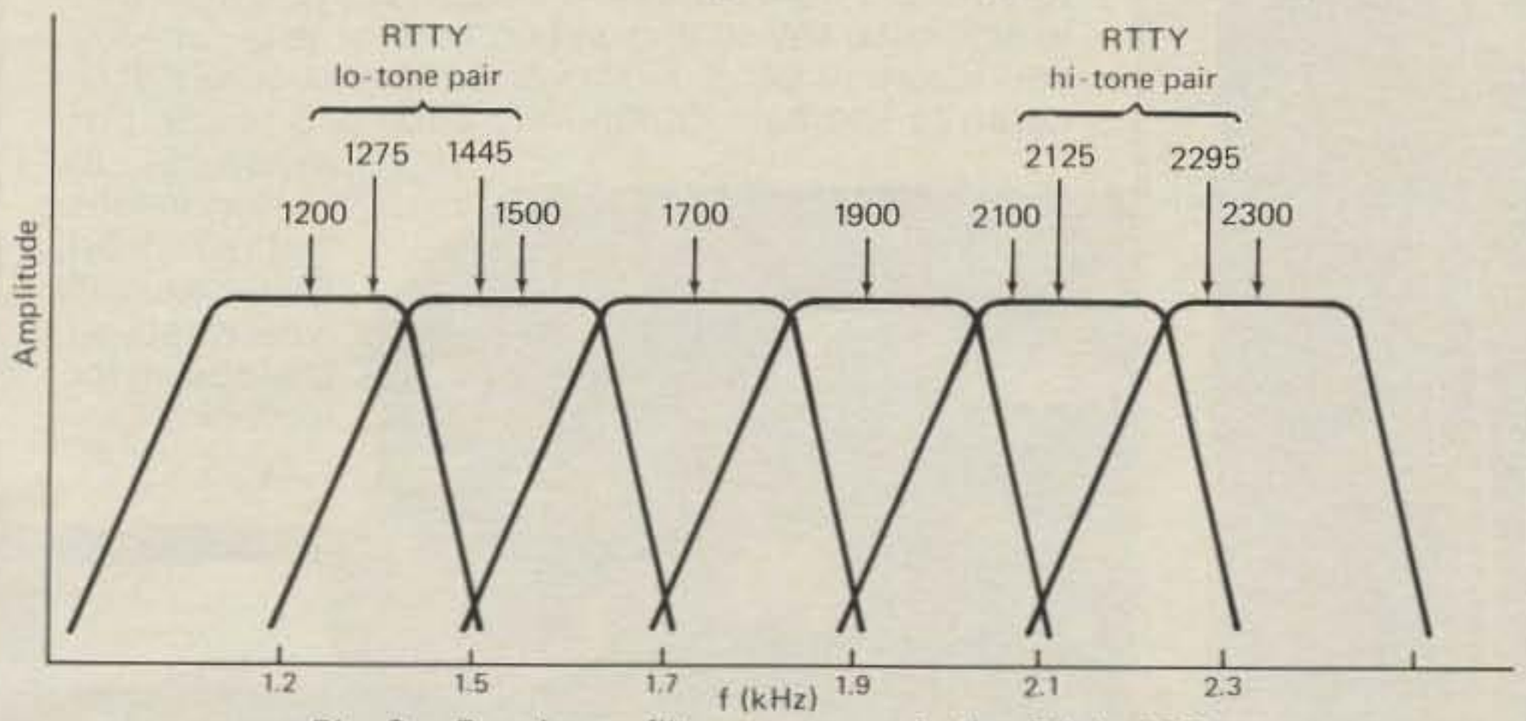

Fig. 2– Bandpass filter response in the Blinky 959.

and 1900 Hz; tuning higher, we would get 1900 and 2300 Hz "winks" (obviously 425 Hz commercial shift rather than 170 Hz amateur shift). A slight bit of further tuning until the highest frequency ran off scale, and the lowest frequencies displayed at 2100 Hz once again gave perfect RTTY copy. Nice! Returning to the amateur bands, it soon became apparent why difficulties are sometimes experienced when tuning "unusual sounding" RTTY. Blinking indicators at 1500 and 2300 Hz revealed "wide shifts" of 850 Hz, or European low tone pairs at 1275 and 1445 Hz. Seeing these parameters real-time displayed on the Blinky, we merely tuned the receiver for proper audio tone output and set the RTTY interfacing unit for the proper shift. Once again the computer terminal responded with smooth RTTY copy. Reverse-tone RTTY signals were spotted by noting which LED flickered the most, a technique that can be mastered within a few minutes' time. This isn't meant to sound "commercial," but once you've used a Blinky, you can easily wonder how you got along without one, or why someone didn't think of it sooner.

Using the Blinky with an SSTV setup also proved quite beneficial and gratifying. Rather than checking for proper voice reception, we merely tuned the receiver until the 1200 Hz LED flickered (sync), and the 1500 to 2300 Hz range indicated incoming video tones. Bingo—video displays! Checking the Blinky during c.w. reception also gave some interesting results. The unit proved useful when tuning with narrow-band audio filters, plus it acted as a "mini panoramic display" when using regular s.s.b. bandwidths.

Conclusion

All aspects being considered, the Blinky is a very useful tuning indicator which can prove its worth in any RTTY or SSTV setup. Hookup is quick and simple, and the display isn't overbearingly bright when used in a dimly lit (SSTV) room. Any 12 volt d.c. supply can be used for power, or TimeKit's Model 60 wall adapter is available. The Blinky retails for $99.95; the d.c. adapter is $9.95. For more information, contact Fred Sharp, W8ASF, TimeKit, P.O. Box 22277, Cleveland, OH 44122.

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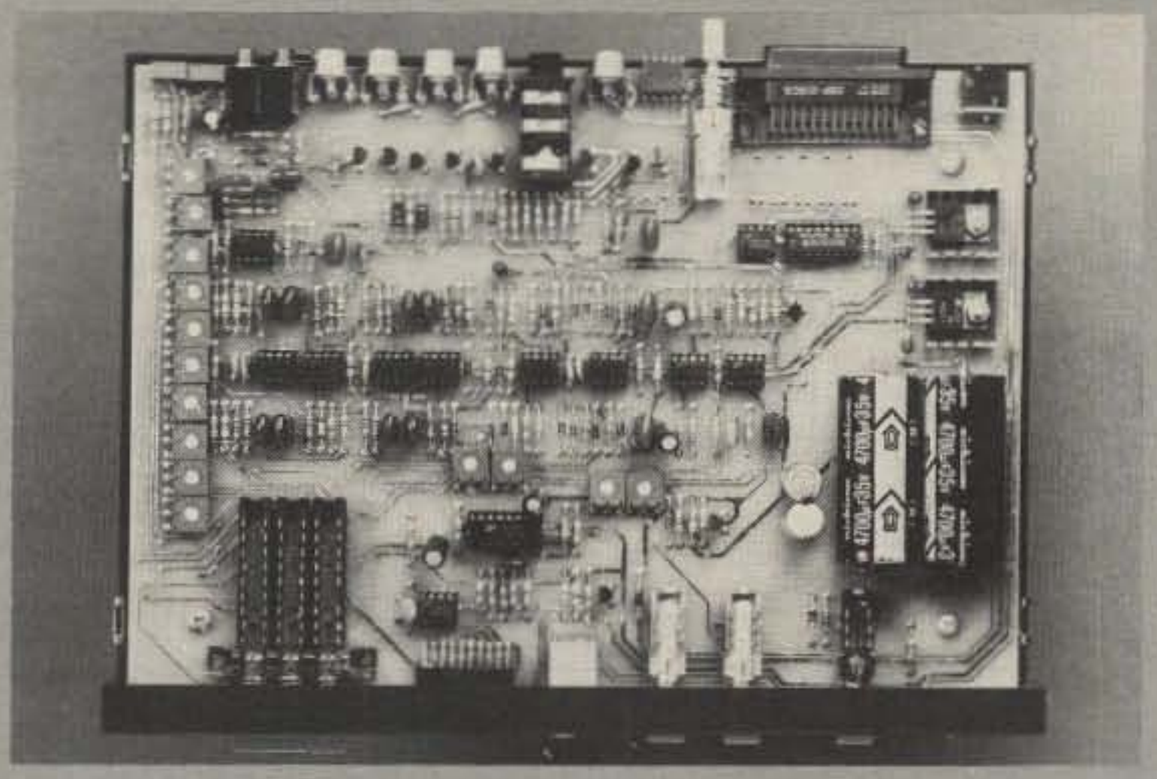

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Sometimes there is a fine line between want and need. Often, however, there is a wide gap that is not logically satisfied. K0WVN presents practical considerations and food for thought on buying computer-based RTTY equipment.

Getting Started In Computer RTTY/C.W. What Should I Look For?

BY JOE A. ELLIOT*, K0WVN

There is nothing like shopping in various amateur radio magazines for something you know nothing about. Many RTTY amateur radio operators have been stung by products that have very limited uses. I hope the following information will help those who are confused and searching for knowledge on this subject.

In recent years, computers have entered almost every household in one form or another. With mass production of the mini-computer and competition within the market, low cost has attracted even the most cautious buyer. When the home computer hit the market with such great response, software programs began to appear. It was just a matter of time before other companies joined in, realizing this to be a big business. Computering is a stand-alone hobby, and many have only this hobby in mind. Most of you will find this true even though you attempt to combine it with amateur radio. Using the two together just makes both hobbies that much more interesting. No matter what age you are, there is that adventure into the unknown lurking in there somewhere, and you will find yourself stepping into the world of computing.

RTTY was one of the first modes to make use of the mini-computer for communications. All it took was getting the price down to a level where most amateurs could afford them and then getting software programmers to work on amateur software and hardware. Soon after some programs appeared in the magazines, the airways were full of mini-computers and their proud operators.

C.w. is still alive. Even though a lot of you feel it is a waste of time, the urge is still there. Yes, it is embarrassing to admit that you have lost some of your code speed. You find it hard to keep up with a lot of those holding the same license class, and this is just a matter of "practice makes perfect." Now that the mini-computers have entered into the amateur radio shacks, along with some dedicated equipment, a number of amateur radio operators are venturing back into the c.w. mode. To those who say it is lazy (you have no talent for copying code when you use a computer or a video c.w. receiving device), I disagree. This is totally wrong for those people to think that visual c.w. makes a person lose their ability to copy by ear. On the contrary, it increases the operator's copying speed if he listens to the audio and watches the visual device at the same time. With video c.w., you are verifying the audio character along with the visual character. Somehow along the line, this is how you learned the code in the first place, using visual and audio. Indeed, this is a very good learning tool when used this way. If you increase the device speed to 100 w.p.m. or beyond your normal receive capability, or remove the c.w. character audio, then you gain nothing. As for helping your ability to send c.w., it may not help at all. Very few send c.w. anymore without a keyer of some type.

When it comes to the subject of interfacing mini-computers to our normal amateur radio equipment, the same question pops up, "Why does it cost more for the RTTY terminal unit than it did for my mini-computer?" There are a lot of computers being sold in department stores of all kinds nowadays. A good analogy of this was when the CB days first began and the number of buyers for these units outnumbered amateurs by far and the prices of CB rigs were about the same as that of a regular car radio. Since the RTTY terminal units are not being made for the greater population, but instead only for those interested amateurs, the manufacturers of amateur equipment have to share the high cost of low component count and labor with the amateur radio consumer.

Some of the mini-computers do not connect directly with amateur equipment and require some type of interfacing. The ideal way is to try to get as much into one box as possible without having to mortgage the home to pay for it. Of course, it would have to be dependable and made so that a change of mind does not mean there has to be a critical change to the equipment or a new piece of equipment bought to replace the one now in use. In other words, who wants to buy something that will be obsolete the day after he purchases it?

A newcomer to this type of operation (computerized RTTY and c.w.) has a very evident problem, the problem being an "unbiased opinion" as to what is best to purchase, or not having any guidelines to really follow and compare. No one likes to be embarrassed or admit that they were wrong, so personal opinions may not be the best source of information. Even guidelines are quickly made obsolete with the growing number of features within a mode of communication such as RTTY and c.w. In any case, advertising is an effective tool for selling products, and the "unaware" and "unfamiliar" amateur radio operator who is trying to get into these modes for the first time can be a victim instead of a satisfied customer.

What program should I buy for my computer? This depends on how serious you are about RTTY. There are the cheap programs that will get you by, and then more expensive programs that have all the bells and whistles. It is nice to have all the features, but for most RTTY newcomers, they may seem very complicated and hard to learn. Another problem is the

*607 Wabash St., Topeka, KS 66616

number of software programs you have to select from for your particular computer. Be sure to research whatever you decide to get. There are some unfortunate amateurs out there with blown computers from using some interfaces.

Do I need a mailbox operating program for my computer? No, you do not need this type of operation considering how many are already piled up on h.f. This type of system is a good way of keeping in touch with each other without the need for making schedules. There is an interesting drawback when getting involved in this type of system: someone has to volunteer their computer to be on line all the time. How many computers do you have to spare? I am sure if you were to call most of the mailbox stations on h.f. to contact the operators, you would find that most of them are unattended. Many times I have witnessed several of these unattended systems jam in transmit for hours before the operator appeared and discovered it. Some will come on and remind you that you are in QSO too close to their mailbox systems. Of course, the answer to this could be "How much did you pay for this portion of the band?" I am sure you will find that the FCC did not assign this frequency to be used by anyone any more qualified than yourself, and if it is clear of a QSO, you have all rights to use it. This type of operation is just like the s.s.b. nets that made me venture into RTTY in the first place. However, v.h.f. use of the mailbox programs does help you to keep in touch and meet new amateurs in your local area. You may find this type of system in your area and make good use of it.

What do I look for in an RTTY terminal unit? What features should I have? What computer should I buy? These questions come from those lost amateurs who are just venturing into the RTTY mode every day. To answer the computer question, buy one that you know has good hobby software programs available and is expandable. You should also be able to leave the computer printer connected while working RTTY and c.w. for hard copy. A lot of the small game computers will not have programs available for RTTY and c.w., or support printers while running RTTY and c.w. Of course, a lot depends on what you have in your shack and what you do intend doing with it.

One of the most important things you should first consider is the fact that RTTY is a "key-down" mode, and your transmitter should be able to handle this constant output power. Be sure you read your equipment manuals carefully, and make sure you do not exceed the levels it recommends. If there is no mention of RTTY within the manual, contact the manufacturer.

When shopping for an RTTY terminal unit, get picky. If a machine (TTY printer) is going to be used, make sure that the terminal unit has a built-in loop supply to run the machine. The most common supply needed for most of the older machines is a 60 ma (milliampere), and some of the newer variety take 20 ma. The term "loop" comes from having the printer selector magnets, keyboard contacts, and other devices you might have, such as a reperforator and tape distributor, connected in series so that any of these devices would break the circuit. Machines are not valued as much today, as there are a variety of speeds and modes of RTTY being used. A great number of ASCII machines have become available recently, and without an "ASCII to Baudot" converter, they are of very little use to the amateur. Most machines do not have gear shifts, but do have the capability of going at faster speeds. The fun begins when you have to change the gears, and they certainly are not available at the corner drug store. Be aware: 60 w.p.m. is still the most common speed used today, but some are using 75 w.p.m. and 100 w.p.m. Older machines do well on 60 w.p.m., but problems start when trying to run them faster. ASCII is being used on the h.f. bands, but the old 60 w.p.m. pace is what most RTTY amateurs use. In any case, you would want to make sure the terminal unit you buy has a loop supply with it to run these machines.

Computer RTTY has become very popular, and if you are going to take this route, then there are a few things you will have to consider. After you are sure you know there is a program and you get the computer, you then have to get a terminal unit that will not only interface to the computer, but also isolate it completely from all transmitter controls. It is very important that we do not attempt any direct connect from the computer to the transmitter without some protection.

It is a good idea to ask around and see what is being used with the same type of computer you have purchased. Compare notes with various operators; one may not want to admit he was wrong and may give you bad advice. There are some "fast buck" interfaces on the market that are not only discouraging for those operating them on h.f., but also are blowing computer I/O lines. There are some cheap terminal units on the market, and these poorly filtered units work well on v.h.f., but discourage the operators when working with them on h.f. For those persons who have never used a good quality terminal unit, these units seem to be fine until you compare notes later with others using the better grade equipment and enjoying better quality printing. Remember the saying "You get what you pay for!"

The two most popular levels of computer keying are RS-232C and TTL. It would be advisable to find a terminal unit that will interface to both types of levels in case you want to purchase a different computer in the future that requires the other type.

What about AMTOR, or some of the other various named modes being talked about today? Well, AMTOR is a good traffic-handling type of communication that works well for ship-to-shore and other commercial-type traffic handling. AMTOR is being used on at least one RTTY mailbox operated on h.f., mostly by those out of this country. This is okay if you wish to leave a message directed to an amateur station operated by another station's computer and be reasonably assured that the message will be correct. The message is then stored on tape, disk, or memory for retransmission at a later time when the amateur it was directed to calls for it. Of course, AMTOR can be used in QSO if the letter-perfect communication is desired.

AMTOR systems will keep repeating until they receive a valid character set. Even if you spelled something wrong, it still sends your errors. AMTOR does nothing for your misspelled words, and you are still subject to Mother Nature's band conditions. It is the general opinion that letter-perfect copy is not all that important in QSO-type operation, which most prefer to do. In any case, it would be an extra piece of equipment that sits alone in search of something with which to communicate.

If you plan on working with h.f. RTTY, you should think twice before buying a single-tone detection type of terminal unit, especially a PLL (phase-lock-loop) type unit. While they will do a good job on v.h.f., the PLL type is subject to noise, touchy input level, fading conditions, and ringing from QSB on h.f. Most of these types use chips that were made for landline services which never have to worry about bad band conditions. You would desire a TU which offers at least a three-stage, six-pole active filter for each frequency, and detects both tones on common shifts.

If you plan on trying some commercial listening as well as standard amateur RTTY and maybe MARS, then you need the ability to copy at least 170 Hz, 425 Hz, and 850 Hz shifts. Again, there is nothing like two-tone detection and good filtering. The ability to copy single tone, when odd shifts are present, would be handy to have. This can be accomplished with active filtering without the use of touchy PLL circuits.

Crystal-controlled AFSK units are far more dependable and drift free than tone-generator-type chips that depend on components to keep them stable. Here again, the tone-generator chips were designed with telephone-type communications in mind and they are usually not subject to a great deal of temperature change. If your rig has FSK built in, you will want to make sure you get a terminal that has this type of keying output. However, in most rigs with FSK it is hard to change from one shift to another, limiting the ability to change quickly. In the FSK mode, the rig usually limits you to a safe power output, switches in an RTTY filter,

and also offsets the frequency for pure transceive. Having both the AFSK and FSK outputs would have you covered on h.f., v.h.f., and u.h.f. RTTY operations.

If you plan on running program listings or long messages, the faster baud rates would be handy to have. The ability to transmit and receive up to and including 300 baud ASCII using 170 Hz, 425 Hz, or 850 Hz shift would be most desirable. Even if you think that you will never indulge in this speed, you may have a need for it later. Only a few terminal units available are capable of this speed using 850 Hz shift.

Indicators are handy if they are true indicators. There are units being sold that will indicate SPACE only in the absence of MARK, not really detecting a SPACE signal, just indicating SPACE because MARK is absent. What is the purpose of indicators if they do not represent the true status? If the MARK or SPACE signal is not present, then it is not indicated. This not only makes sense, but it helps when you tune-in a station. Of course, other indicators are handy, too, including power, RDA (receive data available to indicate when a valid signal is present and the autostart condition), and when in send. You can tell at a glance just what the terminal unit is doing at any time. If you prefer to use a scope for tuning, be sure these outputs are also available.

A preselector filter for 170 Hz shift h.f. operation is very handy for rigs that do not have filtering to offer when running RTTY in the s.s.b. mode. This will help keep those nearby stations from blanking out the station you are trying to receive. The ability to switch this filter in and out would be very handy.

If you would like to work some computer c.w., then you would require the unit not only to have the receive capability, but also the send capability. A 750 Hz, 3-stage, 6-pole active-filter type would be less frustrating to the operator than a PLL in marginal conditions. The output keying of this c.w. demodulator should be on the same RS-232C and TTL compatible lines as the RTTY keying. The Bi-polar PTT line could be used to key a c.w. key jack of a transmitter without using an external circuit or relay. Of course, you would require some type of tuning indicator.

There are times where a reverse shift would be handy, but not one that uses one control for both transmit and receive, or that switches one with no control over the other. Some terminal units have added only the ability to reverse the receive and not the transmit. Others have added the ability to reverse both at the same time. Separate controls for reversing either receive or transmit are very desirable for various reasons. There have been many operators who get on RTTY and transmit upside-down while receiving rightside-up. You will find the RTTY bunch generally very helpful in solving your problems. If this were to happen to you, then the ability to reverse either transmit or receive shift independently would be very handy. When copying commercial broadcasts, the reverse receive is a very handy control to have. In any case, you can use any combination you might need in order to make the contact.

Threshold control is very handy when working h.f. RTTY. This control, when set to where you like it, will probably never have to be changed again. This control allows you to set the threshold of the demodulator just above the noise level (QSB) to keep noise from randomly printing characters on the screen or printer. Basically, this works similar to an f.m. squelch control.

A Standby/Operate switch is handy when you wish to have the machine on and not copying from off the air, or when you just want to lock up the demodulator keying so it will not print a c.w. identification from another station. This control was used frequently by those running RTTY art to keep the random characters, caused by keying c.w. identification, from printing.

Autostart is a good feature when using a mechanical machine. It has very little purpose when using computer RTTY.

Anti-space and good mark hold circuitry is a must for enjoyable RTTY. When using a computer system, it helps keep garbage print off the screen. Most of the so-called "interfaces" probably will not include this type of circuit. When using a machine, it not only keeps random print from occurring, but also turns the machine on when only a space signal is received.

Construction plays an important part in what you buy. You will be dealing with r.f. within the shack, and a well-shielded terminal unit would certainly help. The terminal unit should have an all-metal case with bypass caps on all I/O's. All the features should be in one case and not strung out.

Prime parts are cheap insurance that you will have trouble-free service from the unit for years to come, along with well-marked boards, a complete set of schematics, and a manual that includes alignment procedure without having to send it back to the factory or requiring expensive test equipment to do the job.

Also, do not forget service. This is very important to everyone. Several of the most important questions for you to ask are what is the turn-around time and what is the rate? Can you get help from the service department on the phone? If they are not available at the time, will they call you back? The answers to these questions will help you decide which company to deal with, if they have the equipment and the features you want.

No matter what kind of unit is purchased, there is still a certain amount of knowledge required on the part of the buyer. The more information you have on what you are connecting, the easier it will be for you to tie it all together. No one likes surprises after they get the equipment home and find that it will not interface. Be sure you do not limit yourself by buying something that will be no good when you decide to up-grade or purchase other equipment. Not many companies, if any, have full knowledge of every rig or computer available to the amateur today. Some companies will refuse to give any assistance to those asking for help in connecting their units to other brand-name units, even if they know the answer. Most likely, you will not be able to get direct wiring information to interface everything together properly. It would be rare for most rigs and computers not to interface with just about anything available.

What you have in mind for now and in the future will make a difference in what must be purchased to satisfy your needs. This information should help you be a wise shopper and not waste your time, or money, on products that fail to meet your requirements. Okay, shopper, it's your decision and your money. Good luck! CQ

CQ REVIEWS: BY LEW MCCOY*, W1ICP

The Crown Microproducts ROM-116

Let me say at the outset, that when a person does many product reviews it is easy to become blasé, even with some of the new things that come along in our wonderful hobby. It isn't often that something really "turns me on" these days. I guess it's the penalty for being around a long time. However, when I started to play around with Crown's ROM-116 and read their wonderful manual, it definitely turned me on!

First off, the ROM-116 is an RTTY and c.w. operating system designed for use with the TRS-80[1] Model I or Model III microcomputer. It is a software/hardware system that can be used with any terminal unit or amateur equipment. It is designed to interface to any terminal unit. Therefore, the user can use his existing terminal or get one that has the features he wants or needs (I used the Flesher TU-170A). The ROM-116 software package permits the operator to use the TRS-80 as a terminal for operating RTTY or c.w. on the amateur bands. Either cassette or disk versions are available for the software (I tested both).

Several things turned me on about the ROM-116. First, as a writer I am always impressed when anyone does a good job of describing how to use their product. By a good job, I mean simple, easy-to-understand language. The manual that comes with the unit is 140-plus pages of very well written explanations—and it's fun to read. The problem in doing a review of this kind is that the program does so many things that it is practically impossible to cover even a small portion of it in any detail. However, I'll try.

The ROM-116 front panel has the power switch at the left, and just above an LED for showing power on and another LED for indicating when c.w. signals are correctly tuned. The unit measures 3" × 7" × 10".

What It Does

The ROM-116 takes decoded RTTY signals provided by the terminal unit, converts the decoded signals, and displays the information on your video screen. Also, it will translate code, c.w., providing a visual readout on the screen. More about this feature later. The program provides split-screen video display on the upper portion of the screen, and while this information is coming in, you can type in your replies or comments on the lower half of the screen. Brag tapes (!) can be typed and saved on cassette or disk for transmission at the proper time.

During unattended operation, the ROM-116 can save all received data on tape or disk. Then at your convenience, you can run the tape or disk and see what was said. Another cute trick is that the program can be set to save only the messages sent to you via the SELCAL (selective call) feature.

Fourteen buffers are included in the program. The main text buffer holds approximately 2500 characters in a 16K system. The size of the main text buffer is dependent upon the total amount of memory in a user's system. The main text buffer holds 18,500 and 34,500 characters in a 32K or 48K system, respectively. A general-purpose buffer holds 2000 characters for brag tapes, bulletins, etc. The remaining 12 buffers will hold up to 70 characters each. Two of these buffers are set up as callsign buffers, but they can be used for other things. The remaining 10 buffers can be used for CQ messages, contest exchanges, etc.

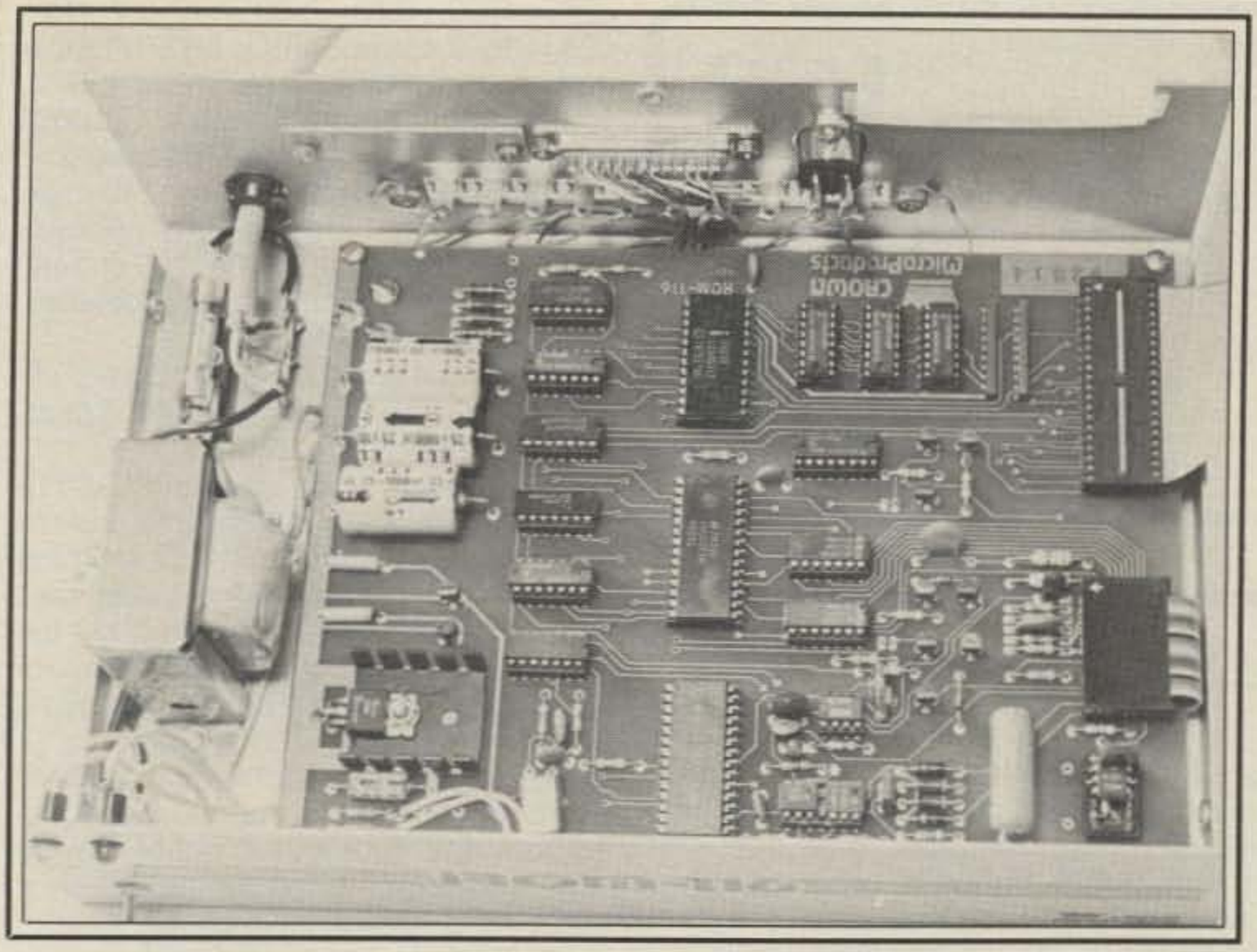
The ROM-116 contains a 24-hour real-time clock, the accuracy of which is determined by the frequency of the a.c. power line.

The program sends a CW/ID at the beginning of each transmission. The interval at which the ID can be sent is adjustable, from zero to 99 minutes, and is selected at the time of program initialization. The CW/ID is sent using full shift c.w., and when sent, it includes the date-time-group and callsign sent on RTTY at the selected baud rate. However, the sending of the date-time-group and callsign on RTTY may be eliminated during initialization if desired. If the **WRU** (who are you) is enabled, there are several commands available to all calling stations. In addition to activating your WRU to see if you are monitoring, they can, by using the proper command, turn on your transmitter and have your last transmission repeated or transmit the contents of the general-purpose buffer. A single cassette or disk contains all the software, which includes the complete RTTY and c.w. programs.

As mentioned above, there is an excellent c.w. program. The speed of the incoming c.w. signal is calculated by the program. The program will then automatically track the speed of the signal being received. As with RTTY, split-screen operation is available for c.w., so you can

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

[1]*Trademark of Tandy Corp.*



This is an inside view of the ROM-116. The power supply is at the left side of the chassis. Ports A and B are visible on the back.

pre-type your reply as you read what is being sent. On the front panel of the hardware unit is an LED which blinks when you have a c.w. signal tuned properly.

The software also includes an ASCII/Baudot driver routine. When this program is resident in the computer, the **LLIST** and **LPRINT** commands can be used to obtain hard-copy listings or printouts from BASIC. The listings can also be transmitted over the air. Before talking more about the software package, let's discuss the hardware.

The Hardware

The internal-view photograph of the cabinet will give the reader some idea of just how extensive the hardware package is. First, it is extremely well made. The circuit-board material is excellent, and quality components are used throughout. However, the instruction manual that I praised so highly is lacking in circuit information for the hardware, although there is an excellent parts list and circuit diagram.

The hardware circuit is designed primarily for handling the signals it receives from your TU unit or directly from the receiver. There are timing circuits, parallel to series communications chips, and so on. The weak point about the manual is that the operation of these chips is not explained. However, it can be said that the unit works and does its job extremely well. It has a built-in power supply powered from 117 v.a.c. The back of the cabinet has two ports (connectors) for use to interface to your station. Port A is a terminal strip with connections for keying transmitter, INT TU OUTPUT, RS-232 INPUTS and OUTPUTS, TTL INPUTS and OUTPUTS, CW RECEIVER AUDIO and GROUND. Port B has connections in parallel to Port A, but Port B uses a DB-25 female RS-232 type plug. Additionally, there is a two-terminal female 60 ma keying loop connector.

RTTY and C.W. Interfacing

The manual contains details for interfacing the ROM-116 to just about any type of RTTY equipment used these days. In my first tests, I tried using the ROM-116 without a terminal unit for copying RTTY. There are provisions for such connections. I was able to copy amateur RTTY, but not nearly as well as when using a TU. However, to copy c.w. one merely connects the receiver audio to the ROM-116 and copy is easy. I then tested the ROM-116 with a Flesher TU-170A terminal. RTTY copy was very good, and the unit worked much better with very low-level signals when using the terminal unit.

One question I am sure the average reader would ask is how good was the ROM-116 at copying c.w. Frankly, it surprised me. I spent several days going up and down the bands tuning in various c.w. signals, both bad and good fists, high speed and low, and got good copy out of about 90 percent of the transmissions. One doesn't need a TU unit for c.w.; the connection from the receiver audio is made directly to the ROM-116.

As mentioned above, the manual is very detailed on interface connections and covers just about any condition an amateur can dream up. The transmit control line for keying the rig is equipped with a 2N5655 which serves as a high-voltage keying transistor. The maximum keying ratings of the transistor are 250 v.d.c. at 500 ma. For RTTY operation, grounding the PTT line should put the transmitter into the transmit mode. For c.w. operation, grounding the c.w. keying line on the rig should place the transmitter in the transmit mode.

The Video Screen Display

When the disk or cassette is loaded into the computer, a video display of information is set up on the screen. Several questions are asked of the operator, which when answered, put the program in operation for either RTTY or c.w., depending on which is loaded in. Fig. 1 is a drawing with this display, plus the first operator prompt is shown at the bottom. The first question asked is the Line Printer Baud Rate and Line Length to be used. When this is answered, the next prompt is for CALLSIGN/SELCAL, which is followed by Transmit Line Length (30–99/Diddles? (0-99). After that comes CW-ID Control, then the Month/Day/Year/Time-Zone/Time/50 Hz, and then the prompt, "Hit any key to start."

The status line, the vertical column of information at the right of the screen, must be initialized. The first line is the desired RTTY baud rate being sent or received, and these rates include 45.45, 50, 56.88, 74.20, 110, 300, 600, or 1200 baud. The second line displays the current RTTY mode being used. AUTO line

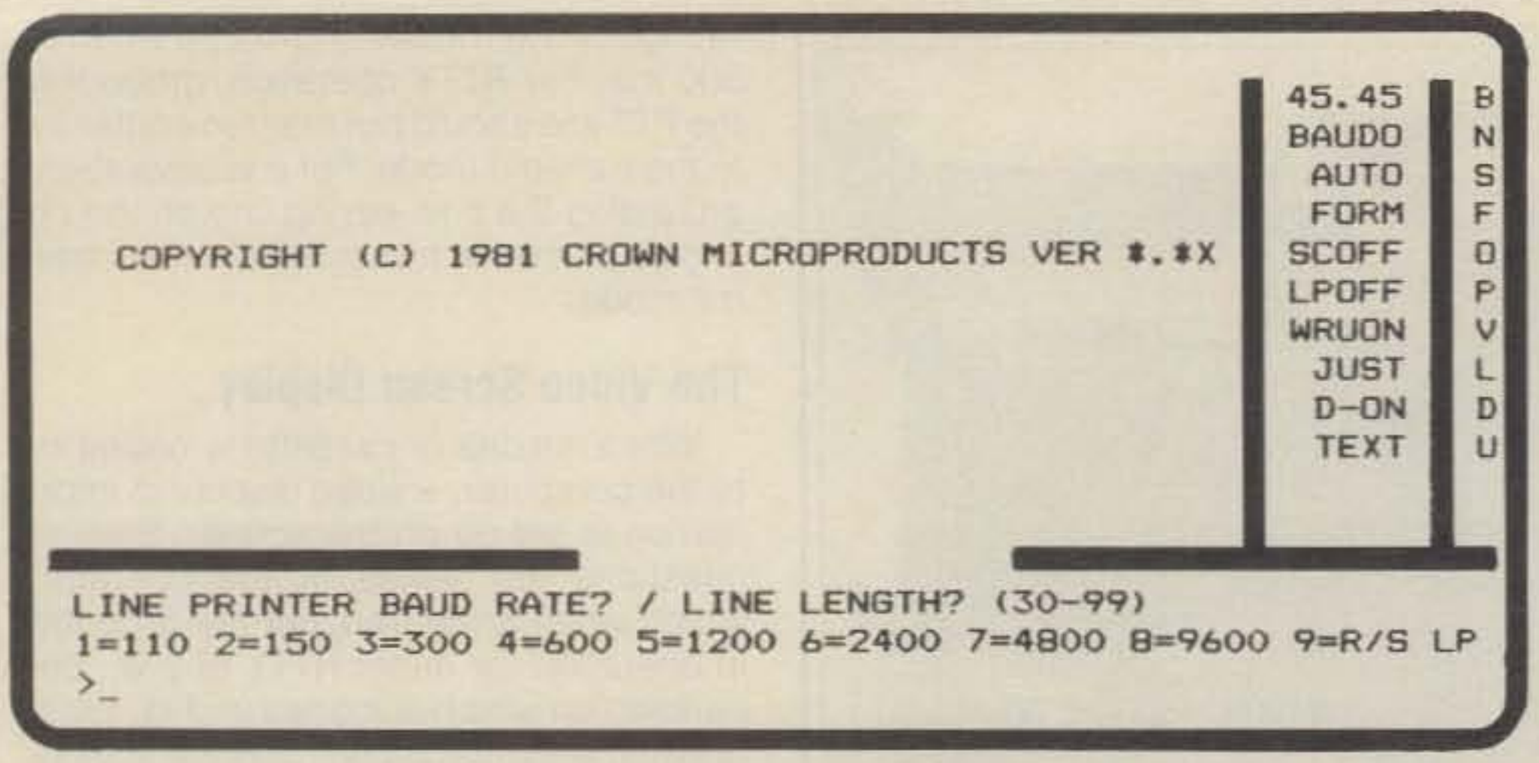


Fig. 1– This drawing shows the appearance of the video screen when the software is initiated. Details for the various lines of information are given in the text.

displays how the output speed is being controlled. Line 4 displays the current video formatting, and Line 5 shows the condition of the SELCAL mode. The next line displays the condition of the output to the ASCII line printer. Line 7 is the status of the WRU feature, and Line 8 is right margin conditions. The next line (9) shows Diddler conditions, and Line 10 displays whether you are in the TEXT or PIX mode. Line 11 has the number of characters in the buffer being used, and Line 12 displays the current program mode. Needless to say, these features are described in considerable detail in the manual.

Additional Software

It is important to mention in this review of the ROM-116 that Crown has additional software available that works with the unit. These include "MAILBOX," "DUPER," "MODEM," and "LOADHEX." This software is sold separately from the ROM-116. A brief description of each of these items will provide the reader with information about what the software can accomplish.

The **MAILBOX** program can be thought of as a post office. If someone wants to receive mail at the post office, he is required to go to the post office and fill out an application. After being issued a post office box number, any mail for the box owner would be placed in the box for that person.

That is almost the way MAILBOX functions. If someone wants to receive a message via the MAILBOX, he must first contact the control operator and ask that his callsign be placed in the mailbox directory. Once the callsign is entered into the system, messages can be left in the mailbox for that callsign. Multiple messages for an individual call are maintained in a single disk file. There is only one disk file per call in the directory. MAILBOX will work with cassette or a single-drive, 32K system, but a 48K dual-drive arrangement would be better. Again, as with the ROM-116, the instruction manual provided with MAILBOX is very good and covers much more detail than is possible in this review.

The **DUPER** software program, also available for TRS-80 Models I and III, can be had in disk or cassette form. I believe I mentioned this before, but if not, all of the Crown software is available in disk or cassette for both models. DUPER is somewhat like the name implies, but it is not just a simple program for checking dupes. In addition to being useful in contest work for checking dupes, the program can be used by net-control stations or traffic handlers for keeping a record of check-ins, their locations, and traffic handled as well. Also, it will maintain your DX lists, including "wanted" stations. Keeping five-band DX records are a cinch with the system. Working for All States? Here again the system is valuable. In addition to its high speed for look-ups, it will handle a large volume of entries, depending on the size of your system: for example, cassette for six characters per entry, such as WB1ICP, 16K = 2100 entries, 32K = 4200, 48K = 6300, and with disk, 32K = 3800 entries, 48K = 6200. If larger entries are used, such as "W1ICP, 20M, 1650Z, 7/30/83, Silver City, NM" DUPER would handle less than stated above. The example just quoted runs about 40 characters. For 60 characters, 32K disk will handle 440 entries, and 48K, 700 entries. Again, the instruction manual is detailed, simple, and excellent.

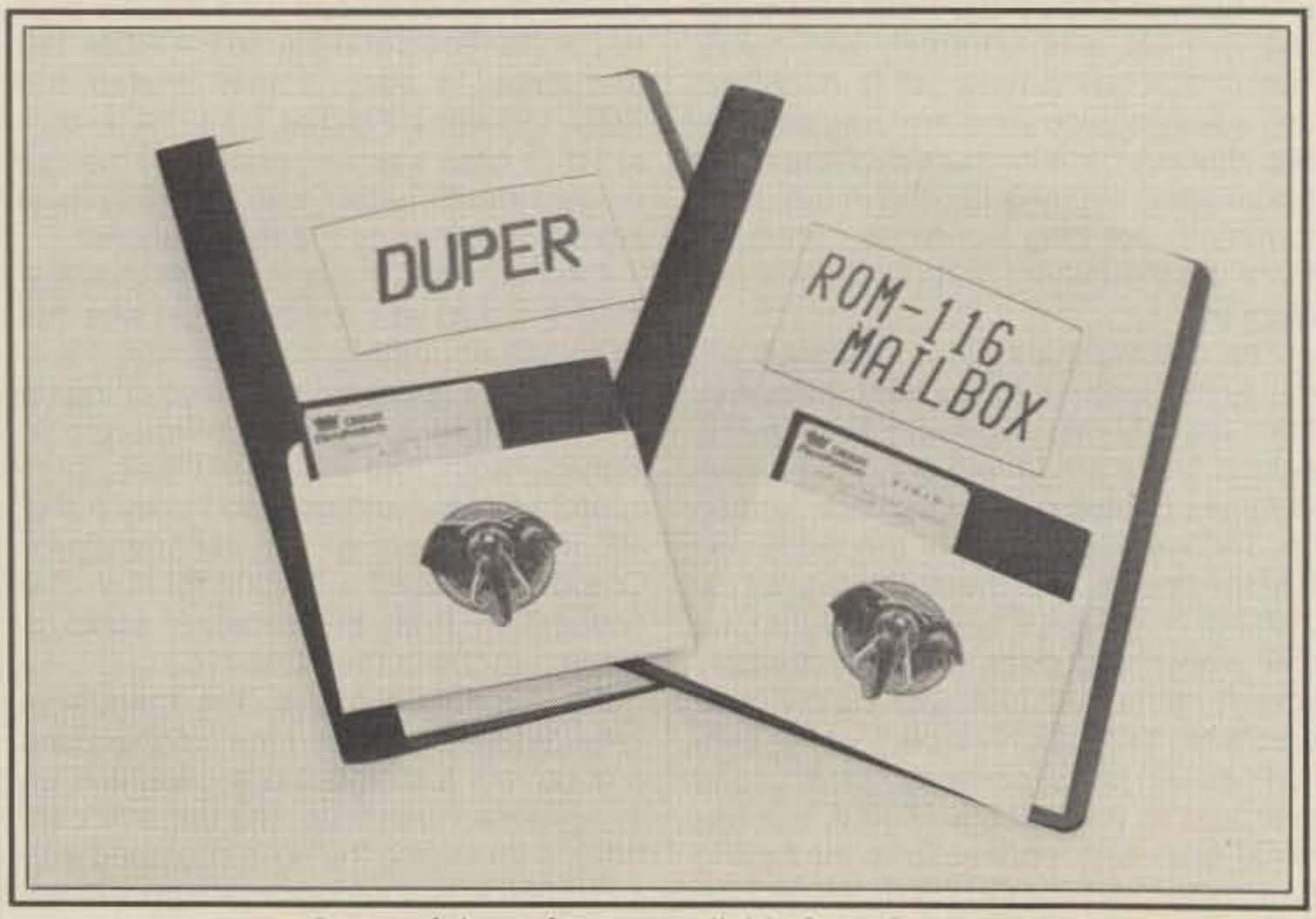
The **MODEM** program allows communications over the phone lines with a modem connected to port B of the ROM-116. Data received via the modem/ROM-116 is displayed on the computer system screen. In the half-duplex mode anything typed on the local keyboard is displayed on the screen and transmitted by the modem. In full duplex mode the data typed is not displayed, but is transmitted by the modem only.

A buffer is provided for storing received data or transmitted via the modem or loaded from disk. Data in this buffer may be saved to disk, printed on the line printer, or transmitted through the modem.

LOADHEX is a conversion program that converts hex programs to ASCII. The program then has provisions for transmitting any of your files over the air (ASCII) to another station. The program is used in conjunction with the ROM-116.

Conclusions

From my own experience with RTTY, I would say that the ROM-116 just about does it all. The unit was designed by two very knowledgeable amateurs, Gary Martin, W7XT, and Craig Larsen, WA7HTN, who appear to know what amateurs want. They own the company and are willing to help anyone interested in getting into RTTY or upgrading their equipment. Price class for the ROM-116 is $325. The unit is marketed by Flesher Corporation, P.O. Box 976, Topeka, KS 66601. FDJ



Some of the software available from Crown.

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Good ideas are not necessarily complicated or expensive. NA7K comes up with another antenna project—a circular polarized array for listening to and perhaps working the orbiting space shuttle.

The Turnstyler

A Circular Polarized 2 Meter Antenna

BY DAVE PLANT*, NA7K

The "Turnstyler" is an easy to duplicate circular, polarized, self-supporting array developed by a group of amateurs in the northwest. Our challenge was to attempt to improve on the classic turnstile antenna to try to hit the upcoming orbiting space shuttle and other space objects.

The classic turnstile consists of two horizontal dipoles crossed at their centers and fed 90 degrees out of phase so they do not interfere with each other. The dipoles, each sharing power, gave a horizontal omnidirectional pattern that was valuable in previous v.h.f. work. Horizontal polarization does result in less reception of man-made QRN. Also, there is an "edge effect" that does appear to benefit horizontal polarization somewhat more.

The interest in the turnstile antenna has returned because circular polarization is valuable in space communication. Fig. 1 shows the basic configuration of the two dipoles. Dipole "A" gets fed. Dipole "B" then gets its half, 90 degrees later. The arrow shows the direction of activity. Conventionally, the direction of the arrow has been controlled by mechanically changing the array or switching the feedpoint connections. This is where KA7AEF suggested we attempt to find a simple mechanical method to turn the driven elements upside down. The analogy is taking fig. 1 and looking at the circular arrow from the other side. It does go from ccw to clockwise.

Mechanical Considerations

The solution was to create a turnstile arrangement that could be reversed. The problem was reversing everything. The answer was to create a driven section that could be reversed at will, yet have a dedicated reflector that would keep its reflected pattern, encouraging upward transmission. Fig. 2 shows the solution. The reflectors are part of the mast and always stay in position. The upper driven element section can be reversed at will, depending upon which circular polarization makes best copy. A good test of this is that typical QSB type sound is reduced measurably.

The author takes the Turnstyler out for a mobile run.

Looking at the photographs, a small mini-box is shown. The author used this to tie the matching section of 50 ohm coax to whatever direction of the Turnstyler was headed downward. PVC was used primarily to keep the cost down to about $5.00 and because it was readily available.

Performance

It was a sunny August day when the bottom line was checked. KA7AEF brought his multi-mode 2 meter rig, a Daiwa s.w.r. bridge, and a 200 watt out class AB2 power amplifier. The author also had on hand a Bird model 43 and a pair of 4X150A's. The computer said that OSCAR 10 (Phase 3B) was in sight, and we went shopping for it.

Richard found the beacon signal tumbling away, and we reversed the "sense" of the Turnstyler and copied several states far removed from our northwestern Washington state locale. Not yet convinced, Richard, KA7AEF, brought in a wide-spaced 11-element array and a 3-element job. My wife, Carolyn, watched us fit his antenna gear through the house to the back porch and was polite enough not to ask why two grown men were doing such a silly thing.

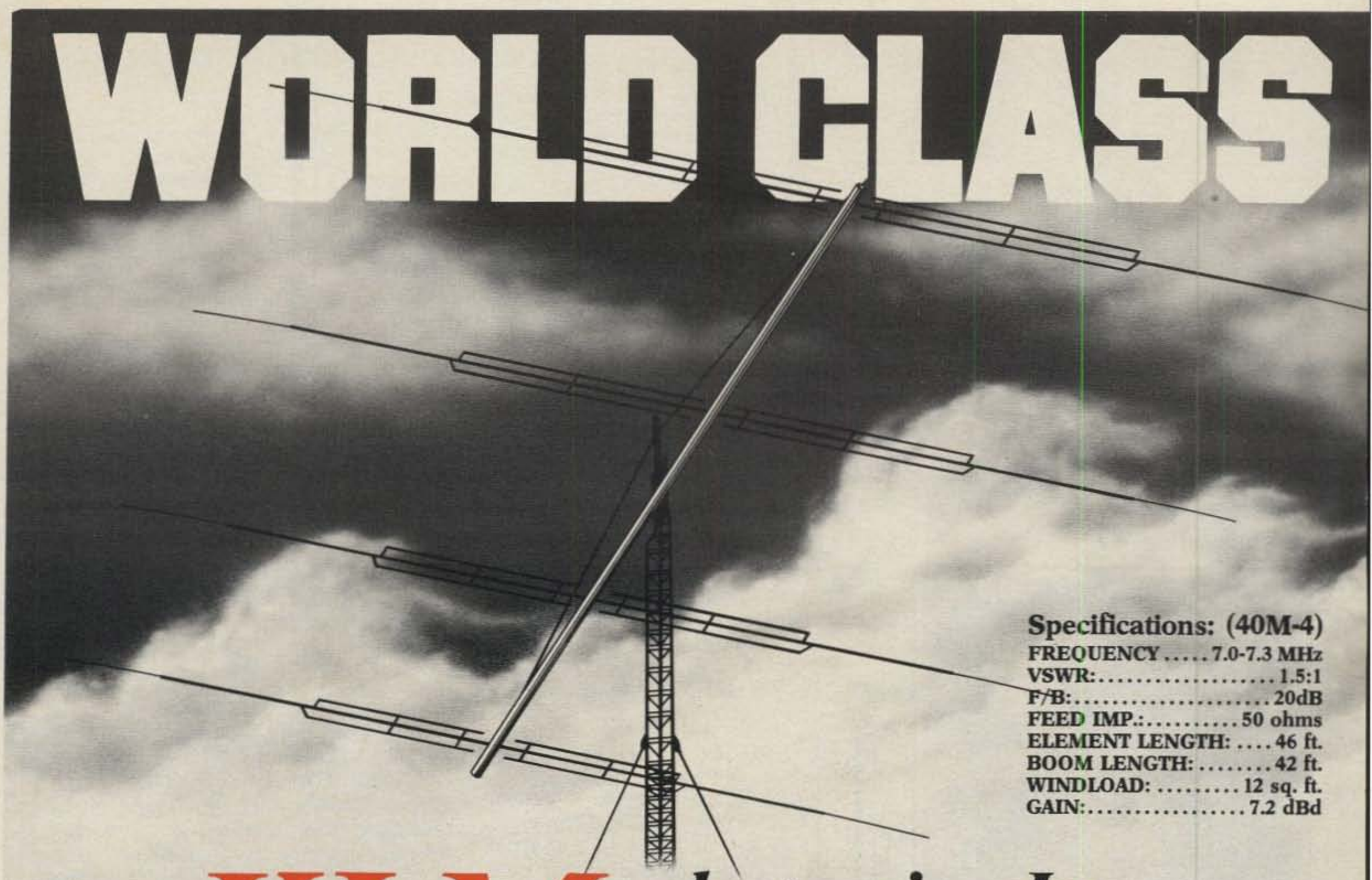
The next test was running 200 watts into the thing and checking s.w.r. The Turnstyler was happier at 144.5, and a hacksaw was necessary to take off a quarter inch on the driven elements. At the 200 watt level the s.w.r. was flat using good-quality RG59/U.

Final Thoughts

In conclusion, we learned as we followed OSCAR 10 down to the horizon that

*10811 NE 143, Kirkland, WA 98033

WORLD CLASS



Specifications: (40M-4)
FREQUENCY ..... 7.0-7.3 MHz
VSWR: 1.5:1
F/B: 20dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 46 ft.
BOOM LENGTH: ..... 42 ft.
WINDLOAD: ..... 12 sq. ft.
GAIN: ..... 7.2 dBd

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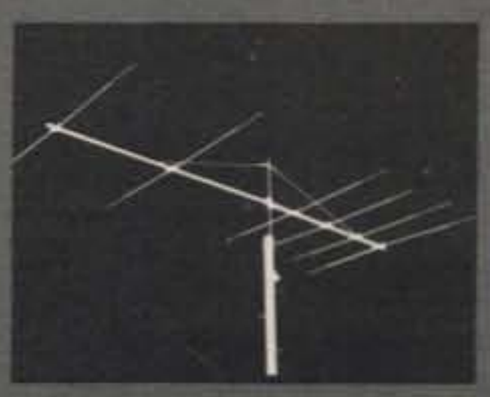
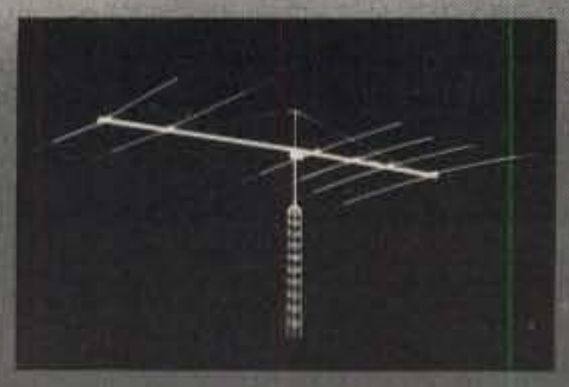
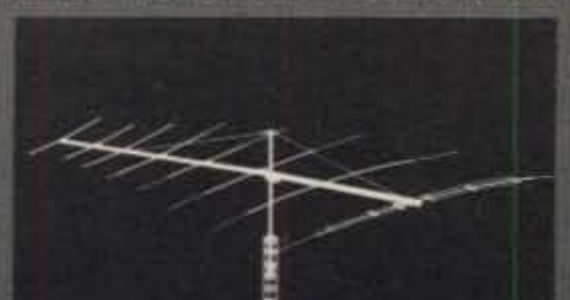


Specifications: (20M-6)
BANDWIDTH: ... 13.9-14.4 MHz
VSWR: 1.5:1
F/B ..... 35 dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 37 ft.
BOOM LENGTH: ..... 57 ft.
WINDLOAD: ..... 12.8 sq. ft.
GAIN: ..... 11 dBd



Specifications: (30M-3)
BANDWIDTH: ... 10.1-10.150 MHz
VSWR: 1.5:1
F/B ..... 20 dB
FEED IMP.: ... 50 ohms unbal.
ELEMENT LENGTH: .... 35'6"
BOOM LENGTH: ..... 24'3"
WINDLOAD: ..... 7 sq. ft.
GAIN: ..... 7.0 dB



Specifications: (15M-6)
BANDWIDTH: ... 21.0-21.5 MHz
VSWR: 1.5:1
F/B: ..... 30 dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 25 ft.
BOOM LENGTH: ..... 36 ft.
WINDLOAD: ..... 8.5 sq. ft.
GAIN: ..... 10.5 dBd

Specifications: (7.2/10-30-7LPA)
BANDWIDTH: . .7.2/10-30 MHz
VSWR: ..... 2:1 typical
F/B: 10/15
FEED IMP.: .... 50 ohm unbal.
ELEMENT LENGTH: .... 46 ft.
BOOM LENGTH ..... 42 ft.
WINDLOAD: ..... 12 sq. ft.
GAIN ..... 3/7 dBd typical

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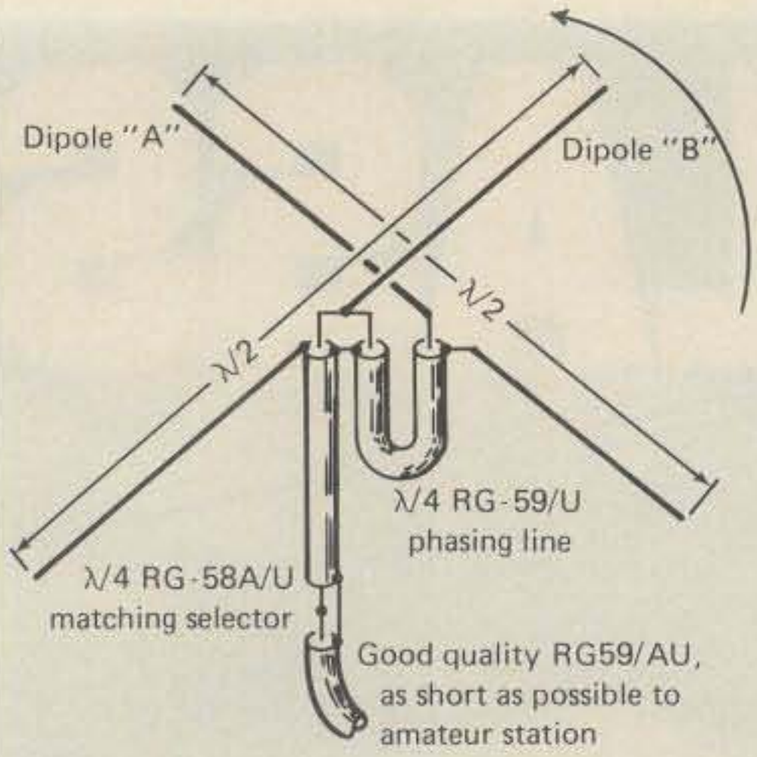
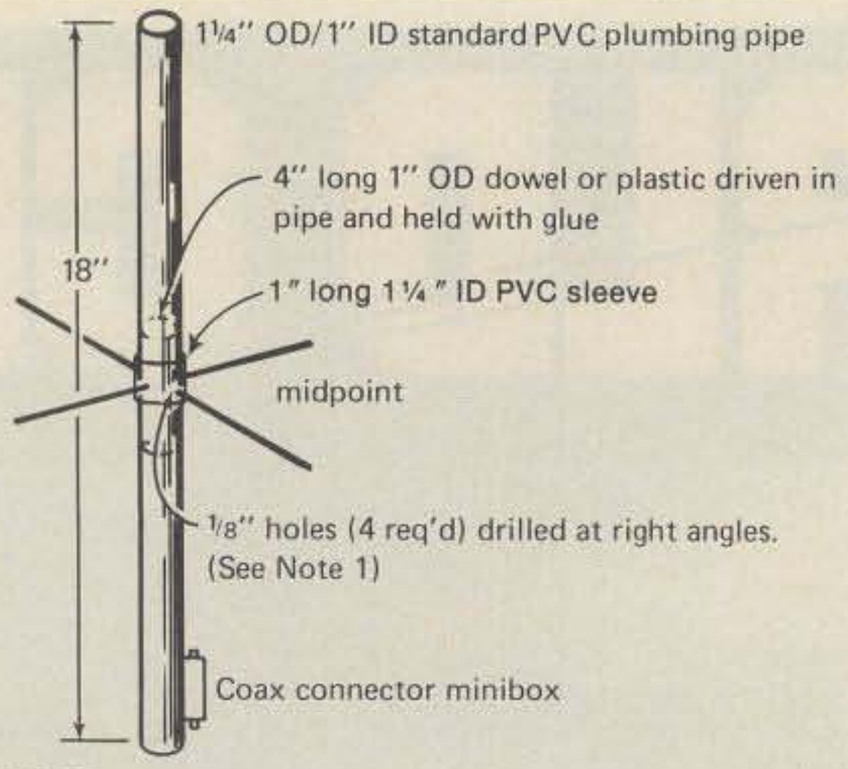


Fig. 1– The electrical configuration for the driven elements of the Turnstyler antenna. As mentioned in the text, the circular arrow shows the circular "sense" of the antenna when constructed in this manner.



NOTE:
1. These holes are then tapped to accept 8-32 threaded rod. The rods are threaded in and locked into place with nuts. Additional washers are added to fit the feed and phasing lines and secured with washers.
2. Driven rods are all 19" long.
3. Upper turnstyler is reversed to change sense

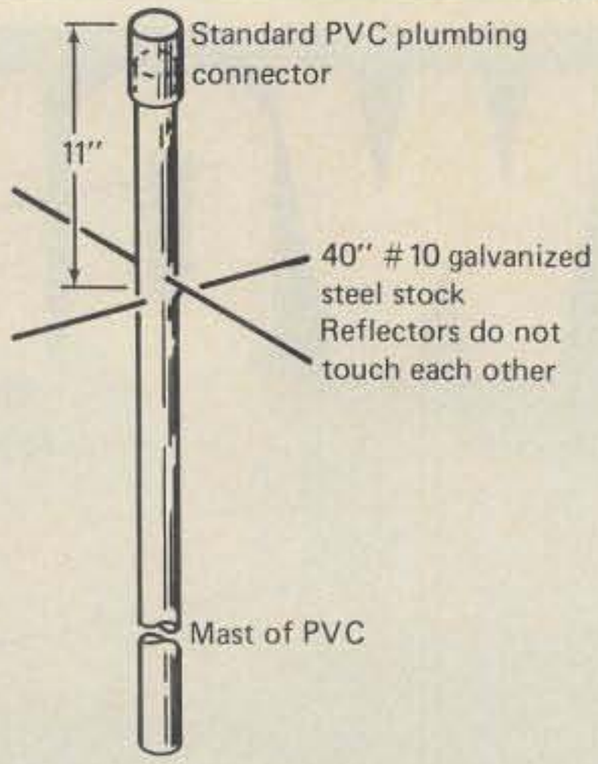
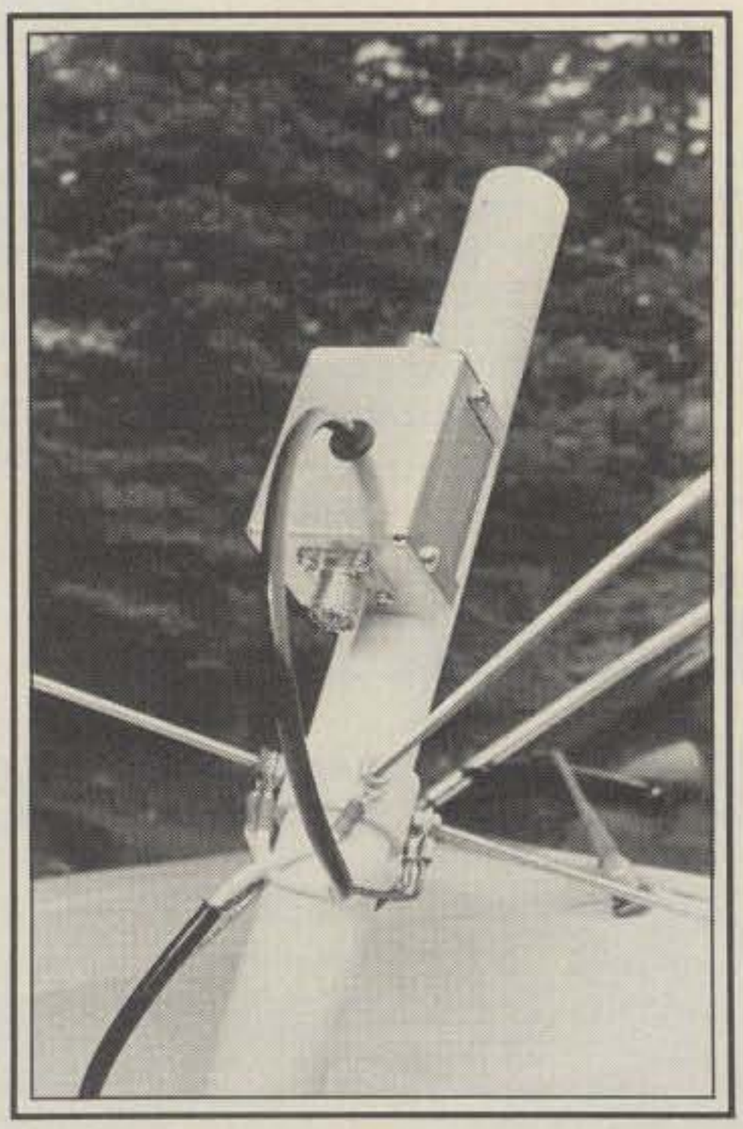


Fig. 2– Mechanical details for constructing the Turnstyler antenna. The minibox contains only two SO-239 connectors in parallel, with the RG-58 A/U quarter-wave matching section connected—through a grommet—to them. There is no electrical significance to the box.



Close-up view of the 8-32 threaded rod assembly. The four rods are cut to 20 inches and then trimmed back via fine tuning. Make sure that the four rods do not make contact within the PVC and internal dowelling.

Fig. 3– Mechanical details for the phasing and matching leads. Be sure to avoid reversing the center conductors and shield leads when attaching these lines to the driven elements.

nearby trees greatly absorbed the signal. However, for most applications where the bird is overhead, and as the next space shuttle passes overhead, a simple unobstructed location on the house roof or in the backyard seems to work fine. We also learned that the spacecrafts do indeed change "sense." My guess is that the Faraday matter has something to do with that.

As I mentioned earlier, many amateur operators were involved in this project. Richard, KA7AEF, came up with the driven-element reversal to change circular "sense." John, N7AHX, developed the method of attaching the driven elements to the reversible PVC section. Howard, W7GFU (my father), came up with the idea of keeping the reflectors separate. Ivory, N7CHN, took the photographic responsibility. John, WA7HEE, loaned test equipment. Jim, W7SFX, provided the necessary theory. Last, but not least, Bob, K7ZBF, provided encouragement and chained this writer to the wordprocessor until the job got done.

The 2 meter and 450 MHz gear was provided by ICOM, and Cushcraft provided the 450 MHz uplink antennas. Turnstyler is now trademarked by Benchmark Research, Inc. CQ

Ivory, N7CHN, is shown examining the phasing section of the driven assembly. Ivory took the photos of the project.

MFJ RTTY / ASCII / CW COMPUTER INTERFACE

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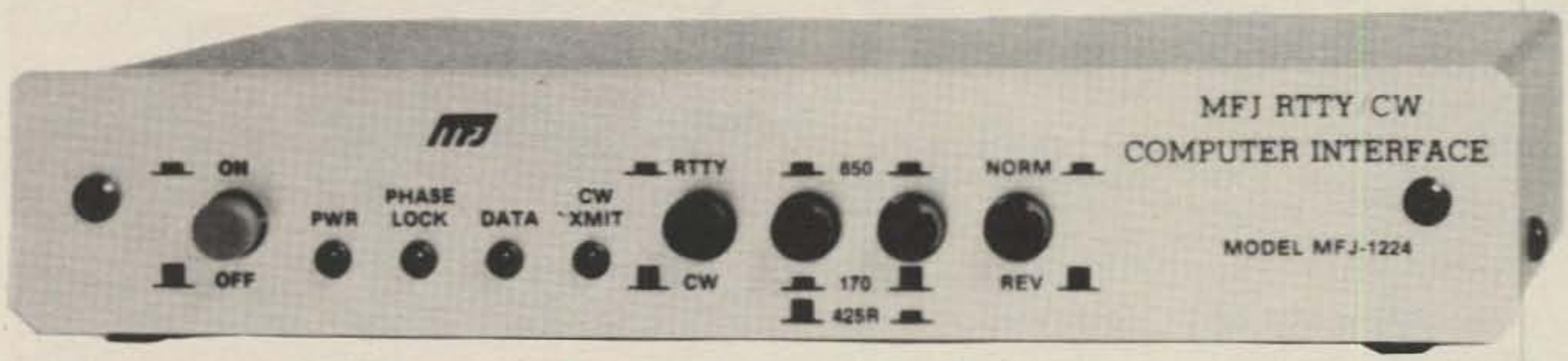

- *Copies on both mark and space tones.*
- *Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.*
- *Uses Kantronics software and most other RTTY/CW software.*

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Once tuned in, the interface allows you to copy any shift (170, 425, 850 Hz and all shifts between and beyond) and any speed (5 to 100 WPM on RTTY/CW and up to 300 baud on ASCII).

Copies on both mark and space, not mark only or space only. If either the mark or space is lost the MFJ-1224 maintains copy on the remaining tone. This greatly improves copy under adverse conditions.

A sharp 8 pole active filter for 170 Hz shift and CW allows good copy under crowded, fading and weak signal conditions. Uses FET input op-amps.

An automatic noise limiter helps suppress static crashes for better copy.

A Normal/Reverse switch eliminates retuning while stepping thru various RTTY speeds and shifts.

The demodulator will even maintain copy on a slightly drifting signal.

A +250 VDC loop output is available to drive your RTTY machine. Has convenient speaker output jack.

Phase continuous AFSK transmitter tones are generated by a clean, stable Exar 2206 function generator. Standard space tones of 2125 Hz and mark tones of 2295 and 2975 Hz are generated. A set of microphone lines is provided for AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying is provided for transceivers with FSK.

High voltage grid block and direct outputs are provided for CW keying of your transmitter. A CW transmit LED provides visual indication of CW transmission. There is also an external hand key or electronic keyer input jack.

In addition to the Kantronics compatible socket, an exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. The following TTL compatible lines are available: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

For example, you can use Galfo software with Apple computers, or RAK software with VIC-20's. Some computers with some software may require some external components.

DC voltages are IC regulated to provide stable AFSK tones and RTTY/ASCII/CW reception.

Aluminum cabinet. Brushed aluminum front panel. 8x1¼x6 inches. Uses 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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In addition to the Kantronics compatible socket, a general purpose socket provides RTTY out, RTTY inverted out, CW out, CW inverted out, ground and +5VDC for interfacing to nearly any personal computer with most appropriate software.

Audio in, speaker out jacks. 4½x1¼x4¼ in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

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CIRCLE 72 ON READER SERVICE CARD

W6XM comes up with a little gem of a construction project. Comb your junk box (and anyone else's) to build this worthwhile addition to your RTTY station.

Build An RTTY Oscilloscope Monitor

BY ED MARRINER*, W6XM

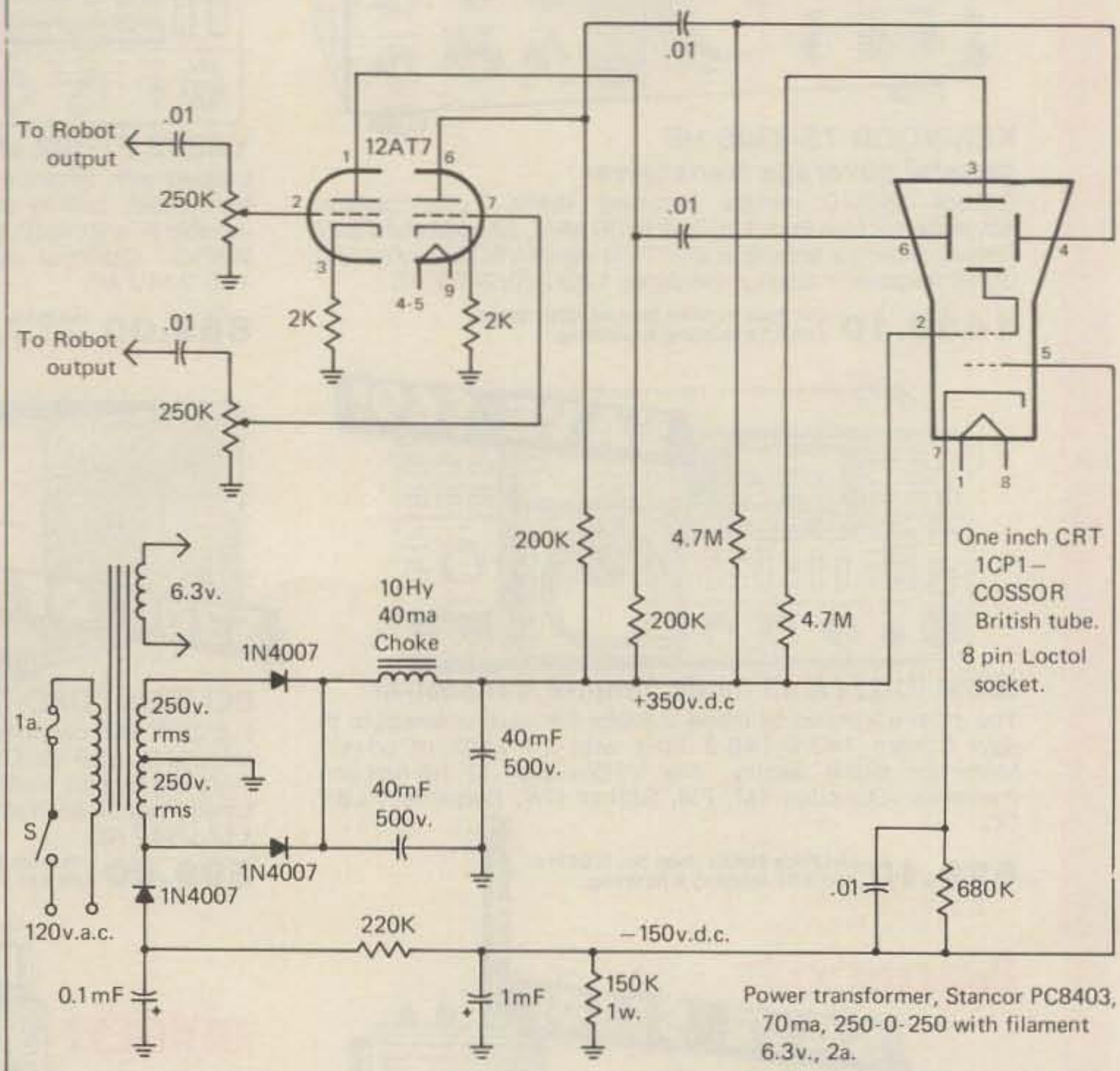


Fig. 1– The RTTY oscilloscope monitor. Check a local fleamarket or hamfest for parts.

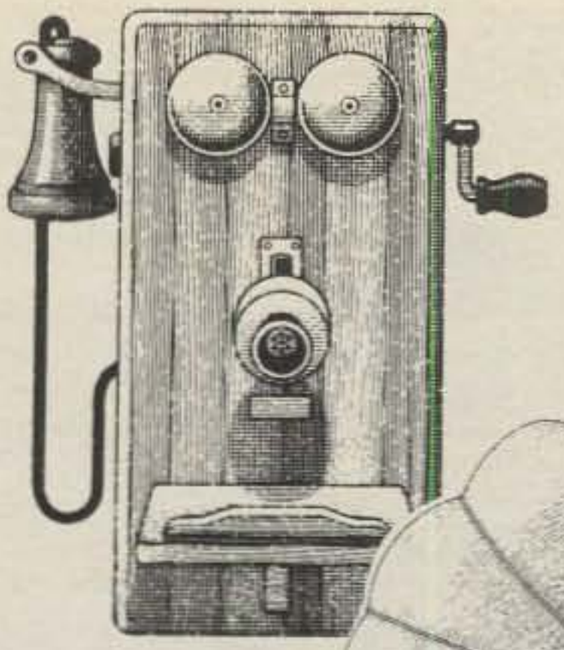
Tuning RTTY signals using a tuning bar such as that on the Robot 800 can be difficult. A much easier method is to use an oscilloscope and tune for the cross trace of the mark and space. There are two outputs on the back of the Robot RTTY for an auxiliary oscilloscope monitor. Most of the oscilloscope monitors are expensive. However, if you can find the parts, a monitor is easy to build. I understand the 1 inch tube is no longer made, but there are some advertised surplus. I found a British 1CP1 made by Cossor in England at a radio swapmeet. I was lucky! The 8-pin loctol tube socket was found on the dusty shelves of a local radio store, a holdover from the old tube days.

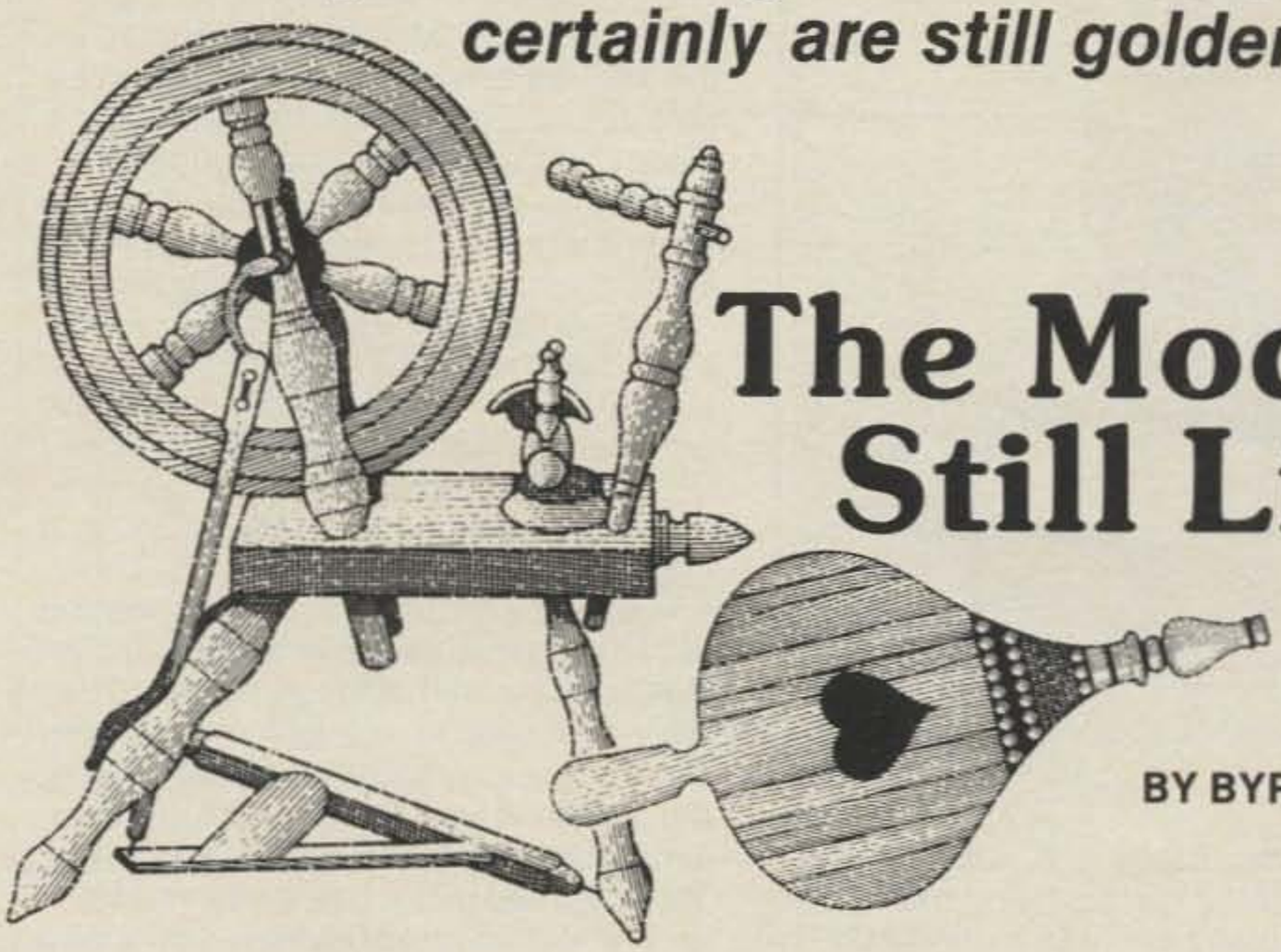
While finding the parts was difficult, this monitor has made RTTY tuning a pleasure, and a glance will tell if you are on the proper shift of 170 or 850.

Perhaps someone has a better idea for a monitor, but I have not seen any circuits. With the popularity of RTTY, a simple monitor such as this does not take up very much space on the operating desk. It was built on a 5" × 9" chassis using a minimum of parts, because there are no centering or focus controls.

*528 Colima St., La Jolla, CA 92037

RTTY need not be expensive. You can get your feet wet for very little money and a little bit of effort by taking advantage of some golden oldies that certainly are still golden.





The Model 15 Still Lives!

BY BYRON KRETZMAN*, W2JTP

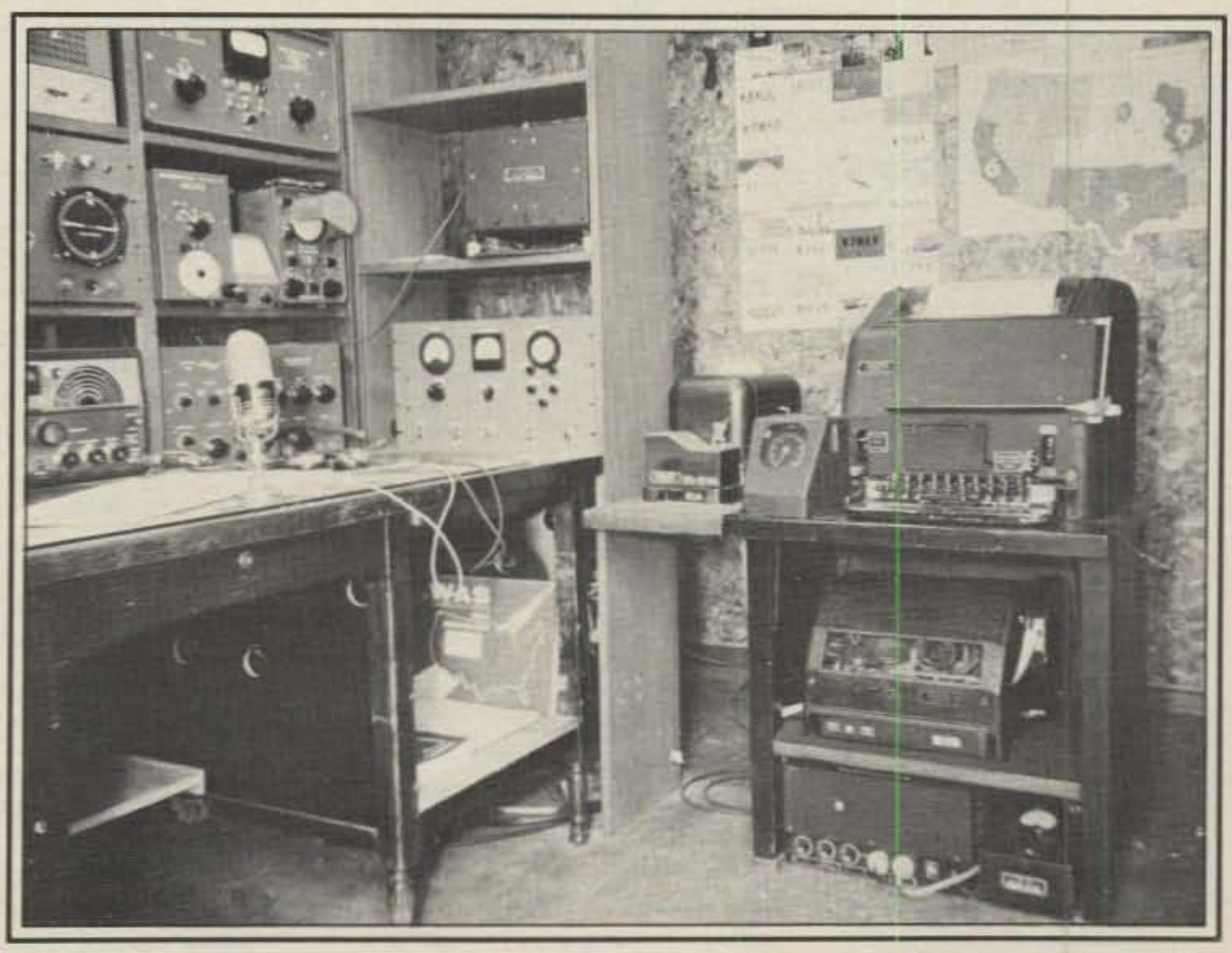
In amateur radio, RTTY (radioteletype) has evolved in the past 25 years or so into an apparently highly sophisticated, and expensive, facet of our hobby. Picking up any amateur radio magazine, one gets the impression that the RTTYer of today sits before a computer keyboard and video screen, both connected to a complex combined interface, terminal unit (TU) and AFSK oscillator (modulator) connected in turn to the latest all-band, all-mode transceiver. No clanking Teletype[1] machine is in evidence. Well, it ain't necessarily so, to paraphrase George Gershwin.

Actually, there are still a substantial number of RTTYers still using old Model 15, 19, 26, and 28 machines. Like the automobile fascination to many teenagers, there is a large fascination to a good number of amateurs in getting one of those old machines to perform on the air. And, those of us with limited means, especially for amateur radio, have discovered that Model 15 machines are available at fleamarkets, club auctions, and in the basements of amateurs who never quite got around to setting them up, and now getting ready for retirement moving, must clean out that basement. These machines, in particular the Model 15, can be had for peanuts, or just for the asking in some cases. The required electronics, the TU and the AFSK oscillator or frequency shifter, can indeed be simple and easy to build as we will subsequently show, and, most important, without a large outlay of cash.

TTY Basics

It is desirable to understand the basics of teleprinter operation. Its d.c. signaling circuit is similar to the old telegraph make *(mark)* and break *(space)* system now synchronized indirectly to the 60 Hz line. It is this d.c. circuit, called the "local loop," which we must connect to a terminal unit (TU) and modulator, or frequency shifter, to receive and send RTTY. Not too long ago an article appeared in *CQ* which detailed the basics of the local loop.[2] It is suggested that this be read first if you intend to hook up a machine.

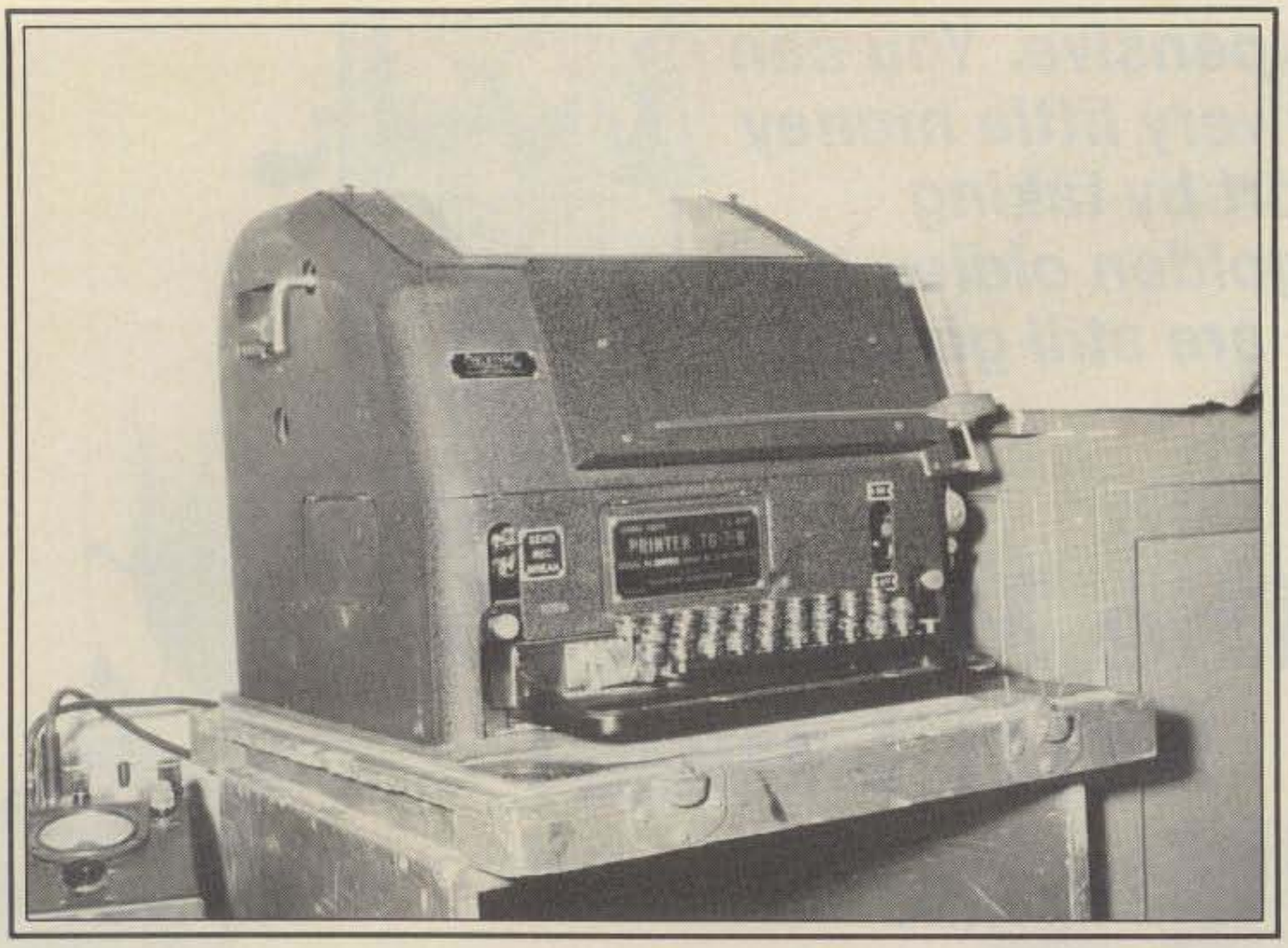
The Model 19 at K9CNG.



**431 Woodbury Road, Huntington, NY 11743*

[1]*Trade name, registered, of the Teletype Corporation.*

[2]*Kretzman, B.H., "The RTTY Local Loop," CQ, July, 1980, p. 28.*



The TG-7B, the military version of the Model 15 teleprinter.

Amateur RTTY Standards Today

On the h.f. bands—80, 40, and 20 meters—the r.f. carrier is shifted back and forth between *mark* and *space* 170 Hz. This is called frequency shift keying, or FSK, and it is F1 emission. The baudot code is in general use and the speed is the nominal 60 w.p.m. On the v.h.f. bands, 6 and 2 meters being most popular, audio tones are used to modulate the transmitter which could be f.m. or a.m. with 2125 Hz *mark* and 2295 Hz *space.* This is called AFSK, or audio frequency shift keying. It is F2 emission if an f.m. transmitter is used, and A2 if an a.m. transmitter is used. Likewise, the baudot code and 60 w.p.m. are most common.

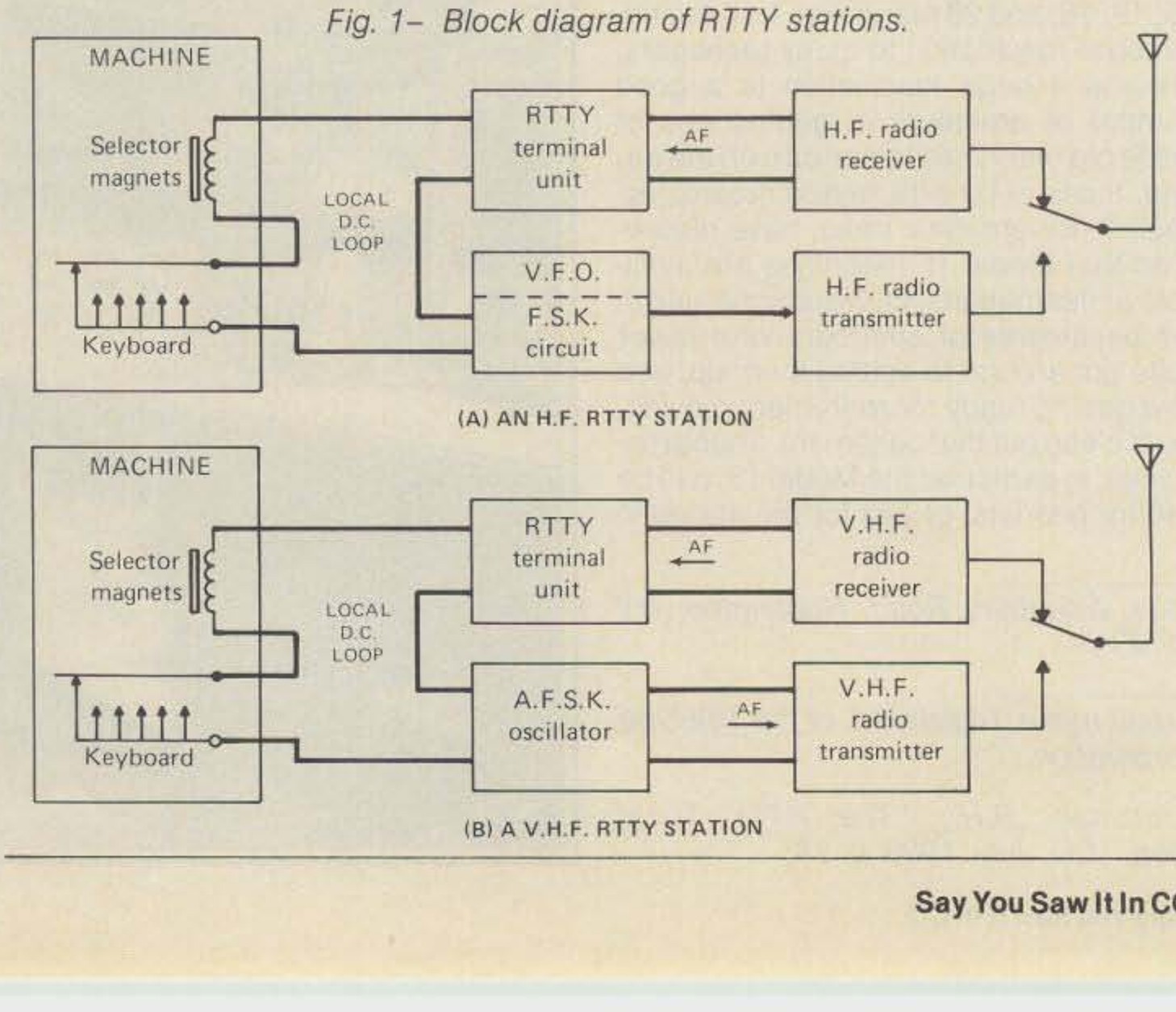
On 80 meters, RTTY will be found around 3620 to 3630 kHz. On 40, RTTY will be found just below 7100 kHz. On 20, RTTY will be found just below 14,100 kHz. On 6 meters, the "national" RTTY frequency on f.m. is 52.6 MHz, and on 2 meters the "national" RTTY frequency on f.m. is 146.7 MHz. This was agreed upon years ago, and many RTTY repeaters across the country use 146.1 in and 146.7 out. In some areas, where a wide-area phone repeater is in operation on 146.7, other frequencies have had to be found (146.55 in the Long Island, NY, area, for example).

The Model 15 Machine

The Teletype[1] Model 15 teleprinter, on the XRT table, is probably the most available today. The Model 19 is actually a Model 15 page printer and keyboard mechanically linked to a perforator to enable the preparation of punched tape from the keyboard (not from an incoming receive circuit). Either on the same table, or adjacent, is a Model 14 Transmitter-Distributor (TD) which is used to send from the tape perforated. A heavy power supply, RE-6 or WE KS-5928, fits under the table. A military version of the Model 15, in a transportable case, is the TG-7B. This is similar to the more available commercial versions but has selector magnets requiring 60 ma instead of the strappable 20 or 60 ma choice in the commercial versions. Also, the motor of the TG-7B is of the governed type, whereas the commercial version has a synchronous motor. The governed motor has strobe marks on its flywheel which are observed through a special aperture tuning fork while adjusting the speed.

The commercial version of the Model 15 frequently has a polar relay inside the cover. This is seldom used on amateur RTTY. Direct connection to the selector magnets is then made with a minor change in wiring as shown in fig. 2. The red plug then provides access directly to the selector magnets which should be series-connected for a 20 ma circuit or parallel connected for a 60 ma circuit. Space limitations here do not make it possible to reproduce the complete schematic diagram of the Model 15, but it can be found in military technical manual TM

Fig. 1– Block diagram of RTTY stations.



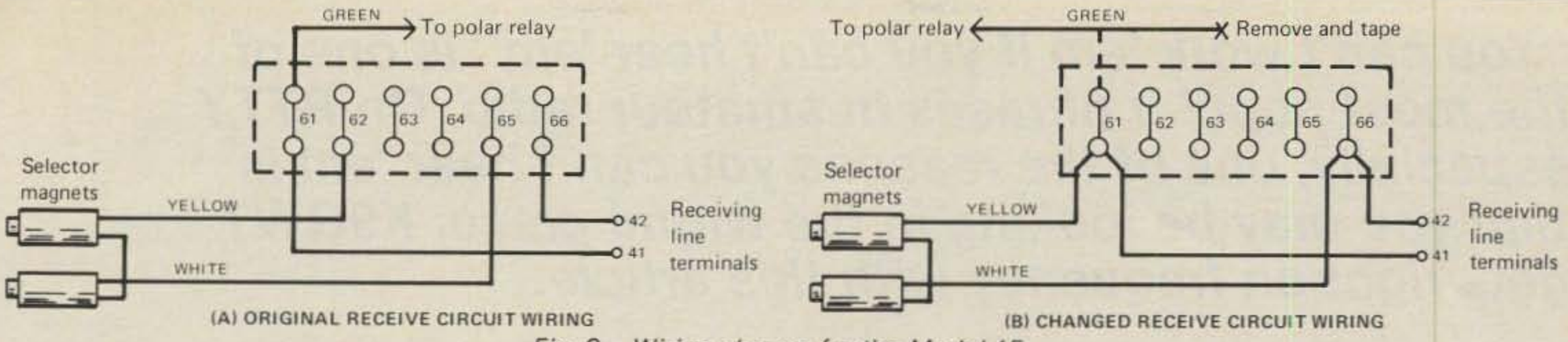
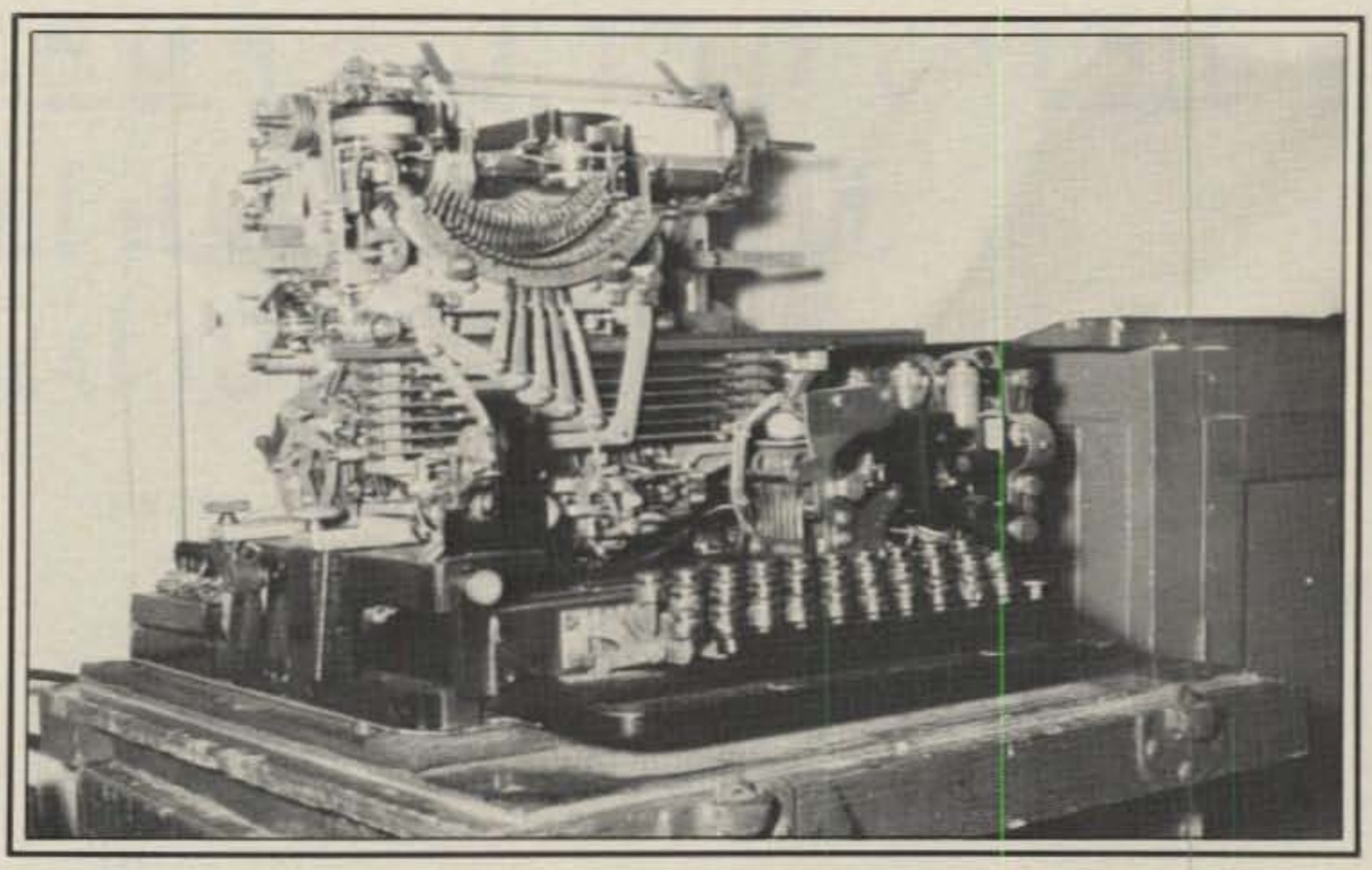


Fig. 2– Wiring change for the Model 15.

11-353 or in some of the RTTY handbooks now on the market.

Note that there is a spark suppression filter in the keyboard circuit. If it is desired to directly key the FSK circuit of a v.f.o. or AFSK oscillator, rather than keying a d.c. local loop, the 0.1 mF bypass capacitor should be disconnected.

Of course, to use your Model 15 on the amateur bands you will need a few other items like the TU and the AFSK oscillator or FSK frequency shifter for the v.f.o. previously mentioned. Fig. 1 shows in block-diagram form how these items might be hooked up to make an RTTY station.(Of course, these are not the only ways of doing it.) Subsequent articles will give construction information on simple, easy-to-build, low-cost TU's and AFSK oscillators, as well as some simple frequency shifters for the v.f.o., should you decide to go that route. Watch for them on the pages of *CQ*. RTTY *is* fun! CQ



Inside the TG-7B.

"You can't work 'em if you can't hear 'em" is one of the most popular phrases in amateur radio. On RTTY especially, one of the reasons you can't hear 'em is that you may be looking in the wrong place. K9GWT gets right on frequency with this article.

LET'S GET ON FREQUENCY! HOW TO TUNE IN RTTY SIGNALS

BY BILL HENRY*, K9GWT

With the increasing popularity of net-type operations, the RTTY operator often finds himself with a real problem of determining first what his actual RTTY r.f. frequencies are and how they compare with the net "standard." The problem is particularly acute with autostart and mailbox nets where a frequency tolerance of just 10 or 20 Hz must be maintained. The addition of digital dials on our transceivers has both aided and complicated the process. Further complicating the issue is the existence of at least two different ways of specifying the RTTY operating frequency. This article will address both the existing standards and the practical techniques for RTTY operators to set and measure their output frequency.

RTTY Frequency Specification

At present, there are two techniques commonly used to specify the RTTY operating frequency in the 3 to 30 MHz frequency range. U.S. amateurs have long used frequency meters or counters to measure the "rest" or "MARK" radio frequency of the RTTY transmitter. This frequency is easy to determine, since it only requires measurement of the transmitter carrier frequency when the RTTY equipment is in the normal "rest" or "MARK" condition. Furthermore, since the early 1960's, we have all followed the convention of shifting to a *lower* radio frequency for the "SPACE" condition. This was bannered for years in W8CQ's *RTTY Journal* as "LSMFT," or "Low Space Means Fine Teletype." This is the standard that most amateurs still use to this day.

In most commercial and military applications, however, RTTY operating frequency is specified in a much different manner. This standard is to specify the **center frequency** of the "occupied bandwidth" of the RTTY signal. In other words, if you use 170 Hz shift RTTY, the channel frequency would be midway between the MARK and SPACE radio frequencies. This technique makes a lot of sense from a frequency management viewpoint, but is not as easily measured or set up for operation, since the measurable MARK or SPACE frequencies change with the shift selected. Many amateurs discover these problems when they first venture into the Military Affiliate Radio Service (MARS) or when they try to track that elusive shortwave broadcast station.

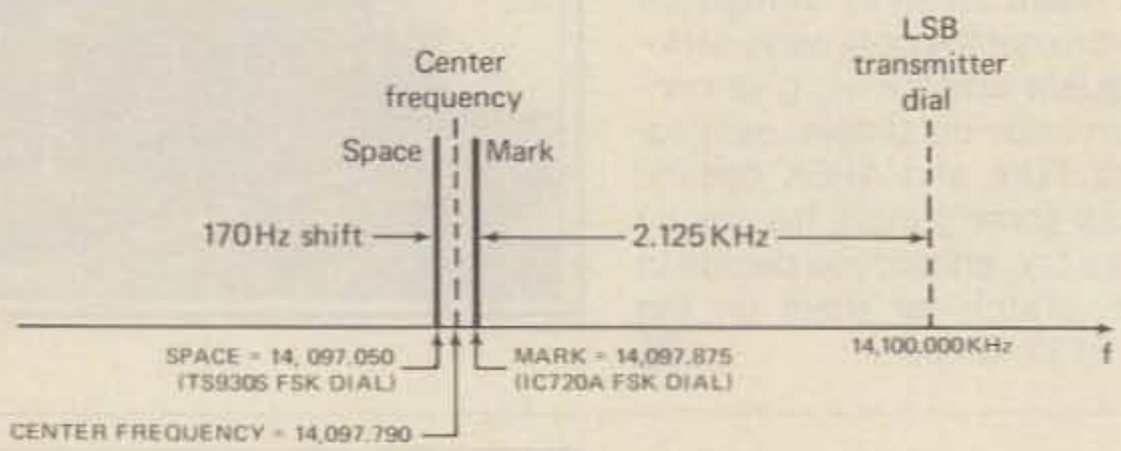


Fig. 1– Frequency relationships for a 20 meter RTTY signal.

S.S.B. Transmitters

Most of us on amateur RTTY are using s.s.b. transmitters in LSB (Lower Sideband) mode. Audio tones are connected to the microphone jack to produce the desired FSK output. As has been discussed in previous articles, this output is truly type F1 emission, and it has the advantage of being both convenient and reliable. One of the biggest problems for early RTTY operators was maintaining a standard shift between MARK and SPACE frequencies. This problem has all but disappeared since we started using l.s.b. transmitters, and it is rare to find any amateur signal the shift of which varies by more than a few Hz from 170 Hz. We may determine our output MARK radio frequency simply by using a frequency counter to measure the transmitter output when the RTTY system is in MARK condition, just as we did with a direct FSK transmitter. However, most modern s.s.b. transmitters now include a digital dial readout of "operating frequency." This digital dial is very convenient, but it has greatly complicated and confused the specification of the true RTTY frequency.

Digital Dials and S.S.B. Modes

The modern amateur transceiver includes a very nice digital readout of frequency with an impressive display calibrated in 100 Hz or 10 Hz increments. The high resolution of these dials is comforting to the operator, but in fact it may give some rather misleading indications. First of all, consider that the transceiver and its dial reading are designed primarily for s.s.b. voice operation. The *amateur* standard for specifying an s.s.b. voice frequency is to specify the frequency of the suppressed carrier if it were there. When we use audio tones on an l.s.b. transmitter, the *carrier* frequencies that

*Box 365, Urbana, IL 61801

are transmitted are *displaced* from the digital dial indication. The amount of this displacement is equal to the audio frequency of the tone input.

For example, if "High Tones" are used on an l.s.b. transmitter the dial of which is set to 14,100.000 kHz, the MARK radio frequency output is 14,097.875 kHz and SPACE is 14,097.050 kHz. Thus, the "correct" amateur specification of the RTTY frequency is 14,097.875 kHz, not 14,100.000 as shown on the digital dial. The MARK output frequency is therefore 2.125 kHz *lower* than the dial indication. The commercial or military (MARS) center frequency of this same signal would be 14,097.790 kHz, 2.210 kHz *lower* than the dial. As illustrated in fig. 1, it can be down-right confusing to relate your dial readings to a net frequency specification.

Digital Dials and FSK Mode

Some of the larger (and more expensive) amateur transceivers now include a special FSK mode just for RTTY operation. This can be very convenient to use, especially now that c.w. identification is no longer required (c.w. ID often so complicated the use of the FSK input that many of us chose not to use it). What does the digital dial mean when FSK mode is used? Many different things, it would seem! Some transceivers (such as the ICOM "700" series) show the MARK radio frequency output. Others (such as the TS-930) show the SPACE radio frequency output. Still others (such as the TR7) show a frequency that is displaced by 2.125 kHz! (The TR7 has an "RTTY" mode, but it is in fact a special audio input l.s.b. mode rather than an FSK input.) So, how do we deal with these new variables? The answer is, of course, to read your manual and then make some frequency measurements of your own.

There is another special problem associated with use of the direct FSK inputs on these transceivers. When we used l.s.b. mode with tones, we could be fairly sure that we were transmitting and receiving on the same radio frequency. If our transceiver is correctly set for true voice transceive and if we use demodulator filters the frequencies of which match our transmit tone frequencies, all will be well. However, the FSK mode directly shifts the frequency of an oscillator in the transmit section. When we switch to receive, the transceiver must therefore also switch in a frequency offset so that the tones of our demodulator filters are matched. In the U.S., this offset should be 2.125 kHz to match our standard "High Tone" filters. However, in the rest of the world, the offset should be 1.275 kHz to match the "Low Tone" standard. To date, all of the current models of transceivers I have tested have indeed had the correct 2.125 kHz offset in FSK mode. However, if you travel a lot, be careful of such units sold outside the U.S. They may be set up for "Low Tones" with a 1.275 kHz offset!

How Do I Get On Frequency?

If you are just interested in normal QSO's on random frequencies, all you really need is a *good* tuning indicator. For most experienced RTTY operators, this means a tuning oscilloscope. A tuning meter such as used on the ST6 demodulator or LED arrays as used on the Dovetron MPC1000 demodulator also work well. A single flashing LED will not get you very close, and two hams with such equipment will often "walk" up and down the band as each station "tweaks" the tuning dial. If you don't already have one, a tuning scope is a very good investment for your RTTY station.

If you want to participate in an RTTY net, you first need to find out how the net frequency is specified. Important parameters are:

1. Is the specified frequency for MARK or for the center frequency of the occupied bandwidth? For 170 Hz shift, there is an 85 Hz difference between the two. Or, is the net frequency specified from the dial reading on an l.s.b. transmitter? This specification will be offset from MARK by the mark tone used (2125 Hz in the U.S.) or by the mid-point between MARK and SPACE from a center frequency specification (2210 Hz for 170 Hz shift).
2. What is the shift used? For amateur transmissions 170 Hz shift is commonly

used, but 425 or 850 Hz shift may also be used in commercial and military systems.

3. What is the polarity of the RTTY signal? "Normal" amateur RTTY polarity is to transmit MARK as the higher radio frequency (LSMFT). On an s.s.b. transmitter, use l.s.b. mode for the standard 2125 Hz MARK/2295 Hz SPACE demodulator filters. In commercial and military systems, a "reverse" polarity is often used.

4. How does your equipment dial reading relate to the actual frequency transmitted for MARK? An l.s.b. transmitter's dial will read 2.125 kHz higher than the radiated MARK frequency. FSK transmitter dials may read either MARK or SPACE frequency.

5. Is your transceiver dial accurately calibrated? Most digital dials do *not* read the actual r.f. output frequency, but instead measure the frequency of an intermediate oscillator. The dial accuracy is therefore very dependent upon an accurate alignment of one or more heterodyne oscillators. Check receiver calibration against a standard radio signal (WWV, etc.) and use a frequency counter to check the transmitter output frequency.

6. If you use an FSK input to a transceiver, does the receiver offset match your demodulator filters? For U.S. use, the offset normally will be 2125 Hz.

Once all of the above parameters are known, you should be able to do some simple calculations to determine your correct digital dial reading. Some examples are:

1. K4CZ operates an RTTY mailbox on 40 meters. He specifies that the MARK radio frequency should be 7096.500 kHz. If you have an l.s.b. transmitter and use a "High Tone" demodulator, the correct dial reading will be 2125 Hz higher, or 7098.625 kHz. If you use FSK on an IC-720A, for example, the dial will read 7096.5 kHz; a TS-930 dial in FSK mode will indicate 7096.33 kHz, the SPACE frequency.

2. A 20 meter net of mailbox users operates on an l.s.b. dial reading of 14,087.80 kHz. Actually, the net frequency has been defined by KØVKH as 14,085.625 kHz. Therefore, the correct dial setting for an l.s.b. transmitter is actually 14,087.75, which will be rounded to 14,087.7 or 14,087.8 if your dial has only 100 Hz resolution. An IC-720A used on FSK should be set to 14,085.6 kHz; set the TS-930 dial in FSK mode to 14,085.46 kHz.

3. Suppose a MARS net is to operate on a CENTER frequency of 13,995.500 kHz, 850 Hz shift, with MARK as the higher radio frequency. The MARK frequency is therefore 425 Hz above the center frequency, or 13,995.925 kHz. The l.s.b. transmitter dial should be set to 13,998.05 kHz. The IC-720A dial would be set to 13,995.9 kHz (MARK frequency); the TS-930 dial would be set to 13995.08 kHz (SPACE frequency).

Conclusions

It can be seen that there are at least two different ways that the same RTTY operating frequency can be specified. Also, the digital dial reading of your transceiver may *not* agree with this specification. However, the correct dial setting can be calculated simply once all of the parameters have been defined. The calibration of the transceiver dial and the alignment of its internal oscillators can greatly affect the relation between dial reading and the actual output frequency. Also, not all FSK circuits behave the same, and dial readings may vary between brands of equipment used. If you use an l.s.b. transmitter, the dial reading will be different from that of an FSK transmitter and will also be different between stations using "HIGH" or "LOW" tone demodulator units.

When receiving, there is *no* substitute for using a *good* tuning indicator. An oscilloscope has been the traditional tuning indicator for RTTY; some meter and LED array indicators also work well. A flashing light impresses visitors, but gives you little tuning information. When setting and checking your transmitter frequency, a frequency counter is very desirable. If the calibration is known, a second communications receiver or a heterodyne frequency meter (such as the BC221) also may be used. In order to get on frequency and then stay there, you must know your equipment and be able to check it CQ

WARC for FT-101/901

Modernize any model of the original FT-101 Series by adding *all three* WARC bands for RX and TX!

- Use 10 MHz now; be ready for the others.
- Increase resale value of your rig.
- Easy installation, detailed instructions.
- Includes all crystals, relays, etc.
- Tested, fool-proof design for all but 'ZD.

FT-101 WARC Kit #4N ..... **ONLY $25.**
FT-901 WARC Kit #4J (30M only) **ONLY $10.**
Shipping $3 (Air $5). Florida sales tax 5%.

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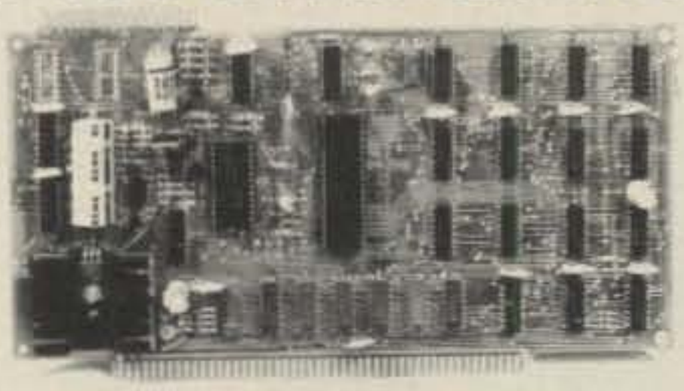
CIRCLE 7 ON READER SERVICE CARD

Say You Saw It In CQ!

$129.00 STAND ALONE VIDEO TERMINAL GETS YOU STARTED IN RTTY.

ASCII → BAUDOT



COMPOSITE → VIDEO

SCT-100 FEATURES:

- Serial ASCII/BAUDOT with multiple baud rates
- 64 x 16 line format with 128 characters
- Full cursor control with scrolling
- On board power supply
- Microprocessor controlled
- $229.00 assembled and tested, $189.00 full kit, $129.00 partial kit

Call or write today. MC/VISA accepted.

CIRCLE 119 ON READER SERVICE CARD

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214 - 840-2072
P.O. Box 2952 / Garland, TX. 75041

QUALITY COMPONENTS – *NOT MAIL ORDER "SECONDS"*

Send SASE for FREE Flyer or send $1.00 postage and handling for FREE COMPLETE CATALOG which includes coupon for $1.00 OFF purchase.

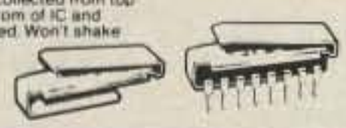
ARIES ZERO INSERTION FORCE SOCKETS –

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

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

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

Stock No.	No. Pins in IC	Price
22225	14	$.29
22226	16	.29
22228	18-20	.29



MIC 6000Z

Stock No. 62503
$75.00
Full 1 year warranty

DIGITAL MULTIMETER

Single rotary switch operation. Large, easy to read .5" 3-1/2 digit display. 800 hours operating life with single 9v battery. Seven functions – (DC Volts, DC Amps, Ohms, AC Volts, AC Amps, Diode and Resistor Junction, Audible Continuity Check).

Stock No. 62504 Carrying case with belt loop **$10.00**

WILD ROVER

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

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

60/40 ROSIN CORE SOLDER

Stock No	Dia	Length (feet)	Weight (oz.)	Price
50075	062	9	1.5	$1.16
50076	062	25	4	2.39
50077	062	50	8	4.25
50078	032	33	1.5	1.31
50079	032	88.5	4	2.47
50080	032	175	8	4.57

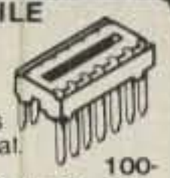
TI WIRE WRAP SOCKETS

Tin plated phosphor bronze contact – 3 wrap

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

TI LOW PROFILE SOCKETS

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



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

EKI KITS come with all parts necessary to assemble!

- Stock No. 88844 TV Jammer Kit "wipes out" your TV screen .... **$ 7.71**
- Stock No. 88850 Whooper Alarm Kit makes a great alarm or siren..... **$11.33**

MANY, MANY MORE KITS AVAILABLE IN FULL LINE CATALOG

ELPAC POWER SUPPLIES – DC/DC CONVERTERS

SINTEC Stock No. 300 MW Type	ELPAC No.	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (MA)	Dimensions (HxWxD) in Inches	Price
13825	CB3801	3.0-7.0	12±0.6	0-25	.48x.51x3.05	$ 7.95
13826	CB3811	3.0-7.0	-12±0.6	0-25	.48x.51x3.05	7.95
13827	CB3802	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.95
13828	CB3812	3.0-7.0	-15±0.7	0-20	.48x.51x3.05	7.95
13829	CB3804	3.0-7.0	28±0.7	0-10	.48x.51x3.05	7.95
13830	CB3814	3.0-7.0	-28±0.7	0-10	.48x.51x3.05	7.95
1.5 W TYPE:						
13831	CL3801	4.0-7.0	12±0.6	125	.651x1.2x1.77	$24.95
13832	CL3811	4.0-7.0	-12±0.6	125	.651x1.2x1.77	24.95
13833	CL3802	4.0-7.0	15±0.7	100	.651x1.2x1.77	24.95
13834	CL3812	4.0-7.0	-15±0.7	100	.651x1.2x1.77	24.95
13835	CL3804	4.0-7.0	28±1.4	50	.651x1.2x1.77	24.95
13836	CL3814	4.0-7.0	-28±1.4	50	.651x1.2x1.77	24.95
13825-1	DATA SHEET FOR DC/DC CONVERTERS					.25

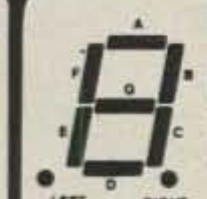
Special of the Month!

CONTACT ELECTRONICS D-SUBMINIATURE CONNECTORS (RS232)

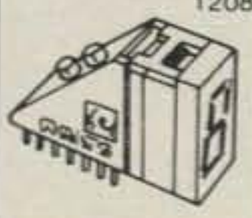
Stock No.	Description	Price
11354	25 Male solder cup	$1.65
11355	25 Female solder cup	2.45

OPCOA

Single Digit Displays - Common Cathode



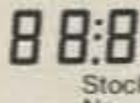
Stock No.	Color	1	100
12082	Red	$1.12	$ .99
12085	Green	1.84	1.63
12087	Yellow	1.92	1.70
12089	Orange	2.08	1.84

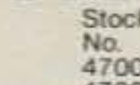


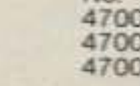
Right Angle Socket for Above Displays

Stock No.	1	100
11010	$1.24	$ .99

OPTEL LCD's with pins


Stock No. 47005


Stock No. 47006


Stock No. 47007

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

The Battery Just Wrap™ Tool

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

Stock No.	Description	Price
13340	Battery just-wrap tool with bit and 100 ft. 30 AWG wire	$49.95
13341	Replacement bit	9.95
13342	100 ft. blue replacement wire	6.95
13343	100 ft. white replacement wire	6.95
13344	100 ft. yellow replacement wire	6.95
13345	100 ft. red replacement wire	6.95

MINI-DRILL

This portable hand drill is appropriate for circuit board drilling. Runs at 2,500 RPM on 4 "AA" batteries (not included). Supplied with one .039 dia. drill bit. Drill stand is designed like a drill press for precise hole drilling.

Stock No.	Description	Price
13346	Hand drill with .039 dia. bit (no batteries)	$24.95
13347	Replacement bits: 2 each of .040 and .060 dia.	5.95
13348	Drill stand	13.95

PIN FORMING TOOL

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

ONE TOOL DOES 8 thru 40 PINS!

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

OK MACHINE AND TOOL

IC INSERTION/ EXTRACTION KIT

Includes DIP IC extractors and inserters to accommodate ICs from 14 to 40 pins. Tools that engage conductive surfaces are CMOS safe and include grounding lugs. Stock No. 13309 **$37.74**

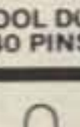
SOCKET WRAP ID

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

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

$1.82 per pack

IC EXTRACTOR



One-piece, spring steel construction. Will extract all LSI, MSI and SSL devices with 8 to 24 pins.

Stock No. 13313 **$2.10**

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We accept VISA, MC, C.O.D., CHECK, or M.O.
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CIRCLE 74 ON READER SERVICE CARD

Connect your computer to the air!

The "AIRWAVES" that is, thru the Microlog AIR-1, a single board terminal unit AND operating program that needs no external power supply or dangling extras to put your VIC-20 computer on CW & RTTY. And what a program! The famous Microlog CW decoding algorithms, superior computer enhanced RTTY detection, all the features that have made Microlog terminals the standard by which others are compared. Convenient plug-in jacks make connection to your radio a snap. On screen tuning indicator and audio reference tone make it easy to use. The simple, one board design makes it inexpensive. And Microlog know-how makes it best!

There's nothing left out with the AIR-1. Your VIC-20, America's most popular computer, can team-up with Microlog, America's most successful HAM terminal, to give you an unbeatable price and performance combination for RTTY & CW. If you've been waiting for the right system at the right price, or you've been disappointed with previous operating programs, your time is now. At $199, the complete AIR-1 is your answer. Join the silent revolution in RTTY/CW and put your VIC-20 ON-THE-AIR! See it at your local dealer or give us a call at Microlog Corporation, 18713 Mooney Drive, Gaithersburg, Maryland. TEL (301) 258 8400. TELEX 908153.

Note: VIC-20 is a trademark of Commodore Electronics, Ltd.

MICROLOG

INNOVATORS IN DIGITAL COMMUNICATION

CIRCLE 147 ON READER SERVICE CARD

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

"Skip" Skaptason, VE4SK, All Counties #409, at his station in Manitoba.

The story of the month for November as told by "Skip" is:

Freeman "Skip" Skaptason, VE4SK All Counties #409, 9-12-82

"My first introduction to radio came in the 1930s while I was working in the gold mines in northern Canada. This remote area was served by the bush pilots of Wongs Airways who had a 'big' 40 watt commercial station (c.w.) which doubled as an amateur station in the off hours.

"The next step was during World War II when I joined the Royal Canadian Corps of Signals. Eventually, after service in Africa, Italy, and northwest Europe, I was discharged in 1945 and immediately forgot all about radio in the hustle and bustle of making a living and raising three children. Finally in 1964 I met an old Signal Corps buddy who suggested I go after my ham ticket. So, armed with an album to relearn the code and some books on theory, I went at it and got my first ticket on 13 September 1964 and my Advanced ticket one year later.

"In the summer of 1971 while on a visit with my brother Skip, WA0WOB, I met a character named Jack Scroggin, W0SJE, and that was my undoing. I got hooked on County Hunting. Subsequently, I ran scores of counties in the northern and western states and Hawaii and became accepted in the County Hunting family.

"I received USA-CA 3000 in 1979, and with only a handful of counties left I lost interest and started chasing DX and got on the DXCC Honor Roll.

"One day in 1982 I was chatting with Arnie Bachman, K9DCJ, and I revealed the number of counties left to work. In the next two weeks Arnie telephoned me long distance five times to alert me to a new county I needed. Finally, on the 19th of November, Tom Beasley, K4JFI, made a day-long trip to get my last county—Pamlico, North Carolina.

"Now the beautiful *CQ* magazine All Counties Award reposes on the wall of my shack, reminding me of all the wonderful, wonderful people I met on the County Hunters' net and at three County Hunters' conventions. Thanks to Ed Hopper, W2GT, for his years of work for us all and to *CQ* magazine for sponsoring this prestigious award.

333 South Lincoln Ave., Mundelein, IL 60060

Special Honor Roll
All Counties
#428 William L. Jansen, K2HVN.

Jim Whittaker, WB0TVL, new Awards Chairman for MARAC. (Photo by N9WA)

Awards Issued

William L. Jansen, K2HVN, waited until he finished them all and then claimed All Counties #428 Mixed, dated 7-2-83.

Florence Reitzel, KU7F, did all of her paperwork and had me send her USA-CA 500 through USA-CA 2500, All 2 × S.S.B., dated 7-18-83.

Bob Declercq, VE2OG, received USA-CA 500 through USA-CA 2500, All 20M Mobile. Beginning in September, Bob and his wife Bud will have a new address, and Bob will be calling us using his new "CT" call. They are moving to the south of Portugal, so no more Canadian winters for them!

Edward A. Sanders, WA6VJP, added USA-CA 1000, All 2 × C.W., to his certificate.

P.K. Webb, W3MGP, collected USA-CA 1000, endorsed Mixed. Welcome back to County Hunting, P.K.

USA-CA 500 certificates went to:

Akira Tani, JA1BN, #1851, Mixed.

William L. Jansen, K2HVN, #1852, Mixed.

Herve van Hauwaert, ON5SY, #1853, Mixed.

Larry Allen, K1ZIT, #1854, All 20M S.S.B.

Florence Reitzel, KU7F, #1855, All 2 × S.S.B.

Henry Ringleb, DL8YBM, #1856, All 2 × S.S.B.

Bob Declercq, VE2OG, #1857, All 20M Mobile.

Luigi Gaudino, I2KKL, #1858, Mixed.

Michael Mitzinger, N4AYJ, #1859, Mixed.

Ronald W. Asbill, W9ROK, #1860, Mixed.

Dick D. Hughes, WB5MTU, #1861, Mixed.

Emmie B. Patience, KA4LRM, #1862, All 20M S.S.B.

New Awards Chairman Appointed by MARAC

At the annual MARAC (Mobile Amateur Radio Awards Club) Board of Directors meeting in Charleston, West Virginia, Dr. Thomas Storm, KB0KS, tendered his resignation as MARAC Awards Chairman. Dr. Storm has been holding two jobs, and the 24-hour days were just not long enough to do everything he wanted to do. The board asked Jim Whittaker, WB0TVL, to assume the responsibilities, and Jim has agreed to do so. Address applications for MARAC awards and related correspondence to Jim Whittaker, WB0TVL, 3019 O'Henry Road, Minneapolis, MN 55429. This change applies *only* to MARAC awards.

The Trans-Canada Award.

Awards

Over the years CANADA-X has been offering three very distinctive awards. The requirements for each award are listed below.

The Trans-Canada Award. *Requirements:* 5 contacts with each of the 8 VE call areas

USA-CA Honor Roll

3000		1500		500	
K2HVN	458	K2HVN	637	JA1BN	1851
		KU7F	638	K2HVN	1852
2500		W3MGP	639	ON5SY	1853
K2HVN	515	VE2OG	640	K1ZIT	1854
KU7F	516			KU7F	1855
VE2OG	517	1000		DL8YBM	1856
		K2HVN	785	VE2OG	1857
2000		WA6VJP	786	I2KKL	1858
K2HVN	569	KU7F	787	N4AYJ	1859
KU7F	570	W3MGP	788	W9ROK	1860
VE2OG	571	VE2OG	789	WB5MTU	1861
				KA4LRM	1862

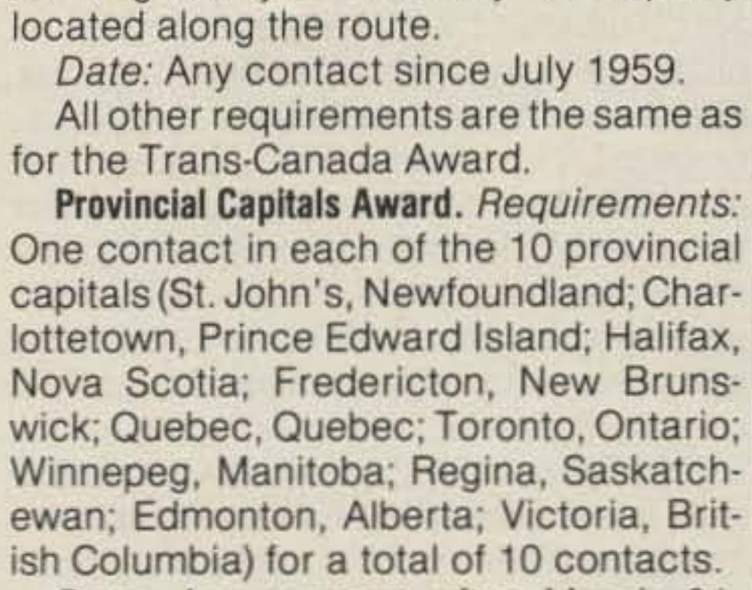
(VE8 and VY1 count as one area) plus 5 contacts with VO1/VO2, any combination, plus one contact with VE0 maritime mobile station. Of the 5 VE8/VY1 contacts required, one must be in the Yukon Territory (VY1) and one must be located on the off-shore islands of the Northwest Territories (VE8). A grand total of 46 contacts is required.

Band and mode: Any band or mode, mixed or otherwise.

Date: Any contact since 1945.

QSL's: Not required unless specifically called for, but should be in your possession. Instead, send a list of the contacts showing date, time, mode, and definite location of the stations worked. This list should be certified by either one radio club official or two other licensed amateurs.

Cost: $1.00 or 10 IRC's for North American amateurs only. All DX amateurs will be issued the award free of charge.



The St. Lawrence Seaway Award.

The Seaway Award. *Requirements:* 10 contacts in different locations with VE stations along the route of the St. Lawrence Seaway. Of the 10 required, one must be in each of the following areas: Thunder Bay, Greater Toronto, Greater Montreal, Greater Quebec City. The remaining 6 may be from any municipality located along the route.

Date: Any contact since July 1959.

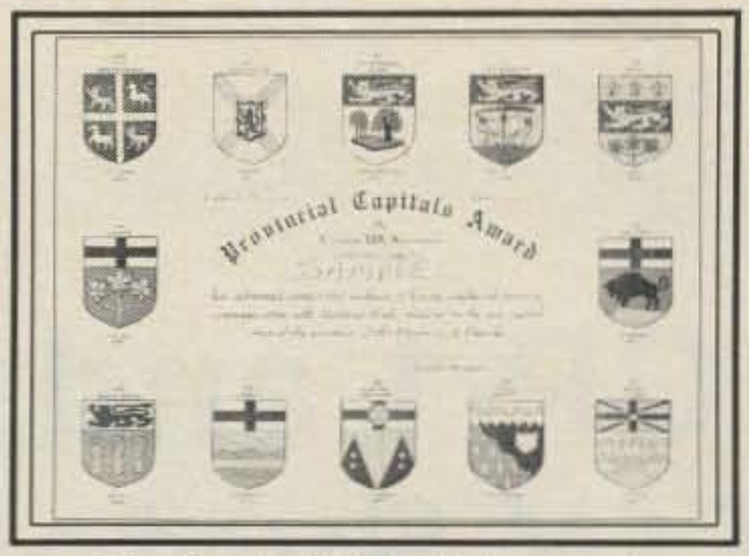
All other requirements are the same as for the Trans-Canada Award.

Provincial Capitals Award. *Requirements:* One contact in each of the 10 provincial capitals (St. John's, Newfoundland; Charlottetown, Prince Edward Island; Halifax, Nova Scotia; Fredericton, New Brunswick; Quebec, Quebec; Toronto, Ontario; Winnepeg, Manitoba; Regina, Saskatchewan; Edmonton, Alberta; Victoria, British Columbia) for a total of 10 contacts.

Date: Any contact after March 31, 1949.

All other requirements same as above. In order to get your award, send your award application directly to Ron N. Nickle, VE3SF, Awards Manager, 286 Burnett Avenue, Willowdale, Ontario, M2N 1W1 Canada.

Worked All Maryland Counties Award. The Worked All Maryland Counties Award is sponsored by Carl E. Anderson, W3XE. If you have worked all counties and have the All Counties award sponsored by *CQ* magazine, send your USA-CA number and the month it was published in *CQ* magazine along with an s.a.s.e. (8½" × 11" with 37¢ postage).



The Provincial Capitals Award.

Worked All Maryland Counties Award.

Others send a list of the stations worked and confirmed with a QSL card or MRC in each of the 23 counties plus Baltimore City; the list must be certified by two licensed amateurs. Also send an 8½" × 11" envelope with 37¢ postage. Applications should be sent to Carl E. Anderson, W3XE, 14601 Claude Lane, Silver Spring, MD 20904.

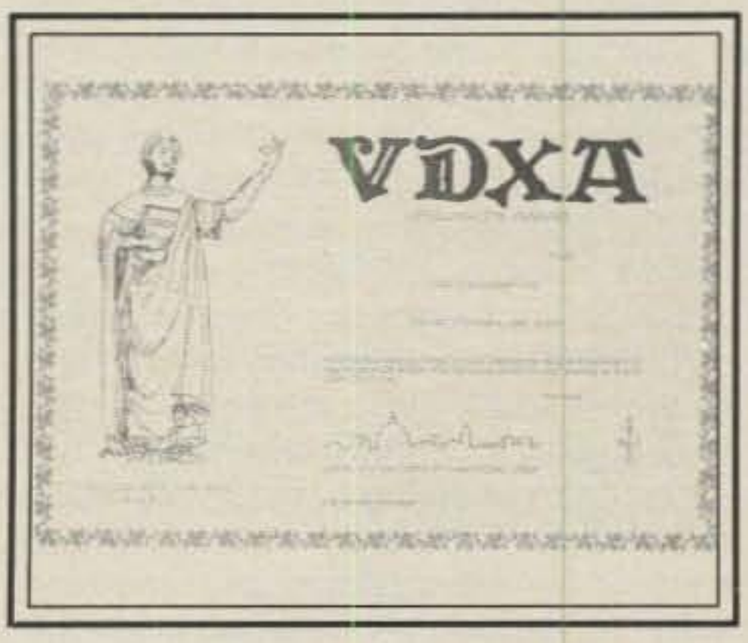
Notes

In last month's column DL7CS was listed as the call for Dr. Hans Schneider. DL7CS is, in fact, the call held by Bruno Strangnowski, who holds USA-CA 1500 #630, endorsed All C.W.—the first such endorsement in West Germany.

The 1983 County Hunters' Convention is now history (more about the convention in a later issue), and the next convention will be held in Kansas City, Kansas, with WA0WOB and W0AYO as co-hosts. We invite all our County Hunting friends to join us and travel through midwest America. If the weather cooperates, wheat harvest will be in full swing then.

Those of us who follow the dates on the Gregorian calendar are nearing the end of another year—perhaps enough time to finish all the "not done yet's" before the New Year rings in. Anyway, enjoy the last days of fall, and *good hunting!*

73, Dorothy, WB9RCY



The VDXA Virgilian DX Award. (Details of this award were published in the October CQ Awards column.)

CQ REVIEWS:

The AEA CP-1 and AEAsoft RTTY System

BY DAVE INGRAM*, K4TWJ

The AEA CP-1 features dual RTTY filters, variable or fixed shifts, normal or reverse tone phase, and an accurate tuning indicator. The unit is enclosed in a dark gray "wraparound" and black metal front cabinet.

Have you noticed the expanded RTTY activity that is happening each day on our amateur bands? Escalated by the introduction of inexpensive home computers and RTTY interfacing systems, this mode has become a worldwide craze of unlimited proportions and capabilities. Electronic keyers and desk mikes are now sharing station room with typewriter-size keyboards and flashing LED displays while typed messages are peppering the airwaves in rising quantities. It's a new twist to an older rooted means of communication offering a special station warmth and enjoyment to all. While the ability to type rather rapidly is useful and beneficial, it is no longer an absolute necessity. Preprogrammed, or "canned," messages can be stored in these systems for immediate recall as needed. Additionally, several "touch typing" lessons are available on cassette or disc programs for many home computers.

All aspects considered, this new form of RTTY is an exciting and quite enjoyable area, appealing to both operators and listeners (or should we say "readers"). Indeed, there are a vast number of news broadcasts and wire services passing timely and noteworthy information almost 24 hours a day via RTTY. If you like being informed about situations, getting details almost directly from the source rather than via local news medias, shortwave RTTY monitoring is an avenue truly worthy of investigation.

Home-computer-type RTTY systems are noticeably different from the nostalgic and large clattering machines of yesteryear. Gone are the whirring motor, the piles of contact-keying cams, and the hundreds of pawls, levers, and rods. Replacing these items are integrated circuits, logic supplies, and a cathode-ray-tube display. Additionally, the new style systems are quite flexible: The associated computer can be removed quickly from the shack and reprogrammed for an unlimited number of family functions ranging from arcade-type video games to home inventory, bookkeeping, etc. The capabilities and possibilities are limited only by one's imagination!

While home computers are dandy little items which can repeatedly "change faces" to become many things, these functions usually are limited to one action at a time. Thus, if the computer is set up for RTTY, it doesn't accept normal programming; if a game cartridge is inserted into the computer, it doesn't accept RTTY information; etc. This "face changing," however, is usually as quick as swapping cartridges and switching the unit on. How do these computer RTTY units compare to dedicated RTTY counterparts? That primarily depends on the terminal or interfacing unit connected between the station receiver and the home computer. Basic units give fairly good results, while sophisticated units provide better copy under adverse conditions.

The CP-1

The units described in this review, the Advanced Electronics Applications CP-1 computer patch and its associated software, form a complete system for adapting one's home computer and its video display to RTTY. The CP-1 acts as a form of Modem (Modulator-Demodulator unit) which is connected between the h.f. transceiver's speaker and mike jacks and the home computer's joystick input port. This unit coverts incoming tones to binary voltage levels (TTL) which can be interpreted by the computer during receive, plus it converts binary voltage levels from the computer (TTL) to audio tones which modulated the s.s.b. transmitter during transmit mode. The AEA software programs the computer to process this binary information into RTTY communications.

The CP-1 itself is a very attractive and high-performance unit measuring approximately 10"H × 7½"W × 2½"D. Front-panel controls include selection of normal or reversed tones, a manual/automatic transmit switch, filter selection and adjustment, plus an LED bar graph display to aid in proper receiver tuning. The CP-1 will copy all teletype shifts from the popular 170 Hz (2125 Hz mark and 2295 Hz space) to shifts of 1000 Hz. In the latter's case, or during times when the incoming RTTY shift is unknown, the lower frequency tone is receiver-set to 2125 Hz and the CP-1's control is adjusted for the "other" tone. A combination of LED bar

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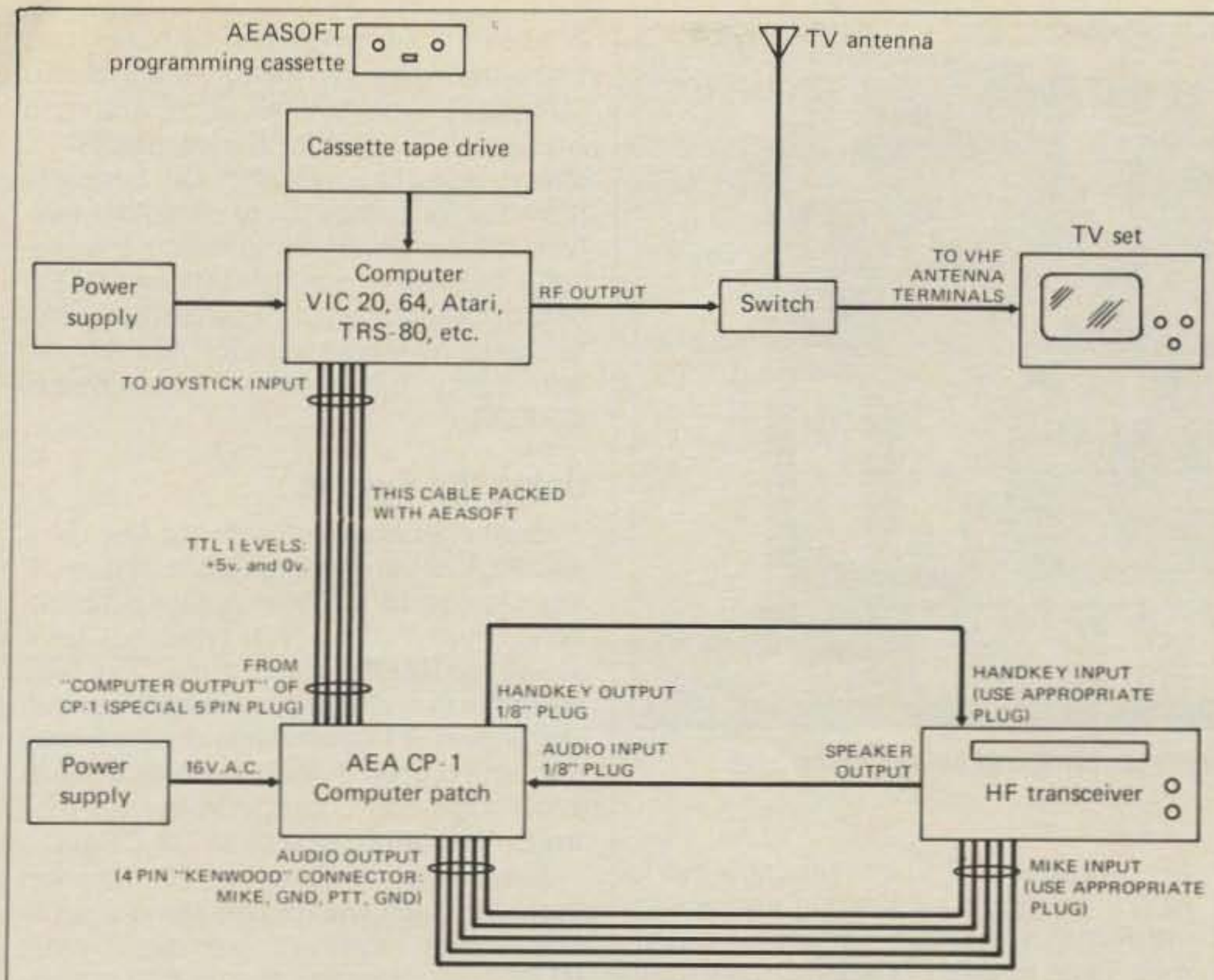


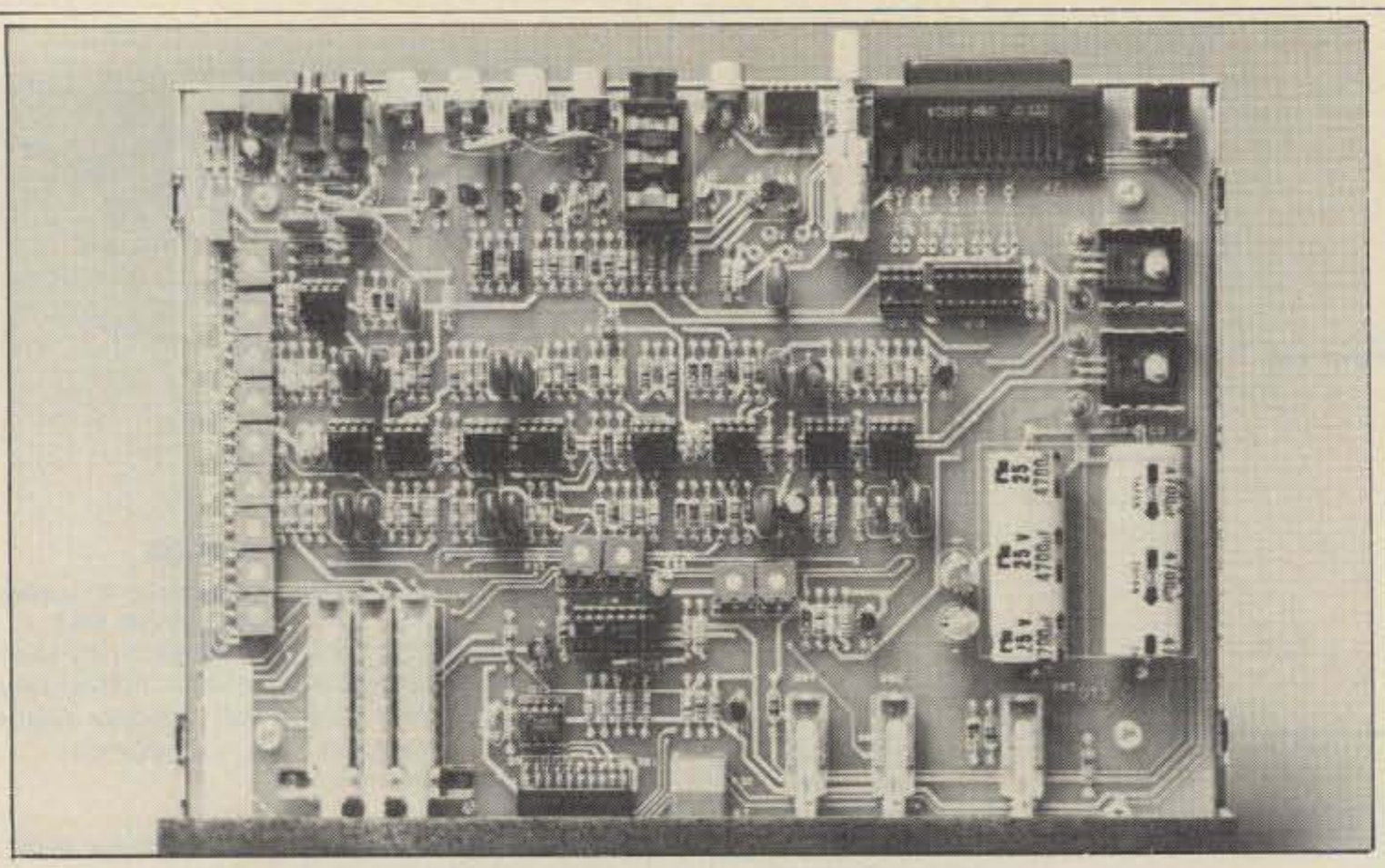
Fig. 1– Interconnections and layout for using the CP-1 and software with a home computer system.

graph closure and flickering aids in this adjustment, operating independent of the computer's display. I might add that the front-panel normal-reverse tone switch is a blessing when tuning "strange" RTTY signals.

Rear-apron connections on the CP-1 include receiver speaker (which also "normals through" for use with an external speaker), 'scope X and Y outputs for RTTY "crosshair displays," positive and negative key outputs for computerized high-speed c.w., key input for Morse ID during teletype operations, and a 5-pin "TTL output" which mates with a cable that connects to the computer's input. Following the trend of other manufacturers, this patch-to-computer cable is packaged with the system's software. Finally, a 4-pin mike connector is used for outputting RTTY tones to the mike input of an s.s.b. transceiver. This popular technique is called Audio Frequency Shift Keying (AFSK). Quite simply, it means the RTTY tones modulate an s.s.b. rig to produce the RTTY mark and space tones (fig. 1).

One of the CP-1's attractive features is the use of dual RTTY filters. The mark filter is fixed tuned to 2125 Hz, and the space filter to 2295 Hz. When switched to variable shift, however, the 2295 Hz space filter is tunable from 2225 to 3125. The results of these filters is evident in the CP-1's performance. A direct comparison between several RTTY computer interfacing units revealed the CP-1 would produce the most consistent copy under adverse QSB, QRN, and QRM—very impressive. An additional filter tuned to 950 Hz is included in the CP-1 for c.w. opera-

Rear connections on the AEA CP-1 permit quick and easy interfacing with a variety of amateur gear.



Interior view of the CP-1 reveals a sophisticated and well-planned unit.

tions. Since our software is strictly for RTTY, however, this mode hasn't been used.

The CP-1 is powered by a 16 v.a.c. wall supply—somewhat unusual, but this item is furnished with the CP-1 to reduce problems. Neither the wall supply nor the CP-1 produces significant heat during extended periods of operation. Neither r.f. interference to the CP-1 from the transmitter nor interference to the receiver from the CP-1 was noted. This was probably due to AEA's extensive r.f. filtering and shielding. Finally, a rear-panel threshold adjustment (akin to an RTTY squelch) prevents off-the-air non-RTTY noises from printing "babbles" on the computer's display.

The AEAsoft

Although our AEA system has been operating with the VIC-20-1 "basic RTTY" cassette program, several more expanded software packages using plug-in ROM cartridges should be available from AEA by the time this article appears in print. These cartridges and CP-1 to computer interface cables will set up the VIC-20, VIC-64, Atari 400, Atari 800, TRS-80 Model III, Heath H89, or TI99 for full-featured Morse, Baudot (RTTY), and ASCII operation. Meanwhile, the cassette RTTY-only program is proving its worth as an inexpensive means of RTTY fun.

The cassette AEAsoft provides full-screen displays for transmit and receive functions, plus three 80-character message buffers and CW ID. A single computer key (F1 on the VIC-20) toggles the system between transmit and receive modes. The receive display is orange with a yellow border, and the transmit display is a colorful shade of green with no border. Monochrome displays distinguish transmit and receive modes according to the border's presence. A type-ahead buffer isn't included. If you type over 10 characters ahead of what is being transmitted or "up for transmission on the next over," they are lost. The three type-ahead buffers help during times of fumbling, however, and they can be "chained together" if desired. Received information is displayed double spaced, while transmitted information is single spaced. Distinguishing information is thus an easy matter.

The AEAsoft operates RTTY at 60, 67, 75, and 100 words per minute. Selection of speed is accomplished by hitting two computer keys for menu recall, typing "SYS4352" for reinitialization, and then typing a, b, c, or d for the desired RTTY speed. Automatic UnShift On Space is provided for compatibility with older teletype setups. Generally speaking, the cassette AEAsoft is a quite sufficient RTTY-only package at a fair price ($19.95). The full-featured Morse, Baudot, ASCII package easily fulfills other requirements ($29.95).

Using the System

On-the-air activities with the AEA CP-1 and AEAsoft are an enjoyable and exciting change of pace in amateur operations. Furthermore, you need not be a seasoned RTTYer to join the action. Simply cable everything according to our outline shown in this article and start tuning the action. You'll soon acquire enough knowledge and courage to fire up your transmitter and "type back" to CQers.

Personally, I found the AEA system thoroughly enjoyable. Not being a proficient typist, however, we spend most RTTY time "reading the mail" on amateur bands and monitoring international news broadcasts. (Can you believe that a fellow who has written over 8 books and 300 articles can't type? It's on our agenda, though, as one of the first few projects after retirement.)

Initially, tuning RTTY signals takes some patience and perseverance, but once that feel is acquired, you're home free. There are three possible variables to consider: RTTY speed, mark and space tone shift, and normal or inverted tones. While watching the CP-1's display, the RTTY signal is first tuned for eye closure and minimum flicker. If an intelligible message doesn't print, tape the normal/reverse switch. If the messages are still unintelligible, switch to 67, 75, and 100 w.p.m. Finally, if an "odd shift" is being tuned (usually outside of amateur bands), switch the CP-1 to "variable" and restep through the previous adjustments as required. All this may seem difficult to non-RTTYers, but rest assured that it's an easily mastered technique.

Summary

The home computer and RTTY trend is a popular area that is destined to become even more appealing during coming months. Likewise, the AEA CP-1 and its associated group of software for various personal computers will soon prove challenging competition to the many commercially available interfacing systems. Personally, I think the AEA system is a winner. It is cosmetically attractive, it copies all shifts and speeds, and it can "reverse" mark/space with a single push-button. Put that with your VIC and try it. For more information, contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036. CQ

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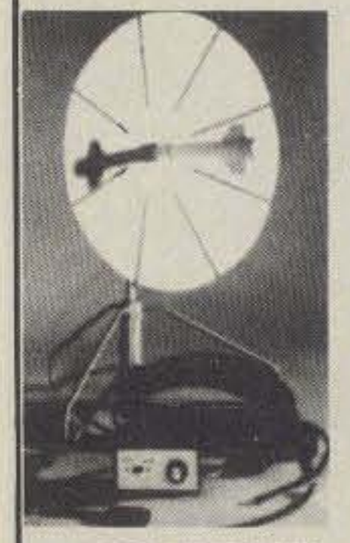

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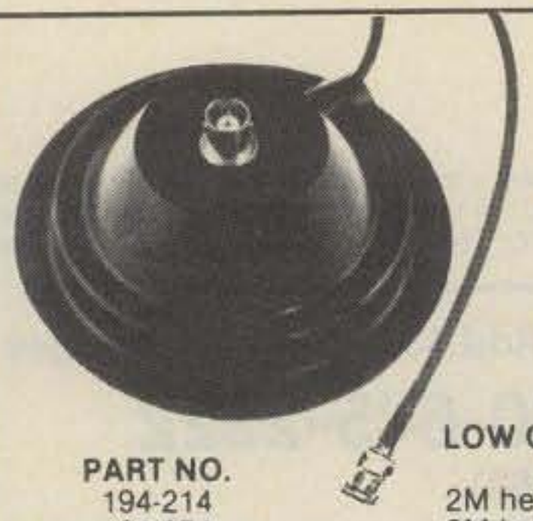

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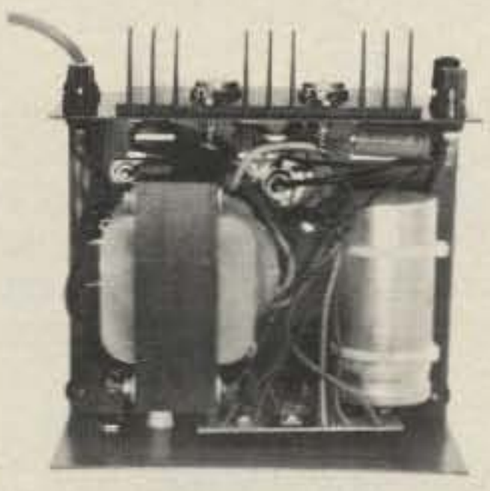

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RS-12A	9	12	4½ x 8 x 9	13
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*ICS—Intermittent Communication Service (50% Duty Cycle 5 min. on 5 min. off)

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FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The month of November, like the preceding month of October, is really loaded with contest activity. With the two largest competitions in the world, the *CQ* World-Wide DX Contest and the ARRL Sweepstakes, taking up most of the month, there is only one weekend open for domestic stateside competition. However, do not become alarmed when you see three state QSO parties on the same weekend. The situation is not as bad as it appears. There was little or no planning in making up the schedule, but in spite of this there are a couple of favorable items.

First, each state is in a different call area, making the identity less confusing when you are looking for a particular party. Second, there is little or no duplication in the suggested operating frequencies. If you check and study the suggested operating frequencies of the three parties—Rhode Island, Delaware, and North Carolina—you will see that there is a comfortable separation in the c.w. frequencies and only a few marginal spots in the phone section of the bands.

When a new event is organized, a little more time should be taken in setting up the rules, dates, and operating frequencies. Since the scheduling of most events follows the same pattern each year, it should not be difficult to avoid conflicting and duplicating problems. If there is another activity on the same weekend, it would be proper to contact that organization and work out an operating plan that would be acceptable. It is bound to improve the success of your operation.

When you have worked out a favorable plan, get the announcement to me at least three months before the date of your event and I will give you the proper coverage. Remember, November 15th is the deadline for the February issue, and December 15th for the March issue. All communications should be addressed to my home.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

Oct.	**29-30**	**CQ WW DX Phone Contest**
Nov.	5-6	ARRL C.W. Sweepstakes
* Nov.	5-6	YLRL Anniv. Phone QSO Pty.
Nov.	5-6	Int. Police Assn. Contest
Nov.	6	"Corona" 10 Meter RTTY
Nov.	12	OMISS QSO Party
Nov.	13	Czechoslovakian Contest
Nov.	12-13	DARC WAE RTTY Contest
Nov.	12-13	Delaware QSO Party
Nov.	12-13	North Carolina QSO Party
Nov.	12-14	Rhode Island QSO Party
Nov.	19-20	ARRL Phone Sweepstakes
Nov.	**26-27**	**CQ WW DX C.W. Contest**
Dec.	3-5	ARRL 160 Meter Contest
Dec.	3-4	Telco. Pioneers QSO Party
Dec.	10-11	ARRL 10 Meter Contest
Jan.	14	Hunting Lions Contest
Jan.	**27-29**	**CQ WW DX 160 CW Contest**

** Covered last month.*

Int. Police Assn. Contest

Sat. Nov. 5 and Sun. Nov. 6
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's open to all, IPA members, non-members, and s.w.l.

Exchange: RS(T) and QSO number. Members will identify by including IPA in their report. 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 one 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 multipliers 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 are available for IPA members, non-members, and s.w.l., and the Sherlock Holmes Award and Trophy.

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

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

"Corona" 10 Meter RTTY

1100Z to 1700Z Sun., Nov. 6

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

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

OMISS QSO Party

0000Z to 2400Z Sat., Nov. 12

This is a new one organized by the Old Man International Sideband Society. It's open to members and non-members. However, certificates are only awarded to members (?). Each station may be worked once on each band on s.s.b.

Exchange: Signal report, name, state/province, and OM number for members.

Scoring: Contacts with OMISS members are worth 5 points, with non-members 2 points. Multiply total by sum of states, VE provinces, and DX countries worked.

Awards: Plaques to the top-scoring member and non-member. Certificates to the winning member in each U.S. call district.

For additional information send an s.a.s.e. to KA1HGY. Mail logs within 15 days of end of party to Rich Besitka, KA1HGY, 480-B Radmere Road, Cheshire, CT 06410.

Czechoslovakian Contest

0000 to 2400Z Sun., Nov. 13

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

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

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

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

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

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

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

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

Mailing deadline for all entries is December 31st to: The Central Radio Club, P.O. Box 69, 11327 Prague 1, Czechoslovakia.

Rhode Island QSO Party

1700 to 0500Z Sat.–Sun., Nov. 12–13
1300 to 0100Z Sun.–Mon., Nov. 13–14

This one is sponsored by the East Bay A.W.A. The same station may be worked on each band and on each mode. RI stations may contact other in-state stations for QSO points.

Exchange: RS(T) and QTH. City or town for RI; state, province, or country for others.

Scoring: Phone contacts are worth 2 points, c.w. 3 points, and Novice/Tech. 5 points.

RI stations multiply total QSO points by the number of states, VE provinces, and DX countries worked. Others by the number of different RI cities and towns worked for their final score. (There are 39 cities and towns in RI.)

Frequencies: C.W.—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110. Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, and 146.52. Use of f.m. simplex encouraged. (No repeaters.)

Awards: Certificates to top-scoring stations in each RI county, and each state, province, and country. Also to the winning Novice and Technician in RI and out of state.

Include a summary sheet showing the scoring and other essential information, and an s.a.s.e. for a copy of the results.

Mailing deadline is November 15th to East Bay A.W.A., P.O. Box 392, Warren, RI 02885.

North Carolina QSO Party

1700Z Sat. to 2359Z Sun., Nov. 12–13

This year's party is again being sponsored by the Alamance ARC of Burlington, NC.

The same station may be contacted once on each band, mobiles in each county change, and NC may work in-state stations, but for QSO point credit only.

Exchange: Signal report and QTH. County for NC, ARRL section for all others.

Scoring: *For NC*—One point per QSO; multiply total by sum of ARRL sections worked.

Out of state—Two points for each NC contact; multiply total by NC counties worked (maximum of 100). A bonus of 25 points can be added to your final score if you work club station K4EG.

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

Awards: The top scorer in and out of state will receive a set of 1984 Callbooks. 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 desire a copy of the results.

Logs must be received by December 16th and they go to: F.R. Ashley, WB4M, Rt. #1, Box 471, Mebane, NC 27302.

1982 OK DX Contest Results

U.S.A.

All Band

K4PQL	36,864
KA1CY	25,079
N2IT	17,340
K5LZO	15,774
W2ZZ	10,419
W1END	5,676
AA2Z	3,991
W9OA	1,500
KA3DSW	710
W1CNU	685

7 MHz

K8MNG	285

14 MHz

*N4OL	12,903
W2XV	2,430

21 MHz

W1BL	2,704
K2FE	1,110
WA0BNX	540
AA6EE	100
K6VL	6
KD4PP	3

28 MHz

W4DFU	5,214
KA1XN	3,621
WB2TKD	748
WA4OML	588

Canada

All Band

VO1AW	13,364
VE3NBW	5,552

*N4OL was #2 in world.

Delaware QSO Party

1700Z Sat. to 2300Z Sun., Nov. 12–13

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

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

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

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

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

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

Mailing deadline for all entries is December 16th, and they go to Charles Sculley, AE3H, 103 E. Van Buren Avenue, New Castle, DE 19720. Include an s.a.s.e. for a copy of the results.

DARC WAE RTTY Contest

0000Z Sat. to 2400Z Sun., Nov. 12–13

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

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

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

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

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

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

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

ARRL Sweepstakes

C.W.: Nov. 5–7 Phone: Nov. 19–21
Starts: 2100Z Sat. Ends: 0300Z Mon.

This is the 50th running of the Sweepstakes, making it the oldest domestic competition going, and it really stirs up a lot of activity.

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

Operation is limited to 24 out of the 30 hour contest period. Times off may not be less than 30 minutes and must be clearly indicated in your log.

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

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

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

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

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

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

In celebration of the 50th anniversary, certificates will also be awarded to anyone making more than 200 QSO's, but not having earned other awards. There is another award for making at least 500 QSO's in 50 sections (minimum score of 50,000). Look for a special award for making a "clean sweep."

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

CQ World-Wide DX Contest

Phone: Oct. 29–30 C.W.: Nov. 26–27
0000Z Saturday to 2400Z Sunday

We believe that all sections of the rules for our World-Wide DX Contest have been covered thoroughly the past two months. Complete rules were in the September issue, with a follow-up in this column last month, so it would serve little purpose to review them again here.

There have been some inquiries regarding the use of the new WARC bands. As indicated in last month's column, the 10 MHz band is *not* to be used. Use only the six bands, 1.8 through 28 MHz, that were available prior to WARC.

Mailing deadline for Phone entries is December 1st, and this year go to N6AR. Mail your C.W. entries to K3EST before January 15th. Requests for a reasonable extension of the above dates must be made in writing to the respective Directors stating reasons for the request.

Phone logs go to Larry Brockman, N6AR, 7164 Rock Ridge Terrace, Canoga Park, CA 91307. C.W. logs to Bob Cox, K3EST, 6548 Spring Valley Dr., Alexandria, VA 22312. If in doubt, send them to CQ Magazine, 76 North Broadway, Hicksville, NY 11801. Indicate Phone or C.W. on the envelope.

Addendum To The 1982 CQ WW DX Contest Results

The following entries were either received too late for publication or inadvertently left out of the results.

S.S.B.

Single Operator

K3IE	A	371,763
AD3Z	A	205,821
K8QWY	A	40,200
K9SD	A	251,407
N9BKN	A	164,797
KD9M	A	12,012
V3ZZ	**A**	**1,074,150**
		High Zone 7
Z23JD	**A**	**97,092**
JT1AN	**A**	**77,106**
YO6AFP	A	276,975

QRPp

YO3SF	**28**	**3,744**
YO5BEU	**3.5**	**2,375**

Multi-Single

YO3KWJ	**945,648**

PA3AAN should have been listed as Single Operator on 21 MHz instead of 28 MHz, making him #1 in The Netherlands.

C.W.

Single Operator

A4XJO	**A**	**3,463,873**
	#6 in World, #2 in Asia	
YU3EY	**A**	**3,140,960**
	#7 in World, #1 in Europe	
4X8U	**14**	**735,504**
		#1 in World
N2IC/8	**A**	**1,155,649**
K9BLY/0	A	1,115,150
W4OGG	A	57,768
JA1EF	A	101,910
JA2MYA	A	23,085
JH1CNN	A	3,000
JA1DFQ	28	101,910
JF3GKE	28	21,546
LZ1CW	28	46,008
OZ4HW	A	53,676
OZ1GRS	A	18,785
OZ7YL	14	29,050
DJ6QT	**1.8**	**12,773**
CT1AOZ	**7**	**128,384**
PA0INE	A	9,009
PA3ASC	3.5	4,736
YO3CR	A	8,137
YO3KWJ	**28**	**194,004**
YO3BIZ	14	1,856
YO3BEJ	**7**	**143,136**
SM5CSS	A	33,048
SP5CNX/SM0	A	16,830

German Dem. Rep.

Single Operator

Y44YK	**A**	**572,064**
Y43WK	"	**426,618**
Y37UF	"	**406,175**
Y25TG	"	396,804
Y51XE	"	369,936
Y36UE	"	198,904
Y68WG	"	177,057
Y25NN/A	"	161,800
Y32UL	"	147,384
Y22HF	"	135,792
Y34SE	"	121,584
Y51UE	"	105,786
Y25PE/A	"	105,490
Y67ZG	"	101,803
Y34NI	"	93,912
Y23CM	"	61,560
Y54UL	"	53,361
Y24VF/A	"	41,340
Y23HN	"	41,265
Y23GB	"	35,880
Y47ZF	"	35,026
Y79WN	"	33,222
Y22UL	"	32,364
Y45UA	"	30,804
Y38YE	"	27,918
Y41ZF	"	24,854
Y24EA	"	23,980
Y21EA	"	23,760
Y35UB	"	14,800
Y79VN	"	14,774
Y49RF	"	12,775
Y39YD	"	11,135
Y23JA	"	10,044
Y52XF	"	9,720
Y46YH	"	9,656
Y23LM	"	9,159
Y22JA	"	7,257
Y21JH	"	6,681
Y65ZI	"	5,625
Y24UA	"	4,896
Y37VK	"	2,904
Y38ZB	"	2,703
Y44WA	"	2,541
Y51WE	"	252
Y36XC	**28**	**44,520**
Y56YF	"	38,222
Y42YG	"	29,580
Y54XA	"	17,372
Y31KK	"	16,218
Y21YA	"	12,816
Y21YH	"	9,688
Y37RL	"	6,642
Y23YE	"	6,292
Y62XG	"	660
Y24IF/p	**21**	**82,524**
Y37ZE	"	48,418
Y32KE	"	969
Y39YA	**14**	**41,720**
Y22PF	"	15,369
Y22YE	"	6,532
Y22DK	"	6,110
Y24MI	"	1,712
Y26FL	7	10,908
Y67XL	**3.5**	**40,736**
Y52ZL	"	4,708
Y32ZF	"	3,968

Multi-Single

W6UA		387,192
JA1YAG		180,323
OH2RF		103,973
Y44ZI/p		**1,098,843**
Y33ZL		836,097
Y58ZA		376,516
Y55ZA		254,024
Y45ZM		190,854

QRPp

Y27KL	**A**	**12,432**
Y22PM	**21**	**9,758**
Y23OH	3.5	1,080

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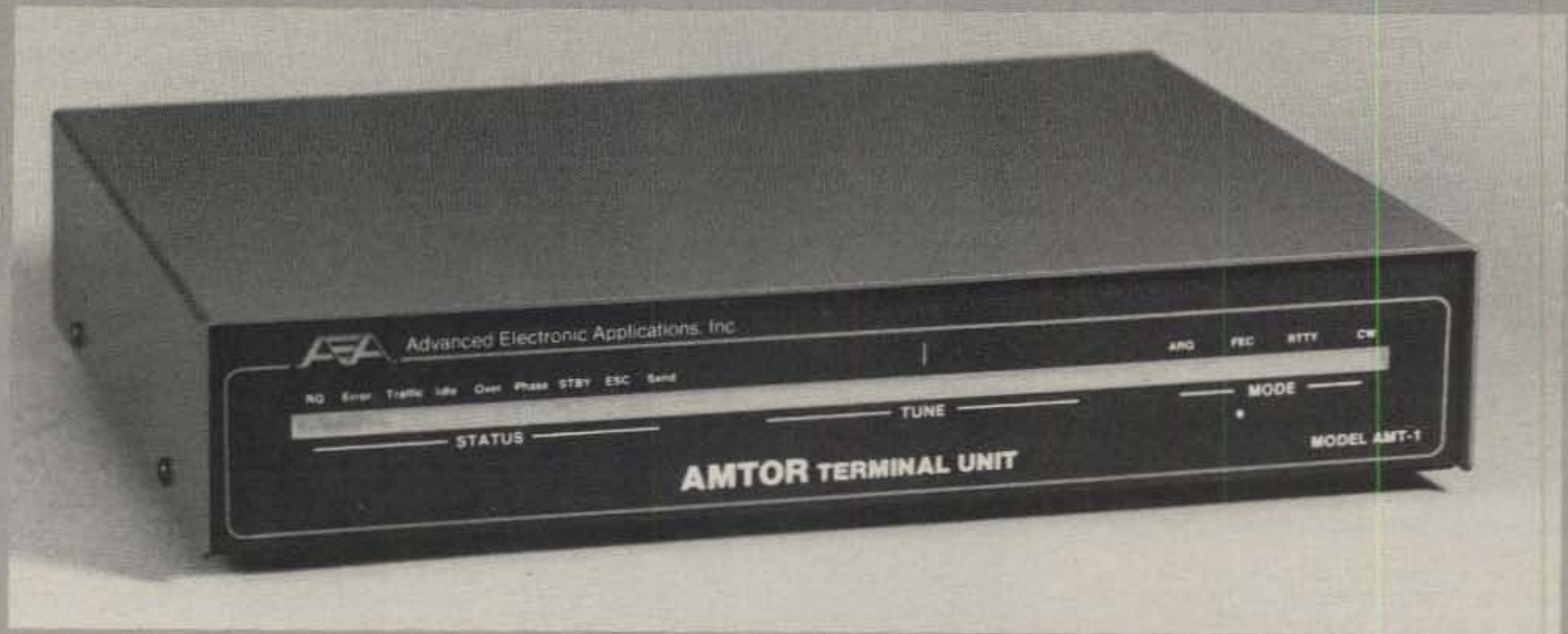

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AMTOR is the system of error correcting RTTY which has been rapidly overtaking conventional RTTY in Europe, just as its marine equivalent, SITOR, has been taking over in ship to shore communications.

It was originated by Peter Martinez, G3PLX (see June 1981 QST, p. 25). He first interpreted the international marine CCIR 476-1 specification for amateur use. Virtually all of the 400+ stations presently on AMTOR world wide are using software/hardware designs originated by Peter. The AMT-1 is a proven product which represents his latest and most highly refined design. It represents the culmination of over three years of development and on the air testing, and sets the standard against which all future AMTOR implementations will be judged.

Not only does it incorporate the latest AMTOR specification, but it gives superlative performance on normal RTTY, ASCII and CW (transmit only). As well as some fairly incredible real time microprocessor software, the AMT-1 boasts a four pole active receive filter, a discriminator type demodulator, a crystal controlled transmit tone generator, and a 16 LED frequency analyzer type tuning indicator, which is very easy to use.

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It used to be that C.W. was the ultimate mode for "getting through" when QRM and fading were at their worst. That's no longer true — AMTOR will get through with perfect error-free copy when all other conventional transmission modes become useless.

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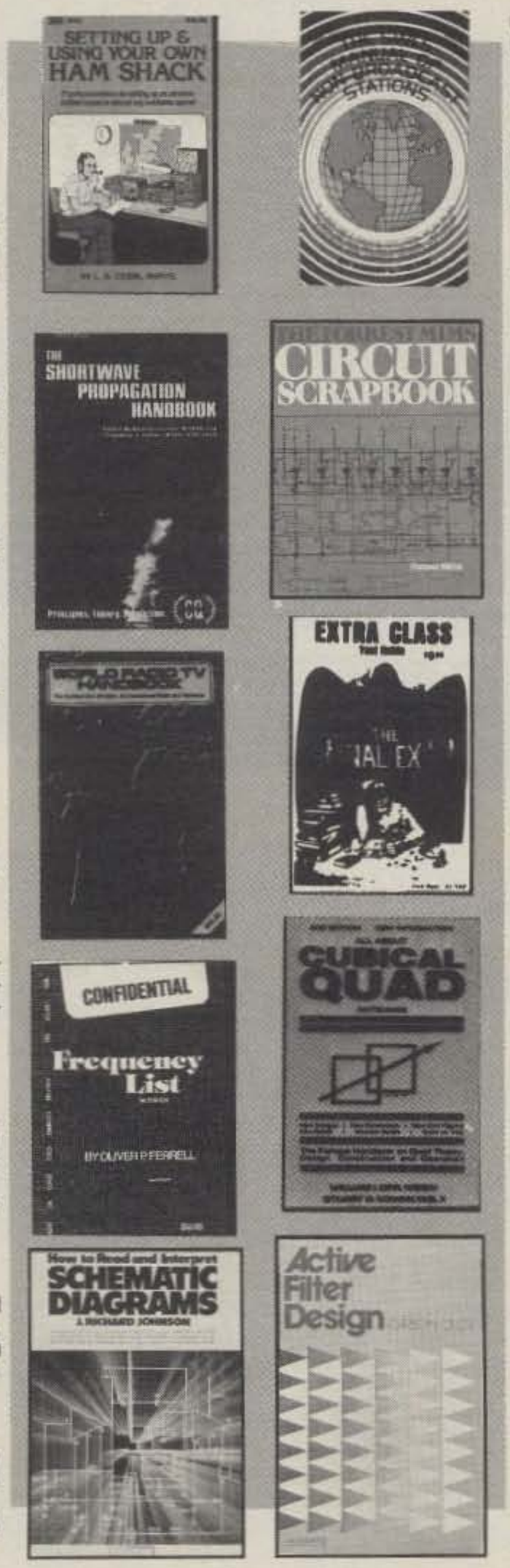

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dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

Capitol Hill Amateur Radio Society Responds To ARRL Filing On No-Code License

While the ARRL has stated that "the subject of a codeless amateur license is *not* a controversial matter" (The ARRL Letter, 4 August 1983), the headline of their 7 July 1983 Letter—"ARRL Continues Fight Against No-Code"—suggests that there are more than a few amateurs who favor the creation of a code-free license.

Among those responding to the comments filed on PR Docket 83-28 ("Establishment of a Class of Amateur Operator License Not Requiring a Demonstration of Proficiency in the International Morse Code") were the members of the Capitol Hill Amateur Radio Society. Filing *in support* of the Rulemaking, CHARS, in comments submitted by its president, David R. Siddall, K3ZJ, refuted the arguments set forth by the League in its move to kill the proposal.

Below are summaries of the six parts of the League's argument against a no-code license and of CHARS' response to each:

(1) The ARRL attacked the FCC's structuring of the Notice of Proposed Rulemaking for suggesting the possible parameters of a codeless license.

CHARS believes that "by including precise proposals, the FCC . . . enhanced the rulemaking process and clarified what action it is considering." Further, said CHARS, "if . . . the Commission merely proposed a no-code license in the abstract, without including details of its reach, then the Administrative Procedure Act would be violated."

(2) The ARRL claims that at first it maintained a fairly neutral position on the matter of a code-free license so as not to bias its members.

CHARS, citing information released by the ARRL to its members in 1982, noted that the League's "Board of Directors passed a resolution opposed to any license not requiring code before the details were even settled within the FCC, let alone publicly released."

(3) The ARRL stated that the benefits of a codeless license are "illusory and insubstantial" and that they would not attract young people to the service.

CHARS did not expect that the FCC would be flooded with applications for no-code licenses. But it did state that "a couple thousand bright computer-oriented persons who are too smart to spend time learning a Morse code system that their machines will send and receive for them would both benefit the amateur ranks and further the ideal of enhancing a radio experimentation."

(4) The League listed six reasons why Morse code is "an essential ingredient of each amateur's qualifications." Following are comments on but a few.

CHARS, citing the fact that a code-free license, by international agreement, could only carry privileges with allocations above 50 MHz, argued that the ARRL's argument that c.w. provided for the "economical use of limited frequencies" was not of concern in bands that are exceptionally wide. Further, while the ARRL noted that "Morse communications uses simpler and more easily maintained equipment," CHARS argued that "the purpose (of a code-free license) is to attract electronically skilled persons who can build and maintain more sophisticated equipment." Finally, the League stated that "Morse code is often the most effective communications mode in emergency communications." "False," cried CHARS, citing the fact that in a review of *QST* for the 18 months preceding its filing of reply comments, it was unable to find *"one single instance in which Morse code was reported to have been used in an emergency communications situation."*

(5) The League asserted that Canadian and Japanese experiences with no-code licenses did not demonstrate that such licenses benefited the amateur services in these countries.

CHARS responded by noting the following three items:

(i) "Neither the Canadian nor the Japanese license grant privileges similar to those proposed by the Commission;"

(ii) "We believe that at least Great Britain, France, West Germany, Spain, the Soviet Union, and Argentina" all have code-free licenses; a well-known amateur (Alfred A. Laun, III) is quoted as saying that "experience by (European countries) with a no-code amateur VHF license has been positive."

(iii) It is not possible for the American amateur tradition of public service to exist in Japan because the country's telecommunications systems are government owned; thus, the relaying of public-service communications by amateurs is prohibited.

(6) Finally, the ARRL asserted that "the Morse code requirement is a primary factor in the history of rule compliance of the amateur radio service."

CHARS noted that no evidence was presented to back up this assertion. Further, the Society linked compliance with an amateur's knowledge of the Commission's rules and regulations . . . a knowledge that must have been demonstrated in the FCC's written exam.

In sum, CHARS supported the establishment of a code-free license in the amateur service, with the license to carry privileges in certain portions of the VHF/UHF spectrum above 220 MHz. In taking this position, CHARS joins the editor and publisher of *CQ* magazine, among others, who feel it's time to set aside our emotional ties to the past, and get on with the business of building a stronger Amateur service.

Toyota Acknowledges RFI Problems With On-Board Computers

In response to an amateur's complaints on the "runability" of his 1982 Toyota Cressida, Mr. Stephen Oakley, Manager, Customer Relations, Gulf States Toyota, Inc., Houston, TX, noted:

"We are certainly sorry to hear of the problems you are encountering with the runability of your Cressida, but feel the problems could possibly be directly related to your Ham radio unit. As you know, Toyota has a precautionary suggestion in the owner's manual regarding the use of two way (radio) equipment. They feel that since there could be the possibility of high output from the transmitter it could cause a malfunction of the vehicle's computers. If this happens, Toyota will assume no liability for the replacement of such components."

As we noted earlier (Dateline . . . Washington, D.C., October 1982) regarding a similar problem with 1982 Subarus, it is truly unfortunate that automobile

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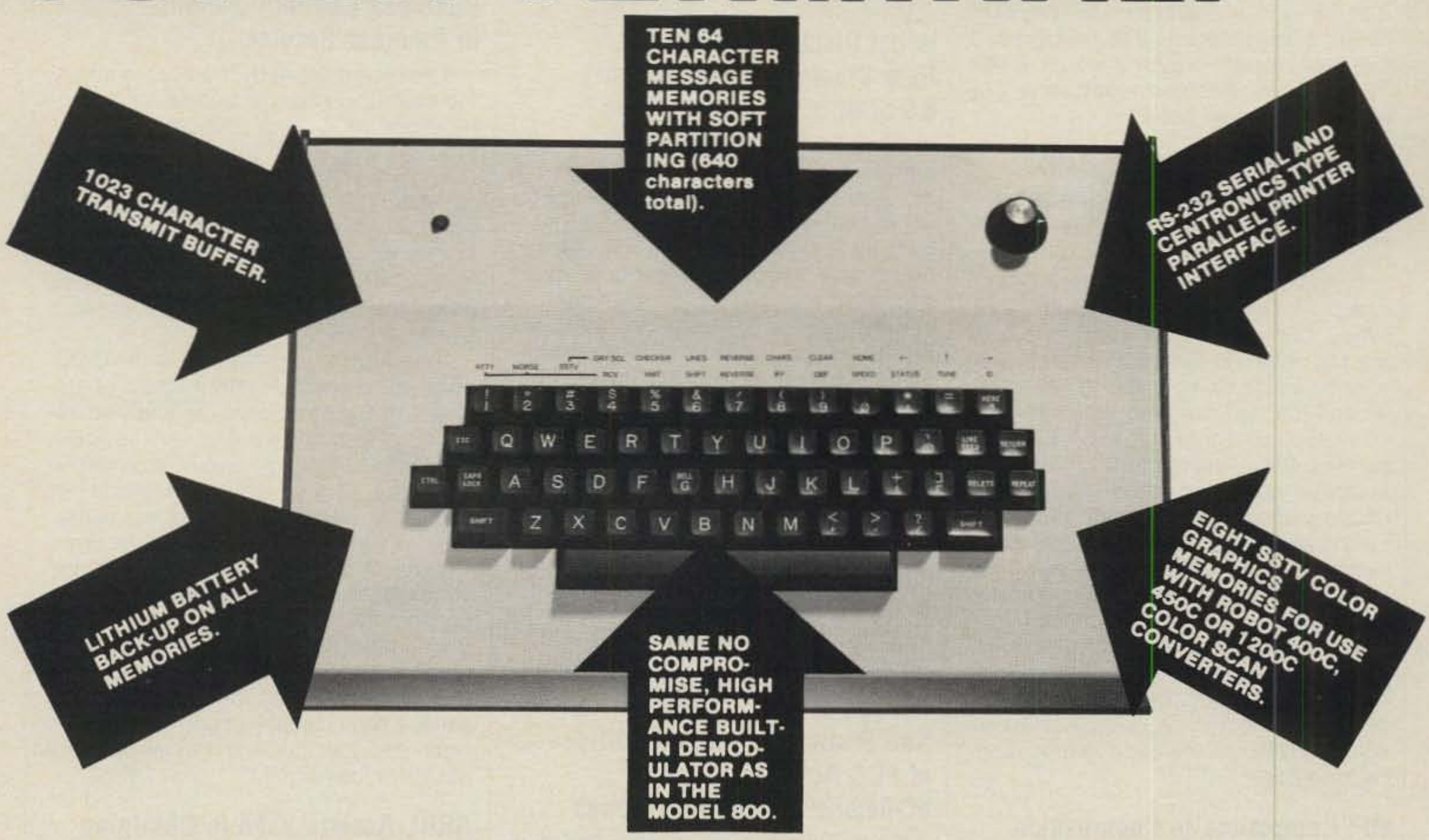

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manufacturers are not taking the proper steps to correct such susceptibility problems, for regardless of whether the RF signal is generated in the car or by a transmitter in a nearby vehicle (e.g., police car, taxi, delivery truck, etc.), a number of passenger cars on the road today will apparently malfunction in the presence of any strong signal.

Given the diversity of mobile radio transmitters in use today, and the rapid growth expected in the Land Mobile service (among others) in the coming years, it certainly would be in the automobile industry's best interests if the design deficiencies responsible for the susceptibility problems observed today were corrected as soon as possible.

CQ Interviews Ralph A. Haller, Chief, Experimental Engineering Branch, FCC Laboratory

Elsewhere in this issue you will find an in-depth interview with Mr. Ralph Haller, N4RH, of the FCC Laboratory in Columbia, MD. A career Government employee who joined the Commission in 1971, Haller and his staff are responsible for providing technical guidance to the Commission in rule-making matters; for resolving technical questions faced by the Commission; and for providing technical consulting services to other elements of the Commission. For a timely overview of issues such as radio-frequency interference, voluntary RFI standards for home-entertainment equipment, the linear amplifier ban, cable television operations, and other areas of interest to amateurs, read this month's exclusive interview with the Chief of the Experimental Engineering Branch.

RFI Complaints to Commission May Be on the Rise

According to Jeffrey Young, Field Operations Bureau, FCC, RFI complaints to the Commission in the period April–June 1983, inclusive, totaled 18,051. This is up from the 17,306 complaints reported during the same period a year earlier, and may indicate that RFI complaints are again on the rise.

As always, so-called television interference (TVI) accounted for the majority of the complaints, with 77% citing a television receiver as the victim device. Of these, 9,644 were alleged to have resulted from CB operations, while only 700 reports cited amateurs as the interference source.

In all, amateurs were cited in 1,063 RFI cases, while CB operations accounted for 10,944 complaints. And when it comes to intra-service complaints, amateurs cited other amateurs in 333 RFI cases, while 1,202 CBers cited their fellow CBers as interference sources.

Finally, while the Commission has been moving towards deregulation of the Amateur and other radio services, the Field Operations Bureau continues to enforce the rules still on the books. To this end, on-scene monitoring of numerous facilities during the April–June period resulted in 107 amateurs and 62 others being cited for out-of-band or unlicensed operations. Meanwhile, the Commission's fixed monitoring stations observed the on-the-air activities of 6,592 amateurs, citing 575 for rules violations. Mobile stations, meanwhile, monitored 422 amateurs, citing 16 for violations.

Initial Discussions with New Chief of PRB Indicate No Shift in Current Policies

Discussions with Robert S. Foosaner, newly appointed Chief of the Private Radio Bureau, reveal that at this time Foosaner intends to continue the policies set forth by his predecessor, James McKinney. Foosaner also anticipates no major personnel changes within the Bureau. In commenting on his relationship to the Amateur service, Foosaner indicates that he intends to be a "vigilant and vigorous defender of the service's allocations."

Bob Foosaner, of course, is "his own man," and as time passes we can expect him to put his own imprint on the PRB and on the Amateur service. But with his many years of service to the Commission (Foosaner joined the FCC in 1968), and his participation in numerous international telecommunication conferences, we feel sure that the PRB, in general, and the Amateur service, in particular, are in good hands!

San Francisco Regional Office of FCC Active in Malicious Interference Cases

Earlier this year west-coast FCC field offices received numerous complaints from San Francisco Bay Area amateur radio operators concerning malicious interference to their v.h.f. repeater station operations. These complaints prompted a field investigation by the San Francisco district office in a semi-wilderness area of the Santa Cruz Mountains (near the community of Boulder Creek, CA), and around San Anselmo, CA.

In the Santa Cruz Mountains, officials obtained evidence supporting their claim that Philip J. Beaudet, an Advanced Class operator holding station license WD6FGE, was intentionally transmitting an unmodulated carrier, thereby causing extensive interference to amateur repeater communications. As a result of the investigation, Beaudet voluntarily surrendered his license rather than face severe administrative penalties. His operator license was suspended from 8 June to 8 December 1983 by order of the Private Radio Bureau.

In the area of San Anselmo, an investigator observed a Mill Valley, CA, amateur operating from a mobile unit on a frequency used by a local amateur repeater station. The operator, who held an Advanced Class license and a "KE6" callsign, failed to identify his transmissions by the assigned callsign. An official Notice of Violation was issued to the licensee on 6 May 1983. No additional information is available at this time on the identification of the licensee involved in this violation.

FCC Clarifies Order Against Business Communications in Amateur Service

The recent move by the FCC to clarify the prohibition against business communications (FCC Order 83-298) by amateurs created much confusion in the amateur ranks. Responding to a letter from the ARRL, in which their Counsel, Chris Imlay, requested clarification of the FCC's position, James McKinney, formerly Chief of the Private Radio Bureau (and now Chief, Mass Media Bureau) stated:

"We want to emphasize that the Order does not prohibit Amateur Radio operators from participating in the routine events of traditional public service activities. For example, Amateur radio operators may provide communications for municipal parades, marathons, walkathons, Eye Bank activities, and the like.

"The Order was not intended to impose any new restrictions or to cut back on what Amateur operators have legitimately been doing all along. What was intended was to alert the Amateur community to the fact that the Amateur Radio service should not be used in lieu of other radio services for the transmission of business messages."

ARRL Assists VITA in Obtaining License for PACSAT

As noted in our May 1983 *CQ* interview with Mr. Henry Norman and Dr. Gary Garriott, WA9FMQ, of VITA (Volunteers in Technical Assistance), that organization is funding the development of a low-cost packet radio satellite system called PACSAT. The satellite, which would have two transponders working up on 435 MHz and down on 145 MHz, and which would have message store-and-forward capabilities, could significantly speed up communications between VITA and its volunteers around the world. These volunteers are striving to provide people in developing countries with the information and help they need to build dams, telephone systems, power generators, and other needed improvements, and the delays encountered today in obtaining needed information are delaying many projects.

One question that must be resolved before PACSAT can fly, however, revolves around the communications service under which the satellite would operate.

To this end the ARRL is working with VITA and the FCC in an attempt to obtain a license that would permit a test of the PACSAT concept. Two alternatives appear promising at this point:

(1) The transponders would be operated in the Amateur Satellite service; one would be used for regular ham activities while the other would be reserved for VITA (waivers of business communications rules would be required; in addition, temporary third-party agreements would have to be arranged).

(2) One transponder would be operated in the Amateur Satellite service, while the other would be licensed in the Experimental Radio service. The latter would operate on amateur frequencies on a non-interference basis to the Amateur service.

The successful test of a computer-based, store-and-forward packet transfer satellite in the Amateur Satellite service would represent an important step forward for amateurs everywhere, and would serve to demonstrate that we are still capable of making contributions to the radio art.

Intercontinental Packet-Radio Tests Are Successful

As announced in "QEX," the ARRL's newsletter for experimenters, a successful long-distance, digital, packet-radio exchange was accomplished on 27 May 1983 by Tom Clark, W3IWI, and Ian Ashley, ZL1AOX; the band used was 28 MHz. This contact, over 13,850 km, is the longest distance yet covered using packet radio. Both stations used a Terminal Node Controller developed by the Tucson Amateur Packet Radio Group, with data transmitted at 120 baud. Later tests, at 600 baud, involved the two operators cited above as well as Vernon Riportella, WA2LQQ. All three stations are affiliated with AMSAT and are experimenting with high-speed digital communication techniques as part of the preparations for working with both AMSAT AO-10 and VITA's PACSAT (a packet-radio satellite now being designed by AMSAT).

Commission Adopts New Power Measurement Method

With some exceptions (specified in the amateur rules), amateurs may now operate their transmitters with a maximum, peak envelope power output of 1500 watts. This action was in response to the Commission's concern that "... the present rules governing maximum transmitting power in the service *(rules involving the measurement of input power—ed.)* were archaic and unsuitable" for use with modern transmitting equipment. In particular, the old rules did not adequately apply to s.s.b. and other advanced modulation techniques, were difficult to enforce, and required measurement techniques which were considered dangerous.

The ARRL, which had filed comments in favor of the move to the measurement of peak envelope power output, argued, among other things, that if such a method were adopted, amateurs working at the higher frequencies would no longer be constrained by amplifier inefficiencies.

In addition to adopting the new technique for power measurement, the Commission took the position that it was not going to require amateur operators to have equipment on hand for making any power measurements. All that actually is required is for the operators to comply with the rules regarding the power used.

Finally, the peak envelope power output of an amateur transmitter may not exceed 200 watts in the following bands: 3700–3750 kHz; 7100–7150 kHz (7050–7075 kHz in Regions 1 and 3); 21100–21200 kHz; and 28100–28200 kHz. Limitations on power levels authorized on the 160 meter band may be found in Section 97.61 of the Commission's rules.

Launch of AMSAT OSCAR 10 Marks Transition to New Generation of OSCARs

According to "Amateur Satellite Report," AMSAT's newsletter of amateur space programs, the launch of AO-10 on 16 June 1983 marks the introduction of a new breed of amateur satellite, Phase III. Unlike OSCAR 1 (which, believe it or not, was launched nearly 22 years ago!), AO-10 was launched into a very high orbit. Further, it was intended for long service life, having both a primary and a spare battery aboard. When the primary battery weakens, the spare will be placed into service, a move that should extend the life of AO-10 to beyond seven years.

While AO-10 is an unqualified success, AMSAT is already planning its Phase IV birds, all of which would be geosynchronous satellites. Plans are even in the formative states for Phase V satellites, which are envisioned as amateur space vehicles capable of leaving the vicinity of Earth.

If you would like to learn more about AO-10 and other AMSAT projects, write to Satellite Report, 221 Long Swamp Road, Wolcott, CT 06716.

FOB Movies Ahead on Voluntary Enforcement in the Amateur Service

With the support of Congress, and specifically, with the passage last year of PL-97-259 (the so-called "Goldwater Bill"), the FCC is moving quickly, but carefully, to implement voluntary enforcement procedures. Uppermost in the minds of those working on the problem, says Elliott Ours, Chief, Enforcement Division, FOB, are the administrative requirements for such a program and the various options available to the Commission on the use of volunteer observers.

The voluntary enforcement program was made possible by two provisions of PL-79-259:

(1) Regulations pertaining to the privacy of communications (better known as Section 605 of the Communications Act of 1934 [as amended] were lifted for amateur and CB operations;

(2) Legislation that prohibited Federal agencies from using voluntary services was waived so as to permit implementation of the program.

At the earliest, says Ours, voluntary enforcement will begin in March 1984.

Your Washington Editor thanks Mr. Richard I. Vaughan, Regional Director, FCC, San Francisco, CA, for his contributions to this month's column.

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Since this issue of *CQ* should reach most subscribers prior to the *CQ* World-Wide DX Phone Contest weekend of October 29–30, here is an updated day-to-day forecast for that weekend. Conditions still look very good for October 29th. Expect High Normal most of the day with some periods of Above Normal. Conditions are expected to drop a bit on the 30th, with mainly Low Normal expected. A radio storm is expected to begin on October 31st, and this may mar the last few hours of the Contest period.

See the Last Minute Forecast appearing in this month's column for a day-to-day forecast of conditions expected during the C.W. Contest weekend of November 26–27.

Sunspot Cycle Progress

The Royal Observatory of Belgium reports a monthly mean sunspot number of 82 for July 1983. This results in a 12-month running smoothed sunspot number of 93 centered on January 1983. The sunspot cycle is measured by the value of smoothed sunspot number.

A smoothed sunspot number in the mid-70's is forecast for November 1983, as the present cycle continues its steady decline.

Contest Tips

The C.W. weekend of the 1983 *CQ* World-Wide DX Contest will take place November 26–27. If you are planning to participate in the C.W. Contest, be sure to check the special DX Propagation Charts appearing in last month's column for band-opening predictions, work plans, and other propagation data especially tailored for the Contest. For a day-to-day forecast of general conditions for November, including the C.W. Contest weekend, see the Last Minute Forecast appearing in this column.

Here are some propagation tips that should be helpful in working DX during November, particularly during the C.W. weekend of the 1983 *CQ* World-Wide DX Contest.

During and *shortly after sunrise*, excellent DX conditions to most areas of the world are forecast for *20* meters. Also check for openings on *40*, *80*, and *160* meters towards southerly and westerly directions.

From an hour or so *after sunrise*, and until *late afternoon*, *15* meters is expected to be the optimum band for world-wide DX, with both *10* and *20* meters close runner-ups. Reception on all three bands should favor signals from an easterly direction before noon, from the north and south shortly after noon, and from southerly and westerly directions during the later afternoon hours.

During the *late afternoon* and *early evening* hours, check *15* meters for signals arriving from the south and west, and *20* meters for signals from just about every direction. Fairly good DX openings towards the east and the south should also be possible on *40* meters beginning an hour or so before sundown.

During the *late evening* and *early morning* hours, *20* meters should open for DX towards the *south*, *west*, and *northwest*, often with strong signals. Good openings to most areas of the world should also be possible on *40* meters during the hours of darkness. Some fairly good *80* meter, and some *160* meter DX openings are also possible during this period.

Signal levels on most DX openings should be noticeably stronger during November as a result of a seasonal decrease in static levels and solar absorption.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1983

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 6, 13, 23, 25	A	A	B	C
High Normal: 2-3, 12, 14, 22, 24, 26, 30	A	B	C	C-D
Low Normal: 4-5, 7, 10-11, 16-17, 21, 27	A-B	B-C	C-D	D-E
Below Normal: 1, 8-9, 18, 20, 28-29	B-C	C-D	D-E	E
Disturbed: 19	C-E	D-E	E	E

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

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-poor (C-D) on the 1st, good (B) on the 2nd and 3rd, good-to-fair (B-C) on the 4th and 5th, etc. Conditions during the C.W. weekend of the CQ WW DX Contest are expected to be good on the 26th and good-to-fair on the 27th.

V.H.F. Ionospheric Openings

Solar activity has now decreased to a level where few, if any, F-2 layer openings can be expected on the *6* meter band. If any are to occur, the best time to check would be during the afternoon hours when conditions are expected to be High Normal or better. The best chances are for openings towards the Caribbean and Central and South America.

There is a possibility, albeit small, for some *6* meter Trans-Equatorial (TE) scatter-type openings during November, mainly between the southern tier states and deep South America. The evening hours are the best time to try TE propagation, between 8 and 11 p.m. local stan-

HOW TO USE THE SHORT-SKIP CHARTS

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

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

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

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

3). Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

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

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

dard time. At best, expect very weak openings with strong flutter fading.

Two significant meteor showers are expected during November, which should result in some meteor-type ionospheric openings on the v.h.f. bands. The *Taurids* shower, which should last for a day or two, is expected to peak on November 1st, with a peak meteor count of approximately 15 an hour. A second shower of about the same duration and intensity, called *Leonids*, should reach peak intensity on November 14th.

November is usually a month of fairly intense and widespread auroral activity, which can result in short-skip propagation on the 6 and 2 meter bands for distances up to approximately 1200 miles. Auroral activity is often associated with periods of radio storminess, and is most likely to occur on those days shown as Below Normal or Disturbed in the Last Minute Forecast, which appears at the beginning of this column.

This month's column contains short-skip propagation data for use between distances of approximately 50 and 2300 miles, and between the states of Hawaii and Alaska and the continental areas of the United States.

Good luck on the C.W. Contest weekend. Be sure to let me know how these special Contest propagation forecasts work out. For the past 32 years the Contest forecasts have held up with an accuracy better than 90%!

73, George, W3ASK

CQ Short-Skip Propagation Chart
November & December, 1983
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters) — *Distance From Transmitter (Miles)*

	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	07-09 (0-1) 09-11 (0-2) 11-15 (0-3) 15-16 (0-2) 16-18 (0-1)	07-08 (1) 08-09 (1-2) 09-11 (2-3) 11-15 (3-4) 15-16 (2-3) 16-17 (1-3) 17-18 (1-2) 18-20 (0-1)
15	Nil	08-10 (0-1) 10-16 (0-2) 16-18 (0-1)	07-08 (0-1) 08-09 (1-2) 09-10 (1-3) 10-11 (2-3) 11-16 (2-4) 16-18 (1-2) 18-20 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-16 (4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)
20	09-11 (0-1) 11-15 (1-2) 15-17 (0-1)	07-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-17 (1-4) 17-18 (0-3) 18-20 (0-2) 20-07 (0-1)	07-09 (2-3) 09-11 (3-4) 11-17 (4) 17-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-07 (1)	07-09 (3) 09-15 (4-3) 15-18 (4) 18-19 (3-4) 19-20 (3) 20-21 (2-3) 21-22 (2) 22-00 (1-2) 00-06 (1) 06-07 (1-2)
40	07-08 (0-2) 08-09 (1-3) 09-17 (4) 17-19 (2-3) 19-21 (1-2) 21-07 (0-1)	07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-06 (1-2) 06-07 (1-3)	06-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-20 (4) 20-21 (3-4) 21-03 (2-4) 03-06 (2-3)	06-08 (3-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-03 (4) 03-06 (3)
80	08-21 (4) 21-00 (3-4) 00-04 (2-3) 04-07 (2) 07-08 (3-4)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-00 (4) 00-04 (3-4) 04-07 (2-3) 07-08 (4-3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4-3) 04-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-1) 20-04 (4) 04-06 (3-2) 06-07 (3-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-07 (3-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-3) 04-06 (2-1) 06-07 (1-0)

ALASKA
November & December, 1983
Openings Given in GMT#

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

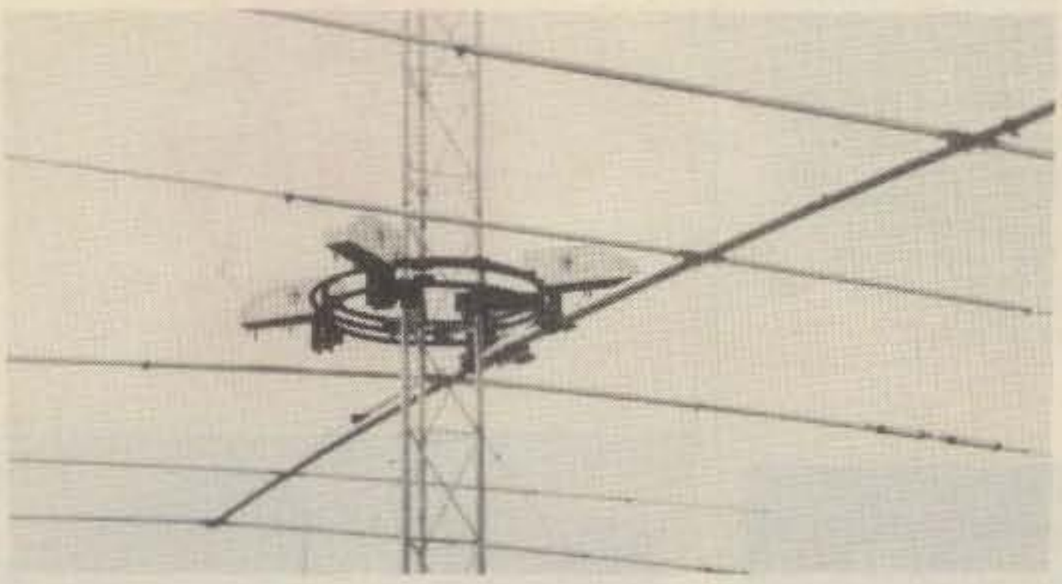
HAWAII
November & December, 1983
Openings Given in Hawaiian Standard Time

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

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

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For openings over shorter distances, use the preceding Short-Skip Propagation Chart.



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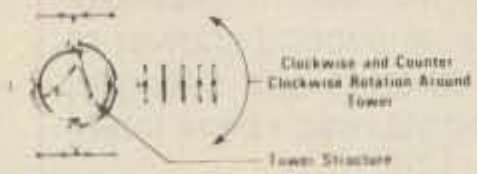

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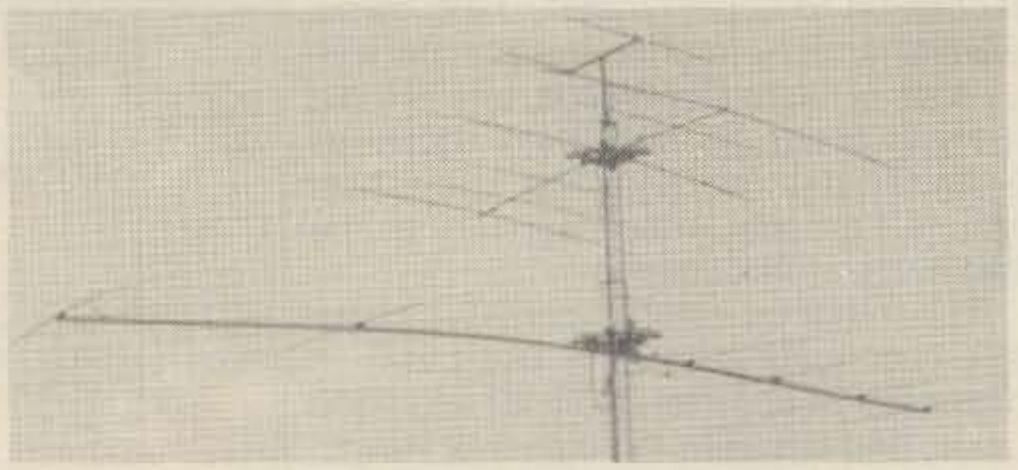
- Allows Independent antenna directional control on the same tower.



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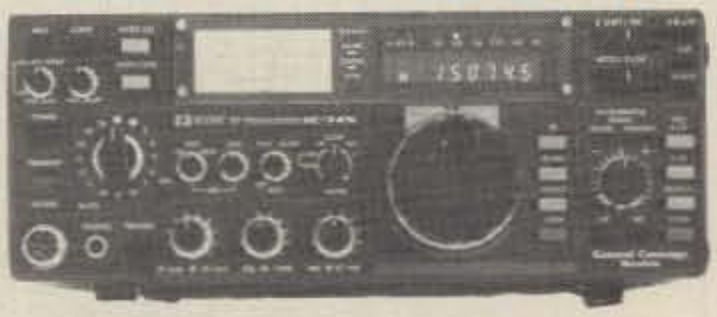

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CIRCLE 17 ON READER SERVICE CARD

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

History of the Novice License—Part II of III

This article is divided into three segments. Last month's column covered purposes, bands, suggested expansion of two current Novice bands, and recommended establishment of two new Novice bands. It is suggested that you read all three parts of this article to gain a better understanding of the Novice license.

Crystal Control

On November 22, 1972 the FCC eliminated the requirement that the oscillator stage of a transmitter operated by a Novice licensee be crystal controlled; this greatly improved Novice operating enjoyment. Modern equipment design had long provided dependable and highly stable variable frequency oscillators (v.f.o.'s) which allow one to quickly select any desired frequency, instead of being rock bound to specific crystal-controlled frequencies in each band. The frequency synthesizers (VFX's) in modern transceivers provide even better frequency stability than v.f.o.'s, and many modern rigs include a digital frequency readout of laboratory-standard accuracy. When using a v.f.o., it is necessary to use a crystal calibrator (or some other accurate device) to ascertain exact band edges, rather than to assume that the v.f.o. reading is precise. Consequently, crystal calibrators were built into most of the amateur equipment that preceded VFX-controlled gear with digital readout.

Operators of VFX-controlled equipment should be aware that it usually includes two types of frequency offsets that can cause problems. The first one is transmit frequency offset. If one were to listen at the exact center of the received frequency, no tone would be heard. Most operators listen to a frequency that is about 700 Hertz away from the center of the received frequency, enabling them to hear the code at an audible frequency of about 700 Hertz. Equipment manufacturers design modern transceivers to take this frequency offset into account. They have your transmitting frequency automatically offset about 700 Hertz from your receiving frequency (in the correct sideband) so that both stations will transmit on approximately the same frequency. This feature minimizes the possibility of interference from other stations because both stations are keeping the same frequency in use. However, transmitter offset must be remembered when operating close to a band edge, since the resultant offset transmit frequency could be outside the band.

2814 Empire Ave., Burbank, CA 91504

Eddie S. Giampapa, KA7FZE, lives in Panaca, Nevada. He is 66 years old and retired. His station includes a Heath DX-40 transmitter, Drake 2-C receiver, a 40 meter inverted Vee antenna, and a 10 meter Yagi-Uda beam antenna. Eddie started operating in September of 1980. He has earned the RCC (Rag Chewers' Club) and TAD (Ten American Districts) operating awards, and he just applied for the WAS (Worked All States) certificate. Eddie has also contacted amateurs in Canada and Japan. He has been retired since August 1977 from a job as night foreman of the Las Vegas city garage. His cat (Fancy) likes the sound of code, and she stays near the rig as long as she hears it. Eddie is an ARRL member.

The second offset problem possibility concerns the feature that allows us to shift receive (only) frequency a few kiloHertz up or down without also changing the transmit frequency. This is a good feature because it enables us to tune to a signal answering our CQ (call to all stations) off our transmit frequency. We can use the receiver offset feature to tune in such an off-frequency station without moving our own transmit frequency (main tuning dial), which could cause the other station to lose us. This feature is usually identified as RIT (Receiver Incremental Tuning), OT (Offset Tuning), or Clarifier. The offset normally extends about 4 kHz above (+) and below (−) the receive frequency selected with the main tuning dial. If you forget to restore this control to the zero offset point after working an amateur who answered your far off frequency, you will not be subsequently answering other stations near their transmit frequencies. If you make this mistake near a band edge, it could cause you to transmit out of the band. Following required RIT usage, remember to return this control to the zero offset point, which is usually with the knob pointer positioned straight up. To further minimize the possibility of making an error, it is a good operating practice to turn this feature off whenever it is not needed.

Testing Novice Stations

Beginning Novices frequently ask experienced amateurs to check out their newly installed stations. Doing this can verify proper station operation, while allowing the experienced amateur to make sure the Novice really knows how to operate the equipment. I take this opportunity to suggest changes which would improve operator comfort and/or station performance. I have also found that Novices have a lot more confidence in their stations after hearing me contact a few amateurs from their station.

A problem that existed for 21 years was eliminated on October 17, 1972, when the FCC changed the regulations and made it legal for a higher class licensee to operate beyond the privileges of a lower class licensee when using the station of an amateur with a lower class license. This privilege is handy when a Novice wants to check out her/his station's performance on a band (20 meters, for example) or a mode (s.s.b., for example) that she/he is not licensed to operate. The on-the-air identification consists of the callsign of the Novice station (KB6ABC, for example) and the callsign of the amateur with the higher class license (W6JEP, as an example). In this example, the correct station identification is KB6ABC/W6JEP. If the higher class licensee does not exceed the operating privileges of the lower class licensee, whose station she/he is operating, just the callsign of the lower class licensee (KB6ABC in this example) is used.

Logging and Identification

These requirements have been reduced in recent years. The changes affect all classes of amateur licensees. The requirement to log unproductive calls was dropped on November 22, 1972. The requirement to log callsigns of stations contacted during mobile operation was also dropped at the same time. Home-

station logging requirements were significantly reduced on June 25, 1974. The requirement to log routine contact information was eliminated on June 9, 1983.

Licensing and License Availability

I have had students as young as 7 and as old as 94 progress from Novice to at least General class licenses. Some ex-students hardly got their Novice stations on the air before they upgraded to General. However, the average person takes about 1½ years to upgrade from Novice to General. Prior to November 22, 1968, Novice licenses were just valid one year and they were not available to anyone who previously (or presently) held any class of amateur radio license, including the Novice ticket. It never seemed reasonable to penalize a prospective amateur for having had a previous interest in amateur radio, which is what that rule did. The one year life of this non-renewable license caused many Novices to go off the air just when they were approaching the point where they could pass the required 13 w.p.m. General/Advanced code test. Several of these people picked up Technician licenses (which became available in 1954) to stay on the air and to retain the same suffix in their callsigns.

The Novice license term was increased to two years on November 22, 1968, and the license was made available to anyone who had not held any class of amateur operator license during the year immediately preceding their newest license application. This 1968 change allowed the first Novice retreads to get back on the air, and most of them took advantage of this opportunity to operate and upgrade. The one-year gap between holding any amateur license was abolished in 1976. The May 15, 1978 change made the Novice license good for a maximum of five years and changed it to a renewable license.

Distinctive Novice callsign prefixes were eliminated on October 1, 1976. At the same time the FCC imposed a 250 watt maximum input power limitation on all classes of licensees (Novice through Extra) operating in the American Novice bands. I think this power limitation was a bad change. One upgrades to increase operating privileges, and the right to use more power is an increase in operating privileges. Few people have spent more time operating the Novice bands than myself. It is my conviction that the power limit for Novices should be 150 watts, and the 250 watt Novice band limitation should be removed for General through Extra class amateurs. It was permissible for an amateur to hold Novice and Technician licenses before November 22, 1968, when this dual licensing possibility was eliminated.

Prior to November 30, 1974, aliens were not allowed to become American amateurs. Prior to December 24, 1975, amateurs (other than Novices) applying for license renewal had to confirm that they had met the minimum operating (hours) requirement and still possessed the code proficiency required to obtain their class of license. Novice license applications never involved a fee, and the fees associated with all other classes of amateur licenses were suspended on January 1, 1977. These fees have not yet been reinstated.

As of March 1, 1977, the FCC implemented instant upgrading. The FCC Form 660-B interim permit is valid a maximum of 90 days (it can be renewed), and it authorizes one to immediately use the additional operating privileges of the higher class license she/he has just earned. As an example, if a Novice with the callsign KB6ABC were to pass the General class code and written tests at the Long Beach, California, FCC office, her/his interim permit would state General class privileges and show KB6ABC/LB as her/his temporary callsign. When an interim licensee is not operating past her/his previous privileges (Novice in this example), the upgrade indicator does not have to be used and KB6ABC suffices.

License copies have been okay to submit with renewal and modification applications since January 18, 1979. Prior to this date we were supposed to submit the original license with applications, although many of us submitted copies.

The license renewal grace period was extended to five years on March 16, 1979, allowing amateurs to renew licenses up to five years past their expiration dates. However, callsigns were just protected one year, and tardier renewals brought new station callsigns. The callsign protection period has recently been extended.

FCC Field Offices and Examinations

Some Novices have trouble finding out when and where the FCC will hold amateur radio operator examinations in their areas. If you want to try to upgrade in license, you should contact the nearest FCC field office to obtain a copy of their current examination schedule. The following list may be of interest; it is in alphabetical sequence by states. Remember to include Federal Communications Commission (or FCC) as the first line of the address.

1011 East Tudor Road
Room 240, POB 2955
Anchorage, AK 99510
907-276-7455

7840 El Cajon Boulevard
Suite 405
La Mesa, CA 92041
714-293-5478

3711 Long Beach Boulevard
Suite 501
Long Beach, CA 90807-3393
213-426-4451

423 Customhouse
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San Francisco, CA 94111
415-556-7701

12477 West Cedar Drive
Denver, CO 80228
303-234-6977

919 Federal Building
51 S.W. First Avenue
Miami, FL 33130
305-350-5542

Interstate Building
Suite 601
1211 N. Westshore Boulevard
Tampa, FL 33607
813-228-2872

Massell Building, Room 440
1365 Peachtree Street, N.E.
Atlanta, GA 30309
404-881-3084

7304 Prince Kuhio Federal Building
300 Ala Moana Boulevard
POB 50023
Honolulu, HI 96850
808-546-5640

230 South Dearborn Street
Room 3940
Chicago, IL 60604
312-353-0195

1009 F. Edward Hebert Building
600 South Street
New Orleans, LA 70130
504-589-2095

1017 George M. Fallon Building
31 Hopkins Plaza
Baltimore, MD 21201
301-962-2728

1600 Customhouse
165 State Street
Boston, MA 02109
617-223-6609

1054 Federal Building
231 West Lafayette Street
Detroit, MI 48226
313-226-6078

691 Federal Building
316 North Robert Street
St. Paul, MN 55101
612-725-7810

Brywood Office Tower, Room 320
8800 East 63rd Street
Kansas City, MO 64133
816-926-5111

1307 Federal Building
111 West Huron Street
Buffalo, NY 14202
716-846-4511

201 Varick Street
New York, NY 10014
212-620-3437

1782 Federal Office Building
1220 S.W. 3rd Avenue
Portland, OR 97204
503-221-4114

One Oxford Valley Office Building
2300 East Lincoln Highway
Room 402
Langhorne, PA 19047
215-752-1324

747 Federal Building
Avenida Carlos Chardon
Hato Rey, PR 00918
809-753-4567

13E7 Earle Cabell Building
1100 Commerce Street
Dallas, TX 75242
214-767-0761

5636 Federal Building
515 Rusk Avenue
Houston, TX 77002
713-226-5624

Military Circle
870 North Military Highway
Norfolk, VA 23502
804-441-6472

3256 Federal Building
915 Second Avenue
Seattle, WA 98174
206-442-7653

The 25 FCC field offices are located in 19 states, plus Puerto Rico. If your closest office has been closed, simply contact the one that is next closest. FCC operator examinations are regularly conducted at specific locations away from the FCC field offices.

The Novice examination procedure changed as of September 1, 1983. Prior to that date, the applicant and the volunteer examiner sent a completed form 610 to the FCC and requested the written examination. The volunteer examiner now makes up the Novice written test using a pool of questions prepared by the FCC. This pool of Novice questions should be available from FCC field offices. Request a copy of PR Bulletin 1035A if you plan to administer a Novice licensing examination. The volunteer examiner administers and grades the code and written tests. If the applicant passes, the examiner forwards the completed form 610 to the FCC, POB 1020, Gettysburg, PA 17325.

Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an s.a.s.e. if a picture must be returned. A free one-year *CQ* subscription or renewal is awarded to the amateur whose picture I select as the winner for the month. If you are a subscriber, enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs who frequently work the American Novice bands are also urged to submit photographs. I have never received pictures from Novices in Connecticut, Hawaii, Louisiana, New Hampshire, Oregon, Rhode Island, South Carolina, Utah, or Vermont.

Part II Summary

This concludes the second part of this three-part article. The third part covers applications, examination answer forms, written examinations, turnaround time, upgrade credit, technician license, and FCC examination elements.

If you know a potential Novice, please bring the preceding information to her/his attention. It will take time for the new Novice examination procedure to become known by most of the potential volunteer examiners. 73, Bill, W6DDB

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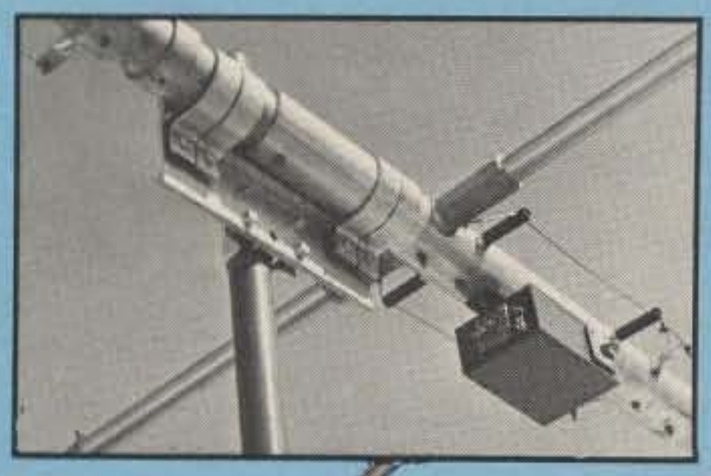

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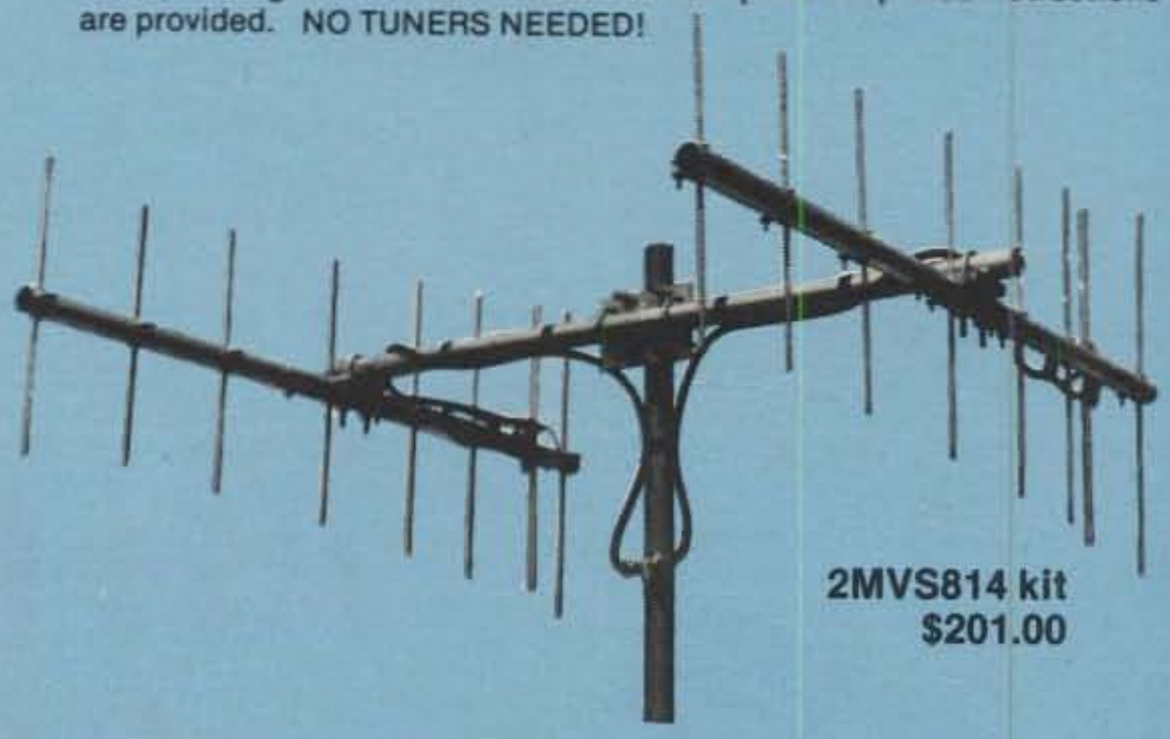

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10M636	10 Meter 6 element	(14.6 DBD)	745.00	**625.00**
15M532	15 Meter 5 element	(13 DBD)	545.00	**455.00**
15M845	15 Meter 8 element	(15 DBD)	1120.00	**925.00**
20M536	20 Meter 5 element	(12 DBD)	645.00	**535.00**
20M646	20 Meter 6 element	(14 DBD)	1130.00	**945.00**
40M214	40 Meter 2 element	(5.6 DBD)	740.00	**615.00**
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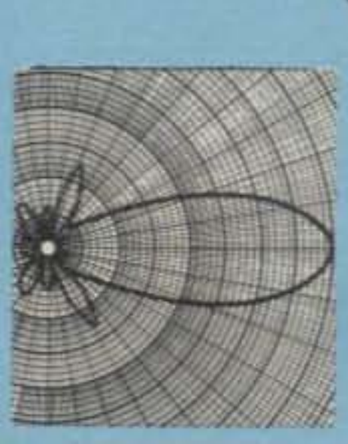

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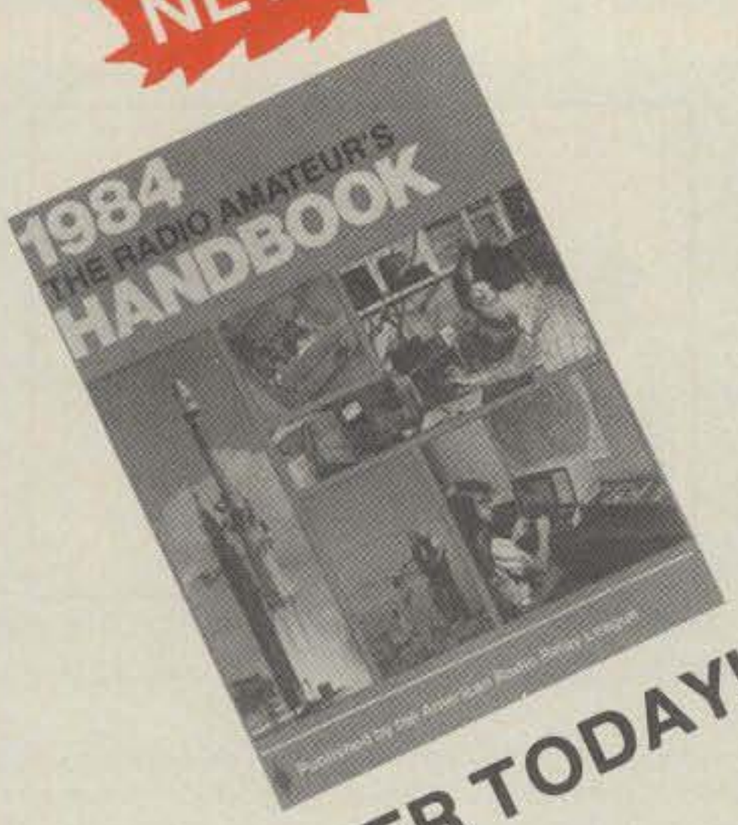

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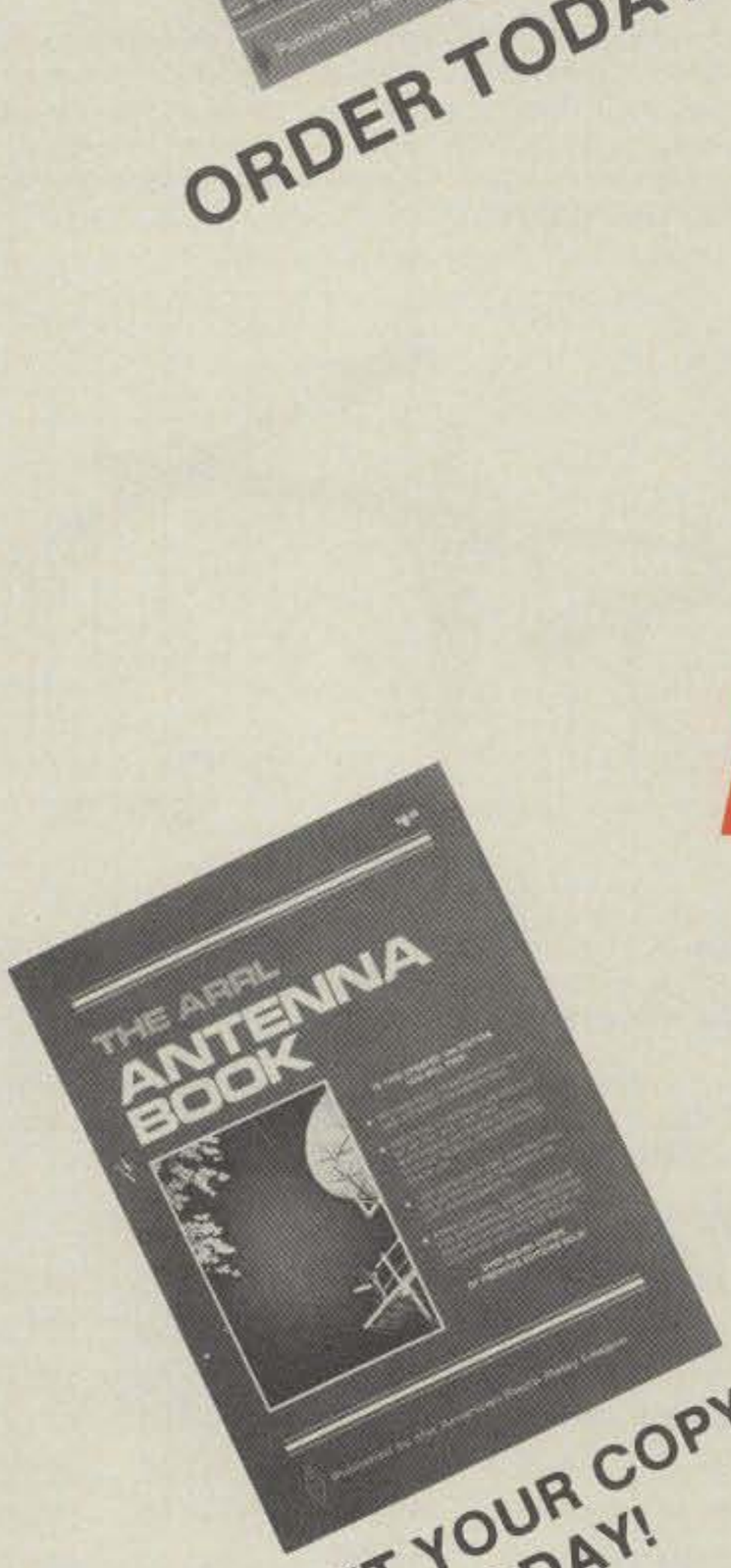

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CIRCLE 131 ON READER SERVICE CARD

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

The moment came,
But what a shame
That no one heard my cry—
"CQ Malpelo!"

Clipperton

There have been reports on a projected Clipperton operation going back to this past summer. The latest indicator is that it will come sometime after the turn into the new year, probably in April.

The planning includes a multitude of operators, these being JA's, FO8's, W6's, a K1, and other high-quality DX types. There is a possibility that the target date may be advanced a month, maybe even two, although the planning was still a bit flexible when this report was written. Keep alert! The group is anxious to put Clipperton on the air again, and something should come in the first half of 1984. The last operation from Clipperton was in March 1978, and the demand for this one has built again to a respectable level. Keep listening!

Aves

YV0AA will be heard in the coming year, the Radio Club Venezolano planning a 72 hour effort towards the end of February. Aves is located at 15°42'N and 63°38'W. Once in awhile you will run into a belief that Aves is close to the Venezuela mainland. Actually, it is quite a way north in the Caribbean and closer to Guadeloupe and Dominica than any other island.

Aves is the above-water part of a reef, running about 1500 feet in a north-south direction and being about 400 feet wide at the widest portion. It is at times difficult to find, as the highest point is only 9 feet or so above the water. Generally, the operations to Aves have taken part in the first part of a year, this to avoid the hurricane season that starts in mid-year and the higher water level in the latter part of the year that usually puts the central portion of Aves under water.

YV0AA in the 1984 effort will operate c.w. and s.s.b. on 160–10. There is also a possibility of RTTY and satellite operation. QSLs for the coming effort will go to Hermes J. Salas Torres, YV5DFI, POB 50332, Caracas 1050-A, Venezuela. There is an awareness of some QSLing problems in previous efforts, and plans are being made to ensure smooth QSL handling for this outing.

77 Coleman Dr., San Rafael, CA 94901

With the biggest signal out of downtown Provadiya, George Kolarov, LZ2VP, is often heard on the c.w. bands. Some of the low-band DXers will recognize this call.

The effort will mark the celebration of the Radio Club Venezolano's 50th anniversary and will activate YV0AA. Edwin Rivera B., YV5HUJ, is supplying information on this effort, he being on the DXpedition Committee. If more information is needed, drop a line directly to him. Efforts are also being made to get a 4M0 callsign.

Marshall Islands

Bill McRae, KX6AO, is currently in the Marshalls and is active whenever the time permits. On weekends Bill is generally active, looking for both stateside and European contacts. Actually, Bill will work anyone he hears, so if you are looking for KX6, look for Bill. On weekends he is usually found from 0100Z at 21300 kHz or 14220 kHz, operating up to 0600Z beaming the states. From 1600Z until about 1900Z he looks for Europe. This is a rough approximation of possible operation periods on other days. QSLs go directly to Bill McRae, KX6AO, P.O. Box 36, APO San Francisco 96555. s.a.s.e. or s.a.s.e./IRC requested.

Lord Howe Island

K. Nad, VK2BQQ, will be active from Lord Howe Island during the *CQ* World-Wide C.W. Test and will be signing his home call /LH. Actually, the action will start a couple of days earlier, on about November 23rd, and will run until November 29th. Frequencies to watch are 3501, 7001, 14030, 21030, and 28030 kHz. The operation will also be heard on 14210 kHz, on 160, and on some of the new WARC bands. QSLs will go direct: GPO Box 3209, Sydney 2001, Australia. S.a.s.e. or s.a.e./IRC requested.

Isle of Man

Returning after previous efforts in 1978, 1981, and 1982, a Frankfurt group of amateurs will be heard during the *CQ* WW DX Test in November. Each of the previous efforts racked up over 10K QSOs, and they are aiming to improve things this year.

The group will be signing GD4UFB, this being a club call issued to the group, as current regulations have ended the granting of GD5 calls to visiting amateurs. They now must sign GD4/p (homecall/A, and the German group figured that obtaining a British club station call would simplify things a bit, possibly making it even a bit easier to figure out what you are working.

The group will operate during the C.W.

The WPX Program

Mixed

1062	G4DNV	1065	I1EEW
1063	ND6U	1066	JG1HUQ
1064	YB2BLI		

S.S.B.

1611	LU8AEJ	1614	VE3KQS
1612	ND6U	1615	JA1HSF
1613	YB2BLI		

C.W.

2216	N1BAX	2220	I2EAY
2218	JA5HAL	2221	KR0S
2219	YU4ELI		

VPX

232 DL-N32/1861913

Endorsements

Mixed: 500 KO9Q. 750 KM1D. 950 WB4RUA. 1000 WB4RUA. 1150 CT1LN. 1200 N6JM, HI8LC. 1300 4X4FU. 1350 4X4FU, KF2O, DJ4XA. 1400 4X4FU, K9BG, KF2O, DJ4XA. 1450 4X4FU, DJ4XA. 1500 4X4FU. 1700 N9AF.

S.S.B.: 350 I1EEW, VE3KQS. 400 W7KWI, KU9C, I1EEW. 450 WB7VHA. 500 WB9TDR. 550 I8HZT, KM1D. 600 I8HZT, I8WES. 650 I8WES. 700 W0ULU, I8WES. 800 W3ARK. 850 W3ARK. 950 KL7AF. 1000 HI8LC. 1050 DJ4XA. 1100 DJ4XA. 1150 DJ4XA. 1250 F6DZU. 1300 F6DZU. 1350 F6DZU. 1400 F6DZU. 1450 F6DZU. 1500 F6DZU, W0YDB.

C.W.: 350 JA7AZJ, K7DBV, N1BAX. 450 KM1D. 600 SP8GSC. 650 SP8GSC. 700 SP6FER, SP8GSC, IT9VDQ. 750 SP6FER, SP8GSC. 800 SP8GSC. 1050 DJ4XA. 1100 DJ4XA, LZ1XL. 1150 LZ1XL. 1200 LZ1XL. 1450 W3ARK. 1500 W3ARK, W4BQY. 1550 W4BQY. 1600 I8KDB. 1700 DL1QT.

10 meters:	CT4NH, KM1D, JA1HSF.
15 meters:	CT4NH, KM1D.
20 meters:	CT4NH, KM1D.
40 meters:	CT2NH, KF2O, DJ4XA.
80 meters:	KF2O.
Asia:	JA1KRU, CT4NH, KM1D.
No. America:	CT4NH, K2POF, KM1D.
So. America:	W5UR.
Europe:	CT4NH, KM1D, I1EEW, I2EOW.
Africa:	KF2O, KM1D.
Oceania:	JA1KRU, DJ4XA.

WPX Award of Excellence Holders: K6JG, K4MM, K5UR, K6XP, K2VV, VE3GCO, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP, K0JN, K4IEX, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, W4CRW.

WPX Award of Excellence Holders with 160 meter endorsement: K6JG, W4CRW, W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4.

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.

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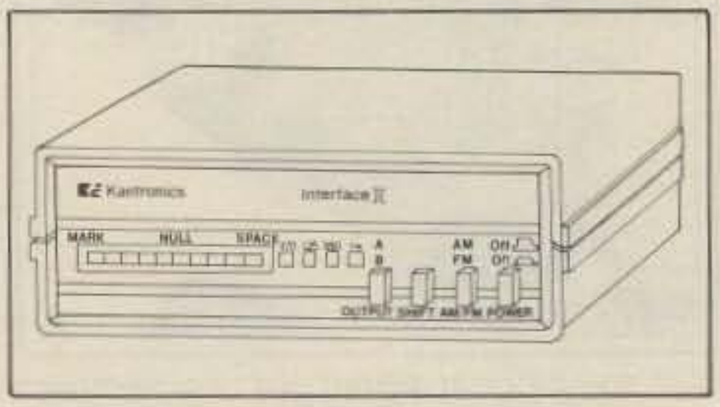
Evansville, IN 47711

The HAM SHACK

TEN-TEC 2591

SANTEC 144/μP



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214B/214FB Boomers 14EL 2M.....75.00 each
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144-10T 2M Oscar Antenna.....52.00
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Indian Ocean Islands

Jack and Judith Binder of the yacht *Banyandah* are headed for the Indian Ocean area around the Mozambique Channel and are working to organize some DXpeditions to Glorioso, Juan de Nova, and Mayotte. The operations from these islands are not scheduled until the middle of 1984, but the *Banyandah* was due to depart Cairns in Australia this October just past.

Many DXers will remember this vessel as being involved in the Mellish Reef effort in 1978; Spratly in 1979; Kingman Reef, Tokelau, and Palmyra in 1981; and another trip to Mellish Reef in 1982. The plan is to base at Mayotte and make the runs to Glorioso and Juan de Nova from there. While departing Australia in October, the vessel is making a round-about course via the Solomons, the Philippines, Singapore, and the Seychelles before arriving at Mayotte. Glorioso is scheduled for early July 1984 and Juan de Nova for the latter part of the same month.

Apparently, the efforts are open to amateurs who might want to participate in such an effort. More information can be obtained by writing to Jack Binder, P.O. Box 542, Cairns, Queensland, Australia 4870.

Kermedec

For various reasons, this is sometimes a hard one—hard to get permission to operate, hard to make arrangements to stay on the island. ZL1AMO has made a number of attempts to get permission to operate from ZL/K and has been turned down flat three times. He hasn't given up and is still working to find the key to getting permission to operate from this island.

On the other hand, Jim Smith, VK9NS, says that he thinks he has found out how to operate from Kermedec and figures to be there the second week in November. A couple of months back Jim was saying that all it takes is to meet with the right New Zealand authorities and get their okay. As we were close to the anticipated time for the VK9NS Kermedec foray, you'll not have to wait long to learn how persuasive Jim was.

Sunspot Numbers

Those who watch the sunspot numbers and the flux and things like that have long known that when the numbers go up, it's good for DXers. When the numbers are down, band conditions are poor in the higher frequencies if there are any conditions at all to judge. And when they get down so you can count them on one hand, the end is near—the end of the current cycle, of course, for when the count hits the bottom, the only way it can go is up. Elementary!

But more than one DXer has looked at a sunspot chart for a certain day and wondered how they get the numbers. It really is simple; all you have to do is understand:

$$\text{The Daily Sunspot Count} = C(f + 10g)$$

where C is the calibration or correction factor, f is the number of sunspots observed, and g is the number of active groups.

As DXers understand most everything,

The WAZ Program

10 Meter Phone

254	JA1NTK	257	K1MEM
255	I3ZKD	258	K1MM
256	JA1BN		

15 Meter Phone

171	K8VFV	173	JL1SEW
172	DF2RG		

20 Meter Phone

467	WB0TEC	470	G3GIQ
468	I3ZKD	471	WB8FIW
469	YB0BLI		

15 Meter C.W.

93	JG1QGT	94	N5US

20 Meter C.W.

199	OK1FAI

All Band WAZ

S.S.B.

2726	YB0ZM	2734	JF1JLW
2727	K5GE	2735	KB2HK
2728	PY4VX	2736	K5SIN
2729	N4DRC	2737	VE3CKP
2730	DF5CL	2738	W2YZ
2731	HB9CIP	2739	IS0NZA
2732	YB0ACL	2740	K1SF
2733	KC2FC		

C.W. and Phone

5615	K8EJN	5622	NU4N
5616	OK1DCU	5623	K9UWA
5617	SP9EEE	5624	PY4DD
5618	WB9UAO	5625	KB9M
5619	W8HXX	5626	W4GIO
5620	KJ0U	5627	IS0NZA
5621	K6GFC		

All Phone

585	AB1U

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.

Bill Elliott, W4DMV, and some of the local QRPers in Barcelona. From the left: EA3BVS, Juan; W4DMV; EA3AIC, Henry; and EA3SF, Fernando. The photo was taken at EA3SF's QTH atop a 700 foot hill looking out over the Mediterranean. W4DMV says the Spanish amateurs are anticipating the new Spanish-language edition of CQ magazine.

we first thought that no further explanations would be needed. But taking into account that some stranger may wander into the DX area, it might be pointed out that one spot would give a count of 11 when the above formula is applied. On a day when the sun showed 44 spots grouped into 6 areas, the count would be 104.

After the count is figured, a calibration figure is applied, this being a number that is used to multiply the sunspot total figured with the above formula. Thus, the observation is calibrated against observations made by other observatories, the calibration number taking into account the type of telescope, the observer, and some other relevant factors.

Or, to look at things another way, when the sunspot count is up, head for 10 meters. When it is down low, look at 160 and 80. When the bands are gone altogether, turn on the TV. The 12-month smoothed sunspot number was getting down into the low seventies and high sixties in recent months. Cycle 21 is headed downhill. When it hits bottom and starts back up in Cycle 22, it will be about 4.5 years to the peak of Cycle 22. These are the times when DXers working for some of the 5-band awards are planning to clean up the low frequency needs in the next year or so.

Some Mixed-Up DX Notes

From the WPX Desk, K6ZDL advises that 1P1 from Pelican Island is not good for the WPX program. Norm says it is not good for the *CQ* DX Honor Roll either.

The Kansas City DX Club bulletin has filtered out some low-frequency DX possibilities and advises that UA9AJO is active on 80 and jumps into the major DX tests. This is Zone 17. Moving up to Zone 18, UA0UCY and UA0AMM have been heard on s.s.b. in the 3647 kHz area from 1200Z and listening up in the U.S. phone

5 Band WAZ

Standings as of August 1, 1983

All 200 zones worked:

1. ON4UN
2. K4MQG
3. SM4CAN
4. AA6AA
5. W8AH
6. W6KUT
7. EA8AK
8. LA7JO
9. EA3SF
10. OH1XX
11. EA8OZ
12. W0SD
13. K0ZZ
14. ON6OS
15. OK3TCA
16. K6SSS
17. ZL3GQ
18. OK3CGP
19. SM0AJU
20. OZ3PZ
21. I3MAU
22. I2ZGC
23. 4Z4DX
24. N4KE
25. K5UR
26. K9AJ
27. SM3EVR
28. LA5YJ
29. DL3RK
30. N4WJ
31. G3MCS
32. SM5AQD
33. W0MLY
34. I0RIZ
35. ON5NT
36. OH6JW
37. OK1AWZ
38. IV3PRK
39. DJ6RX
40. OH3YI
41. I4RYC
42. ZL1BIL
43. I4EAT
44. ZL1BQD
45. TG9NX
46. XE1J
47. F5VU
48. W3AP
49. YO3AC
50. K3TW
51. XE1OX
52. VE7IG
53. OK1ADM
54. CT1FL
55. WA1AER
56. N4RR
57. UW0MF
58. W4DR
59. OK1MP
60. W1NW
61. OE1ZJ
62. HB9AHL

The top 9 contenders for 5 Band WAZ:

1. N4KG, 199
2. JA3EMU, 199
3. N4WW, 199
4. W1NG, 199
5. F6DZU, 199
6. W8UVZ, 198
7. LA9GV, 198
8. K4CEB, 198
9. K7UR, 196

227 Stations have attained the 150 zone level

area. From downtown Tuva, U0Y was planning to be in the *CQ* WW Phone Test the last weekend in October. In previous tests they have been heard both on 75 and 40 meters, offering Zone 23 to the needy DXers. You might also check for a number of 5Z4's (MX/DR/CM) in the lower bands, 5Z4MX reported as putting up an 80 meter array.

There have been some reports that some VU2's have been trying to line up permission to put VU7-Andaman on the air. This has not been easy in recent years. There are some coming changes in the U.S.S.R. callsigns, much of this coming from the effort of Walt Gromov, UV3GM, who has been working on the proposed changes for a number of years. Walt may be remembered from some years back when he was heard as UA0FGM from Sakhalin Island with a tremendous signal on 80. You may be hearing some new prefixes such as UH1 or UB1 and a handful of others coming after the first of the year.

N2EDQ/KH7 is supposed to be on Kure until next summer, aiming to do a good bit

CQ DX Awards Program

S.S.B.

1265	EA8SH	1273	NU4N
1266	KI7M	1274	KN7N
1267	W3IJT	1275	WA4HOT
1268	KAØIQR	1276	EA8TE
1269	K6PKO	1277	NB8C
1270	KC8YM	1278	K8NWD
1271	KT5F	1279	WØIYR
1272	N4AYJ		

C.W.

589	KT5F	591	WA8YTM
590	NU4N	592	K7DBV

S.S.B. Endorsements

310	K4CEB/313	275	WB3DNA/291
310	W4DPS/313	275	W6NLG/286
310	K6JG/312	275	KB5RF/284
310	K9LKA/312	275	K8ZZU/280
310	OK1MP/311	275	W6MFC/278
310	N4MM/311	275	WØIYR/277
310	K5OVC/310	275	ZL1BOQ/276
300	CT1FL/309	275	WA2FKF/276
300	N6AW/309	275	K8NWD/275
300	4Z4DX/308	250	K4LR/274
300	LU3YL/308	250	I8WES/273
300	N4PN/308	250	WD9IIC/256
300	W8PCA/306	200	KI7M/231
300	WØSR/306	150	KN7N/162
300	N6OC/301	150	WB2WEO/151
300	WD8MGQ/300	150	VE2JO/151
300	YU1DZ/300	150	NU4N/150
275	XE1NI/296	150	N4AYJ/150
275	W6SN/294	28 MHz	K6PKO
275	WD9IIX/293	3.5/7 MHz	KAØIQR
275	WB6GFJ/291		

C.W. Endorsements

310	N4PN/313	275	WØSR/295
310	K9MM/312	275	WD9IIX/279
310	K6JG/311	275	K8LJG/277
300	W4OEL/307	150	NU4N/150
300	K6LEB/306	3.5/7 MHz	WD9IIC
300	N4MM/303		

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

of c.w. work. He keeps a schedule with KH6JEB on weekends, usually on Saturday at 21400 kHz from 0300Z. KH6LW is occasionally available from Kure, Loren visiting the island a couple of times a year on Coast Guard duty. The maintenance work on the LORAN system usually takes a couple of weeks in summer and again in winter. Most of the activity on Kure has come via Coast Guard personnel stationed on the island, the island itself having no indigenous population. It is also a bird and wildlife sanctuary.

Ed Radlo, AJ6V, will be signing VP2MEV from Montserrat for the *CQ* WW C.W. Test the last week of November. He will be there prior to the test and can be found on s.s.b. as well as c.w. QSL to home QTH. Ed will be concentrating on the low bands.

With the FCC in late August adopting new regulations on power, most amateur power limits are now expressed in peak envelope power with 1500 watts the limit except if you are using double-sideband a.m. voice. There is still a 1000 watt limit for a.m. voice. Novices are limited to 200 watts PEP in the Novice subbands. Effec-

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. This report reflects the deletion of Serrana Bank, Bajo Nuevo, and the SA/I Neutral Zone. Total countries are now 315. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00. 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	315	N6AV	310	AA6AA	303	W6SN	295	K7ZR	280
DL7AA	314	K4CEB	310	N4MM	303	WØSR	295	I5XIM	280
ON4QX	314	N6CW	308	WA8DXA	302	WØIZ	292	WD9IIX	279
W3GRS	314	W4BQY	308	W2GT	301	AB4H	291	K9IW	279
W9DWQ	313	W4OEL	307	K1MEM	301	N5DX	291	W4BV	277
W8KPL	313	K6LEB	306	SM3EVR	300	W1WLW	289	YU2RTW	277
N4PN	313	W1NG	306	K3FN	298	SM6CST	286	N8MC	277
K6EC	312	DL3RK	306	OK1MP	298	W9RY	283	WB4RUA	277
K9MM	312	K4XO	305	K9QVB	298	W7CNL	283	K8LJG	277
W6ID	311	W9BW	304	DJ7CX	297	K8PYD	281	K4SE	275
K6JG	311								

S.S.B.

K2FL	315	I4LCK	311	XE1KS	303	K4SE	293	VE3MV	283
W6EUF	315	OK1MP	311	W8JXM	303	WD8MOV	293	AE5B	282
K6WR	315	N4MM	311	WA4WTG	302	K9IW	293	CT1UA	282
W3GRS	315	EA4LH	310	VK3JF	302	WD9IIX	293	AI9R	282
W3NKM	315	OE2EGL	310	G4CHP	301	I6PLN	292	TG9EP	281
DL9OH	315	DK2BL	310	N6OC	301	WA4LOF	292	KB5FU	281
W9DWQ	314	WØSD	310	VE3FJE	301	W8ILC/QRPp	292	SM4CTT	281
IØAMU	314	I3LLD	310	K9HQM	301	W9RY	291	WB4KTG	281
F9RM	314	K9RF	310	WB4NDX	301	WA4DAN	291	N5AWS	281
VE3MR	314	K5OVC	310	W7OM	301	KV2S	291	K9TI	280
I8AA	314	OE3WWB	310	WA3HUP	301	VE3IPR	291	I2MQP	280
VE3MJ	314	VE3GCO	309	K8CMO	301	WB3DNA	291	K8ZZU	280
W4UG	314	K8LJG	309	WA4JTI	300	KB5FU	291	W8IMZ	279
W4EEE	314	W2SUA	309	WD8MGQ	300	WB6GFJ	291	KKØC	279
IØZV	314	W9SS	309	W4OHZ	300	JA5PUL	289	KA8T	279
XE1AE	313	N6AW	309	YU1DZ	300	KM6B	289	W4JFE	279
I4ZSQ	313	VE7WJ	308	LA7JO	299	WDØBNC	289	EA3KW	279
I8KDB	313	K4XO	308	AI8S	299	W9TA	289	W6MFC	278
W9KRU	313	W1NG	308	N5FG	299	K4CXY	289	AI8M	278
ZL3NS	313	DL6KG	308	VE3MRS	299	W7FP	288	K4BYK	278
VE3GMT	313	YV5AIP	308	WAØTKJ	299	I3OBO	288	N9AMF	278
YV1KZ	313	K6XP	308	W6FET	298	KØGT	288	I5EFO	278
W3AZD	313	OK1MP	308	K9SM	298	I8KCI	288	VE3IUE	277
ZS6LW	313	WØYDB	308	I8LEL	298	I5BDE	288	KB8O	277
DJ9ZB	313	LU3YL	308	K8NA	298	N2ATD	288	KP4EQF	277
K6YRA	313	N4PN	308	W6DN	298	K1VHS	287	K1VHS	277
ZL1AGO	313	4Z4DX	308	W2FGY	298	EA9IE	287	WBØUFL	277
W4DPS	313	N2SS	307	HP1JC	297	AB9E	287	ACØA	277
K4CEB	313	VE4SK	307	DJ7CX	297	KB9KD	287	K9TI	277
VE2WY	312	K8PYD	307	K5DUT	297	KC8JH	287	WØIYR	277
K6JG	312	OZ8BZ	307	JH1VRQ	297	W4BQY	287	N7ASL	276
F2MO	312	N4KE	306	IØMBX	297	WB4UBD	286	WØULU	276
K9MM	312	N6AV	306	WAØDCQ	296	KB3OQ	286	WA6DTG	276
K9LKA	312	VK4VC	306	K9IW	296	W6NLG	286	ZL1BOQ	276
W3GG	312	K1UO	306	XE1NI	296	YU2RTW	285	WA2FKF	276
W9JT	312	W8PCA	306	I8ACB	295	K8VFV	284	I8INW	275
N4WF	312	WØSR	306	WB1DQC	295	KB5RF	284	JH4PRU	275
W9BW	312	YV5DFI	305	IV3YRN	295	NA5W	284	W8LKG	275
I8YRK	312	W8ILC	305	K9UAA	295	WØKU	284	W4UNP	275
OZ3SK	312	W2CC	305	K9QVB	295	WB3HAZ	283	WB3CQN	275
CT1FL	312	9H4G	304	WA9PWN	295	VP9CP	283	WB1EAZ	275
K6EC	311	K9BWQ	304	W1LQQ	294	XE1OW	283	VE7BSM	275
W4SSU	311	AA6AA	304	KB8DB	294	XE1OX	283	KZ2P	275
K4MQG	311	XE1J	303	AI5I	294	VE3CKP	283	K8NWD	275
WØSFU	311	ZL1BIL	303	W6SN	294				

tive radiated power has also been redefined in terms of PEP output from the transmitter. In the 1900–2000 kHz area the special power limits are now defined in terms of PEP output as are the power limits for transmitters operating 450 MHz around certain military installations.

The DXAC a few months back declined to approve a QRP category for DXCC. They were also considering designating the District of Columbia as a separate state in contests. Some KL7's proposed that they be considered as stateside so that they might facilitate the work of DX in some instances. This did not get off the ground.

Back in late summer the DXAC was considering proposals aimed to limit the frequency space used in contests, a time limit for single operators in DX tests, a possible 160 s.s.b. contest, what steps might be taken to control contest QRM, and a proposal to initiate a DX test in which the W/K's would be prohibited from calling "CQ DX." All of this applies to the ARRL-sponsored tests and not to the great *CQ* WW DX Tests.

In the matter of "no code" license, considerable Congressional support is being gathered by amateurs to oppose the FCC proposal. Oscar A. Goldfarb, Acting Deputy Air Force Secretary, has advised that the Air Force sees a continuing need for Morse code proficiency and has reinstated a Morse code requirement in its radio operator's training course. Goldfarb went even further and said that should the FCC adopt the "no-code" proposal, Air Force MARS would require a demonstration of code proficiency before an applicant would be accepted.

The Pacific Inter-Island Net meets at 14250 kHz at 0800Z most days. Sometimes this net is good for some of the Pacific Islands; sometimes it is good just to listen to the amateurs who show.

HZ1AB is back on the old 160 schedule Thursdays and Fridays from 0230Z at 1827 kHz. Also, the station sometimes shows at 1850 kHz from 2200Z on Thursdays. Peter I Island is getting a lot of attention, some even saying that when spring shows in the Antarctic they will be there. Logistically it will be difficult, but that has never kept plans from going forward. The first part of 1984 probably will be the target dates for any effort; from then on the climate slides downhill.

Tom Wong, VE7BC, who brought BY1PK to the Deserving DXers, says that it took a lot of team work and that Al Johnson, W7EKM, gave continued invaluable help from across the border. VE7BC says he will not rest until there is an amateur station in every province in China, and maybe three or four. VE7BC and W7EKM were photographed at the Northwest DX Convention at Seattle in midsummer.

The long-time Geoff Watts "DX News Sheet" is leaning towards the belief that his health will never allow Geoff to resume publishing, and the RSGB is looking for a permanent arrangement in continuing the bulletin. G3ZAY and G3XTT have held the fort for the last two years, stepping up when Geoff was unable to continue and the RSGB assumed control.

At some of the conventions there have been queries about Spratly. Some indicators are that there may be some consideration to delete it as a DXCC country because it is "non-administered" territory. Actually, reports indicate that it is anything but "non-administered" territory, with a number of countries stepping up to claim the islands as sacred ancestral lands and displaying a willingness to fight to preserve the ancestral rights. Because of the multitude of claims, one source said that these then were to be considered a "non-administered" territory, at least five countries laying claim to the islands. Some have noted that on the other hand there was strong evidence of administration, and if all five countries cemented their claims, there would be five DXCC countries. This must have been a DXCC type with a high total who was getting desperate. If you wonder why so many countries would lay claim to the sand and rock reefs, think petroleum. Seismic exploration has shown great potential for the sacred ancestral oil drillers.

The ARRL continued support for FCC Docket 82-83 aimed at expansion of the voice subbands in the 80, 15, and 10 meter bands is not being greeted with whoops of joy from the VE's. The Canadian Radio Relay League filed in opposition to any U.S. phone expansion, especially into the sacred ancestral VE phone areas. There are hints that if the FCC expands, the CRRL will ask their Department of Communications to move the VE's further down and into the c.w. sacred ancestral areas. The ARRL has favored expansion of the KH-Hawaii 40 meter phone down to 7075 kHz, the rationale being that they are adjoining Region III of the ITU, but no other 40 meter expansion.

Looking at the brighter side, the last ARRL Board of Directors was favoring a ten-year amateur license term with a two-year grace period for renewing.

Whatever your need, there will always be a good rumor to meet the need. However, some may not be rumors, but only listening can tell them apart. JT1AO says that he is being sent to Vietnam after the first of the coming year and figures he will get operating permission. Live in hope.

DX Ten Years Back

San Hutson was signing CE0Z from Juan Fernandez. There were rumors about Clipperton, but it took five more years to nail things down. There were the rumors about South Sandwich. It also took some more years to mature, but then again, look how those rumors turned out. K6SE was operating out of a suitcase from St. Martin as FG0AFA/FS7 during the *CQ* DX Test. OH2BH was in Gambia for the DX Test, EA9AA was headed for Melilla, the Southeastern DX Club signed PJ8GIW in the phone portion of the *CQ* WW Test, FB8WA was active from Crozet, and W9UCW and W9YYG were headed for a December effort on San Andres. The 9U5 stations were going off the air, and a handful of W0's were headed for Baja Nuevo.

QSL Information

K6VNX reports that he is *not* the QSL manager for TR8JL as we mistakenly reported in the September column. His only suggested route for TR8JL is dropping a card to P.O. Box 484, Libreville, GABON.

A4XYA to G4ADJ
A22GM to N4FD
A92NH to KA4S
C31NP to EA3BNX
C43DF to G3LQP
CT2DL (VE/XE/W-K only) to KE4OC
CT2YG (VE/XE/W-K only) to KE4OC
CU2FSJ to CS1ARE
EK10 to UK1OAZ
EL9B to KD4ZS
EM6FCR to UF6CR
GD4UFB to DK9ZL
GD5BLG to DL4FF
GD5CGV to DL7FH
GD5DUR to DF4FO
GD5DVT to DK8WT
GD5E00 to DK9ZL
HK0TO to HK3DDD
J88AN to W3BL
N2EDQ/KH7 to KH6JEB
N7CXB/ST2 to WA2KAB
OY1MJ to HB9CJX
RM9M to UK9MAA
TR8DR to W2PD
VQ9CI to WA4UPJ
VQ9EA to WB8KYT
YV0AA to YV5DFI
ZD8JT to G4MRO
A4XJL to A. Thorne, Box 981, Sultanate of Oman
CP8GB to Box 35, Riberalto, Bolivia
EA9JV to A. de la Fuente, Box 100, Melilla, North Africa
J21CI to Box 1891, Djibouti, Republic of Djibouti
J28WYC to B.P. 1076, Djibouti, Republic of Djibouti
J27RDD to B.P. 1076, Djibouti, Republic of Djibouti
J87BS to 3 Chesterfield Hill, London W1, England
KX6QQ to Box 444, APO San Francisco 96555
KX6AQ to Box 36, APO San Francisco 96555
P29BR to W. Robinson, Dept of SS, Unitech Box 793, Lae, Papua
TL8TX to POB 205, Bangui, Central African Republic
TU2KC to 12.B.P 054, Abidjan, Ivory Coast
YC5AK to P.O. Box 158, Padang, Indonesia
ZP5JAH to Box 1311, Asuncion, Paraguay
5B4JE to A. Kaponides, POB 1723, Limassol, Cyprus
9K2DZ to P.O. Box 44520, Kuwait

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☐ SANTEC ST-144	$289.00	☐ TOKYO HL-90U	$325.00
☐ SANTEC ST-220	$299.00	☐ TOKYO HL-20U	$105.00
☐ SANTEC ST-440	$299.00	☐ VOCOM 2C025	$ 73.00
☐ MIRAGE B108	$159.00	☐ VOCOM 2C050	$105.00
☐ MIRAGE B23	$ 79.00	☐ VOCOM 2C100	$169.00
☐ MIRAGE B1016	$249.00	☐ 20 AMP SUPPLY	$149.00
☐ MIRAGE B3016	$209.00	☐ 10 AMP SUPPLY	$ 74.00
☐ MIRAGE MP-2	$ 99.00		
☐ MIRAGE D1010	$284.00		
☐ MIRAGE D1010N	$294.00		
☐ JANEL QSA-5	$ 39.00		
☐ DAIWA CN-520	$ 65.00		
☐ DAIWA CN-540	$ 72.00		
☐ KENWOOD TS-430	$799.00		
☐ KENWOOD R-600	$329.00		
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☐ HYGAIN TH-5II	$310.00		
☐ HYGAIN TH-3III	$200.00		

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CIRCLE 49 ON READER SERVICE CARD

Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

More Random Headings: Part VII

This month, it's another wide assortment of antenna topics from the Deep South, as columnist Thurber ranges in scope from computer software to reader mail and assorted odds and ends.

In last month's Antennas column, we highlighted several topics of current interest to the antenna buff. These included our customary look at reader mail, an examination of two new antenna offerings, the Butternut 2MCV-5 Super Trombone v.h.f. collinear vertical, and the W2BN "BN Cage." We also provided a representative sample listing of amateur radio, antenna, and electronics software sources.

This month, we'll begin where the previous column left off. We will first make mention of some specific amateur radio and electronics programs for Commodore computers. We will mention a novel, new antenna coupler, the Wayne "B-T-L." We'll also highlight some reader mail regarding an unusual TVI situation, and then take care of various odds and ends. First, more on amateur radio software.

Public Domain Software,

For several months, we have included in the Antennas column reference to the great potential of the personal computer in amateur radio and related practical electronic applications. In a previous column, we described a number of specific uses, including RTTY/c.w. reception and transmission, SSTV, station control, satellite tracking, beam pointing formula computation, antenna design, and the like. In the same column, we also listed a dozen or so amateur software sources known to us.

One of these software sources, geared for the PET, Vic-20, and Commodore 64 computers, is Public Domain, Inc., 5025 S. Rangeline Rd., West Milton, OH 45383 (phone: Bill Munch 513-698-5638; George Ewing 513-339-1725). We found that Public Domain, and firms like it, provide a real alternative to the high cost of software. The company does not "sell" the programs which it offers, but rather provides an 800+ program library service through which users may obtain available non-copyrighted programs that have been contributed by other users. The costs involved in collecting, program cleanup, duplication, printing, and postage are nominal; disks or tapes are sold for $10 each, and they contain an average of 35 to 45 programs in a collection, up to 70 or even more in the case of the several Vic-20 collections.

One of the newer offerings, the Vic-20 collection #3 (V3), I found to contain more than 70 programs for a unit cost of about 14 cents a program. On this particular disk I noted some 10 short programs of amateur radio interest: programs to design an air inductor; teach Morse code; calculate dB gain; make file labels; build a low-pass filter; design quad and Yagi antennas; determine resonant frequency; and sort out vectors. There was also a composite program in the collection called "Ham Formulas," which performed calculations involving 14 useful electronic formulas! Nothing "fancy" was contained in these programs, but they could represent the start of a handy electronic computer reference library.

While this particular program collection is designed for the Vic-20, many of the Basic language programs will also run on the PET and Commodore 64 computers, and conversion to other Basics is possible. Several other Vic-20 and Commodore 64 disks and tapes are available from Public Domain, some of which also include electronic and amateur radio programs. The firm's library is growing rapidly, as it actively solicits program donations to the service.

While your column editor is an enthusiastic Commodore user, we nevertheless wonder if there are comparable low-cost library services to support the other popular personal computer lines, and which include electronic and amateur radio software programs. If so, we would like to hear about them. C'mon, you TI, TRS-80, IBM-PC, Apple, and Atari users.

Wayne Research "B-T-L" antenna coupler is an unusual design intended for mounting at the antenna. It is both an antenna tuner and a wide-range balun which uses a patch-panel concept to allow various "L" or "T" network designs to be created by the user. Principal components include a 12-330 pF variable capacitor, 2.6 microHenry tapped inductor, and 1.8 to 30 MHz balun. The unit is intended to match impedances from about 10 to 300 ohms on most bands and has a power-handling capability of about 1 kw d.c., or 800 watts into a 52 ohm load. (Photo courtesy Wayne Research and Development)

Wayne B-T-L Antenna Coupler

This is a novel device which came to our attention last winter. Designed with the experimenter in mind, this antenna coupler is both a coupler and balun, and it is designed to mount at the center of an h.f. antenna system, replacing the center insulator. It contains a Hi-Q air balun and a matching network between the coax connector and the balun. The whole assembly is housed in an ABS plastic box with a removable lid for inspection and servicing; the strain insulator is of Delrin plastic material.

According to Wayne L. Jemison, W5FJS, of Wayne Research and Development, the B-T-L was designed to fill a void in antenna accessories by placing the matching network "where it belongs," close to the antenna. Wayne sells the $50 units by mail order, and plans to continue producing the item and adding other accessories. It is presently a sideline, part-time endeavor with Wayne, but he's looking forward to a larger scale manufacturing operation in retirement.

The matching network (see photo) consists of a 12-330 pF variable capacitor that may be paralleled with user-provided fixed capacitors on the front panel to allow a wide range of capacitance to be established. The variable capacitor is adjusted by means of an opening next to the coax connector which also doubles as a moisture drain hole. The inductor is a 2.6

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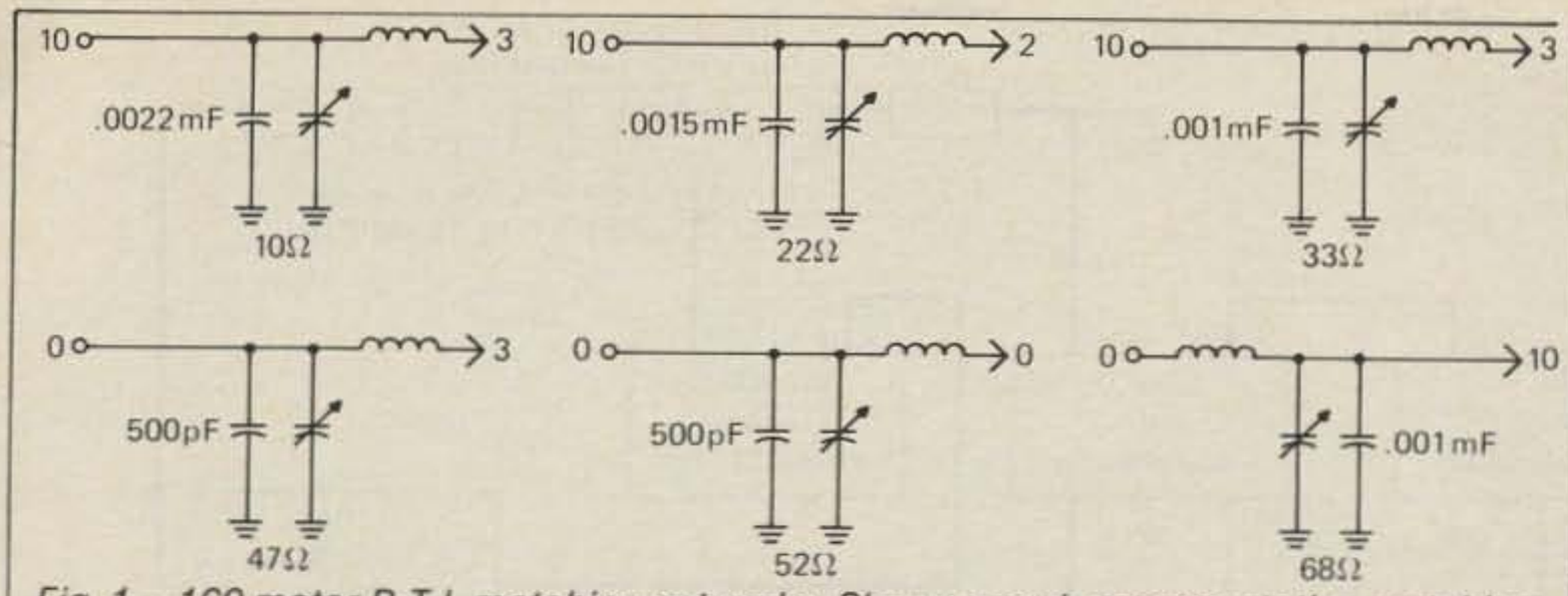


Fig. 1– 160 meter B-T-L matching networks. Shown are six representative matching-network configurations for the B-T-L antenna coupler for 160 meters. The instruction booklet which comes with the B-T-L lists some 50 sample configurations for 160#10 meters. Note that the numbers in the network sketches are labeled terminals on the unit's front "patch panel."

microHenry coil, which is effectively tapped at every turn. The coupler uses a patch panel arrangement for convenient "instant design" of various "L" or "T" networks. Using the instruction booklet and an s.w.r. bridge, the experimenter can custom design a matching network to match either low or high impedance at the feedpoint. Using the network in either a "T" or "L" configuration, the coupler will generally handle impedances 10 to 300 ohms on the h.f. bands, except on 160 meters where the upper impedance limit is 70 ohms, and on 75 meters, where it is 120 ohms. Insertion loss is under 0.55 dB, according to measurements supplied by the firm. Power-handling capability is at least 800 watts to a 52 ohm load. Weight is 1 lb., 2½ oz.

The antenna coupler comes with a nine-page instruction booklet which is also a mini tutorial on "L" and "T" network antenna matching, as well as a description of the B-T-L's theory of operation. The booklet also displays some 50 sample matching network configurations which were experimentally derived and which may be used as a starting point for antenna matching. For purposes of illustration, the six 160 meter sample matching network groups are reproduced from the instruction booklet in fig. 1. Note that the numbers in the network sketches are terminals on the antenna coupler's front "patch panel," and these numbers correspond with the numbering scheme on the coupler's schematic diagram, which is shown in fig. 2. Further information can be obtained from the manufacturer at P.O. Box 75144, Houston, TX 77234.

Reader Mail

The mention of William D. Bierbaum, WB9KUV's good performing "makeshift" mobile home antenna in the May 1983 issue drew some response. Wrote Normand E. Tetreault, W1FO:

"I found your *CQ* description of WB9KUV's mobile home antenna interesting, as I did something similar in the past. I was living in a 55′ × 12′ mobile home and found that I could use a quarter-wave wire connected to the center

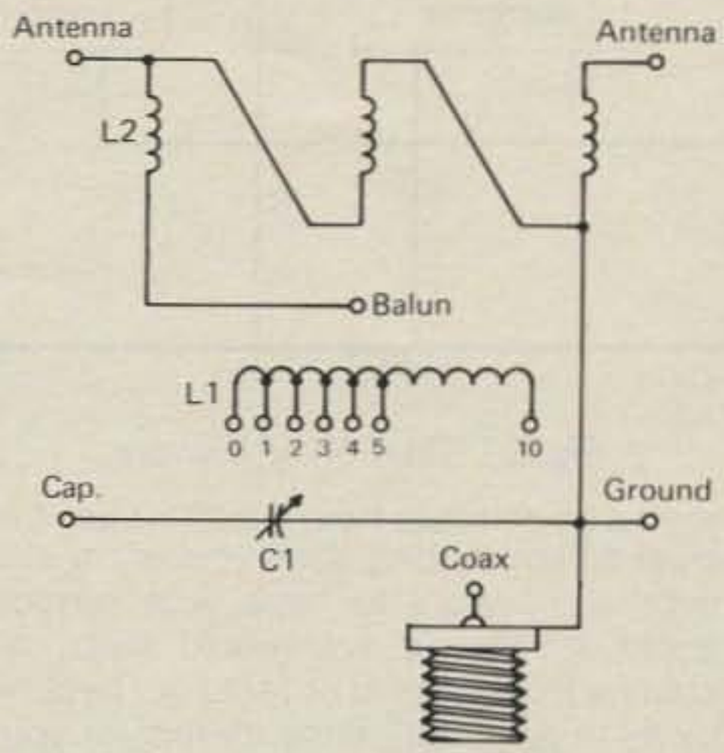


Fig. 2– B-T-L schematic. See text for discussion of B-T-L circuitry and hookup.

conductor with the coax braid grounded to the lower corner of the mobile home. In other words, I used the mobile home as a ground plane and viewed the antenna as a Marconi or 'L.'

"For example, I used a 66′ wire (bent around) in parallel with a 35′ wire and measured the following s.w.r.'s *(all under 2.8:1 on 75/80 meters and under 1.5:1 on 40 meters—ed.).* With this kind of antenna, I was able to work stations 5000–7000 miles distant and regularly worked VK and ZL on 80 c.w. Of course, I was operating from Kwajalein in the Marshall Islands as KX6HC, and location has an enormous effect on perceived antenna performance!

"I also attempted a similar trick in an apartment house in Mountain View, CA. I grounded the braid to the frame of the sliding glass doors which were grounded, and ran a 33′ length of very thin wire along the side of the apartment. The s.w.r. was okay, but the performance using an SB33 transceiver was not so hot. The problem was probably that I ran the wire too close to the wall, which likely had grounded metal lathing to support the stucco. Of course, W1FO/6 is not as good a signal-strength multiplier as KX6HC."

According to Norm, ". . . The conclusion that may be drawn from the above is that if you have a large ground plane

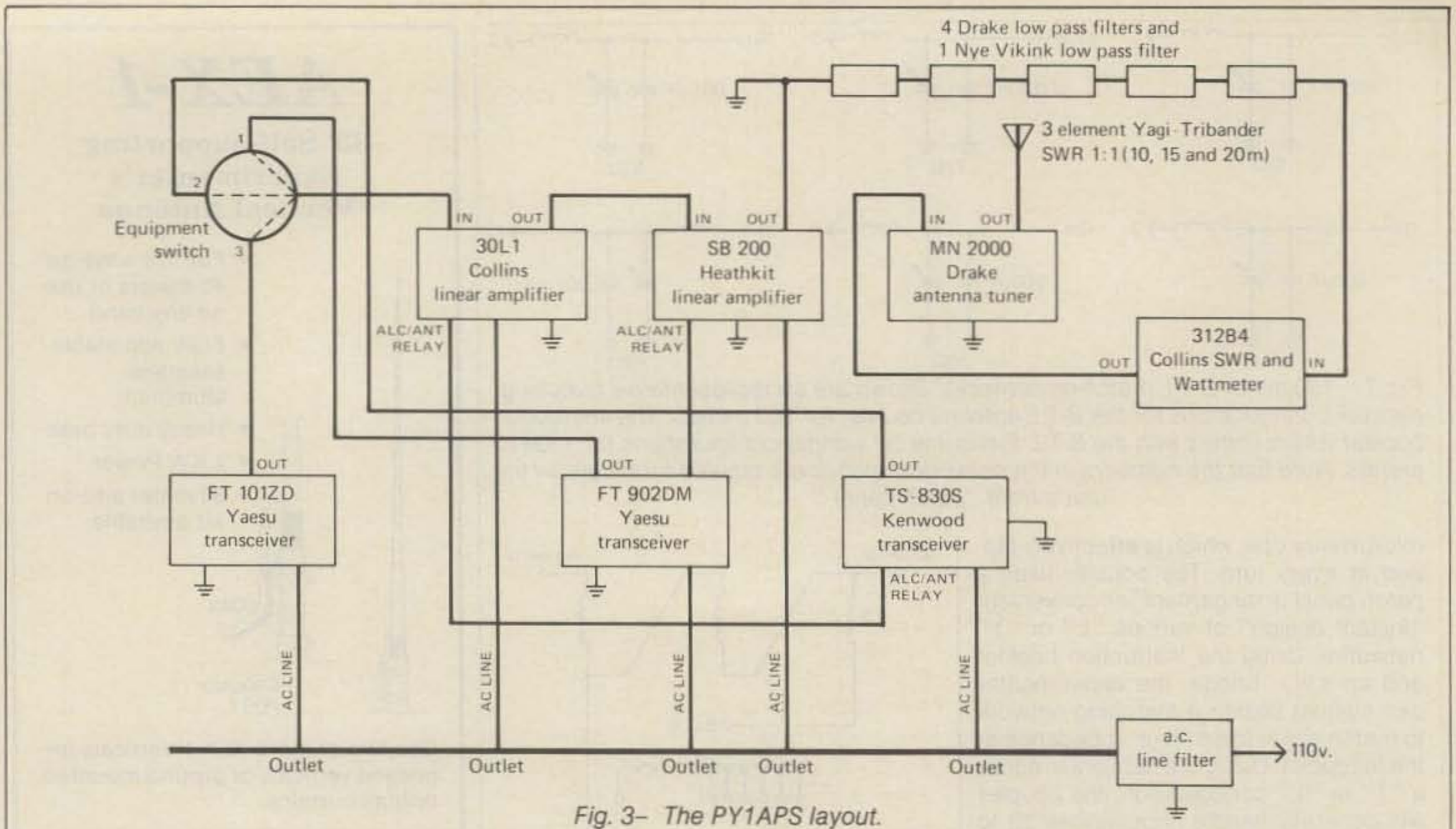


Fig. 3– The PY1APS layout.

available running a quarter wavelength of wire any way you can . . . may result in a usable antenna. I suppose experimenting with the location of the connection of the coax outer connector to the ground plane may be worthwhile, but not always practical."

Both the W1FO and WB9KUV experiences highlight the situation that is increasingly prevalent today: the tendency toward smaller, restricted homes, apartments, mobile homes, and condominiums which often causes the average amateur trying to "work out" under difficult circumstances to cast off "approved" antenna theory and conventional designs in a search for something workable that can be erected under the circumstances. In a future issue of *CQ* we hope to present some thoughts and practical designs for restricted-space antennas. We would like to hear of good results readers have had using such antenna systems, particularly on h.f.

Along different lines, I received an interesting letter regarding television interference (TVI) from Gerson Rissin, PY1APS. Gerson has a truly impressive layout, the effectiveness of which is being marred (at least on 20 meters) by the severe TVI problems experienced. Gerson writes:

"I read your article, 'Antenna Accessories for the Hamshack: Part V' in *CQ* of February (1983) and I enjoyed it very much. I have TVI problems here when I operate between 14.0 and 14.15 MHz, using any of my equipment, even when I operate barefoot. In this way, I cannot work c.w. on 20 meters. Afer (above) 14.2 MHz I can use the exciter with the linear amplifier without any problem. The TVI shows up only on Channel 4. I already tried a lot of things here but all in vain. Enclosed I am sending the layout of my station, and I want to have your opinion about it. Maybe you could help me change this layout in order to get best results. In advance, many thanks for your kind attention."

A glance at the PY1APS layout, fig. 3, makes one "green with envy," and it would seem that practically every reasonable TVI precaution has been taken. I was not able to see an immediate gremlin that might cause the Channel 4 problem which PY1APS described (Brazil uses the same VHF TV frequencies as does the U.S., so Channel 4 is 66–72 MHz). However, I responded with these suggestions, posing some good probabilities, but also including some admittedly long shots:

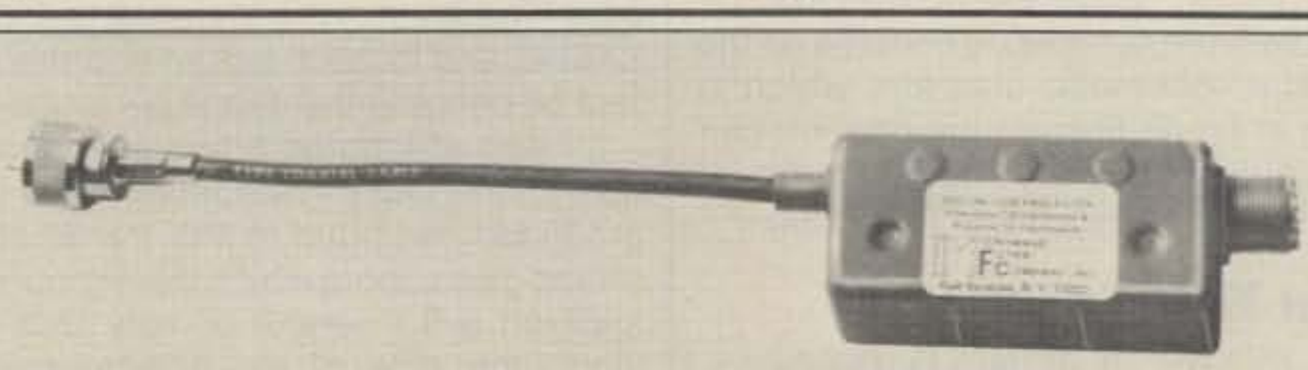
"Your TVI problem seems to be an unusual one, since your diagram indicates that you have taken the usual precautions. I cannot suggest a sure cure to the problem, but you might check the following, individually or in combination with one another:

"1. If any of the low-pass filters are adjustable, adjust them for maximum attenuation about 70 MHz using a grid-dip oscillator or while viewing the interference on a TV set.

2. Move one or more low-pass filters to the output r.f. connector on the transceivers to see if there is any effect.

3. Try a B&W 20 meter harmonic filter (#430-20 or 421-20) for added attenuation above 22 MHz. But you would have to switch out this filter when working 15 or 10 meters.

4. Investigate a 14.1 MHz shorted stub connected experimentally to either the output of one of the 14 MHz transceivers, or at the input of the antenna tuner. You seem to get fifth harmonic interference, and quarter-wave shorted stubs work on



An elementary precaution in preventing TVI is the installation of a low-pass filter in the transmitter r.f. output circuit. In the PY1APS TVI case cited in the article, several low-pass filters were ganged for high suppression. In most instances, using modern-day equipment, a single low-pass filter is adequate. The QRP filter shown here by Unadilla/Reyco is designed to handle 50 watts r.f., has a cutoff frequency above the 10 meter band, and offers 60 dB harmonic attenuation. Barker and Williamson also markets a line of specialized low-pass filters having lower than usual cutoff frequencies, as mentioned in the text. (Photo courtesy Unadilla/Reyco)

even harmonics, but it's worth a try to see if there is any effect. The following formula may be used with the stub connected using a coax T-fitting:

$$\text{Length of stub (ft.)} = \frac{246}{14.1} \times \text{Velocity factor of coax}$$

Note: With a typical coax velocity factor of about 0.66, this would work out to about 11.5 feet. Of course, you would have to switch out the coax stub when working on bands other than 20.

5. Try changing the length of the various connecting cables in your diagram to see if you are getting a v.h.f. resonance that aggravates the 70 MHz TVI.

6. Check for the presence of a 70 MHz spurious radiation. This is unlikely, however, since the problem apparently occurs on all three transceivers.

7. Try varying ground lead interconnections and lead length to the main station ground.

8. Switch out s.w.r./ wattmeter. Harmonics may be generated within.

9. Bypass (disconnect) the antenna tuner for same reason as above."

"These are all the ideas I have at present, but I would be interested in your results for possible mention in my *CQ* column. Good luck with them!"

This tale doesn't have a conclusion as yet, since as of this writing (June 83), a response has not been received from PY1APS as to results obtained in tracking down the TVI gremlins plaguing his operations. However, I present the letter as representative of some of the many things that may have to be doggedly checked and then pursued in tracking down and solving persistent TVI problems. Do any readers have suggestions as to points I may have missed in the PY1APS case?

Odds and Ends

Remember our Slinky Dipole writeup which appeared in *CQ* for December 1980? The Slinky is still going strong, and is an especially adaptable antenna for use on the new 10, 18, and 24 MHz allocations. To retune a Slinky for the already-open 10 MHz band is a fairly simple matter. No cutting is needed, just a resetting of the length and number of turns. The Blacksburg Group, Inc., P.O. Box 242, Blacksburg, VA 24060, offers a chart to easily tune the antenna for the 10 MHz band for an s.a.s.e. The chart shows a "starting point" for overall antenna length and number of coils on each arm to be used in reconfiguring the antenna for the new band. The manufacturer points out that the chart offered is based on experimental data taken from a number of antennas in different settings, so some adjustment using an s.w.r. bridge will be required to get the antenna precisely retuned. Is anyone using the Slinky on 10 MHz?

On another subject, previously we have mentioned the new Palomar Engineers M-827 automatic s.w.r. and power meter. We did not give it a complete review, but rather mentioned its unusual features and initial impressions. However, in the May 1983 issue, fellow author John J. Schultz, W4FA, provided a comprehensive, three-page review of the M-827. For anyone interested in this type of next generation, nonmechanical s.w.r. indicator, his review is a "must."

Finally, it's a fact that one of the largest obstacles faced by new amateurs is that of erecting a suitable antenna and getting it to work well. In many previous Antennas column articles we have presented tutorials relating to a wide variety of antenna subjects of interest to the beginner: dipoles, singlewires, beams, grounds, transmission lines, antenna tuners, and so on. We sincerely hope that these topics have been useful to the many beginners who read the column each month, and we also hope our more technically sophisticated readers have patience with us for taking this approach. Beginners should not overlook the Novice column in *CQ* each and every month. This column, which has appeared in *CQ* for many years, is ably edited by Bill Welsh, W6DDB, in a highly detailed and authoritative but quite readable format. Frequently, antenna topics and issues are presented, usually in "all you need to know" style, so it's worthwhile to check Bill's column each month for such tutorials. For example, in the May issue Bill began a series on dipole antennas that starts with the very basics and works up from there. It, too, is a "must."

Wrapping Up

In this month's Antennas column we have run out of space—already. In this seventh of the "Random Headings" series we have highlighted some specific (and inexpensive) sources of amateur radio and electronics software especially for Commodore computers, made mention of the Wayne B-T-L antenna coupler, selected some reader mail for answer via the column, and taken care of some odds and ends.

73, Karl, W8FX

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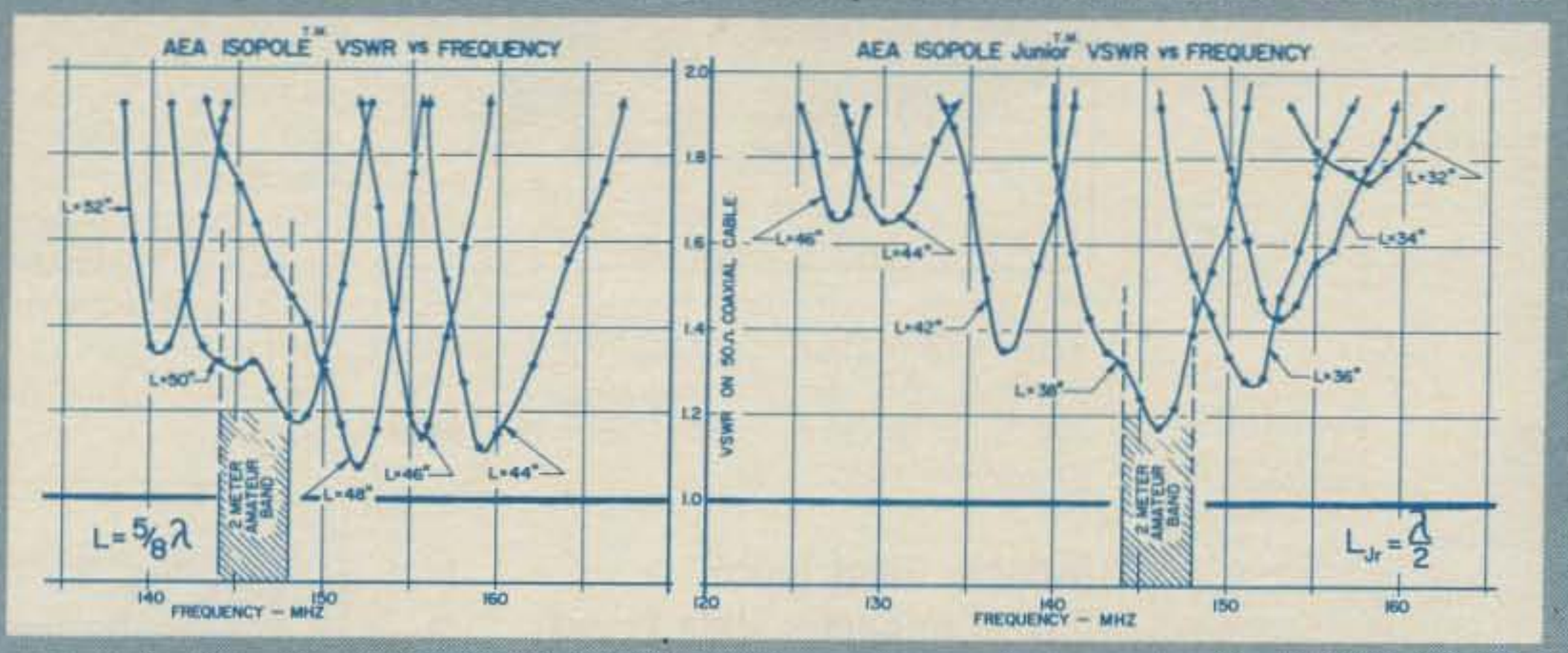

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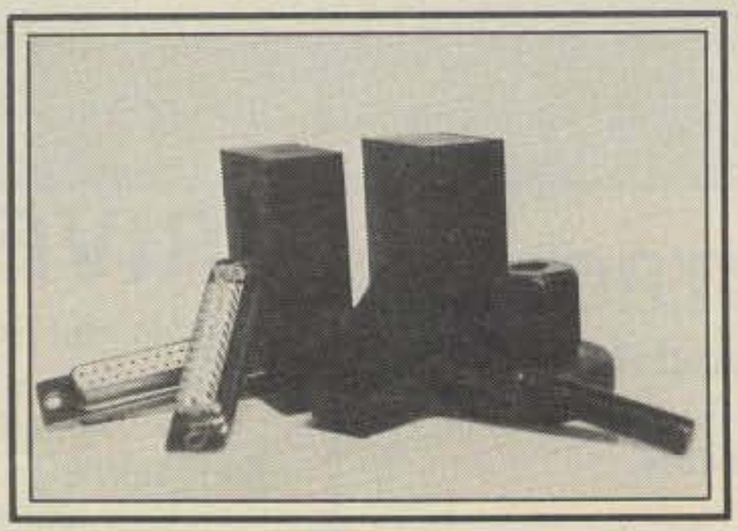

The Hole Punch is available for hole cutting of 9, 15, 25, 37, and 50 pin "D" subminiature connectors. Front- and rear-panel mounting option is also available. The tool is priced at $139.99 for a 9-pin connector punch. For more information, contact Mouser Electronics, 11433 Woodside Ave., Santel, CA 92071, or circle number 107 on the reader service card.

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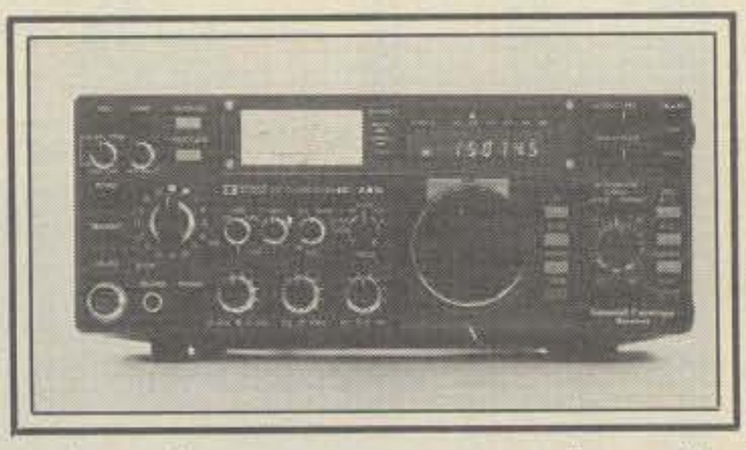

A multi-purpose scanner allows the user to search the 16 memory channel frequencies or scan between two programmed frequencies. The 16 tunable memory channels have the capacity to memorize not only the desired frequency, but also the desired mode of operation. The frequency that is called up from memory can be changed by adjusting the frequency dial. Installation of the optional IC-PS35 internal power supply makes the IC-745 self-contained. For more information, contact ICOM America, Inc., 2112 116th Ave., N.E., Bellevue, WA 98004, or circle number 105 on the reader service card.

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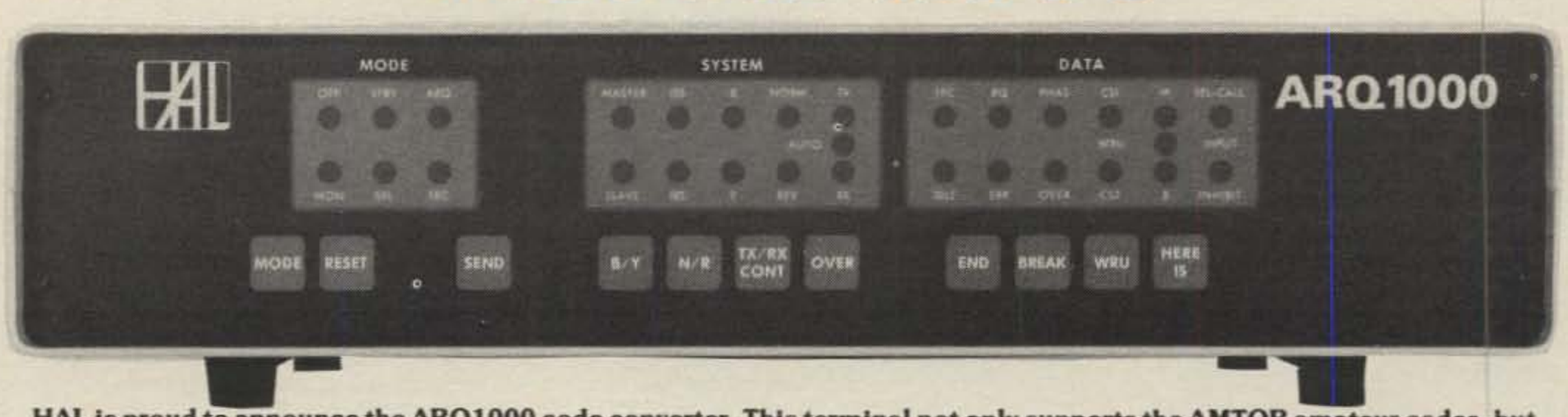

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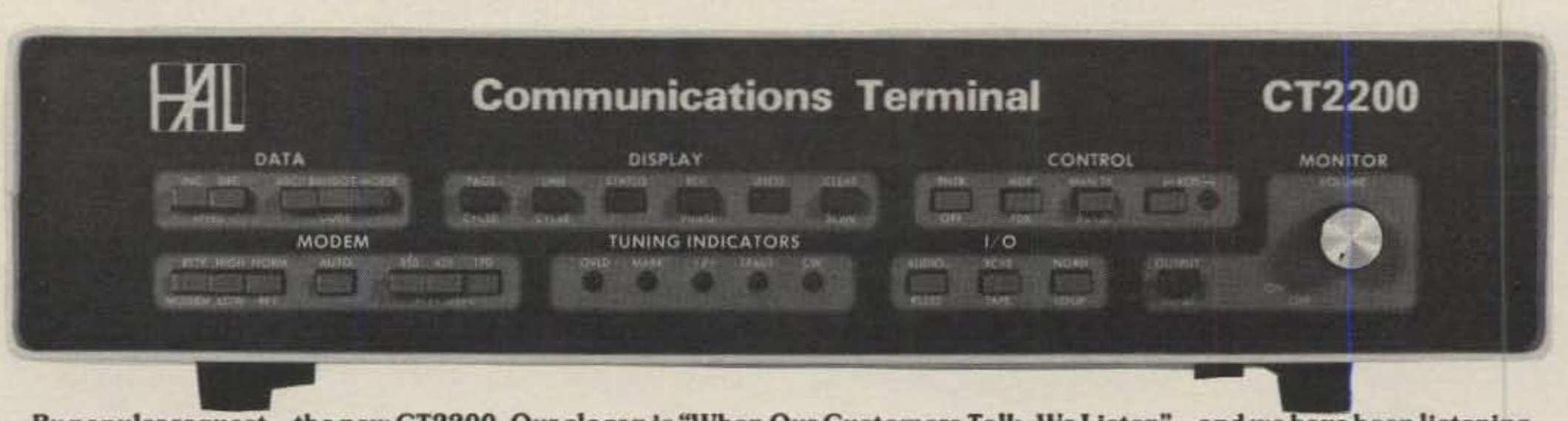

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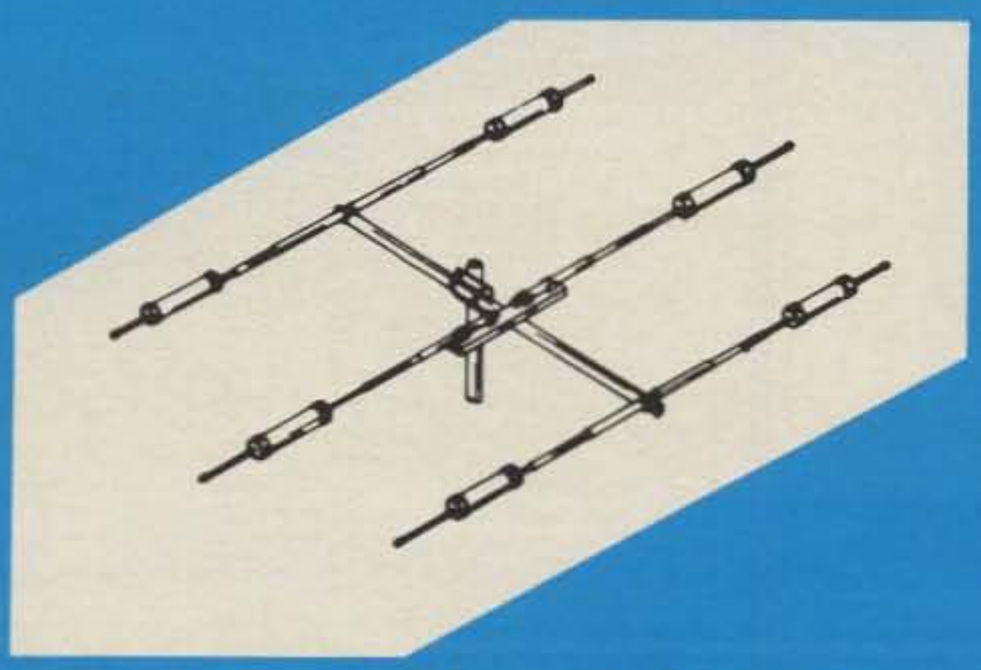

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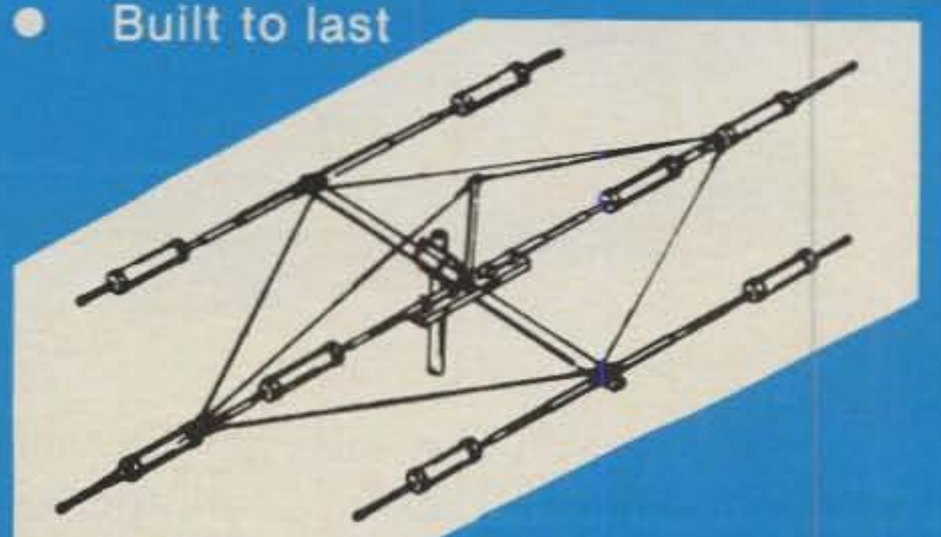

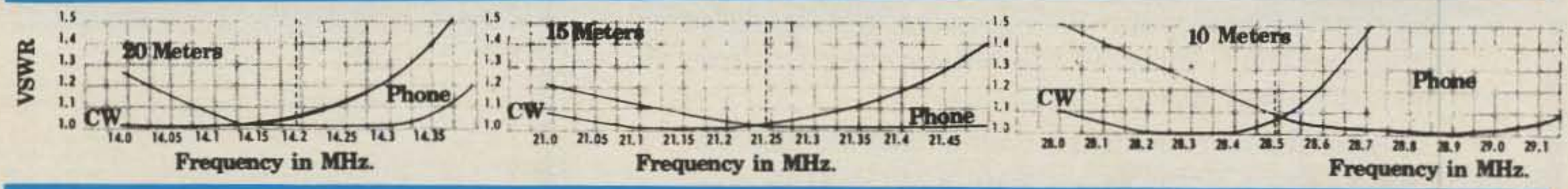

SPECIFICATIONS:

Forward gain		
Front-to-Back Ratio		
Power rating	CW	1KW
	SSB	2KW P.E.P.
Feedpoint Impedance		52 ohm
VSWR HT Resonance		1.5 to 1 or better
Matching System		Mosley
Number of Elements		3
Longest Element		28'
Boom Length		14'
Mast Size		1½" or 2"
Turning Radius		15'6"
Wind surface area (in. sq. ft.)		5.7
Wind load (EIA standard 80 mph)		114 lbs.
Assembled Wt.		39 lbs
Shipping Wt.		44 lbs.

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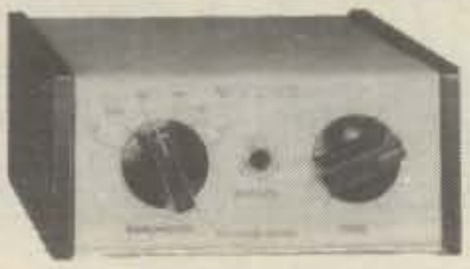

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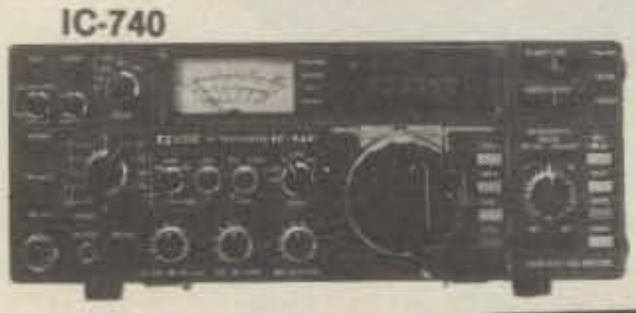

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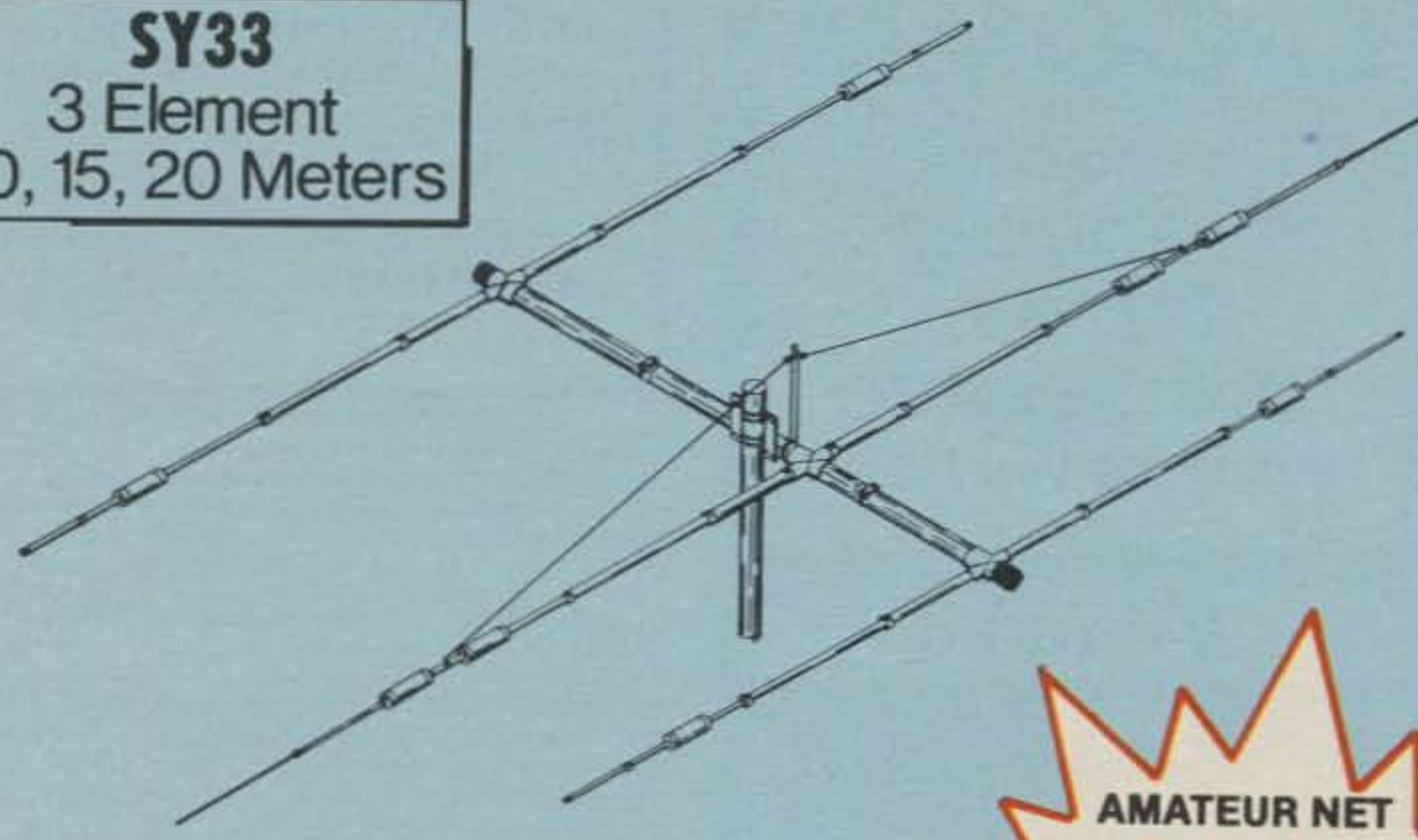
10, 15, 20 Meters



Band MHz:	14-21-28	Longest element:	27'4"
Maximum power input:	legal limit	Turning radius:	15'9"
Gain (dBd):	up to 8 dB	Maximum mast diameter:	2" O.D.
VSWR at resonance:	1.3:1	Surface area:	5.7 sq. ft.
Impedance:	50 ohms	Wind loading at 80 mph:	114 lbs.
F/B ratio:	up to 20 dB	Assembled weight (approx.):	37 lbs.
Boom (O.D. x length):	2" x 14'4"	Shipping weight (approx.):	42 lbs.
No. elements:	3	Direct 52 ohm feed no balun required	
		Maximum wind survival:	100 mph

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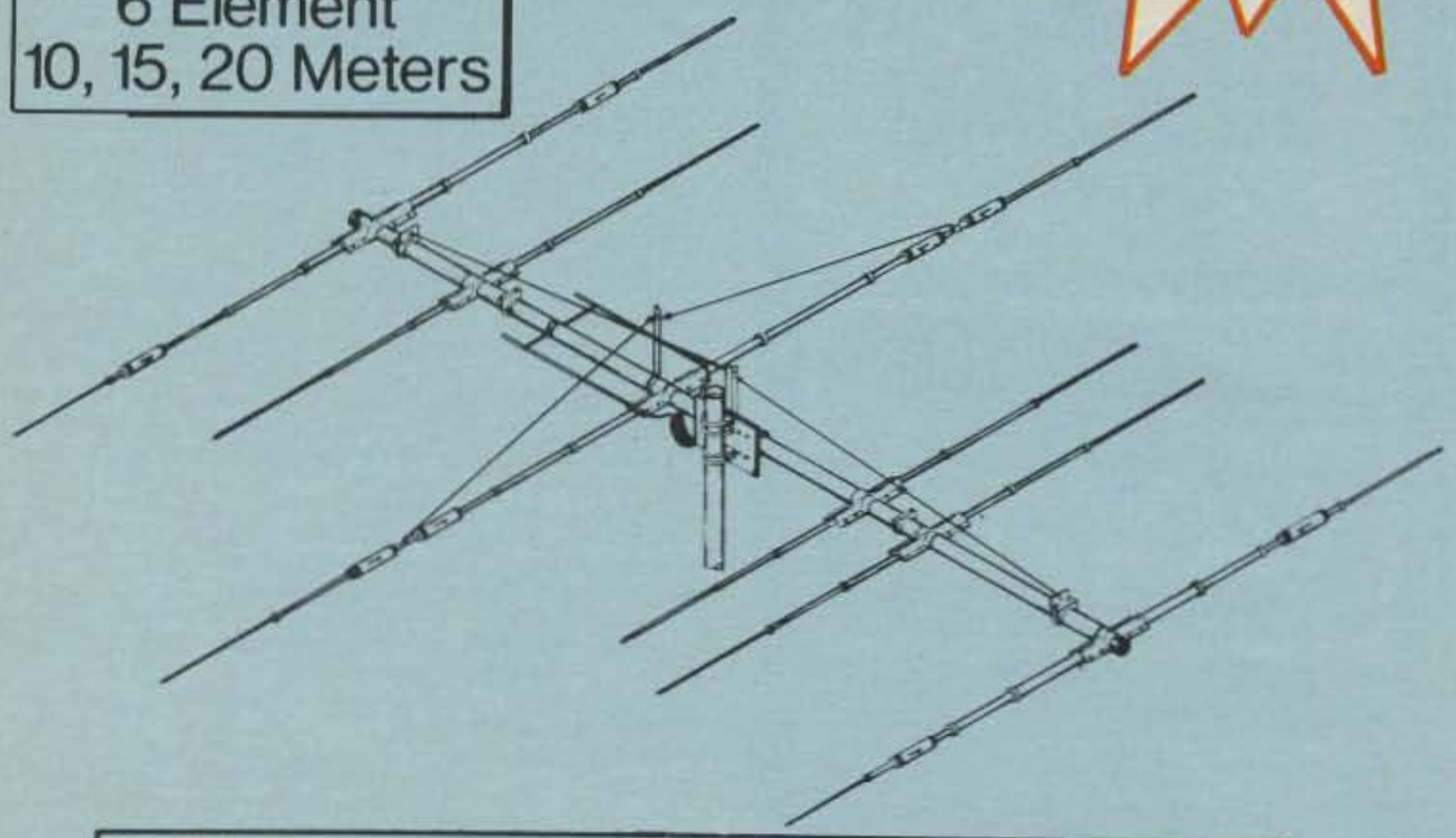

Band MHz	14-21-28	Longest Element:	29'6½"
Maximum power input	legal limit	Turning radius	19'1"
Gain (dBd)	up to 9 dB	Maximum mast diameter	2" O.D.
VSWR at resonance	1.1:1	Surface area	8.6 sq. ft.
Impedance	50 ohms	Wind loading at 80 mph	215 lbs.
F/B ratio	up to 20 dB	Assembled weight (approx.)	53 lbs.
Boom (O.D. x length)	2" x 24'2½"	Shipping weight (approx.)	62 lbs.
No. elements	6	Maximum wind survival	100 mph

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CIRCLE 97 ON READER SERVICE CARD

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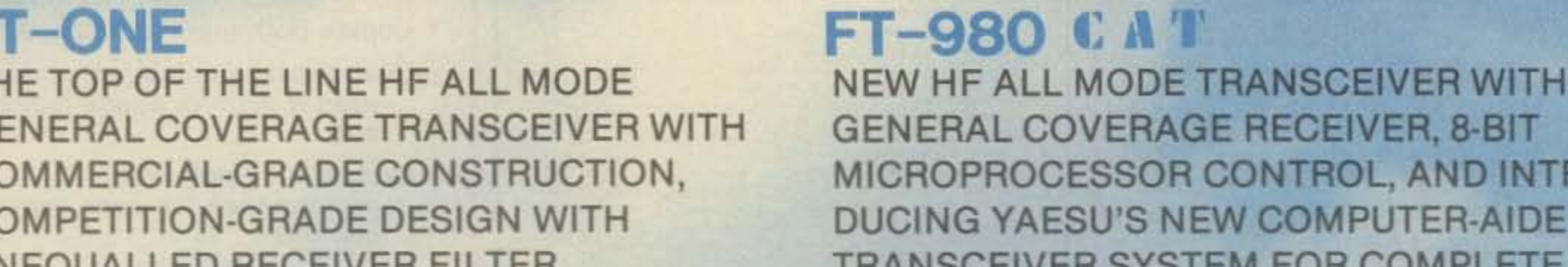
TX: 100W 9 bands
RX: 150 kHz–29.99 MHz



FT-102 LINE

Designed for wide dynamic range and clean transmitter output—to give you that extra competitive edge. Three 6146B's give power to spare, while the ultra-modern features give you total operating flexibility and control.

FT-77 LINE

Simple, reliable and thrifty, the all solid-state rig that gives you everything you need for no-frills mobile HF, or base station with the optional FP-700 Power Supply.
100W: 9 bands, SSB and CW, w/FM optional

FRG-7700

All mode synthesized general coverage receiver—perfect for serious shortwave listening. Options include 12-channel Memory Unit, VHF Converters, Antenna Tuner and an Active Antenna.

Specifications subject to change without notice or obligation.

CIRCLE 146 ON READER SERVICE CARD

V/UHF FAMILIES

FT-208R/708R

Feature-packed FM Handhelds that have proven their superior performance. Microprocessor control assures convenient operation while incorporating every worthwhile feature the serious operator needs.

FT-208R 2.5W/1W RF: 143.5–148.5 MHz

FT-708R 1W/200mW RF: 440–450 MHz

10 memories w/lithium backup
Full scanning features

FT-230R/730R

Compact FM mobiles engineered for reliability and convenience. The perfect balance of current drain and power output for all mobile needs. Built to withstand years of punishing mobile use.

FT-230R 25W RF: 143.5–148.5 MHz
FT-730R 10W RF: 440–450 MHz

FT-290R/690R/790R

All mode portables with full microprocessor control and all of the features needed for serious SSB, CW and FM field operation when powered by eight optional "C" cells. Options also available for mobile and base operation.

FT-690R 2.5/1W RF: 50–54 MHz
FT-290R 2.5W/1W RF: 143.5–148.5 MHz
FT-790R 1W/200 mW RF: 430–440 MHz

FT-480R/680R/780R

All mode base/mobiles with power and performance in all SSB, CW and FM applications. Optional matching FP-80A AC Power Supply makes the perfect base station.

FT-680R 10W RF: 50–54 MHz
FT-480R 10W RF: 143.5–148.5 MHz
FT-780R 10W RF: 430–440 MHz

CIRCLE 139 ON READER SERVICE CARD

YAESU *The radio.*

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
YAESU Cincinnati Service Center, 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

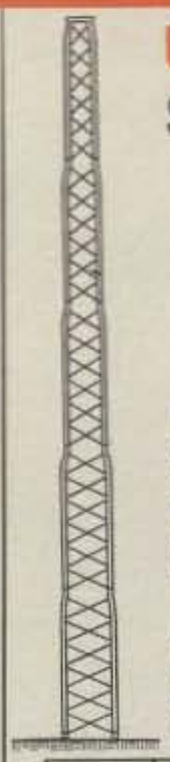
ANTENNA/TOWER SALE!

BUTTERNUT ELECTRONICS CO.

- Designed to operate on all Amateur Bands at "FULL" Legal Power Input.
- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
- New Model HF6V $129.00
- New Model TBR-160HD (High Power 160 meter Base Resonator) $49.00.

Model RMK-11 (roof mount kit with multiband radial kit $39.00.
Model STR-2 (Stub Tuned Radial Kit) $29.00.

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)



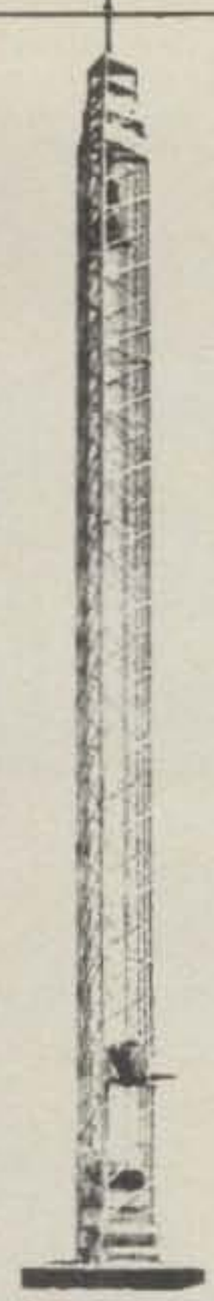
UNARCO-ROHN Self Supporting Towers — On Sale!

Freight Prepaid

These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And — Save even more — include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! How's 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	289	24	313
HBX48	48 ft	10 sq ft	303	BXB7	369	26	395
HBX56	56 ft	10 sq ft	385	BXB8	449	30	479
HDBX40	40 ft	18 sq ft	281	BXB7	339	26	365
HDBX48	48 ft	18 sq ft	363	BXB8	429	30	459



Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq. ft., 50 mph	$549
WT-51	51 ft.	9 sq. ft., 50 mph	$999
LM-354	54 ft.	16 sq. ft., 60 mph	$1599
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2999

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!

RG-213U

$.29/ft $279/1000 ft
Up to 400 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

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

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax™	$1.49/ft
⅞" LDF5-50 Andrew Heliax™	$3.99/ft

select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$22	$22	$22	$22
⅞" Heliax™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259	$1.25	Nickle PL259	$.90
UG21B N Male	$2.95	UG23D N Female	$2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld	$.12/ft	14 Ga. Copperweld	$.10/ft
14 Ga. Stranded	$.10/ft	18 Ga. Copperweld	¼ mi $30
450 Ohm H.D. Line	$.16/ft	H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun	$11		
Van Gorden Center Insulator	$6		

HUSTLER

4BTV 40-10 mtr Vert	$79	5BTV 80-10 mtr Vert	$99
G6-144B 2-mtr Base	$79	G7-144 2-mtr Base	$109

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$10	$10	$12	$15	$19
2KW Super	$14	$15	$19	$24	$33

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

A3 3-el Tribander	$219	A4 4-el Tribander	$289
R3 20/15/10mtr Vert	$279	A743/A744 40mtr Kit	$75

103CD	$95	15-3CD	$115
20-3	$199	40-2CD	$289
A50-5	$79	A147-4	$29
214B	$79	3219	$95
228FB	$219	424B	$79
147	$63	144-20T	$75
14TMB	$29	AMS-147	$29
10-4CD	$109	15-4CD	$125
20-4CD	$279	AV5	$99
A50-6	$99	A147-11	$49
214FB	$79	220B	$95
416TB	$59	617B	$199
144-10T	$52	432-20T	$49
ARX2B	$39	PD-2	$25

Many other Cushcraft models in Stock—CALL!

HY-GAIN

The ALL NEW Broadband 3-el Triband Beam Explorer-14, In Stock—$289

QK710 30/40 mtr. Add-On-Kit	$75.00
V2S 2-mtr Base Vertical	$39
TH5MK2S Broad Band 5-el Triband Beam	$319
TH7DXS 7-el Triband Beam	$379
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 Beam	$299
155BAS 5-el 15-mtr Beam	$179
105BAS 5-el 10-mtr Beam	$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
DB1015BAS 3-el 10/15 mtr Beam	$159
64BS 4-el 6-mtr Beam	$55
66BS 6-el 6-mtr Beam	$109
18HTS 80-10 mtr Hy-Tower Vertical	$339
LC-160 160-mtr Coil Kit for 18HTS	$39
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 W/Coax Seal	$19

MOSLEY

CL-33 3-el Triband Beam	$269
TA-33 3-el Triband Beam	$229
TA-33JR 3-el Triband Beam	$179
TA40KR 40mtr Kit for TA33	$99

HYGAIN/TELEX CRANKUPS

ON SALE! FREIGHT PAID! SPECIAL PRICES! SAVE$$!

Model	Height Up	Down	Wind Load	List	Sale
HG-37SS	37.0 ft	20.5 ft	9.0 sq ft	$777	$669
HG-52SS	52.0 ft	20.5 ft	9.0 sq ft	$1095	$949
HG-54HD	54.0 ft	21.0 ft	16 sq ft	$1818	$1499
HG-70HD	70.0 ft	23.0 ft	16 sq ft	$2850	$2399
HG-33MT2	33.0 ft	11.5 ft	8.5 sq ft	$898	$779

ALPHA DELTA COMMUNICATIONS

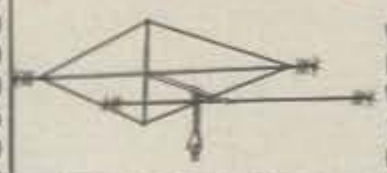
Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
Model LT/N 200W N Type	$39
Model HT/N 2KW N Type	$44
Model R-T 200W Deluxe	$29
Model HV 2KW Deluxe	$32

KLM

KT34A 4-el Broad Band Triband Beam	$309
KT34XA 6-el Broad Band Triband Beam	$469
3.8-1 80-mtr Rotatable Dipole	$429
7.2-1 40-mtr Rotatable Dipole	$159
7.2-2 2-el 40-mtr Beam	$289
7.2-3 3-el 40-mtr Beam	$439
7.2-4A 4-el 40-mtr Beam	$599
6el-20mtr Big Stick Monoband Beam	$599
6el-15mtr Big Stick Monoband Beam	$389
6el-10mtr Big Stick Monoband Beam	$229
10-30-7LP Log Periodic Broad Band Beam	$599
144-148-13LBA 13-el 2-mtr Beam	$79
143-150-14C 14-el 2-mtr Satellite Antenna	$79
420-470-18C 435 MHz Satellite Antenna	$59
432-16LB 432 MHz Long Boom Antenna	$59

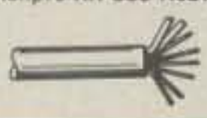
MINI-PRODUCTS HQ-1 only $139!



Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$99
Alliance U100 (for small beams & elevation)	$49
Telex HAM 4 (15 sq ft rating)	$199
Telex Tailtwister (20 sq ft rating)	$249
Telex HDR300 Heavy Duty (25 sq ft rating)	$439
Kenpro KR-500 Heavy duty elevation rotor	$189.00



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

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $32.50 25G $45.50 45G $97.50

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$789
FK2558	58 ft	13.3 sq ft	$879
FK2568	68 ft	11.7 sq ft	$959
FK4544	44 ft	34.8 sq ft	$1099
FK4554	54 ft	29.1 sq ft	$1219
FK4564	64 ft	28.4 sq ft	$1329

25G Foldover Double Guy Kit	$199
45G Foldover Double Guy Kit	$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.12/ft
1/4" EHS Guywire (6000 lb rating)	$.15/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating)	$.12/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.35
1/4" CCM Cable Clamp (1/4" Cable)	$.45
1/4" TH Thimble (fits all sizes)	$.30
3/8EE (3/8" Eye & Eye Turnbuckle)	$5.95
3/8" EJ (3/8" Eye & Jaw Turnbuckle)	$6.95
1/2" EE (1/2" Eye & Eye Turnbuckle)	$8.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$9.95
3/16" Preformed Guy Grip	$1.79
1/4" Preformed Guy Grip	$1.99
6" Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32" or 3/16" Cable)	$.95
502 Guy Insulator (1/4" Cable)	$1.95
5/8" Diam - 8 ft Copper Clad Ground Rod	$11

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$6.95
9902LD Cable End (for 6700 cable)	$7.95
Socketfast Potting Compound (does 6-8 ends)	$12.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$39	$59	$79
.18 in Wall	$39	$69	$99	$100
.25 in Wall	$69	$129	$189	$249

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod	$19	HDT-5 5 ft Tripod	$29
HDT-10 10 ft Tripod	$49	HDT-15 15 ft Tripod	$69

Heavy Duty Tripods include mtg hdw-UPS Shippable

TEXAS TOWERS

DIV OF TEXAS RF DISTRIBUTORS INC.

1108 Summit Ave., Suite 4 / Plano, Texas 75074

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TELEPHONE: (214) 422-7306

MasterCard VISA

CIRCLE 3 ON READER SERVICE CARD

COMMUNICATIONS EQUIPMENT SALE!

MIRAGE AMPLIFIER SALE!

B1016 2 Meter Dual Purpose $249
H.T. 1-2W In - 35-90W Out
or Transceiver 10W In - 160W Out

Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
B23	2M	No	2W	30W	5A	$ 79
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105–125 VAC Output: 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	*Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

MODEL RS-50A

HAL Communications Sale!

CWR6850 $849!

CT2200 KB2100 $959!

CWR6700 Receive Only Telereader	$439
CWR6750 Receive Only Telereader	629
DS3100ASR Deluxe RTTY Terminal	1699
MPT3100 Message Processor Terminal	2199
RS2100 1" Scope w/Loop Supply	289
ST5000 RTTY Demodulator	219
ST6000 Deluxe Demodulator/Keyer	649
DSK3100 Disc Storage Unit	829
ARQ1000 Amtor Error Correcting Terminal	649
KG-12 12" High Resolution Monitor	169

YAESU FT-230R

List $359
Call For Your Special Price

YAESU FT-726R

List TBA
Call For Your Special Price

KDK FM2030

SALE PRICE $269!

YAESU FT-77

List Price $599.00
Call For Special Price

R.L. DRAKE

TR-7A Transceiver On Sale $1389!
Accessories In Stock - Call!
L7 HF Amplifier Only $969 (Less Tubes)
Eimac 3-500Z Tubes $199/pair

TEN-TEC SUPER SALE!

Corsair List $1,169
Your Special Price $1,029

Model 229...$259.00
Model 4229 Kit...$189.00

NEW 2591
NOW AVAILABLE
$275.00

ALL ACCESSORIES IN STOCK—CALL!

SANTEC

ST144μP Handie Talkie ON SALE! Only $279

IN STOCK FOR IMMEDIATE DELIVERY

- 142-149 995 MHz
- 3 5W/1W/.1W Output
- 24 Hour Clock
- Liquid Crystal Display

OTHER SANTEC ITEMS

ST-440μP 440 MHz H.T.	$299
SM-3 Speaker Mic	33
ST-LC Leather Case	39
ST4QC Base Charger	69
ST-500B3 Ni-Cad Battery	29

TOKYO HY-POWER LABS

Regular $69.95 SALE $59!

HL-30V 2 Meters, 2W In - 30W Out

OTHER TOKYO HY-POWER ITEMS

HL-82V 2 Mtr, 2-12W In - 35-85W Out	$139
HL-160V 2 Mtr, 1-15W In - 160W Out	299
HL-20U 440 MHz 1-3W In - 20W Out	99
HL-90U 440 MHz 10W In-80W Out w/Preamp	339
HC-200 HF Ant Tuner w/Wattmeter	89
HC-2000 Deluxe 2KW HF Antenna Tuner	299

AEA CP-1

Computer Patch Interface
List Price $239.95
Call For Special Price
On All AEA Products.

RF POWER LABS AMPLIFIERS

A1000	160–15 Mtr. KW w/AC Supply	$1329
V76	6 Mtr. 8–15W In – 120W Out w/AC Supply	499
V360	6 Mtr. 5–10W In – 450W Out w/AC Supply	1189
V70	2 Mtr. 10–15W In – 90W Out w/AC Supply	499
V71	2 Mtr. 1–3W In – 90W Out w/AC Supply	519
V180	2 Mtr. 5–15W In – 200W Out w/AC Supply	599
V350	2 Mtr. 10–20W In – 400W Out w/AC Supply	1189

Fan Kits and Rack Adapters Also Available—CALL!

JANEL QSA5 PREAMP $39!

QSA-6	$41	432PL	$59
PB-30	$25	PB144	$25
PB-50	$25	PB220	$25

DAIWA CN-620B $111!
160/2 mtrs
20/200/2000 wts

BENCHER PADDLE
BY-1 Blackbase $39
BY-2 Chrome $49

MFJ MODEL 104 On SALE For Only $33!

202B Noise Bridge	$54
250 2KW Dummy w/Oil	31
260 300W Dry Load	25
262 2KW Dry Load	59
422 Keyer w/Paddle	89
482 4 MSG Mem Keyer	89
484B 12 MSG Keyer	125
494 Keyboard	249
496 Keyboard	299
525B RF Processor	109
624 Phone Patch	59
901 300W Tuner	54
940B Tuner w/Meter	72
941C Tuner w/Meter	79
949B Deluxe Tuner	129
989 Deluxe 2KW Tuner	289

KANTRONICS

THE INTERFACE Reg. $169.95 SALE $149.00!

OTHER KANTRONICS ITEMS

Mini-Reader	$239	Hamtext VIC-20	99
Mini-Terminal	259	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
VIC-20 Hamsoft	49	TRS-80C Hamsoft	59

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MasterCard VISA

CIRCLE 2 ON READER SERVICE CARD

YAESU SALE!

FT-ONE

GENERAL COVERAGE—ALL MODE
DELUXE SOLID STATE TRANSCEIVER

Buy Now and Receive These Accessories Free:
300Hz CW Filter..$FREE 600Hz CW Filter..$FREE
800Hz CW Filter..$FREE 6Khz AM Filter..$FREE
Memory Backup..$FREE Installation.....$FREE

List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!

FT-980

CAT SYSTEM—Computer Aided Transceiver
- Wide Dynamic Range
- Low Noise Front End
- General Coverage
- 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!
- Full Break-in CW
- RF Speech Processor
- Variable Bandwidth
- IF Shift
- APF/Notch
- AC Power Supply
- Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- Much, much more—call or write for info

Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!

FT-102

160-10MTR WITH WARC BANDS TRANSCEIVER

- Digital Readout
- Built-in AC Supply
- Variable Bandwidth
- IF Shift
- CW/SSB/AM/FM Modes
- RF Speech Processor
- Noise Blanker
- Much, much more—

List Price $1149—Call for Special Low Texas Towers Discount Price and Save $$$

FT-77

New 80-10mtr Compact HF Transceiver

- Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

List Price $599—Call for Special Low Texas Towers Discount Price and Save $$

FT-230R 2mtr FM.....$359
FT-730R 440Mhz FM.....$399
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

Call today for Special Discount Price & Save $$

FT-726R VHF/UHF
All Mode Tri-Band Transceiver
- 50-54 Mhz
- 144-148 Mhz
- 10 watts output on all bands
- 430-450 Mhz
- 21, 24.5 & 28 Mhz option available soon

Please Call For Price & Delivery Information

VHF/UHF Multimode Portables

FT-690R 50Mhz.....$379
FT-290R 144Mhz.....$399
FT-790R 430Mhz.....$399

Call today for Special Discount Price & Save $$

FRG-7700

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CIRCLE 137 ON READER SERVICE CARD

MEET THE NEW YAESU FT-102

The FT-102 is factory equipped for operation on all present and proposed Amateur HF bands. An extra AUX band position is available for special applications. Equipped for SSB, CW, and AM (RX), the FT-102 may be activated on FM and AM (TX) via the optional AM/FM-102 Module.

The all-new receiver front end utilizes a low-distortion RF preamplifier that may be by-passed via a front panel switch when not needed. Maximum receiver performance is yours with this impressive lineup of standard features: IF Notch Filter, Audio Peak Filter, Variable IF Bandwidth Control, IF Shift, Variable Pulse Width Noise Blanker, Independent SSB and CW Audio Channels with Optimized Audio Bandwidth, and Front Panel Audio Tone Control. Wide/Narrow filter selection is independent of the Mode switch.

The celebrated transmitter section is powered by three 6146B final tubes, for more consistent power output and very low distortion. An RF Speech Processor, Mic Amp Audio Tone Control, VOX, and an IF Monitor round out the transmitter lineup.

Futuristic panel design and careful human engineering are the hallmarks of the FT-102. Convenient pop-out controls below the meters may be retracted when not in use, thus avoiding inadvertant mistuning. Abundant relay contacts, rear panel phono jacks for PTT, microphone/patch input, and other essential interface connections make the FT-102 extremely simple to incorporate into your station.

SPECIFICATIONS

TRANSMITTER

Power Input: (1.8-25 MHz) (28-29.9 MHz)

SSB, CW	240W DC	160W DC
AM	80W DC	80W DC
FM		160W DC

RECEIVER

Image Rejection:
Better than 70dB from 1.8-21.5 MHz
Better than 50dB from 24.5-29.9 MHz

IF rejection:
Better than 70 dB

Selectivity (−6 dB/ −60 dB):
SSB, CW, AM; 2.7/4.8 kHz (with no optional filters)
Width adjusts continuously from 2.7 kHz to 500 Hz (−6 dB)

Spurious Radiation: Better than −40 dB

CIRCLE 48 ON READER SERVICE CARD

SP-102

The SP-102 External Speaker/Audio Filter features a large, high-fidelity speaker with selectable low- and high-cut audio filters. The front panel A-B switch allows selection of two receiver inputs for maximum versatility. Also available is the SP-102P Speaker/Patch.

FV-102DM

The FV-102DM Synthesized External VFO tunes in 10 Hz steps. Keyboard entry of frequencies, UP/DOWN scanning, and 12 memories make the FV-102DM a "must" for serious DX or contest work.

FC-102

The FC-102 Antenna Coupler is capable of handling 1.2KW of transmitter power, with an in-line wattmeter, separate SWR meter, and A-B input/output selection expanding your station's capability. The optional FAS-1-4R allows remote selection of up to four antennas via one coaxial cable connected to the FC-102.

See your Authorized Yaesu Dealer today for a hands-on demonstration of the rig that everybody's talking about. It's the FT-102, The Transceiver of Champions!

Price And Specifications Subject To Change Without Notice or Obligation 1082R

YAESU **ELECTRONICS CORPORATION** 6851 Walthall Way, Paramount, CA 90723 (213) 633-4007
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NEW!

ICOM IC-745

A New Transceiver Worth Celebrating!

9 HAM BANDS!

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16 MEMORIES!

SCANNING!

PASSBAND TUNING!

VARIABLE NB & AGC!

What's the celebration about? The IC-745 . . . a new all ham band HF transceiver with SSB, AM, CW, RTTY and an FM option . . plus, a 100KHz — 30MHz general coverage receiver.

And . . . the IC-745 has a combination of features found on no other transceiver at such an incredibly low price.

Compare these exceptional features:

- 100KHz — 30mHz Receiver
- 16 Memories
- Full function Metering with a built in SWR Bridge
- IF Shift and Pass Band Tuning
- 10Hz / 100Hz / 1KHz Tuning Rates with 1MHz band steps
- Optional Internal AC Power Supply
- Adjustable Noise Blanker (width and level)
- Continuously Adjustable AGC with an OFF position
- Receiver Preamp
- 100% Transmit Duty Cycle

Other Standard Features:

- 100 Watt Output Transmitter with exceptionally low IMD
- VOX
- Speech Compressor
- Tunable Notch Filter
- RIT and XIT
- All Mode Squelch
- Scanning
- ICOM System Compatibility

Optional Accessories:

- IC-PS15 External Power Supply
- IC-PS740 Internal Power Supply for the ultimate in Portability
- IC-2KL Linear Amplifier
- IC-SP3 External Speaker
- IC-MB12 Mobile Mounting Bracket
- IC-AT100 Antenna Tuner (100W)
- IC-AT500 Antenna Tuner (500W)
- IC-BC10 Memory Backup
- IC-EX241 Marker Module
- IC-EX242 FM Module
- IC-EX243 Electronic Keyer
- IC-FL52A 500Hz 455KHz CW Filter
- IC-FL45 500Hz 9MHz CW Filter
- IC-FL54 270Hz 9MHz CW Filter
- IC-FL53A 250Hz 455MHz CW Filter
- IC-FL44A 2.1KHz 455KHz SSB Filter
- IC-SM6 Desk Mic
- IC-HM12 Hand Mic

The IC-745 is the only transceiver today that has such features standard . . . the number of options and accessories available . . . and such a low price.

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