August 1981 $2.95

73 MAGAZINE
FOR RADIO AMATEURS

74470 65946 08

tempo does it again

THE WORLD'S FIRST 440 MHz SYNTHESIZED HAND HELD RADIO

Tempo was the first with a synthesized hand held for amateur use, first with a 220 MHz synthesized hand held, first with a 5 watt output synthesized hand held...and once again first in the 440 MHz range with the S-4, a fully synthesized hand held radio. Not only does Tempo offer the broadest line of synthesized hand helds, but its standards of reliability are unsurpassed...reliability proven through millions of hours of operation. No other hand held has been so thoroughly field tested, is so simple to operate or offers so much value. The Tempo S-4 offers the opportunity to get on 440 MHz from where ever you may be. With the addition of a touch tone pad and matching power amplifier its versatility is also unsurpassed.

The S-4...$349.00
With 12 button touch tone pad...$399.00
With 16 button touch tone pad...$419.00
S-40 matching 40 watt output
13.8 VDC power amplifier...$149.00

Tempo S-1

The first and most thoroughly field tested hand held synthesized radio available today. Many thousands are now in use and the letters of praise still pour in. The S-1 is the most simple radio to operate and is built to provide years of dependable service. Despite its light weight and small size it is built to withstand rough handling and hard use. Its heavy duty battery pack allows more operating time between charges and its new lower price makes it even more affordable.

Tempo S-5

Offers the same field proven reliability, features and specifications as the S-1 except that the S-5 provides a big 5 watt output (or 1 watt low power operation). They both have external microphone capability and can be operated with matching solid state power amplifiers (30 watt or 80 watt output). Allows your hand held to double as a powerful mobile or base radio.

S-30...$89.00* S-80...$149.00*

*For use with S-1 and S-5

Tempo S-2

With an S-2 in your car or pocket you can use 220 MHz repeaters throughout the U.S. It offers all the advanced engineering, premium quality components and features of the S-1 and S-5. The S-2 offers 1000 channels in an extremely lightweight but rugged case.

If you're not on 220 this is the perfect way to get started. With the addition of the S-20 Tempo solid state amplifier it becomes a powerful mobile or base station. If you have a 220 MHz station, the S-2 will add tremendous versatility.

Price...$349.00 (With touch tone pad installed...$399.00)
S-20...$89.00

Specifications:
Frequency Coverage: 440 to 449.995 MHz
Channel Spacing: 25 KHz minimum
Power Requirements: 9.8 VDC
Current Drain: 17 ma-standby 400 ma-transmit (1 amp high power)
Antenna Impedance: 50 ohms
Sensitivity: Better than .5 microvolts nominal for 20 db
Supplied Accessories: Rubber flex antenna 450 ma ni-cad battery pack, charger and earphone
RF output Power: Nominal 3 watts high or 1 watt low power
Repeater Offset: ±5 MHz

Optional Accessories for all models

12 button touch tone pad (not installed): $39 • 16 button touch tone pad (not installed): $48 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Leather holster: $20 • Cigarette lighter plug mobile charging unit: $6

TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS

Boost your signal. . . give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	$209
10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
2W	30W	30A02	$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

HENRY RADIO 53 YEARS OF SERVICE

✓34

Henry Radio

2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820-1234
931 N. Euclid, Anaheim, CA 92801 (714) 772-9200
Butler, Missouri 64730 (816) 679-3127

TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.
Prices subject to change without notice.

FIVE STORE BUYING POWER!

SUMMER SAVINGS

SHIPPING REGULARLY TO COUNTRIES IN ALL CONTINENTS.

SERVING HAMS BETTER.
North...south...east...west.

Bob Ferrero,W6RJ/K6AHV, Jim Rafferty, N6RJ other well known hams give you courteous, personalized service.

FREE PHONE
800
854-6046
CALIF. CUSTOMERS PLEASE CALL OR VISIT LISTED STORES

FREE SHIPMENT
(UPS Brown)
CONTINENTAL U.S.A.

master charge VISA

HAM RADIO OUTLET™

ANAHEIM, CA 92801
2620 W. La Palma,
(714) 761-3033 (213) 860-2040
Between Disneyland & Knott's Berry Farm

BURLINGAME, CA 94010
999 Howard Ave., (415) 342-5757
5 miles south on 101 from S.F. Airport.

OAKLAND, CA 94609
2811 Telegraph Ave., (415) 451-5757
Hwy 24 Downtown. Left 27th off-ramp.

SAN DIEGO, CA 92123
5375 Kearny Villa Road (714) 560-4900
Hwy 163 & Clairemont Mesa Blvd.

VAN NUYS, CA 91401
6265 Sepulveda Blvd., (213) 988-2212
San Diego Fwy at Victory Blvd.

OVER-THE-COUNTER
Mon. thru Sat. 10AM to 5:30PM

AEA • ALLIANCE • ALPHA • AMECO • AMPHENOL • ARRL • ASTRON • AVANTI • BENCHER • BERK-TEK • BIRD • B&W • CALLBOOK • CDE • COLLINS • CUBIC • CURTIS • CUSHCRAFT • DAIWA • DATONG • DENTRON • DRAKE • DX ENGINEERING • EIMAC • HUSTLER • HY-GAIN • ICOM • J.W.MILLER • KENWOOD • KLM • LARSEN • LUNAR • METZ • MFJ • MICRO - LOG • MINI - PRODUCTS • MIRAGE • NYE • PALOMAR • ROBOT • ROHN • SHURE • SWAN • TELEX • TELREX • TEMPO • TEN-TEC • TRISTAO • YAESU and many more!

ETO ALPHA

77DX
REGULAR $4945
YOUR PRICE: **$4199**

78
REGULAR $3185
YOUR PRICE: **$2599**

76PA
REGULAR $2195
YOUR PRICE: **$1799**

374A
REGULAR $2395
YOUR PRICE **$1999**

YAESU FT-207R HANDIE

REGULAR $339.95

Includes:
NBP-9 battery pack.
NC-9B wall charger.
FEP-1 earphone, rubber flex. ant.

YOUR PRICE **$289.95**

MIRAGE B-1016 2M AMPLIFIER

160 W OUTPUT SSB, FM, CW.

Freq. range: 144-148MHz • RF out:160W nom. (10W in). • RF power in: 5-15W • DC operating pwr: 13.8VDC @ 20-25A • Intermittent duty cycle • Built-in receiver pre-amp. Automatic internal or external relay keying.

REGULAR $279.95 YOUR PRICE **$249.95**

R.L. DRAKE TR-7/DR-7

REGULAR $1599
ASK FOR YOUR PRICE

COLLINS KWM-380

NEW REGULAR PRICE $3496
LIMITED NUMBER AT OLD PRICE **$2695**

KENWOOD

TS-130S

TR-2400

TS-830S

TR-7800

CALL NOW FOR YOUR SPECIAL SUMMER SAVINGS PRICES

Prices, specs subject to change without notice

Calif. residents please add sales tax.

INFO

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *73* editorial offices. "How to Write for 73" guidelines are available upon request.

Editorial Offices:

Pine Street
Peterborough NH 03458
Phone: 603-924-3873, 924-3874

Advertising Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-7138

Circulation Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-7296

Subscription Rates

In the United States and Possessions:
One Year (12 issues) $25.00
Two Years (24 issues) $38.00
Three Years (36 issues) $53.00

Elsewhere:

Canada—$27.00/1 year only, U.S. funds. Foreign surface mail—$35.00/1 year only, U.S. funds. Foreign air mail—$62.00/1 year only, U.S. funds.

To subscribe, renew or change an address:

Write to *73 Magazine*, Subscription Department, PO Box 931, Farmingdale NY 11737. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. Postmaster: Send form #3579 to *73 Magazine*, Subscription Services, P.O. Box 931, Farmingdale, NY 11737.

Subscription problem or question:

Write to *73 Magazine*, Subscription Department, PO Box 931, Farmingdale NY 11737. Please include an address label.

73 Magazine (ISSN 0098-9010) is published monthly by 73, Inc., 80 Pine Street, Peterborough NH 03458. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Microfilm Edition—University Microfilm, Ann Arbor MI 48106.

73 MAGAZINE aug. 81

Cover: AEA's Mike Lamb and daughter Julie go bicycle marine mobile with the Isopole™ 144. Photo by Audris Skuja.

W2NSD/1
NEVER SAY DIE

editorial by Wayne Green

ROCHESTER HAMFEST CLOSED DOWN BY TAX OFFICIALS

New York tax officials descended on the Rochester Hamfest and closed down the ARRL booth, threatening president Harry Dannals with an arrest warrant if he continued to hawk his books and magazines. It was at the height of the hamfest just before noon on Saturday, with an estimated 3,000 people milling around the flea market and the handful of exhibitor booths, when the tax officials and police arrived.

The police cars drove up and down the aisles of the flea market, demanding that everyone pack up and leave immediately. Inside the exhibits building, the tax officials demanded proof of a tax certificate, which few exhibitors could produce. The exhibits were then forced to close down. The *73* booth was permitted to continue without interruption, though the *QST* booth was closed.

This all got started about two years ago when several ham dealers collected the New York state taxes on sales, but then did not turn them into the tax department. Out-of-state ham dealers who just ignored the tax did not cause problems, but the collecting of the tax without the payment of it was too much. A New York ham dealer complained through his state congressman and the heat was on.

Last year, a tax official turned up to investigate and made it clear that this sort of thing would have to stop. He told all exhibitors to be sure to get state tax certificates, collect the tax, and pay it. Again, some of the dealers collected the tax . . . and didn't pay it. The New York ham dealer, feeling that this gave his competitors an undue advantage . . . the tax collections being pure profit . . . complained again through his congressman.

When the tax people and the police showed up at the peak of the hamfest, the committee went into hiding and offered no help or advice. The only statement, issued hours later, was to the effect that the committee had no position on the tax one way or the other. The situation was one of total confusion.

The media got the word, and television teams soon arrived, causing a fast exit by the police and tax people. The threats of arrest warrants were apparently just scare tactics . . . and of questionable legality. Exhibitors would have done best, it turned out, to just keep on selling. Losses in sales have been estimated at about a quarter of a million dollars.

Just to make things even worse, security at Rochester was poor and many exhibitors found themselves made miserable by thieves. Some were working in teams to distract dealers while an accomplice grabbed equipment. One dealer lost three HTs . . . from the *back* of his exhibit booth!

MILLER HASSLE WON'T QUIT

The dumping of Miller as a director of the ARRL and the naming of his opponent, Metzger, without the benefit of even counting the votes, has upset hams in Indiana considerably. We published some letters on the subject and I'm told by some of the *73* team which was at Dayton (nine of us were there) that a chap claiming to be a lawyer for Metzger came by the booth yelling and threatening to sue us over the letters. He apparently came across loud and obnoxious.

If this chap is representative of Metzger, the division is in for a most interesting time. I don't envy them. More information has been promised on the details, but from everything I've heard it is a clear-cut case of the ARRL wanting to get rid of a director who was asking too many questions. The smear of Miller is continuing. Insignificant things are being blown up out of all proportion to try to justify the character assassination of Miller. Pity.

DAMNED GOVERNMENT

Many of us expect to see the federal government react about the same as the states to a reduction in funds: Cut the most important and visible services first, protecting the bureaucrats to the last. It is nice that Reagan has put out a call for the public to blow the whistle on government waste, bad management practices, and fraud. If you've run into any such, you might send word to Howard Messner, Office of Management and Budget, Room 10208, New Executive Office Building, Washington DC 20503.

It appears as if there is going to be a try at getting the government out of the large-scale printing business, too. That'll be a relief.

PETERBOROUGH DAYS

"Our Town," as Peterborough is called as a result of being used as the role model for the play of that name many years ago, is having an all-out bash on August 6-7-8th, and you're invited.

PLAIN LANGUAGE DEADLINE EXTENDED

A last-minute effort by *73 Magazine*, the ARRL, and others has resulted in a 60-day extension of the deadline for filing comments on the Plain Language Rules docket. You now have until August 21 to contribute your thoughts about PR 80-729.

We urge every club and repeater association to take a close look at the docket and then submit specific, constructive comments. If you would like to be a formal participant in the comment process, file an original and five copies. If you file an original and 11 copies, every Commissioner will see your remarks. Of course, the FCC will consider all comments, regardless of the number of copies submitted. The important thing is to speak out before the August 21 deadline.

Until October 21, the FCC permits you to file *replies* to comments received by August 21. The difficulty lies in obtaining copies of the many comments the Commission has received. One good way to obtain these comments is to contact the individuals who filed them. For more details about the FCC's activities, call the Office of Consumer Assistance at (202)-632-7000.

W2NSD ON-THE-AIR SCHEDULE AUGUST, 1981 8:00-11:00 PM EDT

4	15m-20m RTTY
11	20m-40m Phone
18	15m-20m CW
25	15m-20m Phone

Look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first.

Dyna-"mite."

Miniaturized, 5 memories, memory/band scan

TR-7730

The TR-7730 is an incredibly compact, reasonably priced, 25-watt, 2-meter FM mobile transceiver with five memories, memory scan, automatic band scan, UP/DOWN manual scan from the microphone, and other convenient operating features.

TR-7730 FEATURES:

- **Smallest ever Kenwood mobile**
  Measures only 5-3/4 inches wide, 2 inches high, and 7-3/4 inches deep, and weighs only 3.3 pounds. Mounts even in the smallest subcompact car, and is an ideal combination with the equally compact TR-8400 synthesized 70-cm FM mobile transceiver.
- **25 watts RF output power**
  Even though the TR-7730 is so compact, it still produces 25 watts output for reliable mobile communications. HI/LOW power switch selects 25-W or 5-W output.
- **Five memories**
  May be operated in simplex mode or repeater mode with the transmit frequency offset ±600 kHz. The fifth memory stores both receive and transmit frequency independently, to allow operation on repeaters with nonstandard splits. Memory backup terminal on rear panel.
- **Memory scan**
  Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Extended frequency coverage**
  Covers 143.900-148.995 MHz in switchable 5-kHz or 10-kHz steps, allowing simplex and repeater operation on some MARS and CAP frequencies.
- **Automatic band scan**
  Scans entire band in 5-kHz or 10-kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **UP/DOWN manual scan**
  With UP/DOWN microphone provided, manually scans entire band in 5-kHz or 10-kHz steps.
- **Offset switch**
  Allows VFO and four of five memory frequencies to be offset ±600 kHz for repeater access (or to be operated simplex) during transmit mode.
- **Four-digit LED frequency display**
  Indicates receive and transmit frequency during simplex or repeater-offset operation.
- **S/RF bar meter and LED indicators**
  Bar meter of multicolor LEDs shows. relative receive and transmit signal levels. Other LEDs indicate BUSY, ON AIR, and REPEATER offset.
- **Tone switch**
  Activates internal subaudible tone encoder (not Kenwood-supplied).

Optional accessories:

- **MC-46** 16-button autopatch (DTMF) UP/DOWN microphone
- **SP-40** compact mobile speaker
- **KPS-7** fixed-station power supply

More information on the TR-7730 and TR-8400 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

Synthesized 70-cm FM mobile rig

TR-8400

- **Synthesized coverage of 440-450 MHz**
  Covers upper 10 MHz of 70-cm band in 25-kHz steps, with two VFOs.
- **Offset switch**
  For ±5 MHz transmit offset on both VFOs and four of five memories, as well as simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- **DTMF autopatch terminal**
  On rear panel, for connecting DTMF (dual-tone multifrequency) touch pad (for accessing autopatches) or other tone-signaling device.
- **HI/LOW RF output power switch**
  Selects 10 watts or 1 watt output.
- **Virtually same size as TR-7730**
  Perfect companion for TR-7730 in a compact mobile arrangement.
- **Other features similar to TR-7730**
  Five memories, memory scan, automatic band scan (in 25-kHz steps), UP/DOWN manual scan, four-digit LED receive frequency display (also shows transmit frequency in memory 5), S/RF bar meter and LED indicators, tone switch, and same optional accessories.

KENWOOD
...pacesetter in amateur radio

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

To do our part in the celebration, we're going to have a wide selection of back issues of *73* available for the taking. . . plus ham gear and parts collected by me over the last 40 years. We have to make room for a new magazine and that means I've lost my ham equipment storage rights. Pick 'em over and watch my stifled sobs as you walk off with my treasures.

The town will be having a lot of special events, including a circus on the 6th, a muster on the 8th, a relatively short marathon race, sports tournaments in tennis, swimming, softball, and volleyball, a book sale, square dancing, a bluegrass band, kite flying, an antique show. . . there's no end to it.

Add to this your chance to visit (and perhaps operate from) the W2NSD ham shack, the growing *73* publishing offices, Instant Software, etc. You may not believe what resources and people it takes to bring you this magazine every month.

Our Town is one of the most beautiful in New England and it is situated in one of the most remarkable little valleys in the country. One visit and you'll see why New Hampshire is one of the fastest growing states in the country. Remember that we have no sales taxes, so when you shop you pay the actual retail price for everything.

If you can arrange for a few days in New Hampshire, you should include a visit to the White Mountains, about 100 miles north of Peterborough. You may want to stop off in Warren and see the Morse Museum. From there you are a short drive to Franconia Notch and the amazing Flume, the Foot Basin, and the first North American tramway on Cannon Mountain.

If you have some time and like to climb around, you might want to visit Lost River, right near Franconia Notch. Or you might want to join the multitudes who have climbed Mt. Washington. . . or at least take the cog railway to the top. The last time I climbed the mountain I took the train back down.

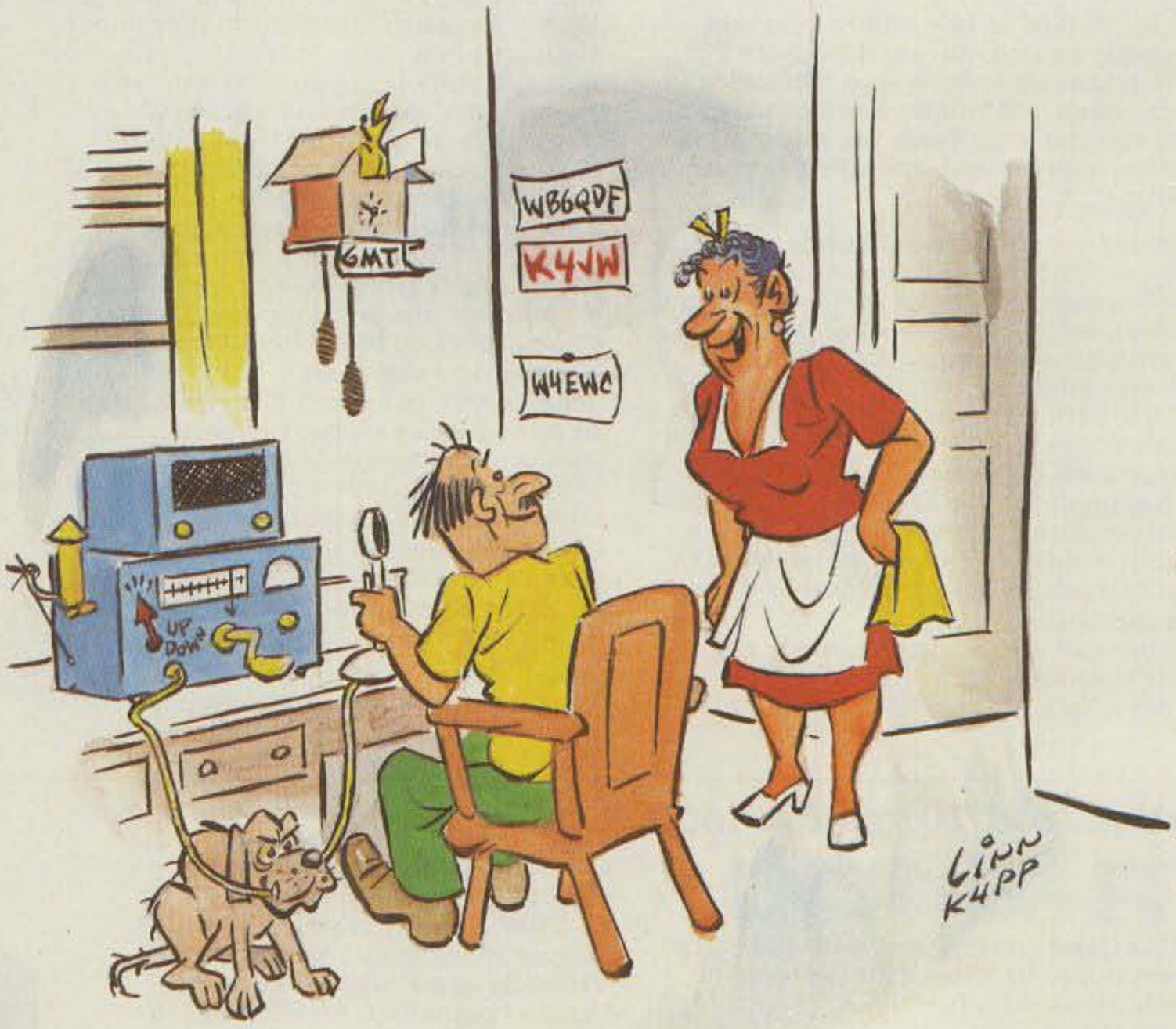
So, if you and your family are within driving distance of lower New Hampshire, you might plan on getting up here in early August to see us. . . and to get in on some of the fun of Peterborough Days. We monitor 147.54 when you're in the area.

This is a mecca for famous writers and artists, so you may be bumping elbows with people who stay at our MacDowell colony, such as Leonard Bernstein, or some of the well-known local residents, such as Ed Land. You never know who you are going to see in the A&P.

One of the highest mountains in southern New Hampshire is in Peterborough, complete with a road to the top. Bring a good HT or mobile rig and see how many repeaters you can kerchunk from there. I've often gotten up there in the early mornings and made contacts all the way down to Washington DC. Long Island is a snap. This is where the big-effort VHF contesters gather.

Well. . . I Can Dream, Can't I?

by Bandel Linn K4PP



"Honey, I know you're talking to DX. . . I've put dinner on hold. . . just tell me when you're ready to eat!"

ICOM Presents the Minicom IC-25A

Imagine..25watts/5 memories/2 scanner systems in a 2"H x 5½"W x 7"D 2 meter transceiver!

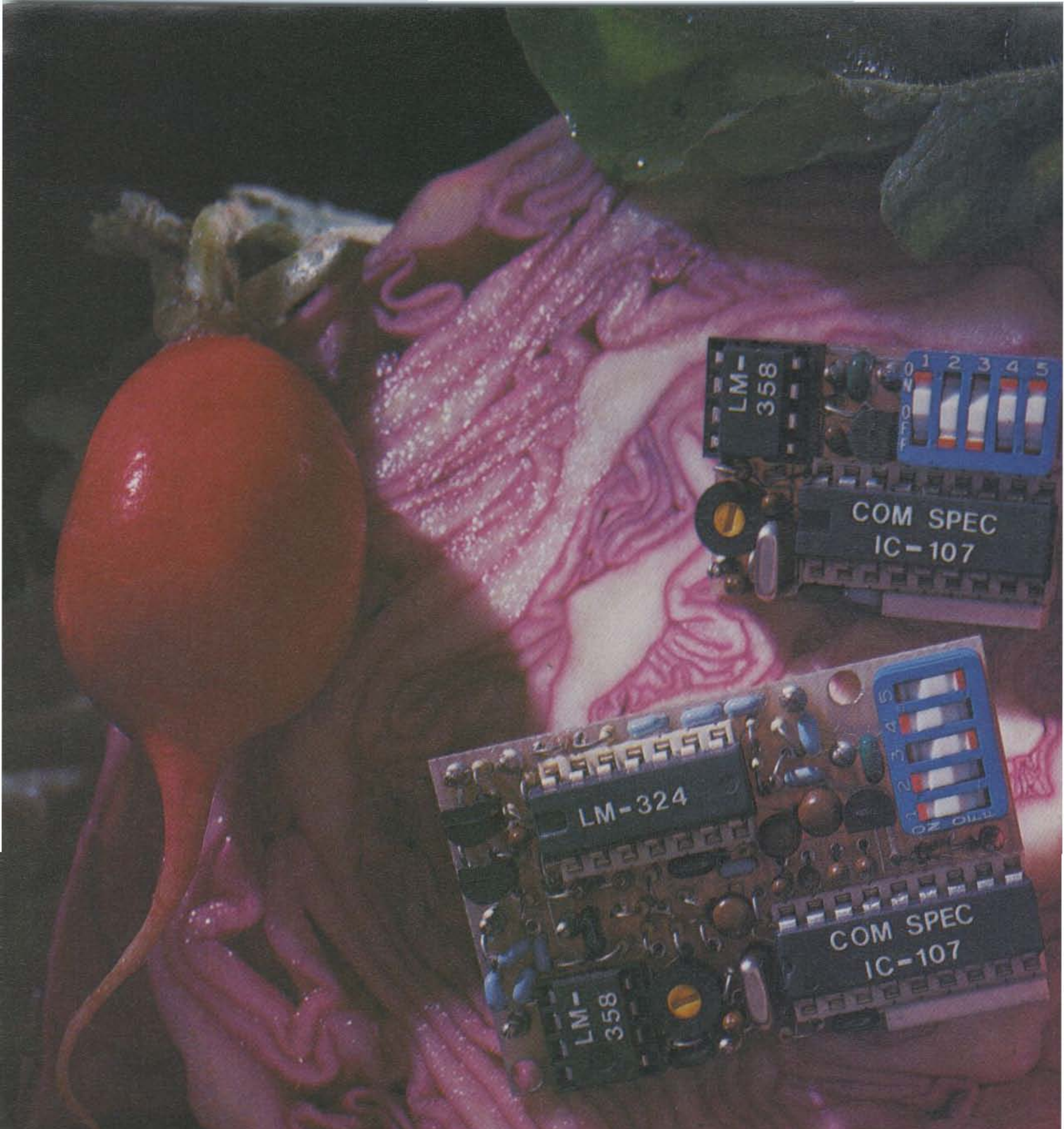
A *very* small package with a 25 watt punch, the IC-25A is a full featured FM transceiver for the space conscientious operator. Nearly the same size as an automotive AM radio, the IC-25A will fit in places usually considered impossible for a one piece 2 meter transceiver. The IC-25A is no lightweight when it comes to features:

- 5 memories. Store your favorite frequencies.
- Priority channel. Monitor your most important frequency.
- 25 watts high/1 watt battery saving low power.
- Touchtone™ mic standard..no extra cost...to work your favorite autopatch repeater.
- Full band scan/programmable scan (set your own limits)/memory scan....all with automatic resume after preset delay or carrier drop.
- 2 VFO's with data transfer standard.
- 2 tuning rates 5KHz (A VFO) or 15 KHz (B VFO).
- Nor/Rev switch for instant monitoring of repeater inputs.
- Memory back up power supply option holds memory when attached.

Actual Size.
(Clip this actual photo out and try it in your car.)

2112-116th Avenue NE, Bellevue, WA 98004
3331 Towerwood Drive, Suite 307, Dallas, TX 75234

ICOM


LM-358
0 1 2 3 4 5
ON OFF
COM SPEC
IC-107
LM-324
LM-358
COM SPEC
IC-107

A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is an astonishing ± .1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our SS-32 encode only model is programmed for all 32 CTCSS tones or all test tones, touch-tones and burst-tones.
And, of course, there's no need to mention our 1 day delivery and 1 year warranty.

TS-32

SS-32

TS-32 Encoder-Decoder

- Size: 1.25″ x 2.0″ x .40″
- High-pass tone filter included that may be muted
- Meets all new RS-220-A specifications
- Available in all 32 EIA standard CTCSS tones

SS-32 Encoder

- Size: .9″ x 1.3″ x .40″
- Available with either Group A or Group B tones

Frequencies Available:

Group A			
67.0 XZ	91.5 ZZ	118.8 2B	156.7 5A
71.9 XA	94.8 ZA	123.0 3Z	162.2 5B
74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

- Frequency accuracy, ± .1 Hz maximum −40°C to +85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

Group B		
TEST-TONES:	TOUCH-TONES:	BURST-TONES:
600	697 1209	1600 1850 2150 2400
1000	770 1336	1650 1900 2200 2450
1500	852 1477	1700 1950 2250 2500
2175	941 1633	1750 2000 2300 2550
2805		1800 2100 2350

- Frequency accuracy, ± 1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

Wired and tested: TS-32 **$59.95**, SS-32 **$29.95**

VISA

COMMUNICATIONS SPECIALISTS

master charge

426 West Taft Avenue, Orange, California 92667
(800) 854-0547 / California: (714) 998-3021

15

Wild Turkeys 1, FBI 0

— another foul-up from the feds

Editor's Note: Some portions of the FBI reports in this article may appear to our readers to be confusing, incomplete, and/or disjointed. They appear that way to us, too.

J. J. Howard WA7UDO
3119 Smith
Boise ID 83703

Photo A. The jamming transmitter in the sagebrush, enclosed in a black-painted first-aid box. Wires lead to the plastic-wrapped, buried batteries.

What do the FCC, FBI, jamming transmitters, and coyote hunters have to do with each other? Read on and you will soon come to know.

On December 2, 1979, a low-power jamming transmitter (less than 0.1 Watt) was placed in a remote area near Boise, Idaho. The transmitter consisted of a VHF Engineering transmitter strip with a quarter-wave antenna attached to sagebrush. The transmitter was located in such a way that detection in the Boise Valley was made difficult.

The transmitter output was set on the input of our local club repeater (146.22-146.82) located on a high mountain peak just north of Boise. Since the repeater was located around other commercial radio and TV transmitters, I assumed, as others did, that a birdie was locking the repeater up and timing it out, rendering it useless.

Since I am a pilot, I thought one way to locate a signal on the input to the club repeater would be to jump into the airplane and do some looking with han-

The Rig That Filters The Crowd

OMNI-C has what it takes to filter the crowds. To narrow the Amateur Radio world right down to the particular signal you want. The selectivity, sensitivity, dynamic range and operational features you need to cut any crowd down to size.

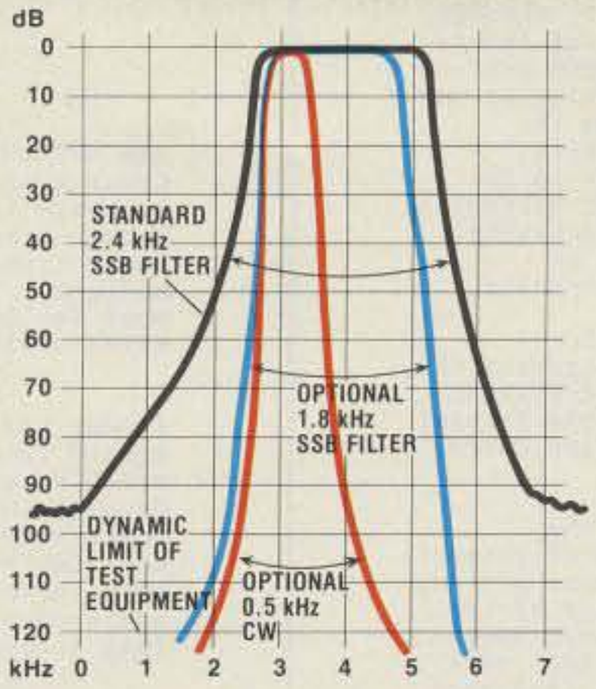
Tailored i-f response. OMNI is equipped with the potential for ***seven*** response curves to handle any listening situation.

Standard filters include an excellent 8-pole 2.4 kHz crystal ladder filter and, in addition, a 150 Hz active audio cw filter with three ranges (450, 300, 150 Hz).

Optional filters include 1.8 kHz 8-pole crystal ladder ssb filter, 500 Hz 8-pole cw filter, and 250 Hz 6-pole cw filter.

Front panel switches put any optional filter in series with the standard filter for up to ***16 poles of filtering*** for near ultimate skirt selectivity.

Four i-f response curves for ssb and three for cw. That's response tailoring, that's crowd control.



OMNI/SERIES C I-F RESPONSES WITH STANDARD AND OPTIONAL FILTERS.

Optimized sensitivity and dynamic range. The OMNI sensitivity range of 0.3 μV typical (slightly less on 160 & 80M) combines with a 90 dB dynamic range to provide an ideal balance that will handle any situation from copying a weak signal half way 'round the world to keeping the next-door kilowatt from muscling in. And a PIN diode switched 18 dB attenuator is included for extra insurance against overload.

More crowd-handling features—and all standard equipment.

Built-in notch filter. To drop out unwanted signals or carriers. Tunable from 200 Hz to 3.5 kHz, with a 50 dB notch depth.

3-mode, 2-range offset tuning. To put you where the others aren't and where the elusive DX is. Move just the OMNI receiver, or just the transmitter section, or the entire transceiver, ±500 Hz or ±4 kHz. For complete freedom of frequency movement to get away from the crowds.

Built-in noise blanker for those times when your noise-generating neighbor is crowding your receiver. Filtered to handle the big signals easily.

2-speed break-in. When QRM or QRN is heavy, switch to "Slow." Use "Fast" for instant, full break-in for enjoyable rag-chews or stalking DX.

OMNI-C features stand out in any crowd.

All solid-state—from the pioneer, Ten-Tec.

"Hang" AGC for smoother action.

WWV reception on the 10 MHz band.

Digital readout in two colors, red for the 5 significant places, green for the 6th digit (100 Hz). Instant recognition.

Separate receiving antenna capability. Switch receiver to a common antenna for transceive or separate receive-only antenna; the system also acts as receiving antenna by-pass with an instant break-in linear amplifier or transverter.

"S"/SWR meter, electronically switched.

200 watts input, all bands, with 50-ohm load. 5 year pro-rata warranty.

100% duty cycle on all bands up to 20 minutes. Full RTTY and SSTV power.

Built-in VOX and PTT with front panel controls.

Built-in phone patch jacks for easy interface.

Built-in zero-beat switch for spotting the exact frequency of a DX station.

Built-in adjustable sidetone volume and pitch.

Adjustable threshold ALC, optimum power for driving a linear. Provides means of working into a high SWR.

Front panel control of linear or antenna. The rear panel bandswitch terminals control relays or circuits in step with front panel bandswitch.

Automatic sideband selection plus reverse.

Low distortion audio, less than 2%; a Ten-Tec trademark.

Clean signal, exceeding FCC requirements.

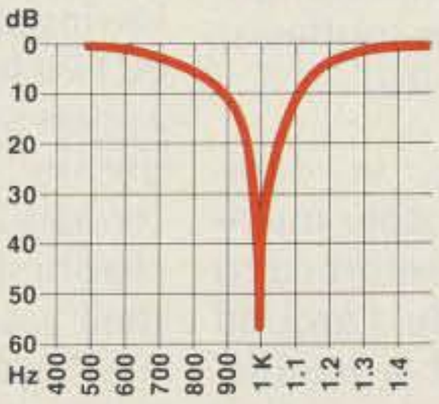
High stability over wide temperature and voltage excursions.

Built-in speaker, compression-loaded; in bottom of cabinet.

Plug-in circuit boards for fast easy service.

12-14V dc power for easy mobile use.

TEN-TEC OMNI-C



NOTCH FILTER PERFORMANCE ADJUSTED TO 1 kHz POINT.

All 9 hf bands—only crystals are needed for 18 and 24.5 MHz bands.

Broadband design for instant band change without tune-up or danger of damage to the final amplifier. Another Ten-Tec *original*.

Full complement of accessories:

Model 280 Dual Primary AC Power Supply, $169; Model 255 Deluxe Power Supply/Speaker Combo, $199; Model 243 Remote VFO, $189; Model 215 PC Microphone, $34.50; Model 214/234 Microphone/Speech processor, $39/$139; Model 645 Dual Paddle Keyer, $85; Model 670 Single Paddle Keyer, $39; Model 227 Antenna Tuner, $79; Filters $55 ea.

Made in the U.S.A.

Model 546 OMNI-C transceiver $1289

Get out of the crowds with OMNI-C. See your TEN-TEC dealer or write for details.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

During the period from December 6, 1979, through January 11, 1980, a survey was conducted by Special Agents of the Federal Bureau of Investigation at all known outlets in the Boise, Idaho, area, in an effort to determine if any purchase was made of a radio crystal operating on the frequency of 146.82 megacycles with negative results. A similar survey was conducted at all known outlets in the Boise, Idaho, area of Ray-O-Vac multiple ignition batteries to determine if the identities of any persons purchasing such batteries during the pertinent period could be identified. This survey also met with negative results.

The evidence obtained from the Blacks Creek Summit, including the first-aid kit housing the transmitter, along with the batteries, wire, wire antennas and plastic sheet protecting the battery, were submitted to the Federal Bureau of Investigation Laboratory by communication dated January 8, 1980.

By communication dated June 13, 1980, the Latent Fingerprint Section of the Federal Bureau of Investigation, Identification Division, advised that there were no latent prints of value present or developed on any of the specimens submitted. On the same date, the Federal Bureau of Investigation Laboratory report advised that tool mark examinations on the submitted items bore very limited tool marks, which were not sufficiently characteristic to determine the tool type and were of no value for identification purposes.

By Federal Bureau of Investigation Laboratory report dated April 11, 1980, the Federal Bureau of Investigation Laboratory advised that the ends of the white nylon string attached to the transmitter submitted to the Federal Bureau of Investigation Laboratory for examination were not suitable for matching purposes. The report also stated that the black paint utilized to cover the JOHNSON AND JOHNSON first-aid kit housing the transmitter could not be specifically identified with a particular source.

By Federal Bureau of Investigation Laboratory report dated May 21, 1980, the Federal Bureau of Investigation Laboratory advised that the transmitter submitted to the Federal Bureau of Investigation Laboratory for examination was apparently a factory made circuit board and various electronic components, which function as a transmitter. The device appeared to have been modified to some extent before being installed in a JOHNSON AND JOHNSON first-aid kit with a bare wire antenna and COAX wire power cord. When the transmitter was connected to the two Ray-O-Vac multiple ignition batteries in series, the transmitter transmitted a frequency of approximately 146.22 megahertz. The report went on to advise that the crystal in the transmitter was marked in part "146.22" and bore the manufacturer's name, "ICOM." No type or Serial Number were noted on the crystal, circuit board or other components of the device. The Federal Bureau of Investigation Laboratory advised that ICOM was believed to be the name of a Japanese manufacturer, whose parts are carried by many dealers.

The Federal Bureau of Investigation Laboratory report went on to advise that the two six volt multiple ignition batteries were both tested to be functioning and applied adequate voltage to operate the transmitter.

On June 25, 1980, the facts of this case were discussed with Assistant U. S. Attorney [redacted] District of Idaho, Boise, Idaho, and he advised that this matter was not suitable for prosecution in U. S. District Court. He stated that the violation was at best a technical violation, and the statute to be applied to this violation was designed to protect the Civil Defense Communications Network from acts of espionage to subvert their defense capabilities, and since this matter appeared to have involved a dispute between two different amateur radio clubs and particular individuals, he did not feel this matter was suitable for prosecution in U. S. District Court. For this reason, he recommended that this violation be referred to the Federal Communications System for whatever administrative action they would deem appropriate.

Fig. 1. Summary report of FBI actions.

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/24/80

SA [redacted] accompanied [redacted] JIM HOWARD, and [redacted] to the vicinity of Blacks Creek Summit in Ada County, Idaho. The purpose of the trip was to attempt to locate the transmitting device jamming the receiver operated by the Boise County Amateur Radio Club, of which [redacted] HOWARD, and [redacted] were members. The trip was made to a parking lot located near the Summit of the Blacks Creek Road in a four-wheel drive vehicle owned [redacted]

From there, utilizing a hand-held direction finder and two snowmobiles, the transmitting signal was traced from the parking lot to an area located near the Arrow Rock Dam Access Road. This access road is located down the hill a short distance from the Summit on the north side of the Summit. The access road to the Arrow Rock Dam leaves the Blacks Creek Road in a westerly direction. From there, it winds around through the sagebrush hills and according to a sign just off the Blacks Creek Road, this access road dead ends at the Arrow Rock Dam.

Utilizing the snowmobiles, the group traveled to a high point on the road where the direction finder pointed to an area on a knoll from which a strong radio signal was originating. Subsequent examination of that area located a transmitter tied to a sagebrush and attached by a wire to two Ray-O-Vac six-volt multiple ignition batteries buried in the ground. The transmitter was housed in a Johnson and Johnson auto travel first aid kit box, which was painted black and sealed from the weather. The Ray-O-Vac six-volt batteries were protected by a piece of plastic and covered with dirt.

At the time this transmitter was located, JIM HOWARD had in his possession a walkie-talkie radio set at the frequency for the jammed transmitter. When the batteries were removed from the transmitter, the receiver immediately came on the air.

The transmitter, the antenna, the string used to hang the transmitter, the wire attached to the batteries, and the batteries, were secured as evidence and removed from the hill.

Investigation on 12/5/79 at Boise, Idaho File # BT #52-5826

by SA [redacted] Date dictated 12/10/79

This document contains neither recommendations nor conclusions of the FBI. It is the property of the FBI and is loaned to your agency; it and its contents are not to be distributed outside your agency.

Fig. 2. Special Agent's investigation report of actions on December 5.

die-talkies. So, on December 4, another radio amateur and I departed Boise in search of the signal which was locking up our club repeater. I was confident that the signal was emanating from the hill where the repeater was located —probably among those commercial transmitters with thousands of Watts of power.

Wrong. The signal increased as we flew in a southeasterly direction, reaching its full strength about 20 air miles southeast of the repeater site.

That evening, in darkness, I and two other members of the club returned to the site and made a ground search with just a handie-talkie. The lack of passable roads, snow, and darkness made our efforts in locating the transmitter unsuccessful, but the following evening, with the aid of snowmobiles, better DF equipment, and with others, including a local agent of the FBI, we returned to the site. Within about 20 minutes the transmitter was located, and it was taken off the air by the FBI agent. He said the transmitter and batteries would be sent to Washington DC for a thorough evaluation.

Unknown to us, the FBI staked the site out the following day and apprehended two local radio amateurs apparently returning from the site where the transmitter had been hidden. It was reported by the agents that their tracks led directly to the sagebrush in which the transmitter was hung. The two hams denied having any knowledge of the hidden transmitter and said they were only coyote hunting.

The wheels of bureaucracy began to turn. We waited and waited for reports from the FBI on materials sent to the lab. The FBI was unable to link the evidence recovered to those persons apprehended at the site.

On June 25, 1980, the FBI discussed the case with the Assistant US Attorney, District of Idaho. He recommended that this violation be referred to the Federal Communications Commission for whatever administrative action that they deemed appropriate. After we heard this news, I made an attempt to obtain a copy of the FBI report under the Freedom of Information Act. After the exchange of several letters and a long wait, I got copies of FBI reports on September 15, 1980. The entire matter was now in the hands of the real Paper Tiger—the Federal

Power Pair

The amp with clout... and the tuner to handle it.

Heathkit SB-221 2kW Amplifier has the power to punch your signal through. Rugged Eimac 3-500Z's deliver 2000 watts PEP and load to 1 kW in on both CW and RTTY. A broad-band, pre-tuned pi-input delivers maximum efficiency with extremely low distortion over the 80 to 15 meter spectrum. And now there's a tuner to put that power to efficient use.

Heathkit SA-2060 Deluxe Antenna Tuner puts you in complete control with continuous tuning in the 160 to 10 meter spectrum. Built-in dual wattmeter/SWR bridge makes tuning a snap. Bypass switch automatically disconnects tuner for dummy load or beam. It's a super tuner.

Build-it-yourself and save. Find out how easy it is to build it yourself and how much you can save. Send today for the latest **free** Heathkit Catalog or pick one up at your nearby Heathkit Electronic Center.*

✓303

Send for free catalog
Write to Heath Company, Dept. **011-804**
Benton Harbor, MI 49022
In Canada, contact Heath Co., 1480 Dundas Highway East, Mississauga, Ontario, LRX 2R7.

Visit your Heathkit Store
Heathkit products are displayed, sold and serviced at Heathkit Electronic Centers* in major cities in the U.S. and Canada. See your telephone white pages for locations.

*Units of Veritechnology Electronics Corporation in the U.S.

Heathkit®

✓See List of Advertisers on page 114

Fig. 3. Special Agents' report of actions on December 6.

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

SAs [redacted] and [redacted] established an observation point near a knoll a short distance from the Blacks Creek Summit where the radio transmitter had been located on the previous day. The purpose of this observation was to determine if the individuals who were responsible for placing this transmitter device would return to that location when the radio discontinued transmitting on December 5, 1979.

This observation was maintained from 8:00 a.m., until 3:00 p.m., on December 6, 1979. The site of the observation point enabled the Agents to observe the north slope of Blacks Creek Summit and any vehicle traffic passing over that Summit could be readily observed.

At approximately 11:00 a.m., an older model pickup was observed traveling down the icy Summit Road in a northerly direction. The vehicle continued on out of sight and was not again observed until approximately 1:00 p.m. This was the only vehicle observed in the area during the time of the observation and the observation was discontinued at 3:00 p.m., in order for the Agents to return to their vehicle at the Summit of Blacks Creek Road and continue the observation.

Both Agents walked from the observation point down the access road to the Arrow Rock Dam to the Blacks Creek Road. While walking up the north slope of the Blacks Creek Road toward the Summit, a GMC pickup with a camper was observed traveling down the slope toward the Agents. The time of the observation was 3:30 p.m. Observed on the vehicle was Idaho License [redacted] which was designated as an amateur radio license. The vehicle was occupied by two white males.

The driver of the vehicle, who was wearing a beard, stopped the vehicle and asked the interviewing Agents if they needed assistance. They were informed that the Agents' vehicle was at the top of the Summit and no assistance was required.

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] SA [redacted] Date dictated 12/10/79

This document contains neither recommendations nor conclusions of the FBI. It is the property of the FBI and is loaned to your agency; it and its contents are not to be distributed outside your agency.

BT #52-5826 - 2 -

The Agents immediately returned to their vehicle and proceeded down the slope to the junction of the Black Creeks Road and the access road to the Arrow Rock Reservoir. Observed parked approximately 140 feet in front of this access road was the vehicle earlier observed. Observation of that area located two sets of footprints in the snow that went directly from the pickup to the gate to the access road to the Arrow Rock Dam.

The Agents followed these tracks up the path on the access road to a point where the tracks were lost. Due to the time involved in realizing that the two individuals had probably already reached the site where the transmitter had been recovered, the Agents returned down the path to where the tracks had earlier been lost and determined that the two individuals had taken a shortcut over the top of a knoll.

The interviewing Agents then continued down the access road and positioned themselves at a point approximately 100 yards from where the access road joined the Blacks Creek Road. While waiting for the two individuals to return, the Agents heard the engine in the pickup truck start and heard the truck drive away. The Agents immediately returned to their vehicle and upon examining the tracks left by the vehicle, it was determined it had proceeded on north down the Blacks Creek Road toward the area of Prairie, Idaho. The Agents followed these tracks and at approximately 4:35 p.m., the pickup truck was observed and stopped by the Agents. At that time, the occupants of the vehicle were identified. The driver of the vehicle presented his Idaho driver's license and identified himself as [redacted], Idaho. The description obtained from his driver's license is as follows:

Race	White
Sex	Male
Date of Birth	[redacted]
Height	5' 11"
Weight	155 pounds
Hair	Brown
Eyes	Brown
Social Security Account	[redacted]
Driver's License	[redacted]

BT #52-5826 - 3 -

The occupant of the vehicle was identified by driver's license and by oral statements as [redacted], Boise, Idaho. His driver's license described him as follows:

Race	White
Sex	Male
Height	6'
Weight	185 pounds
Hair	Brown
Eyes	Brown
Date of Birth	[redacted]
Selective Service Number and Idaho Driver's License Number	[redacted]

The driver of the vehicle, [redacted], acknowledged that the vehicle belonged to him and he gave both Agents permission to look in the cab of the pickup and in the camper area of the pickup. At that time it was determined that MEISSNER had a radio in his pickup which was set at the frequency of 6.820 megacycles. NAME NOT Omitted

Observed in the camper area of the pickup was a Super 48 Preco wet battery, which had been installed on a battery charger and was in the process of being charged.

After the identification was made, the Agents returned to the scene where the pickup had been parked and at that time the footprints were back tracked from the pickup to a point north of where the vehicle had been parked over a large bank and up the hill toward the sight where the transmitter had been located on the previous day. The Agents followed these tracks which were the only tracks observed in the snow in that area. The tracks went together for a short period and separated. One pair of tracks was north of the other and went over several deep slopes and continued on to the exact location where

BT #52-5826 - 4 -

the transmitter had been located on the previous day. The other set of tracks were followed to a point where they joined the access road to the Arrow Rock Dam and continued on where they met the other pair of tracks and continued to the spot where the transmitter had been located.

Both of these pairs of tracks made a distinct pattern in the snow and in the mud, making them easy to follow. A rough sketch was made of the track design, which matched the design on the soles of the boots worn by [redacted] and [redacted] at the time they were identified.

Copies of the sketches of the two footprints are attached.

Communications Commission.

I called the Portland Office of the FCC and they said there wasn't much they could do with this case. I was told that if I wasn't satisfied with their actions I should contact my Congressman or the head of the FCC Investigations Division in Washington DC. After many, many calls to the FCC in Washington, they finally informed me that the evidence that was presented to them in FBI reports was extremely weighty but circumstantial. A staff member of the Investigations Division informed me that the FBI probably had apprehended those individuals responsible for the act.

In essence, the FCC suggested that they could not take actions against the individuals since it was not illegal to be apprehended at the site of the jamming transmitter. I asked what circumstances might enable them to prosecute. They informed me that if the individuals had picked up the transmitter, that would have been sufficient evidence. In other words, had the FBI left the transmitter and the individuals had picked it up, then that might have been sufficient evidence.

I wonder.

Had those individuals

allegations. It was determined that [redacted] b7c
selling this equipment purchased at surplus properties for a profit. Once the allegations had been confirmed, the organization was completely disbanded by the Governor. [redacted] had no idea the Governor would take such drastic action, but assumed that he would only stop members from that organization from buying this surplus property and selling it at a profit. At the time this club was disbanded by the Governor, he was severely criticized by the membership and did make several enemies at that time.

[redacted] explained the jamming of their repeater b7c
being experienced at this time as follows:

On December 2, 1979, the repeater located on Chaeffer Butte stopped functioning at approximately 11:00 a.m. At that time he was listening to his radio and heard the signal come on and run three minutes. After three minutes, the signal dropped off because that was the time b7c
of the setting of the timeout timer. [redacted] that this meant the repeater was either stuck or was being jammed.

On Monday, December 3, 1979, he went up to Deer Point with three other members of his club, [redacted] b7
and [redacted] On arrival at the site, he reset the timer and the signal came back on the repeater. The signal stayed on for three minutes and again timed out. [redacted] that meant there was a signal input into the receiver and lacking a directional finder to locate this signal input, he returned to Boise, Idaho.

The following day, December 4, 1979, at approximately 2:00 p.m., he and JIM HOWARD rented a plane at GEN AIRLINES and flew over the site with a direction finder and found the transmitting signal was coming from Blacks Creek Summit, approximately 17 miles from the transmitter. They over flew the Summit and the meter on the receiver pinned straight down, confirming the general location of the transmitter on the Summit. From the air, he could see snowmobile tracks in the area.

Later that night, he returned to the area of the Blacks Creek Summit with [redacted] and JIM HOWARD. b7
They walked to the Summit with a direction finder and again located the general site of the transmitter, which was north by east of the Blacks Creek Summit. They were receiving ten signal strength units on their direction finder, which was the maximum reading indicating a very strong signal. This direction finder and the strength of the signal would place the proximity of the transmitter very close.

[redacted] stated that from the strength of the b7c
signal, it would indicate to him that the transmitter should have a large storage battery. He also believed the transmitter would have an 11-foot beam antenna.

[redacted] said that their radio equipment transmitted b
at 146.82 megacycles and received at 146.82 megacycles.

[redacted] also explained that if he and JIM HOWARD b7
had not rented the aircraft to try to locate the transmitting device, he did not believe the equipment they had available to them would have allowed them to find the location because of the lack of access to any of the land between where the transmitter was located by the aircraft and the location of the repeater. It would have involved an almost impossible task of walking through the area between Blacks Creek Summit and the site of the receiver with a direction finder, a distance of 17 miles. For this reason, he did not believe that the persons who installed the transmitter believed that it could ever be found.

He also said that the transmitter was placed in a location where it could not be detected from the Boise Valley because the signal was originating from an area over a hill, which blocked out the possibility of it being transmitted into the valley. For this reason, the frequency utilized by their club was blocked out without any detectable signal coming in on the radio. It was only after they went up over Blacks Creek Summit that they were able to pick up any signal on that frequency and under normal circumstances, and without the use of the airplane, they would have assumed the transmitting device jamming their receiver would have been located somewhere near Chaeffer Butte.

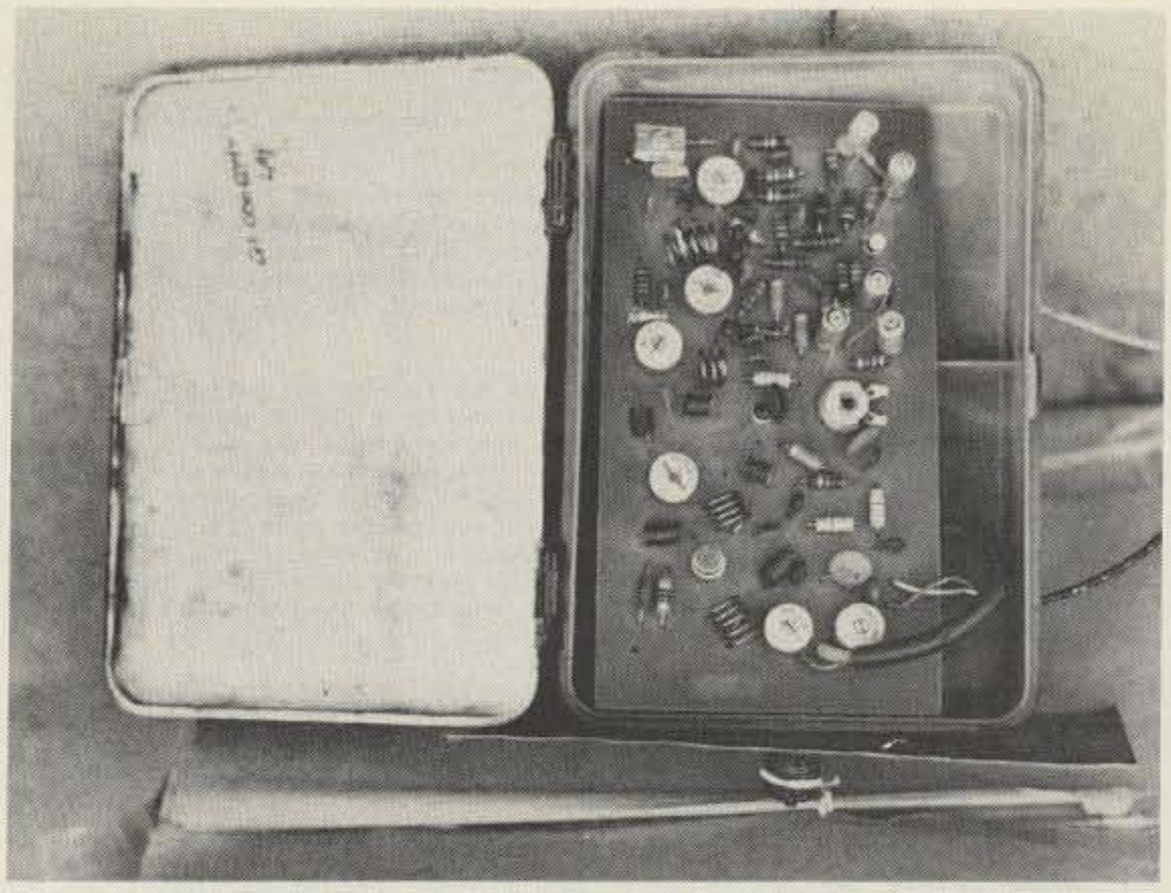


Photo B. The transmitter in the first-aid box.

FEDERAL BUREAU OF INVESTIGATION

 Date of transcription 1/25/80

[redacted], driver of a GMC pickup bearing Idaho license [redacted] who was stopped by b7c
the interviewing Agents on the Blacks Creek Road, was advised of the identity of the interviewing Agents and the nature of the inquiry.

[redacted] furnished the following information: b7c

He advised that he was in that area with [redacted] b7c
to look for a place to hunt. When asked what sort of game he was interested in, he stated that they were going coyote hunting.

[redacted] denied having any knowledge at all about b7c
an illegal transmitting device that had been placed on a hill near the Blacks Creek Summit and in explanation for the reason why he was observed on a hill at the exact location where this illegal transmitter had been removed on the previous day, he commented that he was just following a lot of tracks, and he wanted to see what had been going on. He continued to say that he knew nothing about the illegal transmitter.

[redacted] stated that the GMC pickup and camper b7c
driven by him was owned by him and the Idaho State motor vehicle license, [redacted], were his call letters since he was a licensed amateur radio operator.

[redacted] gave the interviewing Agents permission b7c
to look into the cab of his truck and into the camper area and when the Agents found a Super 48 Preco battery in the camper area of his truck, he stated that he had always carried the battery in a cabinet area of the camper and it needed charging.

At the conclusion of the interview, [redacted] b7c
was asked his destination, and hestated that he planned to go on to Prairie, Idaho, area and back through Mountain Home.

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] b7c Date dictated 12/10/79
SA

This document contains neither recommendations nor conclusions of the FBI. It is the property of the FBI and is loaned to your agency; it and its contents are not to be distributed outside your agency.

[redacted] was also asked to display the soles of b7c
his boots and upon observation of the design on the sole, it appeared to be the same design on the tracks earlier observed by the interviewing Agents, along the access road to the Arrow Rock Dam.

Fig. 4. Report on FBI interview with first coyote hunter.

been apprehended with the transmitter in hand at the site, the story could have been very, very similar: "We were only coyote hunting and found this device tied to the sagebrush." And as the scenario unfolded, I could perhaps have expected a similar reply from the Federal Communications Commission: "It is not unlawful to be apprehended at the site of a jamming transmitter while coyote hunting and stumbling across a device of unknown nature."

In conclusion, I believe that the Federal Communications Commission, in another classic case, has shown its unwillingness to do its job. After a year of investigation and several hundred dollars spent by local radio amateurs, and probably thousands of dollars spent by the government (FBI, FCC, etc.), the efforts of many were brought to an end by the FCC and their do-nothing attitude.

All reports and observations should end with a

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

[redacted] an occupant of the GMC pickup bearing Idaho license [redacted] which was stopped on the Blacks Creek Road by the interviewing Agents, was advised of the identity of the interviewing Agents and the nature of the inquiry. He, thereafter, furnished the following information:

In response to a question as to why he and [redacted] were in the exact location where a jamming transmitter device had been located on the previous day, he stated he did not know anything at all about this transmitter and explained his reasons for being in that area as looking for a place to hunt. He was asked specifically why he went to the exact location where the transmitter had been located and he responded by saying he went on that hill because he saw all the tracks and commented that it "looked like a war had been going on."

[redacted] continued to deny having any knowledge at all about the transmitter being placed on that hill and when he was interviewed concerning the location of this illegal transmitting device, he stated that he believed [redacted] was trying to get him in trouble. When asked who [redacted], he responded by saying, "He's an ass hole!" He also said [redacted] had accused him earlier of stealing solar panels and had tried to get him in trouble at that time.

[redacted] was asked to display the sole of his boot to the interviewing Agents and at that time he turned his foot up and it was observed that the sole of his shoe had a design with the letters, "DEX."

[redacted] also advised that he was a licensed amateur radio operator.

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] SA [redacted] Date dictated 12/10/79

This document contains neither recommendations nor conclusions of the FBI. It is the property of the FBI and is loaned to your agency; it and its contents are not to be distributed outside your agency.

Fig. 5. Report on FBI interview with second coyote hunter.

Photo C. The batteries for the transmitter.

recommendation, and I have mine. In light of what I have seen as inaction and a do-nothing attitude on the part of the FCC, and to join with the efforts of many to bring about a streamlining of our government to reduce its overall cost, I summarily advocate Congressional action to eliminate the Federal Communications Commission from among the many branches of our government. If not, then at least the elimination of the enforcement division within that agency because, by its own admission, it prosecutes very, very few of the cases brought before it.■

ICOM VHF Mobile

Amateur Communications using Space Age Techniques

COM's smallest 2 meter FM mobile, the **IC-25A** offers extremely compact size (5½" × 2" ×7" deep) without acrificing features: 25 watts, 5 memories, 2 scanning ystems, priority channel, 2 VFO's and touchtone™ HM-8 nicrophone standard.

The best 2 meter multimode mobile on the market today, the **IC-290A** has features to make multimode mobile a snap. 2 VFO's, 5 memories, priority channel, memory and band scanning, squelch on SSB, selectable AGC and NB, and RIT. Touchtone ™ encoding provided with HM-8 microphone standard.

6 meter mobile at its best with the **IC-560**, a multimode mobile transceiver for working FM repeaters or sideband simplex, local or DX, 3 memories, 2 VFO's, scanning, squelch on SSB.

Sensible and affordable, the **IC-22U** offers simplicity with ease of operation. Easy to use push buttons for up and down tuning. 800 channels at the push of a button. 4 MHz coverage. EX-199 optional remotable frequency selector.

2112-116th Avenue NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

ICOM

Peter S. Carr WB3BQO
329 Little Avenue
Ridgway PA 15853

Sailplanes on Six

— these thermal-hunting hams have an edge on the competition

What, besides a ham-fest, would get a ham out of bed at the crack of dawn to drive a hundred miles to stand around in dew-soaked grass with eighty or ninety other people? An R/C (radio control) sailplane contest, that's what! One contest in particular draws a very large turnout of these types to Faustown Park just outside York, Pennsylvania. It's the Lancaster Area Soaring Society's annual two-day meet which is held the first weekend after the Fourth of July.

The pilots' meeting begins at nine sharp as the Contest Director outlines the flying task for the day. The "task" is the routine which each contestant and his plane will perform. This day, they will launch, drop the towline, and then fly the plane for exactly ten minutes before landing it inside a twenty-five-foot-diameter circle, right-side up and with no parts shed. Sound easy?

The aircraft are separated into four classes. Scale ships are miniature replicas of full-size planes, right down to the pilot figure and instrument panel. Planes of less than 100-inch wingspan have two classes, one for ships with just rudder and elevator controls and the other for ships using spoilers—which are like air brakes. The fourth group is called "Unlimited" because any plane with any number of controls and a wingspan of over 100 inches may compete in it.

After the pilots' meeting, the contestants break up and return to their planes to check them over before being called up to fly. Usually, a group of hams will gather to chat about the weather conditions, which repeater they used while driving to the Park, or the new FM R/C radio that one of them will be using. Hams usually make up about ten percent of all of the contestants, yet they manage to wind up near the top of the heap when the scores are

Jeff Carr WB3CXC launches his Pierce Paragon sailplane at the 1980 League of Silent Flight Regionals. At age 16 his score was second highest overall and tops in Junior class. (The tow line is too fine to see.)

With the US Air Force Museum in the background, Peter Carr WB3BQO holds his 12-foot-wingspan Craftaire Sailaire sailplane at the 1980 A.M.A. Nationals Contest.

A REVOLUTION IN CONVENIENCE

DAIWA announces an *all-new lineup* of high-quality amateur radio innovations.

Cross-Needle Meters CN-520 / CN-540 / CN-550

DAIWA cross-needle precision is now available in a compact case. Get forward power, reflected power and SWR readings at a single glance—from a meter that fits anywhere!

CN520 - Frequency: 1.8-60MHz • **Power range:** Forward 200/2kw, Reflect 40/400 watts • **Detection Sensitivity:** 40 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** 72W x 72H x 95D m/m

CN540 - Frequency Range: 50-150MHz • **Power Range:** Forward 20/200 watts, Reflected 4/40 watts • **Detection Sensitivity:** 4 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** same as CN-520

CN550 - Frequency Range: 144-250MHz • **Power Range:** Forward 20/200 watts, Reflected 4/40 watts • **Detection Sensitivity:** 4 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** same as CN-520

Active Audio Filter AF-306

By electronically filtering unwanted signals, the AF-306 gives you clean, distinguishable copy. Featuring its own internal speaker, the AF-306 Active Audio Filter is easy to install, easy to operate.

Input: 2.8v (4v max.) • **Output power:** 1 watt @ 8 ohms • **Distortion:** less than .2% • **S/N ratio:** better than 50dB • **Low Cut Filters:** 400Hz, 800Hz, 1100Hz • **High Cut Filters:** 1100Hz, 1600Hz, 2500Hz

Automatic Antenna Tuner CNA-2002

Leading the way in convenience is the Daiwa CNA-2002 2.5 kW (PEP) Automatic Antenna Tuner. Cross-Needle Metering and optimum matching in under 45 seconds make it the perfect compliment to any state-of-the-art amateur station.

Frequency range: 3.5-30MHz including WARC bands • **Tuning Time:** less than 45 seconds • **Power rating:** SSB - 2.5kW PEP, CW - 1kW (50% duty), AM - 500 watts, RTTY, SSTV - 500 watts • **Output Impedance:** 15-250 ohms (unbalanced) • **Dummy Load:** 100 watts/1 minute (installed) • **Metering Ranges:** Forward power - 20/200/2000 watts, Reflected power - 4/40/200 watts, SWR - 1.1 - infinity • **Power requirements:** 11-16vdc @ 200ma

Manual Antenna Tuners CNW-518 / CNW-418

The serious amateur wants to achieve the best antenna match possible. That's why DAIWA offers two manual antenna tuners that maximize power transfer—and offer cross-needle metering as well.

CNW-518 - Frequency range: 3.5-30MHz including WARC bands • **Power rating:** 1kw CW (50% duty) • **Output Impedance:** 10-250 ohms (unbalanced) • **Insertion loss:** less than .5 dB

CNW-418 - Same as above except - **Power rating:** 200 watts CW

Infrared Cordless Microphone RM-940

DAIWA ingenuity is also evident in the RM-940, an Infrared cordless mobile microphone system. Audio and transmit/receive switching are carried on a safe infrared beam. Experience the freedom of cordless mobile operation. Ask your Daiwa dealer for a demo today!

Microphone: Electret Condenser type • **Continuous Operating Time:** 5 hours minimum • **Charging time:** 8 hours max. • **Usable Distance:** 3.5 feet - microphone to sensor • **Power requirements:** Controller - 13.8 vdc Microphone - 2.5 vdc.@ 30 ma

Speech Processor RF-670

DAIWA innovative thinking led to the development of the RF-670 Photocoupler Speech Processor. Its unique design gives your signal the boost it needs to cut through bothersome QRM. Get RF-type processing performance with the RF-670's economic photocoupler design.

Clipping Level: 20dB max • **Frequency response:** 300-3000Hz (-10dB) • **Clipping Threshold:** less than 2mV at 1kHz • **Bandwidth:** 2400Hz at 6dB down • **Distortion:** less than 3% at 1kHz, 20dB clip • **Output level:** 40mV max • **Mike imp.:** 600-50k ohms • **Power requirement:** 13.5v @ 60ma • **Dimensions:** 90 x 25 x 93 m/m

UHF/VHF Mobile Antennas

Premium quality, high-gain design. Special *tilt-over* feature for added convenience.

DA500 - Gain: 2.7dB at 146MHz, 5.5dB at 440MHz • **Length:** 960m/m • **Dual Band**

DA100 - Gain: 4.1dB • **Length:** 1,360m/m • 146MHz

DA200 - Gain: 5.2dB • **Length:** 1,870m/m • 146MHz

Gutter Mount

GM500 - Frequency Range: 1.8MHz-500MHz • **Power Rating:** 1kw • **Dimensions:** 86W x 54H x 37D m/m

mcm COMMUNICATIONS
858 E. Congress Park Drive
Centerville, Ohio 45459

Exclusive U.S. Agents for these Daiwa products. Dealer inquiry invited.

DAIWA

Amateur Radio Innovations

✓451

Bill Melske, a ham who hails from the New York area, launches his Craftaire Viking of 3-meter wingspan.

Don Goodwin WA2FRO puts his 100-inch-span Aquila on the tow line. The plane carries a Thermic Sniffler and is guided by an R/C rig on 53.3 MHz.

counted. This is because they are better prepared.

As each ham is called to the launch area to fly, he collects his transmitter from the Impound Table. (All transmitters remain impounded except when in use in the contest, avoiding jamming through accidental use.) It carries two colored streamers on its antenna; one color is black, denoting a six-meter operating band, and the other color shows which frequency it uses in that band. Also, most hams use a Thermic Sniffler, a telemetry system which senses temperature changes (indicating thermal currents) and radios them to the pilot. This rig operates in the low end of the two-meter band. The use of the six-meter uplink and two-meter downlink is restricted to hams with a Technician or higher-class license.

At the launch area, the ham connects his plane to the towline by a hook mounted on the bottom of the fuselage. He then moves up to the winch unit and steps on a foot switch. This engages a motor and drum assembly which winds in the towline and tows the plane into the air. At "top of the launch," about five- to six-hundred feet up, the line is dropped by radio command and the line falls to earth for the next launch. Meanwhile, the plane banks away to begin its search for lift.

Without finding a thermal, most sailplanes will fly no longer than about three and a half minutes. Finding these thermals is the basis of the contest, and the pilot's ability to locate and gain maximum height from each thermal is what the game is all about. A thermal is an invisible column of rising air which originates just above the earth.

A dark area such as a parking lot, farm field, highway, or the roof of a building absorbs more heat than its surroundings. This heat is passed to the air just above it and the air begins to rise. As this bubble of warm air rises, cooler air is drawn in to replace it and to

Joe Bertin WD8PRG operates a winch-line retrieval system which returns the towline to the launch area for another launch.

Dave Burt of Indiana, Pennsylvania, adjusts the controls of his original design "Penn-Fli" 12-foot-span sailplane.

Here's a Concept You Haven't Seen In Amateur Radio For A Long Time— Low Price.

The right design — for all the right reasons. In setting forth design parameters for ARGOSY, Ten-Tec engineers pursued the goal of giving amateurs a rig with the right features at a price that stops the amateur radio price spiral.

The result is a unique new transceiver with selectable power levels (convertible from 10 watts to 100 watts at the flick of a switch), a rig with the right bands (80 through 10 meters including the new 30 meter band), a rig with the right operational features plus the right options, and the right price for today's economy—just $549.

Low power or high power, ARGOSY has it. Now you can enjoy the sport and challenge of QRPp operating, and, when you need it, the power to stand up to the crowds in QRM and poor band conditions. Just flip a switch to move from true QRPp power with the correct bias voltages to a full 100 watt input.

New analog readout design. Fast, easy, reliable, and efficient. The modern new readout on the ARGOSY is a mechanical design that instantly gives you all significant figures of any frequency. Right down to five figures (± 2 kHz). The band switch indicates the first two figures (MHz), the linear scale with lighted red bar-pointer indicates the third figure (hundreds) and the tuning knob skirt gives you the fourth and fifth figures (tens and units). Easy. And efficient—so battery operation is easily achieved.

The right receiver features. ***Sensitivity*** of 0.3 μV for 10 dB S+N/N. ***Selectivity:*** the standard 4-pole crystal filter has 2.5 kHz bandwidth and a 2.7:1 shape factor at 6/50 dB. Other cw and ssb filters are available as options, see below. I-f frequency is 9 MHz, i-f rejection 60 dB. ***Offset tuning*** is ± 3 kHz with a detent zero position in the center. ***Built-in notch filter*** has a better than 50 dB rejection notch, tunable from 200 Hz to 3.5 kHz. An optional noise blanker of the i-f type has 50 dB blanking range. ***Built-in speaker*** is powered by low-distortion audio (less than 2% THD)

The right transmitter features. ***Frequency coverage*** from 80 through 10 meters, including the new 30 meter band, in nine 500 kHz segments (four segments for 10 meters), with approximately 40 kHz VFO overrun on each band edge. ***Convertible power:*** 100 or 10 watts input with 100% duty cycle for up to 20 minutes on all bands. ***3-function meter*** shows forward peak power on transmit, SWR, and received signal strength. ***PTT*** on ssb, ***full break-in*** on cw. PIN diode antenna switch. ***Built-in cw sidetone*** with variable pitch and volume. ***ALC control*** on "high" power only where needed, with LED indicator. ***Automatic*** normal sideband selection plus reverse. ***Normal 12-14V dc*** operation plus ac operation with optional power supply.

The right styling, the right size. Easy-to-use controls, fast-action push buttons, all located on raised front panel sections. New meter with lighted, easy-to-read scales. Rigid steel chassis, molded front panel with matching aluminum top, bottom and back. Stainless steel tilt-up bail. And it's only 4" high by 9½" wide by 12" deep (bail not extended) to go anywhere, fit anywhere at home, in the field, car, plane or boat.

The right accessories—all front-panel switchable. Model 220 2.4 kHz 8-pole ssb filter $55; Model 218 1.8 kHz 8 pole ssb filter $55; Model 217 500 Hz cw filter $55; Model 219 250 Hz cw filter $55; Model 224 Audio cw filter $34; Model 223 Noise blanker $34; Model 226 internal Calibrator $39; Model 1125 Dc circuit breaker $10; Model 225 117/230V ac power supply $129; Model 222 mobile mount, $25; Model 1126 linear switching kit, $15.

New TEN-TEC Argosy $549

Model 525 ARGOSY —— $549. Make the right choice, ARGOSY—for the right reasons ***and*** low price. See your TEN-TEC dealer or write.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

be heated itself. This results in a column of air which leans over and drifts downwind while going up.

Since all this is invisible, the only way a pilot can tell if his plane is near one is to watch its movements. A sudden change of direction or wobbling of the wings means that the plane has entered the turbulent air around the thermal. If the plane is some distance from the pilot, identifying and staying with the thermal can be difficult. Hams have a better way. Their Thermic-Sniffler rigs send an audio tone of about 850 Hz, which indicates steady flight. When the plane enters a thermal, the tone rises—at a rate determined by the degree of the change in altitude. All else being equal, the higher the tone, the faster the plane will go up. If the plane hits a downdraft (colder air), a much lower tone alerts the pilot to steer away toward better air. By listening to the tone, the pilot can find a thermal, center the plane in it, and keep it centered as the thermal drifts downwind. This is obviously far more efficient than guessing from a thousand yards away.

Having worked the thermal for the required time, the sailplane is then flown back to the landing area. This part of the flight is very important and can add ten to fifteen percent to the pilot's total score. The landing circle has a length of tape nailed down at its center point, and scores are marked on it from 100 in the center to zero at the end. The plane must land as close to the center of the circle as possible, and the score is read where the tape touches the plane's nose.

Each pilot will fly four flights like this during the day. Because there are only seven R/C frequencies for non-hams, there is a long wait between rounds for those without an amateur ticket. Hams, on the other hand, have five R/C frequencies in the top of the six-meter band, and since there are fewer hams, this makes the wait between rounds much shorter for them. As the best lifts occur between 10:00 am and 2:00 pm, being able to choose when to fly is an added advantage for the ham.

At a large contest such as the one at York, the flying isn't completed until late afternoon, at which time the awards and trophies are passed out. It should be no surprise that hams take home a large share of the hardware. By using their electrical and mechanical skills to prepare the aircraft and their license privileges to operate them with confidence in the uplink control and efficiently through telemetry, they are well prepared, and scores show it. They also have the satisfaction of knowing all about their radios as well as their aircraft; they haven't just assembled store-bought items and made them work together in harmony.

The road home is made shorter by the chatter on the area repeater about missed landings, new model designs, better radios, and the feeling that win or lose, you have enjoyed the companionship of a great bunch of people.■

Gene Shelkey from Scottdale, Pennsylvania, gets some help to launch his scale-model Schweitzer sailplane. It is an 11-foot span, 6½-pound flying weight craft complete with pilot figure and full interior.

Gerry Zeigenfuse from Eastern Pennsylvania flies his Pierce Paragon on six meters at the 1980 contest at York.

The Supernova Station Organizer

—in this project, four into one will go!

F.T. Marcellino W3BYM
13806 Parkland Drive
Rockville MD 20853

It was on Roanoke Island, located near the Outer Banks of North Carolina, where I first met Dick Schultes WB2PEF from Cherry Valley, New York. Dick had brought his HW-8 plus tuner and bridge with a box of coaxial cable and antennas for a week of ham camping on the island.

Being thoroughly satisfied with the simplicity of operating the HW-8, I purchased one for my own camping usage. However, instead of WB2PEF's multiple-box station, I wanted just one additional box having as many conveniences as possible.

Thus, the Supernova was created. This device has four functions which enhance the operation of my QRP station. It contains an ac power supply, keyer, transmatch, and swr bridge.

Photo A. The completed Supernova.

The keyer circuit uses the Curtis 8044 chip which is suitable for portable operation and readily adapts to a set of paddles.

The rf department was planned for use with a 40-meter half-wave dipole, center-fed with 50-Ohm coaxial cable. Multiband operation on 20 and 15 meters is aided by a built-in transmatch combined with a unique swr bridge.

Front-panel controls include a speed control for the keyer and a spring-return toggle switch for keying the rig during tune up. The FWD and REV selector and sensitivity controls are located under the swr indicator. The opposite side of the panel contains the voltmeter and power ON control, giving a well-balanced professional appearance to the panel.

The cabinet for the project was retrieved from my junk box and measures 8" × 4-1/2" × 4". The front panel and inner chassis were fabricated from scrap sheet aluminum. The transmatch and swr bridge were

shielded within a 3" × 4" × 5" minibox provided with a removable top section. The bottom section attaches to the inner chassis using sheet-metal screws. Rf input and output connectors plus a wing-nut ground terminal are mounted to the side of the bottom section. This bottom half of the minibox was modified by removing the front side to provide panel clearance for the transmatch and swr components.

The inner chassis was constructed with a rear-apron dimension of 7/8", which is sufficient to accommodate the various rear-mounted parts. These included: two 1/4" phone jacks for the keyer input and output, a twisted pair of #16 AWG wires 24" long with battery clips, fed through a 3/8" grommet for storage-battery operation, a DPDT toggle switch wired in parallel for selecting either battery or ac operation, and another twisted pair of the same size and length terminated with the HW-8 power connector. Next in line are the two fuses, one for protecting the battery circuit and the other the ac circuit. Finally, the input ac wires enter the apron through another 3/8" grommet. It was a tight fit, but I felt that all of these inputs and outputs plus other components were important to maintain complete control and flexibility from my QRP station.

For travel purposes, the three power cords can be coiled and stuffed into the back of the unit between rf box and the power transformer. In addition, the XYL contributed to the effort with a set of custom-made covers using some old towels. A close color match to the HW-8 was obtained by spraying the cabinet with #204 Ford-green engine enamel and the front panel with DS-GM #283 pastel green. These paints are available from your local automotive-parts outlet.

Photo B. Rear view of the Supernova.

Power Supply

The ac power supply is a standard circuit using a 12.6-V ac at 1.5-A transformer and a full-wave rectifier. With the capacitor-input filter, the input voltage to the LM340-15 regulator is about 17.6 V dc, giving a voltage differential of 2.5 V dc across the regulator. During keying periods, the voltmeter shows a steady indication very near 15 V dc. For good regulation and minimum ripple, a large amount of capacity was required, as shown in the circuit diagram.

The plus 15-V dc regulated voltage is connected to the rear-panel selector switch. Notice that the voltmeter is wired to the arm of the switch. This allows monitoring of either the ac-supplied 15 V dc or the storage-battery voltage.

Keyer

I'm accustomed to using a set of paddles in my shack, so I made this a requirement for my QRP rig. I chose the Curtis 8044 chip because of its compactness and low operating power. See Fig. 1.

Since the HW-8 has its own sidetone generator, there was no need to use the 8044's generator circuit. Therefore, pins 11, 12, and 13 were not used. The supplied data sheet showed Vdd max to be 10 V dc. This presented a small problem since I would be using either 12 or 15 V dc. A one-Watt, 8.2-V dc zener and a series resistor provided a simple solution.

The output of the 8044

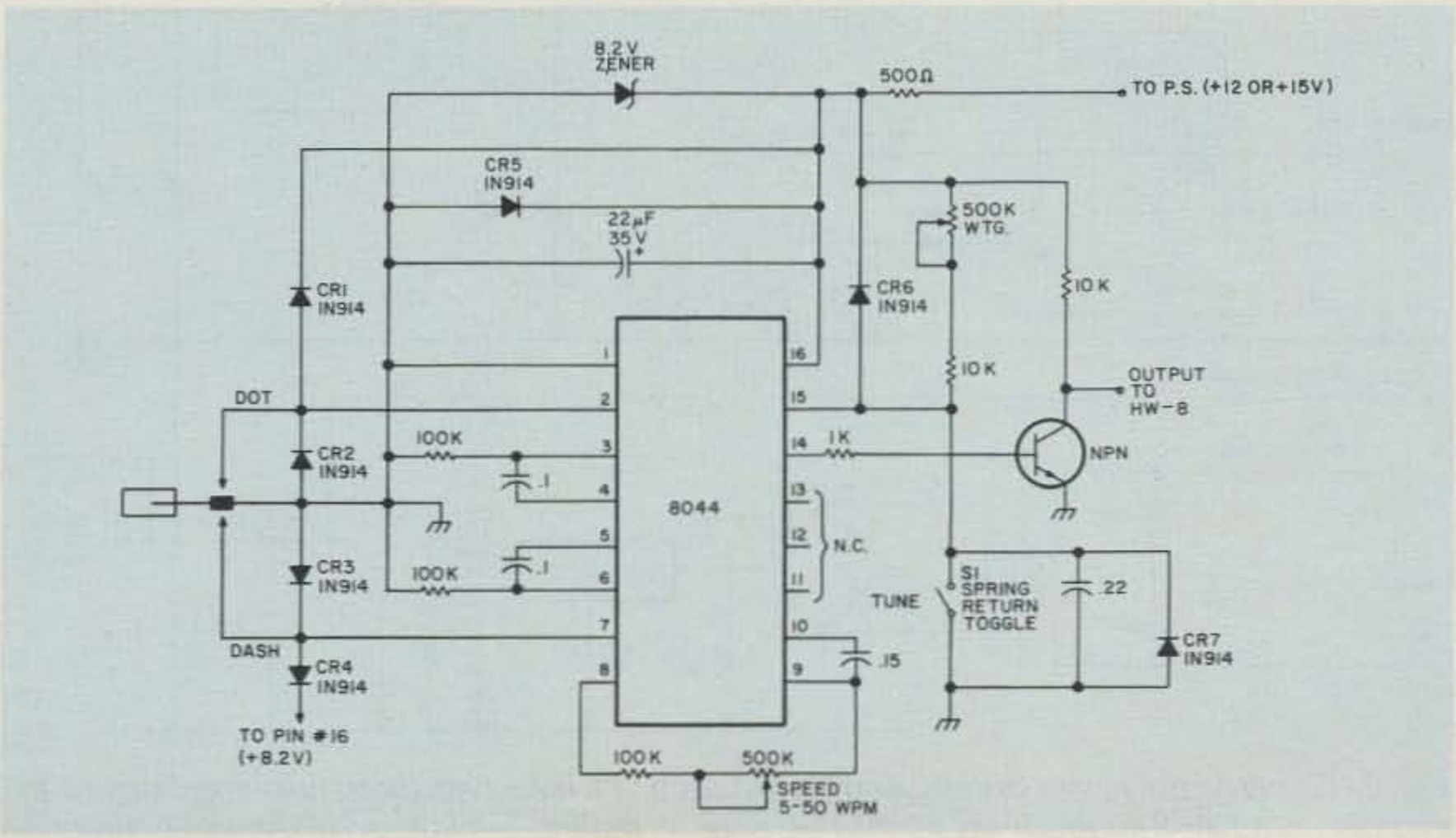


Fig. 1. Keyer circuit.

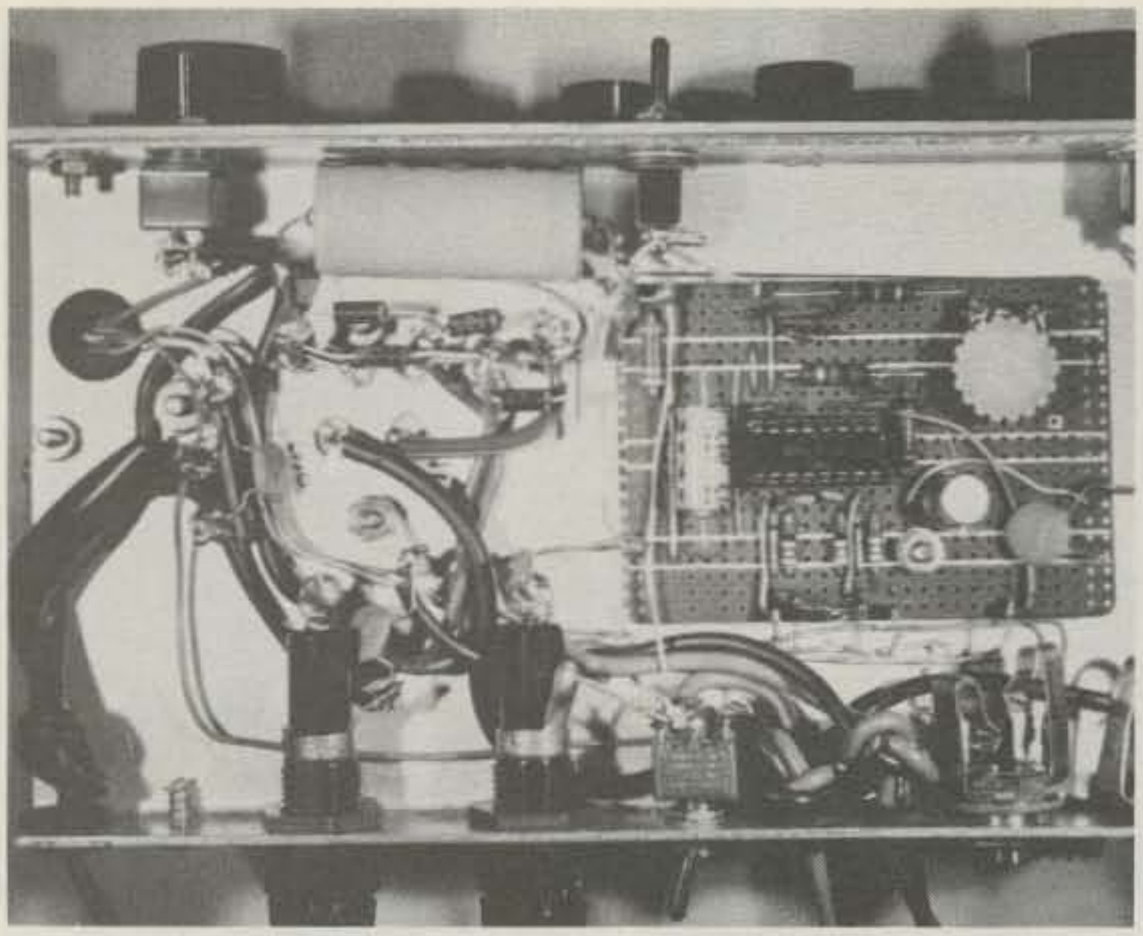


Photo C. This bottom view of Supernova shows the power supply components on the left and the keyer parts on the right. Across the bottom are the various inputs and outputs.

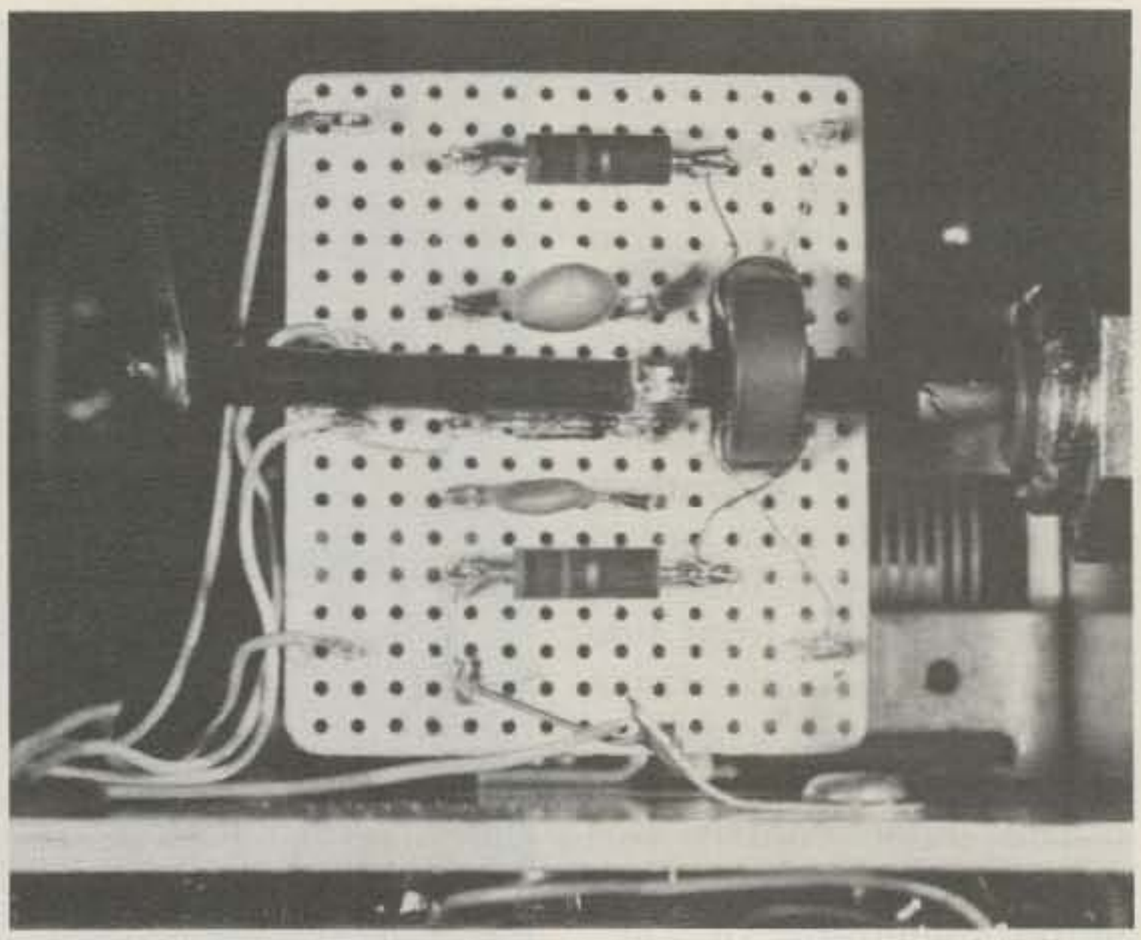


Photo D. This view of the swr bridge shows the main rf wire covered with black insulation. Notice the wire reversal on the lower winding.

drives an ordinary NPN transistor on the keying line. When either the dot or dash paddle is active, the collector of this transistor will transfer from 8.2 V dc to near ground potential thereby turning on the transmitter. Notice that only one keying wire is required to the HW-8. The other connection is supplied by the power ground wire.

The circuit for the keyer shows several diodes. *Do not* omit these diodes—they have a definite purpose. As stated in the Curtis data sheet,[1] this chip uses CMOS technology; and although not stated in the data sheet, the device could be susceptible to electrostatic discharge (ESD). Admittedly, the level of zapping voltage may be higher than for an unprotected MOS device, but you nevertheless should exercise caution during handling.

I recommend that the entire keyer circuit be fabricated using all the diodes called for, and with all wiring to jacks and power supply completed, prior to inserting the 8044 into its socket. Photo C shows the parts layout which I used. The weight control is board-mounted and adjustable through a hole in the case bottom.

When you are ready to install the chip, place the palms of both hands on the chassis. This will discharge any accumulated body charge and place you at the same potential as the chassis. Remember that after removing the chip from its black conductive foam, it becomes vulnerable to ESD damage.

Next, grasp the chip on its bare sides (*never* the lead sides) and install it into the socket. These are relatively simple precautions that could save your device from damage. Personally, I'd rather use a little caution than mail another sixteen bucks to Curtis Electro.

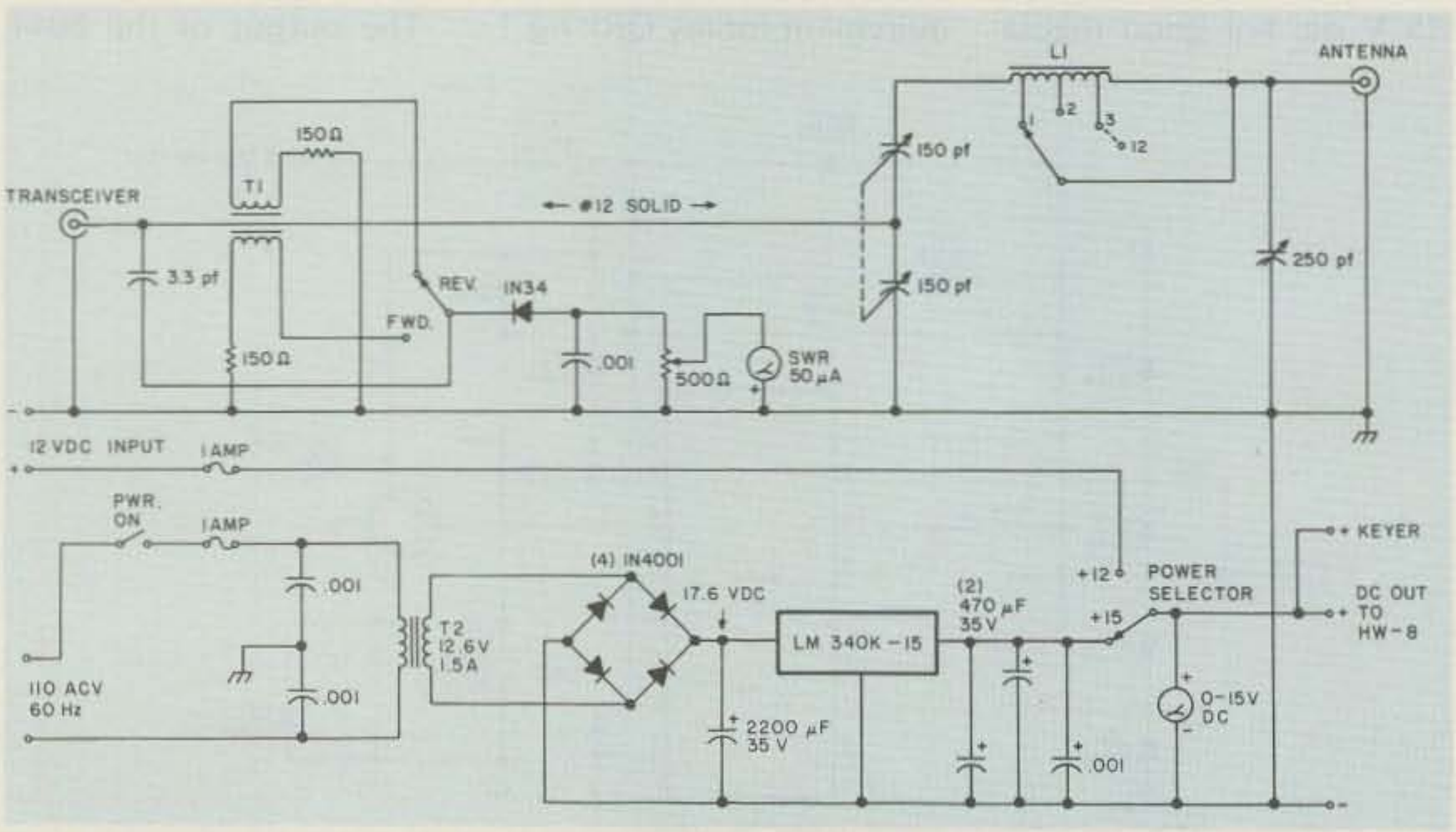


Fig. 2. Power supply, swr bridge, and transmatch. T1 uses two three-turn windings of #28 enamel on a Fair-Rite Products #638MT-L core. Windings are laid on in the same direction. L1 consists of 30 turns of #18 enamel on an Amidon #T-106-2 core.

Swr Bridge

The swr-bridge circuitry is a modification of a circuit which I've used in the past on some CB equipment.[2] All components are attached to a piece of perfboard mounted in the rf box. The main rf conductor, a #12 AWG wire, is secured to the board and serves as the board mount when soldered into the rf connector. See Photo D for details.

This circuit requires two 3-turn windings on a toroid core to form a transformer with the main rf conductor. Once the windings are phased properly, a SPDT toggle is used to transfer the indicator circuit from FWD to REV. Both windings are wound on the core in the same direction using #28 enamel-covered wire.

Phasing is done by reversing the two wires for the REV winding. The bridge components were arranged in an orderly fashion with no great concern given to bridge symmetry. The bridge has been checked against my commercial swr bridge with no difference detected at QRP levels.

Transmatch

This circuit is a basic transmatch configuration[3] using a broadcast transistor transistor-radio dual capacitor, a standard single-gang capacitor, and a core inductor. See Fig. 2. The inductor was constructed using 30 turns of #18 enamel-covered wire with 12 taps, spaced about every two turns. An air inductor could be used, but it would occupy considerably more space. The diameter of the completed core inductor approximated the size of the ceramic wafer on the rotary switch. This proved to be beneficial because after bending the switch solder lugs parallel with the wafer, wires from the 12 taps slipped into the lugs. See (Photo E) for details.

Operation

The Supernova is simple to operate and, when combined with the HW-8, the two units become inseparable. Whether in my home shack or in some remote location, I have experienced a satisfaction that only a QRP operator could appreciate.

When placing my station on the air, I have found that time is saved by first tuning up the HW-8 into a dummy load on the band of my choice. With the swr bridge set to read reflected power, adjust the transmatch for a minimum indication. Use the sensitivity control to maintain meter deflection near midscale for these initial adjustments. For maximum transfer of rf power, use the least amount of inductance while tuning for a 1:1 match.

When you have obtained the best possible match, switch to FWD and set the meter to full scale. While the transmitter is still keyed readjust the loading control on the HW-8. The power meter on the rig will peak, with simultaneous peaking of the swr meter, indicating proper rf coupling to the antenna. The sensitivity control may now have to be reduced somewhat to maintain the full-scale reading. The correct swr ratio can now be read when the switch is placed in the REV position.

The Supernova has performed better then expected. The transmatch loads the 40-meter dipole with near 1:1 ratios on 40, 20, and 15 meters. In the evenings when 20 and 15 are open, I can work from coast-to-coast with respectable signal reports. I have operated the two units from my 12-V dc storage battery or commercial power. The ability to transfer between power sources proved very convenient during unscheduled power outages.

I designed the Supernova to enhance my HW-8 while keeping component cost at a minimum and operation simple. I believe these goals were satisfied, and hope I've contributed in a small way to the big thrill of QRP communication. ■

References

1. 8044 Keyer Data Sheet, Curtis Electro Devices, Inc., revised February 23, 1979.
2. "High Sensitivity Swr Meter," *Popular Electronics*, October, 1979.
3. "The Super Transmatch," *73 Magazine*, July, 1976.

Component Sources

T1—#638MT-L, Fair-Rite Products, available for $1 and an SASE from William Vancura, 4115 35th Ave., Moline IL 61265.

L1—#T-106-2, Amidon Associates, available for $1.50 plus $1.50 shipping. Amidon Associates, 12033 Otsego St., North Hollywood CA 91607.

Keyer-On-A-Chip—#8044, Curtis Electro Devices, Inc., available for $14.95 plus $1.75 shipping direct from the factory: Box 4090, Mountain View CA 94040.

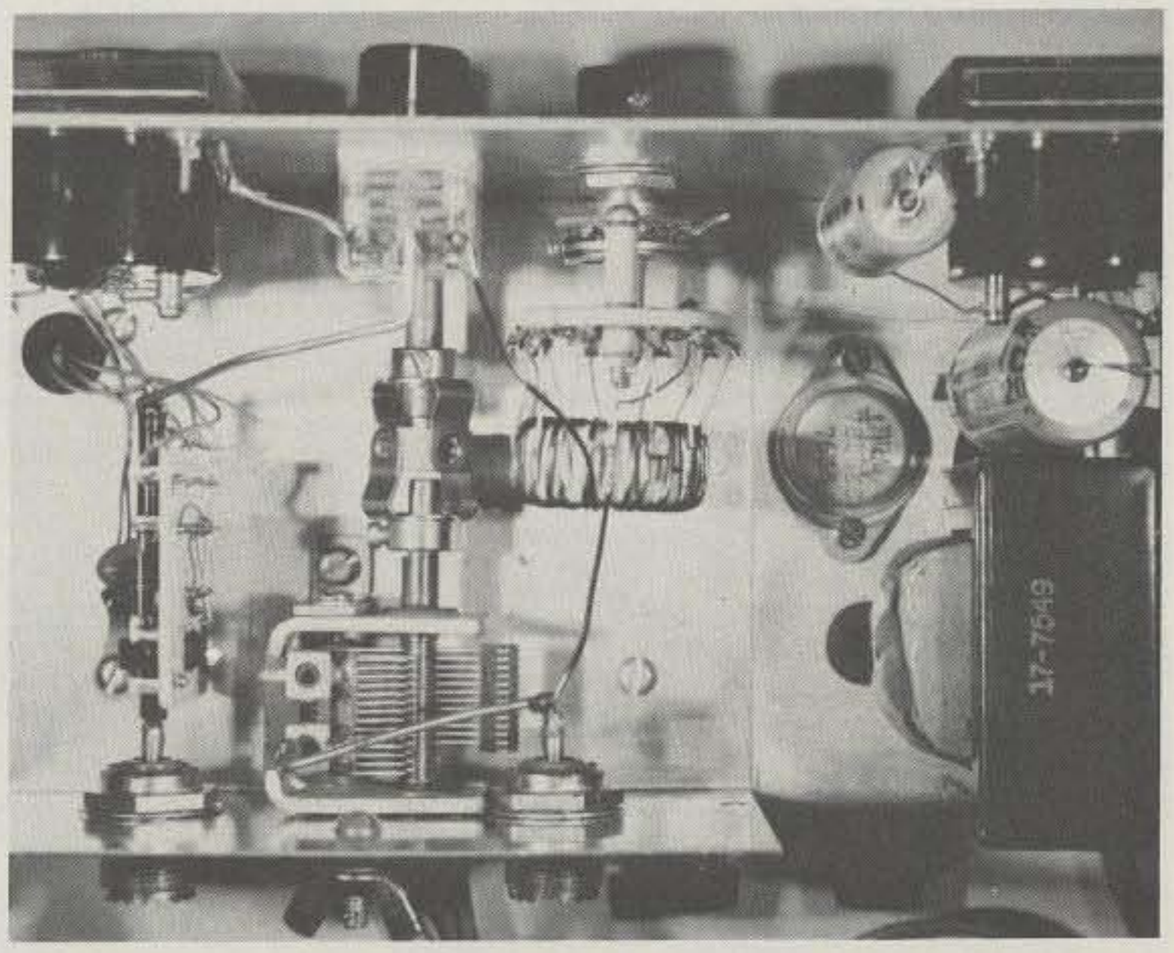


Photo E. This top view shows the swr bridge on the left in the same box with the transmatch. The ac power supply parts are on the right side with two of the large filters.

Jeff DeTray WB8BTH
Tim Daniel N8RK
73 Magazine *Staff*

Kenwood's TR-9000

— the multi-mode 2-meter rig that's making SSBers out of VHFers

If we had to choose one word to describe Kenwood's TR-9000, a multi-mode two-meter transceiver, that word would be *flexible*. In two months of use, we have put this rig to the test as an FM station at home, made it a mobile traveling companion, and used it to enjoy the fun of SSB mountaintopping. All this flexibility comes in a box that is no bigger than most conventional FM-only units.

Tuning, Scanning, And Searching

Each TR-9000 user will discover a favorite way to select operating frequencies. You can use the main tuning dial, stepping across the band in 100-Hz, 5-kHz, or 10-kHz steps. The same thing can be accomplished with the up and down switches on the microphone. If operating is confined to a handful of frequencies, then the memory channels may be preferred. There is even a special oddball channel that allows you to use nonstandard repeater splits.

Three types of searching and scanning can be used. "Autoscan" is an FM-only means of scanning the entire band. If a signal is present, the scanning stops and then restarts when the signal drops. Pushing either the hold switch or the PTT switch returns the rig to normal operation. The second kind of scanning is "free scan," in which the band is swept without stopping. Another version of free scan gives the user "search" capability in the SSB and CW modes. A 10-kHz segment is repeatedly searched in 100-Hz steps. That way you will be aware if there is any activity on what might otherwise be a dead band.

The ten front-panel controls devoted to frequency selection take some getting used to, but the remaining seven knobs are self-explanatory. They give you RIT, volume control, squelch, etc.

Kenwood's TR-9000.

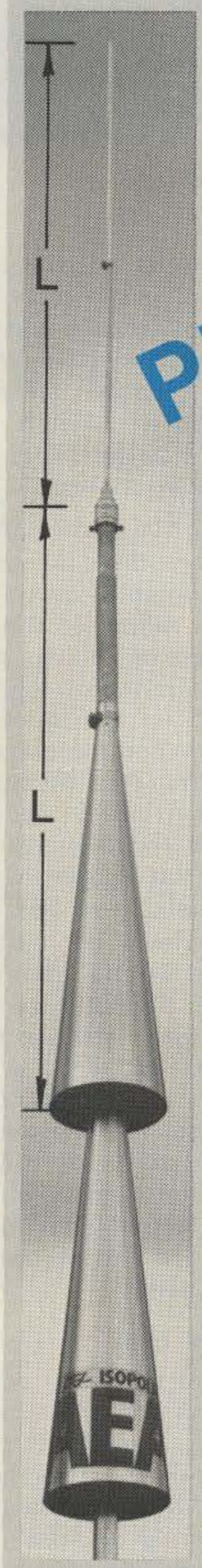
Looking Inside

Before giving the details of what we liked and disliked about the TR-9000, it might be worthwhile to look at the rig's innards. There are eight circuit boards, filling almost every available square inch of space. The frequency selection and control blocks fill three of the boards. The majority of the remaining circuitry is found on the transmitter and receiver cards. Three smaller boards hold the transmitter power amplifier, carrier oscillator for SSB/CW, and sidetone oscillator.

The TR-9000's flexible frequency selection stems from the use of a 6500-based microprocessor system. The magic takes place in one chip that contains the memory, central processor, and much of the support circuitry. The microprocessor has sixteen data lines that drive the phase-locked-loop unit where the frequency synthesis takes place.

The contents of the microprocessor's memory are lost if the power is disconnected, requiring the user to reprogram his favorite frequencies. If the rig is

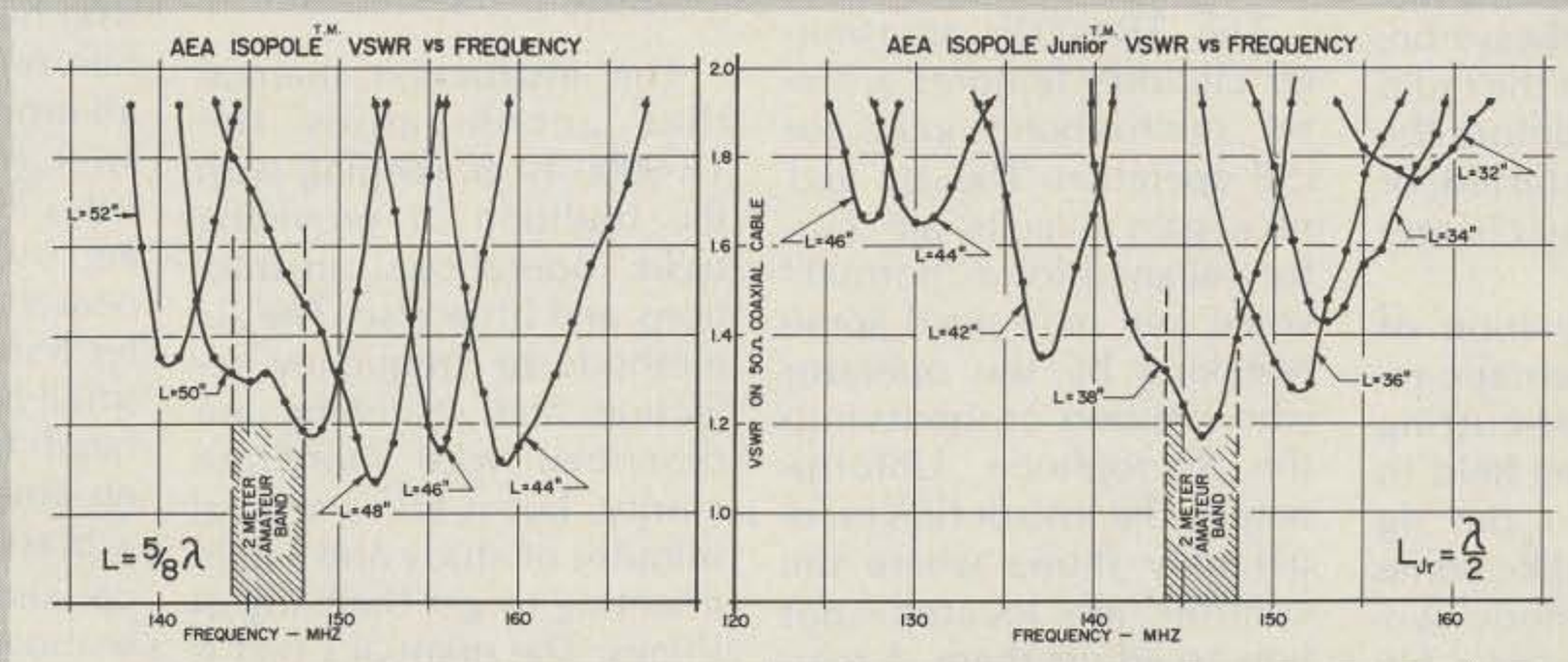
MORE PERFORMANCE FOR YOUR DOLLAR!
COMPETITORS KNOW ABOUT THE
ISOPOLE™
DO YOU? STUDY THE FACTS . . .



ISOPOLE 144
~~$49.95~~
ISOPOLE 220
~~$44.95~~
MAST NOT SUPPLIED

The IsoPole is building a strong reputation for quality in design and superior performance. The IsoPole's acceptance has already compelled another large antenna producer to make a major design modification to his most popular VHF Base Station antenna. Innovative IsoPole conical sleeve decouplers (pat. pend.) offer many **new** design advantages.

All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane and present an unsightly bird's roost with an inevitable "fallout zone" below. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state transceivers. **Typical SWR is 1.4 to 1 or better across the entire band!**



ISOPOLE
144JR
ISOPOLE
220JR
~~$39.95~~
MAST NOT SUPPLIED

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The insulating material offers superb strength and dielectric properties plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is **not supplied**)

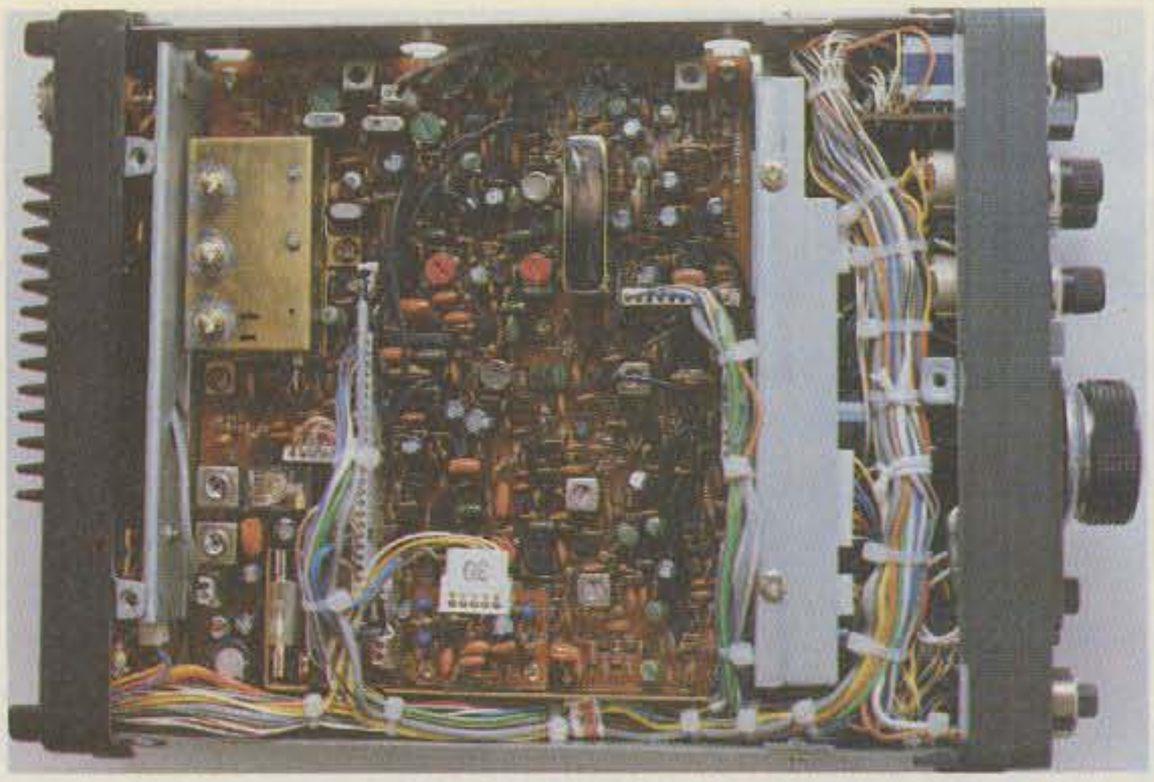
Operating on MARS or CAP? The IsoPole and IsoPole Jr. antennas will typically operate at least ± 2 MHz outside the respective ham band without re-tuning. However, by simple length adjustment, the IsoPoles can be tuned over a wider range outside the ham bands.

Our competitors have reacted to the IsoPole, maybe you should too! Order your IsoPole or IsoPole Jr. today from your favorite Amateur Radio Distributor. For more information on other exciting AEA products, contact Advanced Electronic Applications, Inc., P.O. Box 2160, Lynnwood, WA 98036. Call 206/775-7373 ✓ 2

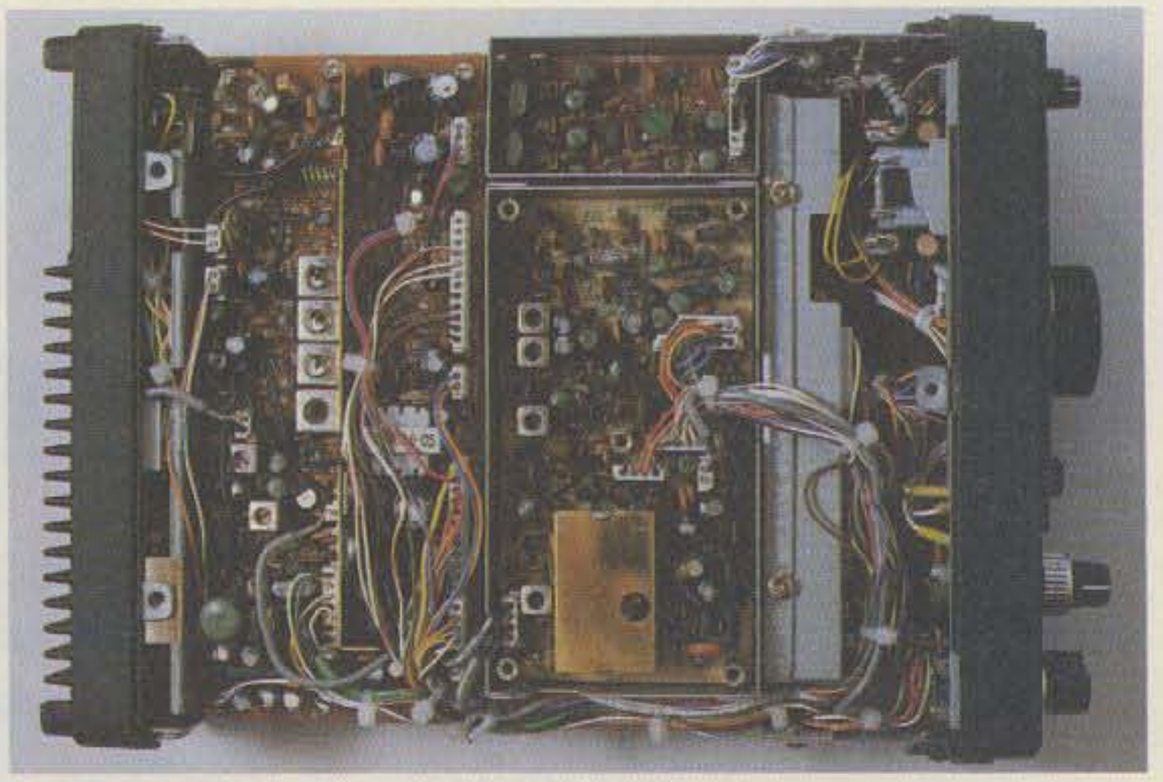
AEA Brings you the Breakthrough!

ISOPOLE
450
NOW AVAILABLE

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.



Bottom view of the TR-9000.



Top view of the TR-9000.

connected directly to a battery, the TR-9000's computer will keep operating even if the power switch is in the off position. This backup function consumes about 2.5 mA, so the rig can be left in the car for several weeks without causing appreciable battery drain. Since the computer is always on, it is important that the radio be disconnected before the vehicle is jump-started or an external battery charger is used.

A close examination of the TR-9000's schematic revealed that cost-cutting measures had been held to a minimum when the rig was designed. Unlike some of the earlier all-mode two-meter rigs, Kenwood's latest whiz-bang box has separate filters for SSB and FM. The dual-conversion receiver for FM offers one level of selectivity, while the single conversion SSB/CW circuit has a narrower bandwidth. This allows you to have your cake and eat it, too.

CW operation is enhanced by a "fast" agc that automatically returns to a slow constant when the rig is switched to SSB. A noise blanker is available for SSB or CW receiving and helps to reduce the plague of impulse ignition noise. Another SSB/CW-only feature is the RIT, which offers as much as 1 kHz of plus and minus offset. Transmitting on CW can be awkward since the T-R switching must be done with the microphone's push-to-talk switch or with a "standby" switch of your own devising. Accommodations for full or semi-break-in CW operation are not to be found.

The TR-9000's transmitter circuitry features a preset microphone gain for SSB operation. The alc and mike gain circuits are factory aligned for a "normal" voice and may need some tweaking by the operator who whispers or shouts into the microphone. Unfortunately, the instruction manual only shows where the controls are located—not how to adjust them. A rear-panel connector is provided for FM operators who desire to use a touchtone™ pad. An 8-volt supply is available at this connector when the rig is in the FM mode.

The TR-9000's final power transistors provide 10 Watts of output in the high-power FM and CW modes and approximately 10 Watts PEP out for SSB. The energy-saving low-power position reduces the output to slightly more than a Watt. Our tests showed these power levels to be consistent from 143.3 to 148.7 MHz, allowing MARS and CAP coverage.

Like other radios using solid-state finals, the TR-9000 employs a protective circuit that reduces the transmitter's output power when the antenna is something other than a nominal 50-Ohm load. Our tests showed that no appreciable power reduction occurred until the swr exceeded 2:1.

The instruction manual that accompanies the TR-9000 is in keeping with the tradition of providing basic operational instructions and little else. The six methods of frequency selection and searching are described with moderate clarity, but it takes several minutes of study and experimenting to get the hang of things. The manual's text is supported by a number of drawings that show the do's and don'ts of installing the rig. Information about servicing is nonexistent except for warnings not to play with the radio's insides. A service manual is available, however.

We previously noted that operating the TR-9000 involves some compromises, especially in the SSB and CW modes. Perhaps an explanation is in order. Until recently, multi-mode two-meter rigs were scarce and expensive. VHF diehards relied on receiver and transmitter converters. This meant tying up an HF station and dealing with cabling and switching hassles. The benefits of this approach include a more sophisticated receiver and the opportunity to have VOX, variable mike gain, and similar goodies. Which approach is better? That depends on your needs.

For *73 Magazine* staffers who have a drive-up mountain ten minutes away, the all-mode radio was the answer. Most of the time it resides in a mobile setup, being used on the local repeaters. When the two-meter SSB bug hits, we toss a small beam into the car and head for the mountain. In no time flat, we are having a blast talking to SSB ops up and down the eastern seaboard. Future plans call for the TR-9000 to be pressed into service as part of an OSCAR satellite station. We can't vouch for the rig's applications in weak-signal work like moonbounce or scatter, but it does do a good job of meeting our FM and mountaintopping needs.

Odds and Ends

Several matching accessories can accompany your TR-9000. The PS-20 is a 12-volt power supply, good for 4.5 Amperes. A matching external speaker, the SP-120, is a nice addition for fixed station operation, as is the system base, B0-9. It has a memory backup power

Continued on page 101

✓See List of Advertisers on page 114

Paul Grupp KA1LR
73 Magazine Staff

Butternut's HF5V-III Vertical

— this one really does work equally well in all directions

The trap vertical antenna is an oft-maligned radiator of rf, but, in truth, it has a few things going for it. It is ideal for the beginner who wants to sample the activity on all the bands without making his backyard look like the high-wire act at the circus or spending a lot of money. Properly installed, the vertical can even be reasonably effective! Truly, the trap vertical is not just for beginners. A roof-mounted vertical is often the only answer for hams with a shortage of real estate who crave 160-, 80-, and 40-meter operation. The low angle of radiation of a vertical has better DX-catching potential than a dipole, and contesters have found the vertical to be excellent for checking activity off the back and sides of a directional array. Many a long-path DX opening has been missed because a station did not do this sort of checking! I frequently use a vertical to make sure that my beam is headed in the right direction. Flip back and forth between the beam and the vertical—if the other station is stronger on the vertical, you are pointing the beam in the wrong direction.

The Butternut HF5V-III vertical antenna.

Once you have a vertical, you'll think of lots of ways to use it. As the sunspot cycle plunges 10 meters into oblivion, you might want to consider taking down that tribander, replacing it with four- or five-element monobanders for 15 and 20 meters. On the rare occasion when 10 is open in the bottom of the sunspot cycle, the vertical will allow you to sample the action. Meanwhile, you'll be enjoying the superior characteristics of the large monobanders on 15 and 20, assured that you aren't missing much on torpid ten!

Some time ago, I installed Butternut HF5V-III vertical antennas in two separate locations—one roof-mounted at the *73 Magazine* ham shack for contest spotting and Novice use and the other ground-mounted at home to serve as my main antenna system until I amass the fortune necessary for a tower and beam.

Why the Butternut?

I chose the Butternut antenna for two reasons. Trap vertical antennas have relatively narrow bandwidth on 80 and 40 meters and must be set for lowest swr in the most often used portion of the band. This is a reasonable compromise, unless you operate in both CW and phone bands, as I do. With many verticals, retuning for different portions of the band is annoying at

Continued on page 131

The 2A Touch

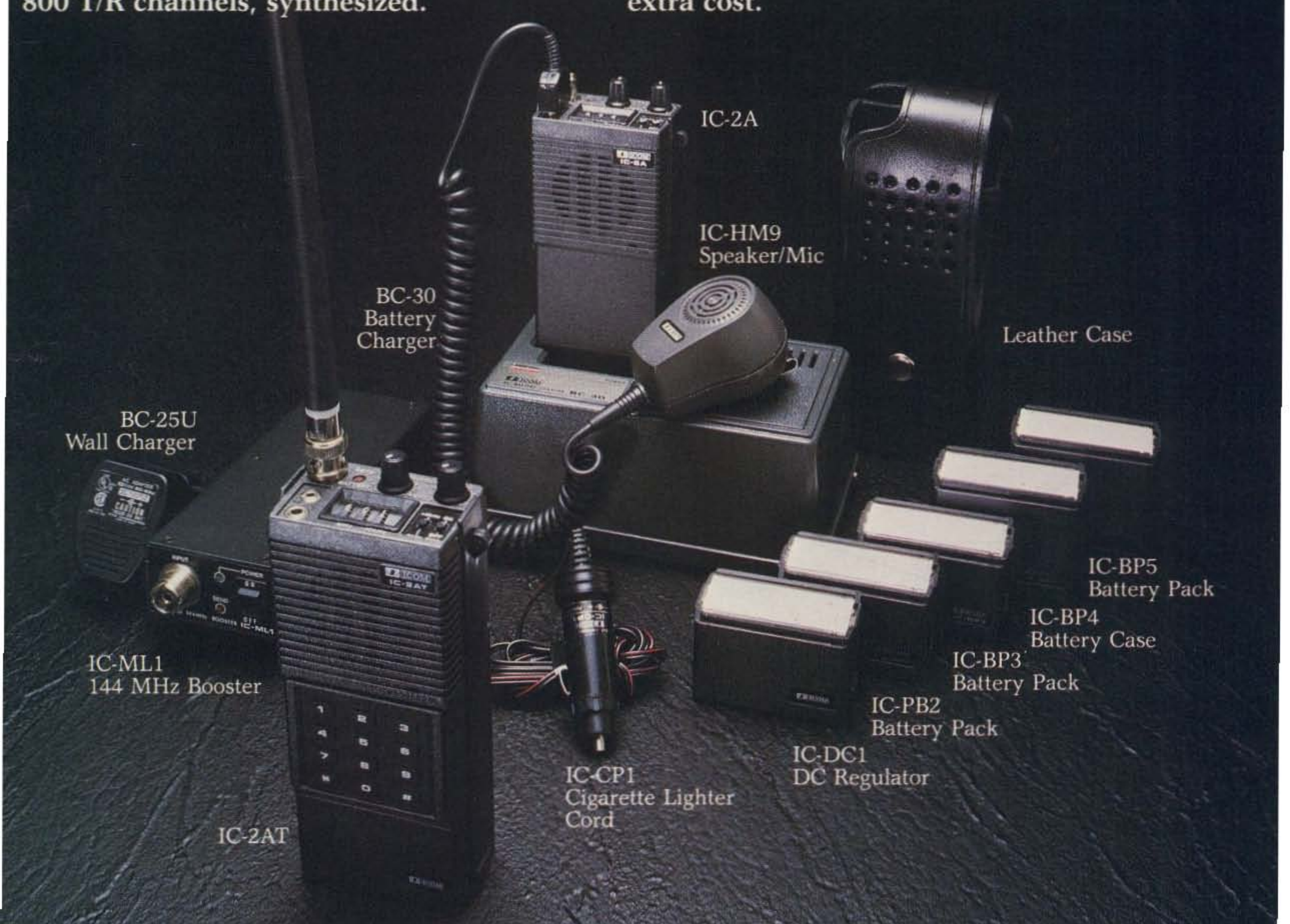
ICOM's Extremely Popular Hand-Held System

ICOM's reliable, field-proven IC-2A/2AT series has become the most successful hand-held on the market. Here are a few reasons why:

High versatility: 3 sizes of battery packs easily slide on and off (providing other power outputs and operating cycles). Extremely compact. Fits in the palm of your hand . . . only 2.6 in x 1.4 in x 6.5 in. 800 T/R channels, synthesized.

Excellent audio quality: Separate speaker and mic built in. Output power: 1.5 watts high (with BP3), .15 watt (battery-saving) low. Touch Tone® Pad (2AT only).

Each IC-2A and IC2AT comes complete with BP3 NiCd pak, AC wall charger, flexible antenna, earphone, wrist strap, and belt clip . . . all standard, at no extra cost.



ICOM

2112 - 116th Avenue NE, Bellevue, WA 98004
3331 Towerwood Drive, Suite 307, Dallas, TX 75234

Charles F. Schoeffler WB7NEZ
455 North Adams
Moscow ID 83843

The Meterless Ohmmeter
—an audible continuity tester

The subject of this article is an audible low-voltage, low-current, and low-cost continuity tester. The tester is also small enough to put in your shirt pocket because it uses a 35mm film container for an enclosure. Originally I had a need for such a tester during a project that was wire-wrapped and I needed to check a lot of connections in as short a time as possible. The tester will give you an audible indication of resistance up to around 2000 Ohms. You can test semiconductor junctions with it and the tester will let you tell the difference between just a few Ohms of resistance because different tones will be heard when testing different values of resistance. Since this continuity tester will let you measure small values of resistance, it is nice for testing any sort of wiring or semiconductor components.

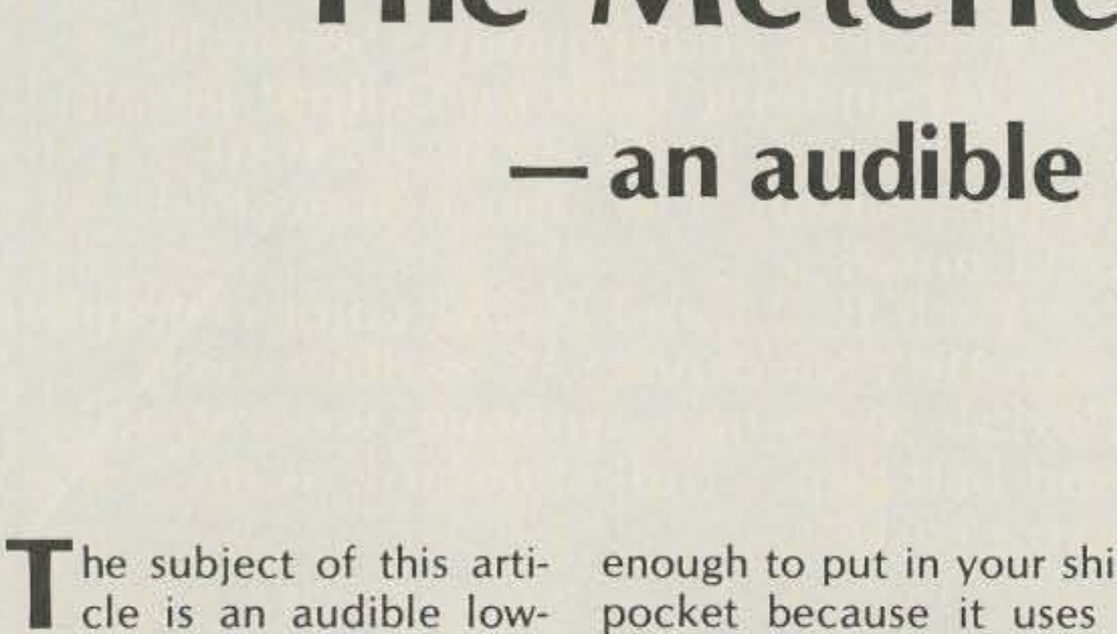


Fig. 1. Continuity tester schematic.

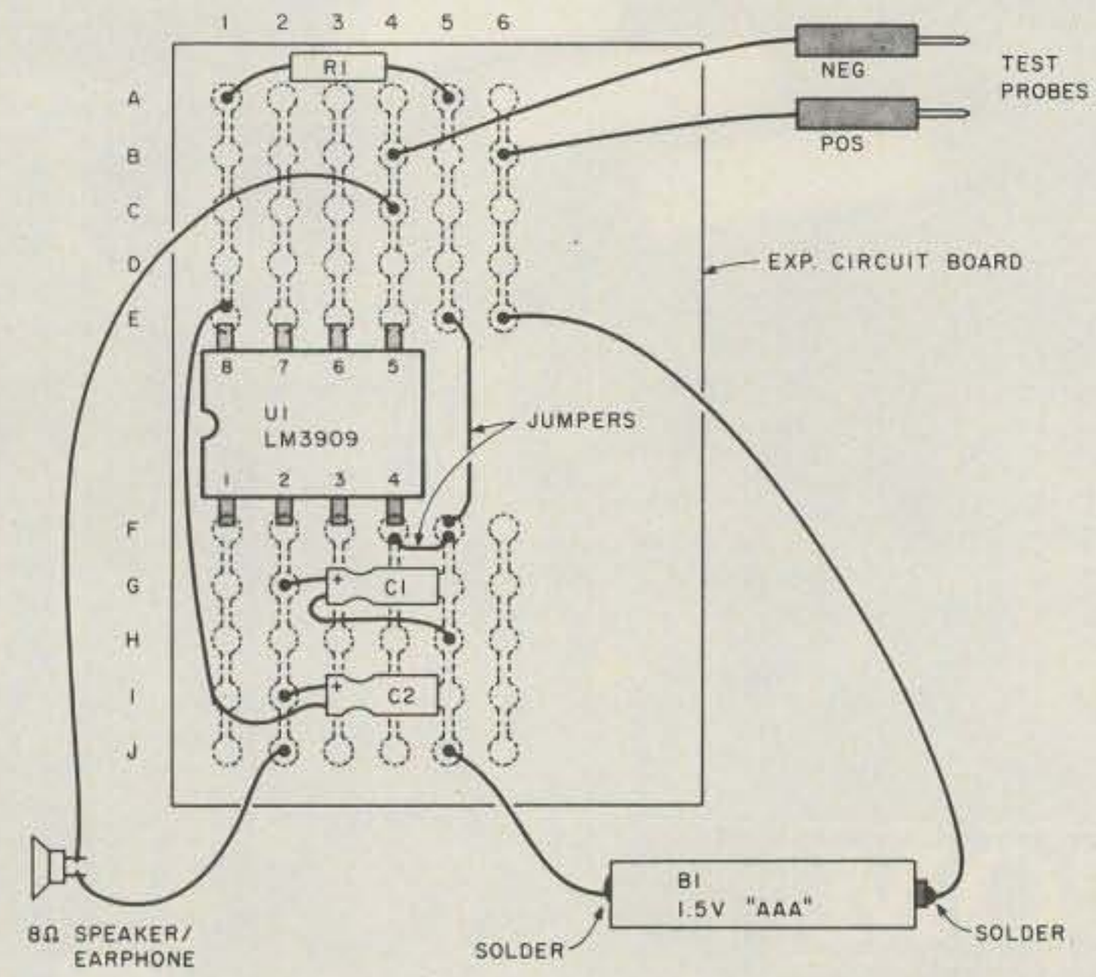


Fig. 2. View from top of circuit board.

The LM3909 used in this tester is almost indestructible provided it isn't fed with more than 1.5 volts. I use an AAA-size 1.5-volt battery in my tester and it has lasted almost a year now. The tester provides enough voltage to turn on transistor and diode junctions and it does so at low current levels. Maximum current levels are obtained when the component being measured has close to zero Ohms of resistance. If you use a 1000-Ohm earphone with the tester, the current will be approximately 2 mA. If you use an 8-Ohm speaker, the current will be around 13 mA. If you're not measuring zero Ohms, the current through the component or wire being tested will be in fractions of a milliampere. The enclosure used for my continuity tester was an empty film container and it is just the right size to put in your pocket and get ahold of when you need it. If you don't have a 35mm camera, ask one of your friends that does to give you an empty film container.

Construction of this continuity tester will only take an hour or so if you have all the parts ready. You can buy all the parts at a Radio Shack store. Depending upon what you have in spare parts and your junk box, the total cost will be from five to ten bucks.

The electrical design of the continuity tester is shown in Fig. 1. If you look at Fig. 2, you can see how the parts are placed on the piece of experimenter circuit board. A completed continuity tester is shown in Fig. 3. Looking at Fig. 1, you should notice that the earphone or speaker has to be connected for the tester to operate. If you don't use an earphone and jack as I did, you might want to install an on-off switch to turn the tester off in case the test

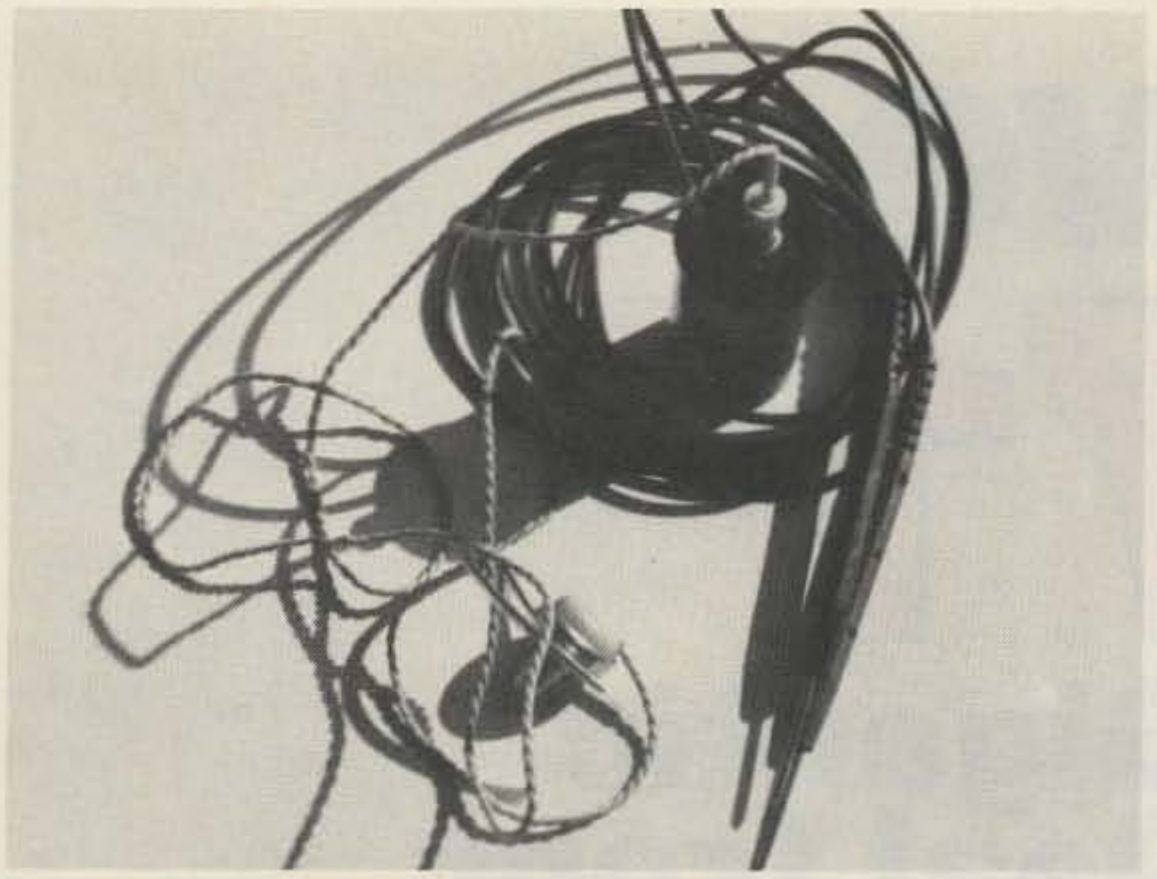


Fig. 3.

leads touch together while it is waiting to be used.

Before you solder the parts in place on the circuit board, trim it down enough to fit into the film case. Then drill two holes in the lid of the film case and pass the test leads through it. Fig. 5 is an example of my trimmed down circuit board. The capacitors used in my tester were electrolytics rated at 50 volts, but any rating small enough to fit on the circuit board and into the film case would work just as well. The voltage rating needs to be only a few volts, so tantalum capacitors would work nicely, too. After you have soldered the components to the circuit board, drill a hole in the center of the film container top for the earphone jack (if you use one) and install it. Finally, solder the leads going to the battery and touch the test leads together. You should hear a tone coming from the earphone or speaker, depending on which you used. At this point, your continuity tester should look like Fig. 4.

If you have some low values of resistance handy, try the tester on them and listen to the different tones generated by different values of resistance. When you're sure that the tester is working correctly and all the wires are soldered, wrap the circuit board and the battery with electrical tape to prevent things from shorting out once you put everything into the film case. Take a look at Fig. 6—you can see what my tester looks like before stuffing everything into the film case. Now that you've got the audible continuity tester put together, you can use it to check wires and semiconductors. By connecting it to a telegraph key, you've got a code practice oscillator. If you replace the earphone or speaker with the correct value of resistor (between 10 and 2000 Ohms) and take an output from across it, you have an audio signal generator, the output frequency depending upon the resistance that you use. ■

Reference

National Semiconductor Corp.
Linear Applications Vol. 2
AN-154
Santa Clara CA 95051

Parts Suppliers:

Global Specialties Corp.
70 Fulton Terrace
PO Box 1942
New Haven CT 06509

Jameco Electronics
1355 Shoreway Road
Belmont CA 94002

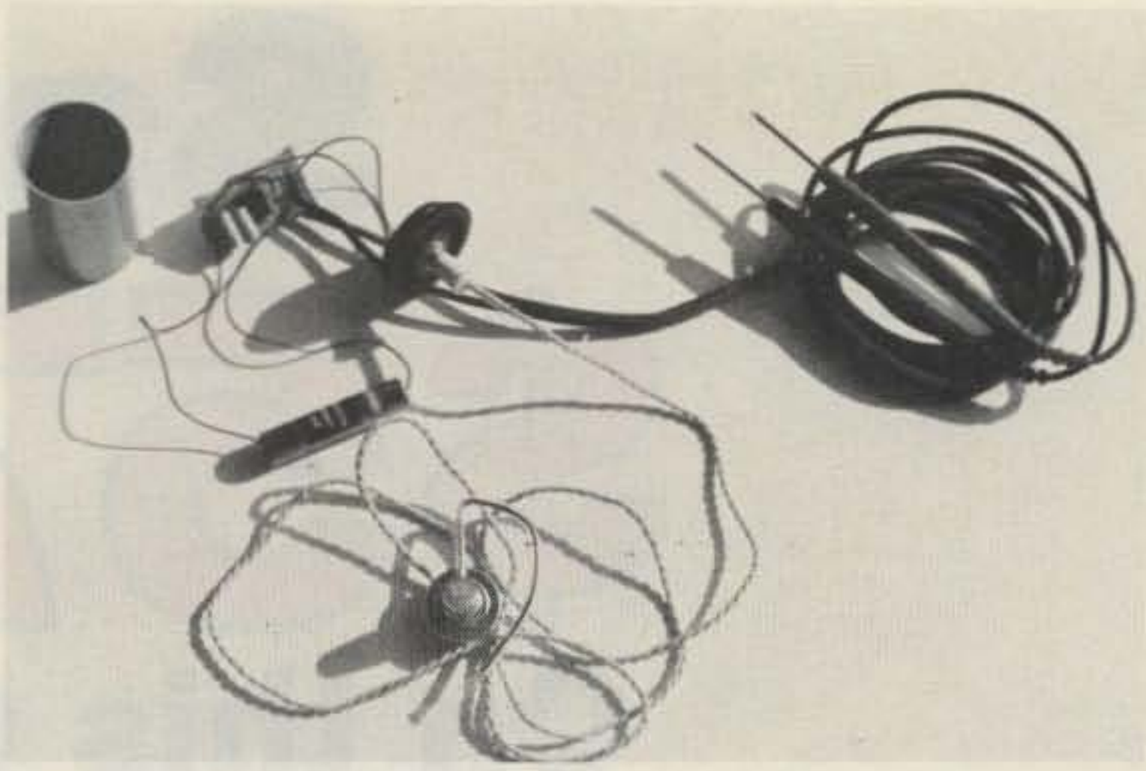


Fig. 4.

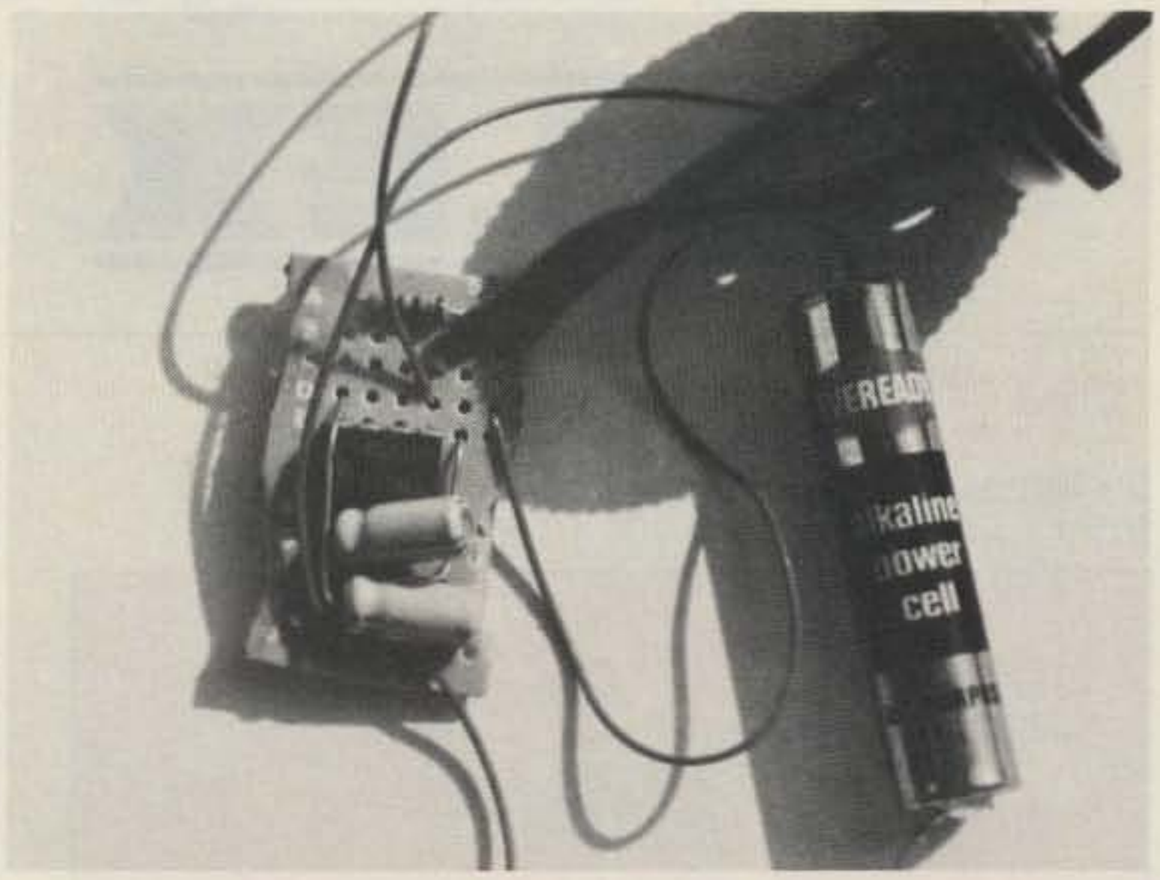


Fig. 5.

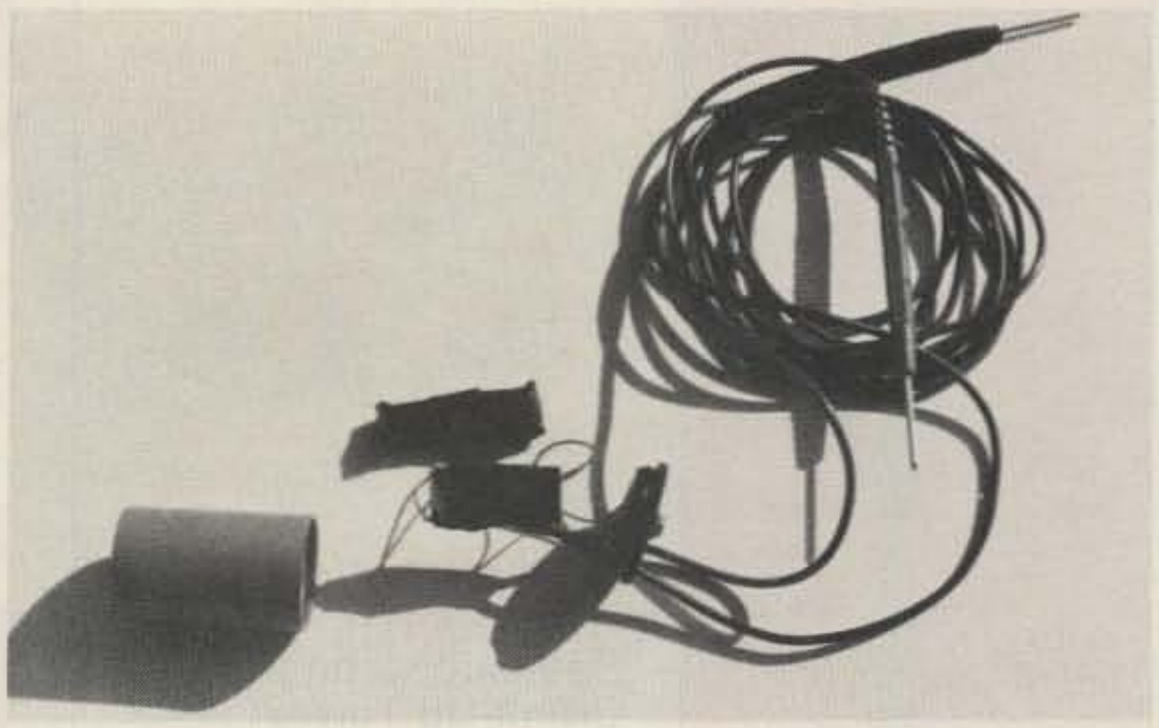


Fig. 6.

Parts List

C1 and C2	1-uF/15-volt electrolytic capacitors
R1	1000-Ohm, 1/4-W resistor
U1	LM3909 flasher oscillator
B1	1.5-volt AAA-size battery

Miscellaneous:
Circuit board (Radio Shack 276-170, Global Specialties Corp. EXP-300), Test probes, 35mm film container, speaker or earphone and jack, wire, solder.

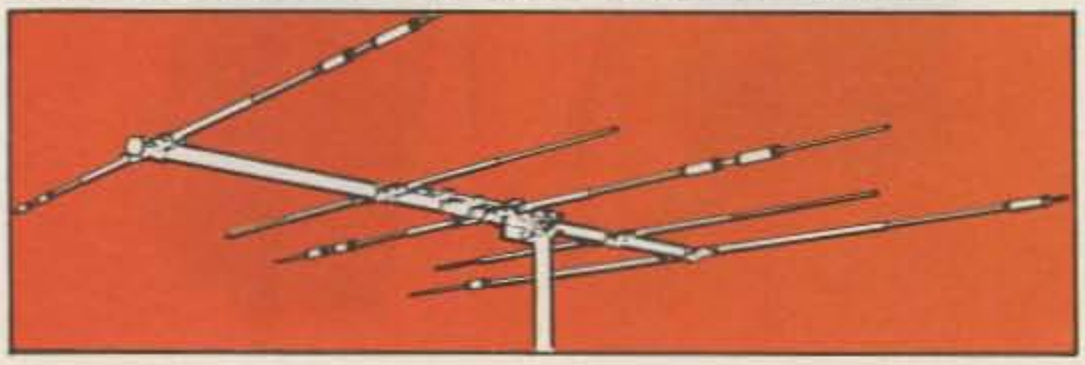
Save $571.75

On this Gigantic Package Deal from

TELEX® hy-gain®

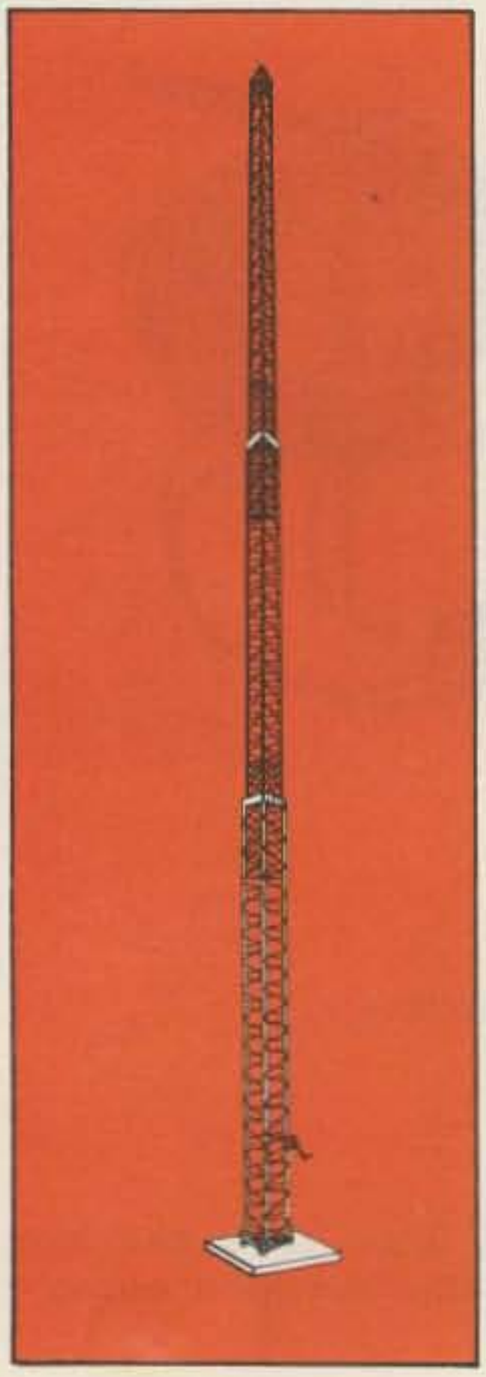
TH5DX Thunderbird

5 elements—superb gain and front-to-back ratio on 20, 15 and 10 meters.



The installation of a ham's first directional antenna system is a memorable event because of the substantial improvement in the capability of the station. You really have to experience using a directional array at your station to appreciate the thrill of improved performance.

A Hy-Gain TH5DX can do more for operating pleasure than an expensive new state-of-the-art receiver and maximum power amplifier combined. The TH5DX is the result of 25 years of experience in designing and building multi-band beams, and represents a focused effort to optimize performance and reduce size. Hy-Gain Beta Match provides dc ground, optimizing energy transfer to the antenna. Air dielectric Hy-Q traps have also been used. The elements are taper swaged to reduce tubing diameter and weight which greatly reduces wind load.



HG52SS

Self-Supporting Crank-Up Tower

This all steel crank-up tower has an improved guide system which provides a rigid close-tolerance structural support. The ends of the tubes are left open to allow complete hot dipped galvanizing of both inside and outside surfaces after welding as well as unrestricted moisture drainage. It comes complete with base mount and rotator mounting plate and requires no guying. It stands 52' (15.8 m) extended and retracts to 21' (6.4 m).

2DBQ Trap Doublet for 40 and 80 meters

This Hy-Q trap doublet provides true half-wave length performance on both frequencies featuring individually pretuned matched traps for each band. Traps are large diameter for exceptionally favorable L/C ratio and power handling ability.

HDR300 Heavy Duty Rotator

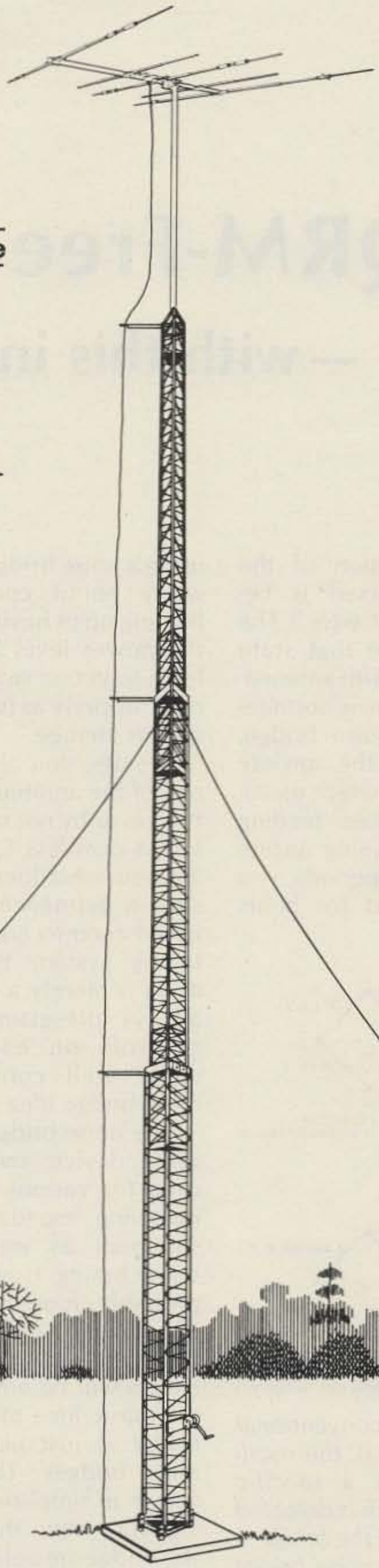
This is a commercial /industrial grade rotator with enough reserve strength to easily rotate the TH5DX and more. The good-looking control console features a digital azimuth readout accurate to ±1°.

PLUS!

One HG10 Heavy duty 10 foot mast
(enough mast to stack a vhf with the TH5DX)
Three HGCOA Coax extension arms
Two BN86 Broad band Ferrite Baluns

Here's what you get!

Model No.	Description	Ham Net Price
HG52SS	Crank-up Tower	990.00
TH5DX	Tri-Band Antenna	289.95
2DBQ	Trap Doublet for 40 to 80 meters	59.95
HDR300	Rotator	499.95
HG10	10 foot mast	56.00
HGCOA	Coax Arms (3)	39.00
BN86	Baluns (2)	31.90
Total Ham Net Value		1,966.75
You Pay Only		1,395.00
YOU SAVE		**571.75**



PLUS FREE DELIVERY

This once-in-a-lifetime package deal is available for a short time only (expires August 31st). Simply contact your favorite participating Hy-Gain Amateur Distributor and ask for the Super 5-Bander Promo and the complete package will be delivered to you promptly with NO DELIVERY CHARGE! Free delivery is offered for shipping points within the contiguous 48 United States only. Offer is extended through participating Telex/Hy-Gain distributors only.

ACT NOW!
Offer expires August 31st

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC. ↙316

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: 22, rue de la Légion-d'Honneur, 93200 St. Denis, France.

↙See List of Advertisers on page 114

73 Magazine *Staff*

QRM-Free Antenna Tuning

—with this inexpensive noise bridge

One definition of the word "relaxed" is "being at rest or at ease." The way to achieve that state when working with antenna tuning problems is definitely to use a noise bridge. Compared to the anxiety and frustration which usually develop when feeding power into a tuning system for protracted periods, you can experiment for hours using a noise bridge and not worry about components heating up or having to vary the power level back and forth to get an swr meter to read properly as tuning conditions change.

Besides, you also do the rest of the amateur fraternity a favor by not radiating a lot of needless QRM. Any amateur who does not have such a permanently established antenna and antenna tuning system that operation is merely a matter of always presetting tuning controls on each band might well consider the noise-bridge idea.

The noise bridge is a versatile device and can be used for various functions involving impedance measurement as well as antenna tuning. However, it is probably most useful for antenna tuning work, so just that aspect of its application will be emphasized. The basic idea of the noise bridge is just like that of most bridges. That is, as shown in simplified form in Fig. 1(a), when the arms of the bridge are balanced, the detector will not have any output.

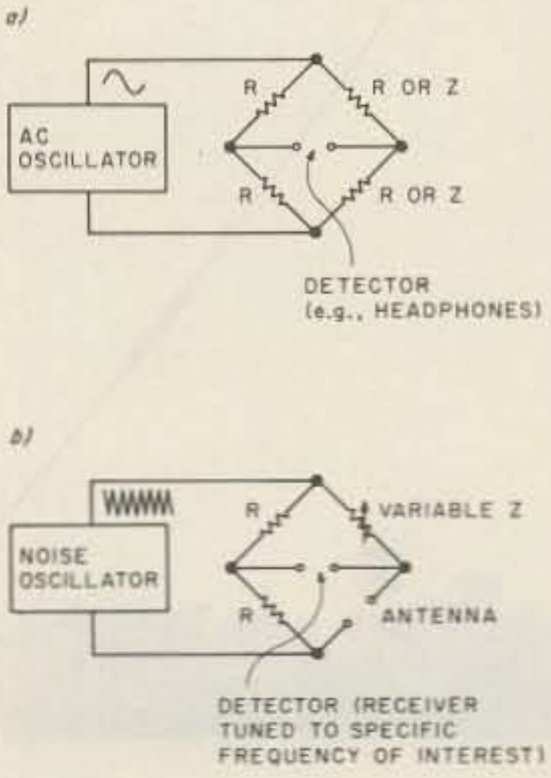


Fig. 1. In a conventional bridge circuit (a), the oscillator generates a specific frequency which is detected for a null when the bridge is balanced. In a noise bridge (b), multiple frequencies are generated and the detector provides selectivity so the bridge can be balanced for a null at the frequency of interest.

Usually, the detector used is not frequency selective: The ac oscillator used, be it in the af or rf range, generates a specific frequency and the detector is a broadband device (like a pair of headphones) which responds to any oscillator frequency being used. As shown in Fig. 1(b), the noise-bridge idea just exchanges this scheme—the oscillator becomes a broadband frequency-generating device, and a frequency-selective detector is used.

In the noise-bridge scheme, the noise generator generates rf noise (a voltage which is a random function of time) over the HF range and a communications receiver tuned to the frequency of interest becomes the detector. When the arm marked "variable Z" in Fig. 1(b) has the same value as that connected to the terminals marked "antenna" at a specific frequency, the noise level (as heard in a receiver tuned to the same frequency) would theoretically be zero. In reality, because of leakage and imperfect components, the received noise is not zero, but it dips to a distinct null as the "variable Z" arm is varied in value around that of the impedance connected to the "antenna" terminals.

The circuit of the noise bridge is shown in Fig. 2. A 6.3-volt zener is used as a noise source and its noise output is amplified by a simple three-stage amplifier. There is nothing particularly critical about the components used. The only item that requires a bit of care in construction, although it is hardly difficult to do, is the output transformer. Care must be taken to obtain good balance between the windings.

The transformer is wound on an Indiana General CF 102, 3/8" ferrite core or on an Amidon T-50-2 core. These items were formerly a bit difficult to obtain but are now readily available from a number of mail-order sources. In fact, Amidon will sell direct and accepts small orders (Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607).

A slightly larger or smaller core also can be used as long as the core is made of a ferrite "mix" intended for the HF range. Four 5" lengths of #28 enameled wire (or any near gauge) are first twisted together along their entire length. One neat way to do this is to insert each wire in a hole on perforated board stock

leaving just enough wire exposed to grip the ends. Then, twist the board and gradually pull the wires back out of the board.

It doesn't cost much to practice this technique a few times and extremely neat results will be obtained. The "quadrifilar" winding on the core is then produced by simply taking the twisted wire bunch and winding it on the core to produce 4 to 5 turns. Space the turns evenly around the core and hold them in place with a bit of clear glue or coil dope. The ends can be marked before winding the transformer or located after using an ohmmeter.

Connect any two windings together to form the primary and the other two together to form the secondary. Take care, of course, to get the windings polarized correctly as shown by the dots next to the windings in Fig. 2.

The circuitry can be assembled on any small PC board using point-to-point or isolated-pad-type wiring. I assembled the circuity on a 2-1/4" × 1-1/2" board. My usual technique in assembling a circuit of this sort where short lead lengths are desired and where really no complex circuitry is involved is just to follow the schematic during construction. That is, components are soldered in place one by one as compactly as they can be placed following the schematic from left to right.

A PC board larger than required is used and, after assembly is finished, the PC board is trimmed to size with a fine handsaw. I also mounted a small trimmer-type capacitor and potentiometer on the board. This was only done for test purposes. In practice, you would normally want to have these components (the 100-Ohm potentiometer and series 140-pF capacitor shown in Fig. 2 which constitute the variable impedance arm of the bridge) as panel-mounted controls.

The circuitry can be mounted in any small enclosure which can contain the circuitry, a battery, and two coaxial connectors for the antenna and receiver terminals. A shielded one is preferable but not absolutely necessary.

The panel-mounted variable capacitor and potentiometer deserve a word of mention. If an air-variable capacitor is available it can be used, but experience has shown that even the cheap transistor radio variables are quite satisfactory and very inexpensive. The same is true of the potentiometer which has to be a linear-taper, carbon-composition type.

An unshielded type is desirable to avoid stray capacitance. In some cases, the metal back cover on a potentiometer can be removed. One can find PC-mount trim potentiometers which are completely unshielded and which can be turned into a panel control by means of a nylon extension shaft. They are very inexpensive but ideal for this type of application.

If you want to use the noise bridge as a calibrated instrument, first connect a 50-Ohm composition resistor to the "antenna" terminals and use a communications receiver tuned to 10 or 15 meters as a detector. As the capacitor and potentiometer are varied, a noise null should occur around the midpoint of their shaft rotations.

Different value resistors above and below 50 Ohms can then be used to calibrate the resistance potentiometer. Various value capacitors below 68 pF and in series with a 50-Ohm resistor are used to calibrate the capacitor rotation. The capacitor rotation on one side of its noise null (as established with just a 50-Ohm resistor as a load) will indicate capacitive reactance while the other side will indicate inductive reactance.

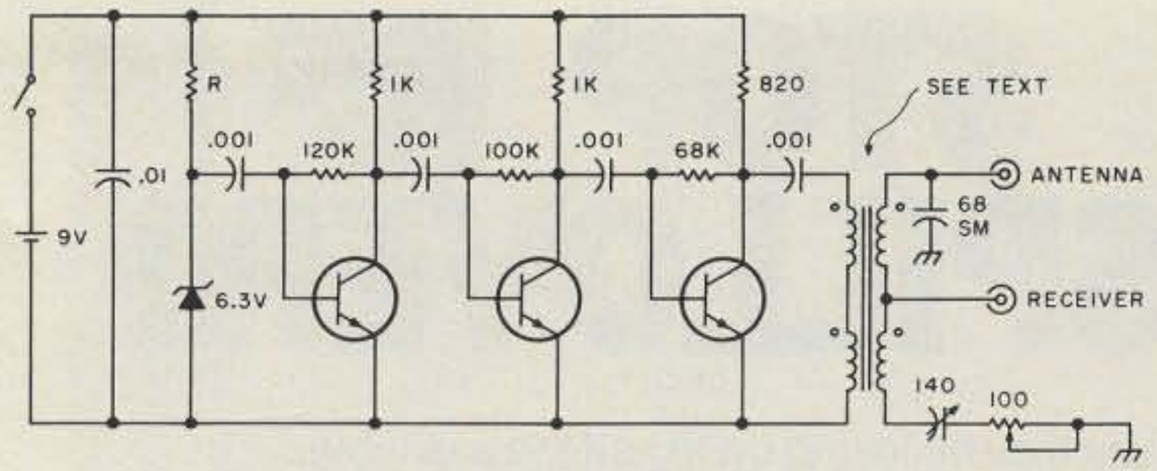


Fig. 2. Complete basic noise bridge. The resistor, R, is chosen for maximum noise output using any given 6.3 volt zener. Start with a value of about 1K Ohm. If the variable RC components on the output have their rotation calibrated, the bridge can be used to directly measure complex impedances over the range of 160-6 meters. Transistors are 2N5129 or HEP or Radio Shack equivalents.

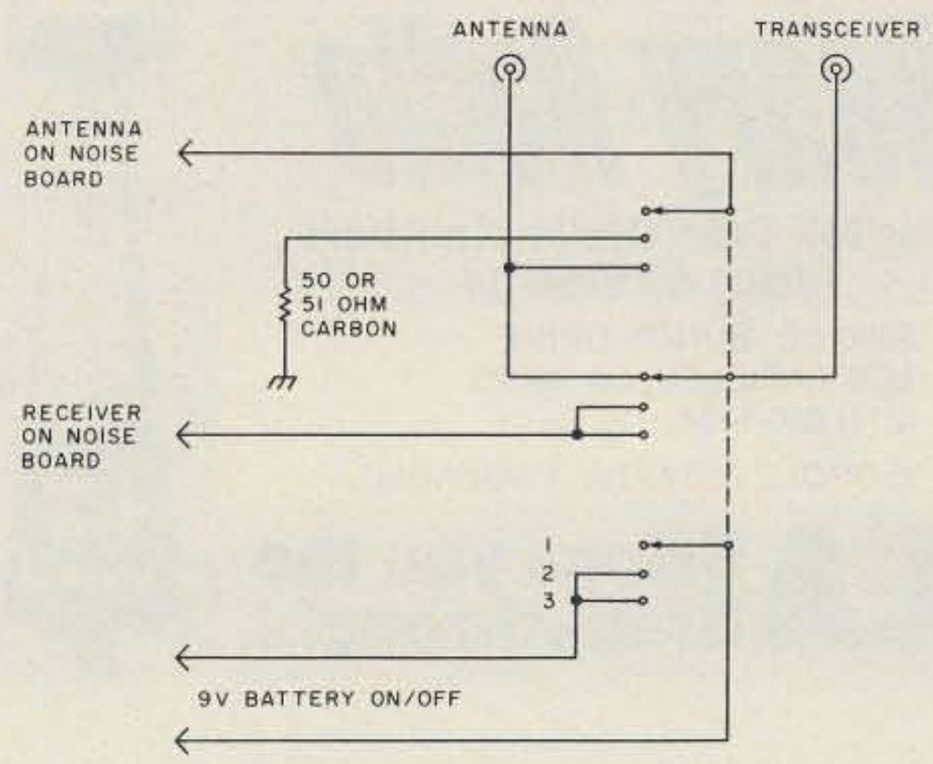


Fig. 3. Some additional switching circuitry makes the noise bridge more versatile and easier to use if you are primarily interested in only 50-Ohm load adjustments. Switch positions are: 1—off (bypass); 2—test (calibrate); 3—on (operate).

Using various value capacitors and calculating X_C for each value capacitor (using the frequency the receiver is tuned to) calibrates the X_C side. You could calibrate the X_L side using various value inductors but it is generally accurate enough to just mark the X_L side as a mirror image of the X_C side.

Following the above procedure, you can develop a nicely calibrated test instrument to measure complex impedances. I have had such an instrument in use for several years with very good results. However, most amateurs really don't measure complex impedances very often.

The main advantage to a noise bridge for most amateurs is that it allows the leisurely setting of antenna tuners or other matching devices to provide a 50-Ohm load to a transceiver. In such cases, by adding an extra switch and resistor to the basic noise bridge one can develop a simple, self-calibrating noise bridge. The switching arrangement shown in Fig. 3 allows the noise bridge to be bypassed (with the battery switched off), switched to a 50-Ohm "calibrate" position, or switched into operation.

I assembled my 50-Ohm noise bridge in a 4" × 2" × 1-1/2" enclosure.

The PC board is just held in place by stiff wiring to the side-mounted variable capacitor and potentiometer. The battery is held in place by back-to-back adhesive tape, although a proper holder is recommended. The 3P3T switch is at the top of the enclosure between the two coaxial connectors.

Rather than using two SO-239 female connectors, one connector was made from a UHF-type male connector. So, this arrangement saves having to use an adapter when inserting the bridge.

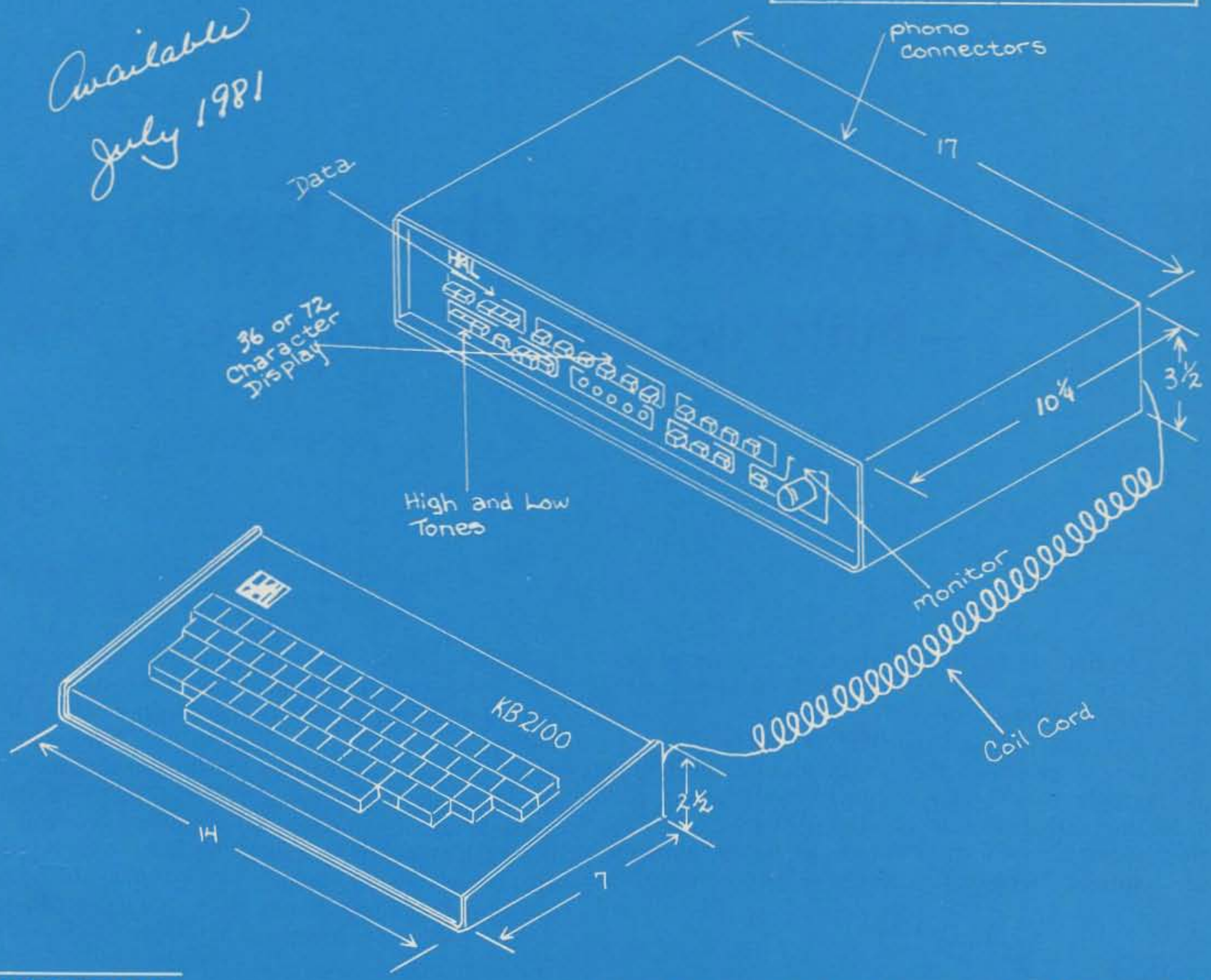
The male connector is mounted by means of a reducing adapter (for either RG-58 or RG-59) which fits the UHF male connector. A lock washer is threaded on the adapter which is too small to pass over the end flange of the adapter. The hole in the enclosure is made just large enough to pass the threaded diameter of the adapter. With the adapter inserted from the inside of the enclosure, the male connector is screwed on to it from the outside.

In operation, the noise bridge is first calibrated by switching to the 50-Ohm "test" (calibrate) position and adjusting the side controls (which are unmarked) for a noise null. Then you can switch to the "on" (operate) position for hours of leisurely testing (well, at least up to 7 or 8 before the battery will give up).

The side controls are, of course, not touched, and whatever device is being tested or adjusted is varied until the same noise null is obtained as with the 50-Ohm calibrating resistor. The "off"—or bypass—position is useful when you want to apply power to check that a 50-Ohm load has indeed been achieved for a transceiver. ■

The CT2100 Communications: Terminal

HAL COMMUNICATIONS CORP	
NEW PRODUCTS	
DATE: 1-26-81	SCALE: ½
DRN BY: GWH APP BY: PTT	No: B1251



SPECIFICATIONS:

- Two cabinets - basic CT2100 plus separate KB2100 keyboard.
- RTTY and Morse demodulators and video circuits included in CT2100.
- Small keyboard size; connects with one "coil-cord" for popular "lap operation".
- Streamlined CT2100 cabinet is attractive and small - may also be rack mounted.
- Satin finish black vinyl front panel with multicolor graphics.
- 26 control switches; red for "primary" and blue for "secondary" controls.
- 16 rear panel connectors - standard phono connectors.
- On-screen tuning indicator, LED indicators, and external scope connections.
- LED indicators for mark, space, cw tune, RTTY tune, audio overload, and KOS.
- CT2100 demodulates, decodes, and displays received Morse and Baudot or ASCII RTTY.
- CT2100 with KB2100 transmits and receives Morse, Baudot, or ASCII.
- Morse receive circuit tracks speed and minor frequency variations; 5 to 100 wpm.
- Morse transmit 5 to 100 wpm; key negative or positive key lines.
- Baudot or ASCII data rates of 45, 50, 57, 74, 100, 110, 150, 300, 600 or 1200 baud.
- Internal RTTY demodulator for both "high" and "low" RTTY tones plus two sets of modem tones (1070/1270 Hz or 1200/2200 Hz). Narrow shift CW ID included.
- All three RTTY shifts (170/425/850 Hz) for both "high" and "low" tones.
- Input/output connections for audio, tape recorder, RTTY loop, or RTTY RS232 data.
- RTTY mark-hold autostart, normal/reverse, full or half duplex, KOS transmit control.
- Large character (36 per line) or standard display (72 characters per line).
- White characters on black screen or reverse video.
- Two pages of receive display.
- Split screen for transmit buffer - pretype WHILE receiving.
- Two user-programmable 32 character HERE IS messages.
- Eight non-volatile 250 character EPROM stored brag-tape and HERE IS messages.
- Serial printer output prints all received text, Morse, Baudot, or ASCII.
- Built-in 120/220 50/60 Hz power supply.
- Receive-only users need only the CT2100 - add the KB2100 for transmitting later.

- LOW COST!

CT2100 Receive Only Communications Terminal	$845.00
KB2100 Transmit Option Keyboard	$175.00
ESM914/TR930 TV Monitor - 9"	$169.00

HAL COMMUNICATIONS CORP.
Box 365 ✓345
Urbana, Illinois 61801
217-367-7373

Phil Salas AD5X
707 Auburn Drive
Richardson TX 75087

IC-2A Accessories the Cheap Way

— build 'em yourself and save!

The Icom IC-2A has been on the market only a short period of time, yet it is already starting to look like it is going to be one of the most popular handie-talkies to hit the market. This article details a few easily built or acquired accessories which will further enhance the flexibility of this fine rig.

Remote Microphone

For mobile and belt-carrying use, an external microphone is a real nicety. You can easily fabricate a lightweight microphone with push-to-talk that fits the hand perfectly. First, accumulate the following parts:

- A single-conductor shielded guitar cord, coiled, available from Radio Shack (RS 42-978), which sells for $5. There's easily enough cord for two microphones, so split this with a friend.
- An electret condenser microphone element available from either Radio Shack ($3.00) or Bullet Electronics ($2.00).
- An SPST momentary contact miniature push-button switch. Radio Shack sells 5 for $2.50.
- A 24k-Ohm ¼-Watt resistor.
- A Polaroid "Print Coater" case. This is the small plastic case that the print-coating applicator supplied with Polaroid film comes in.

First, clean out the Print Coater case with soap and water. You can throw away the cap, as this won't be used. Now, punch a hole in the bottom of the case to take the coil cord, and cut a slot in the side of the case one inch long which has a width equal to the diameter of the shank of the push-button switch you are using. Don't mount the switch at this time. Pull one end of the coil cord through the Print Coater case and wire the coil cord, switch, resistor, and microphone element as shown in Fig. 1.

Note that only the power and shield connections to the microphone element are used. The audio output center conductor is taped up and not connected to anything. The audio feeds into the IC-2A through the power line of the condenser element.

With everything wired up, slide the push-button switch down the slot and fix in place with its locknut. Push the microphone element into the end of the case and secure in place with Silastic compound

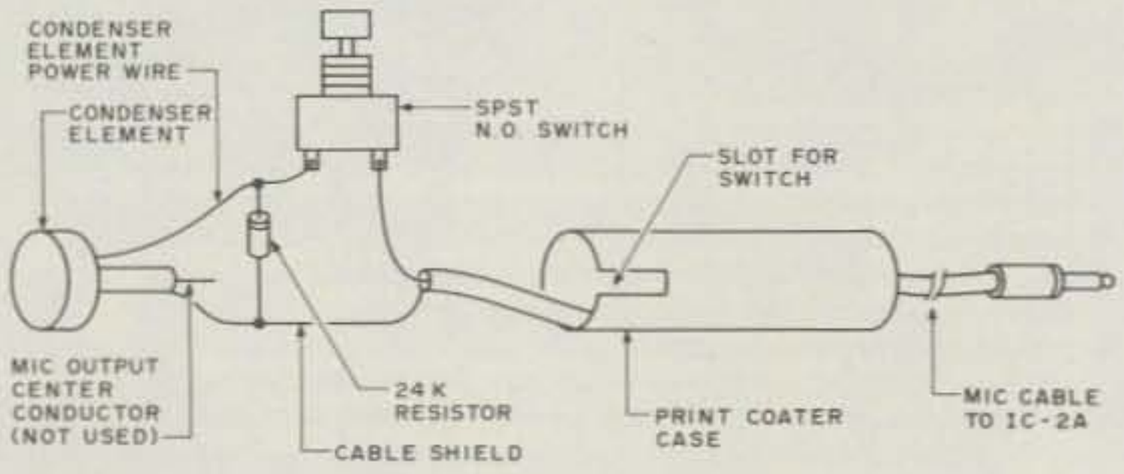


Fig. 1. PTT microphone details.

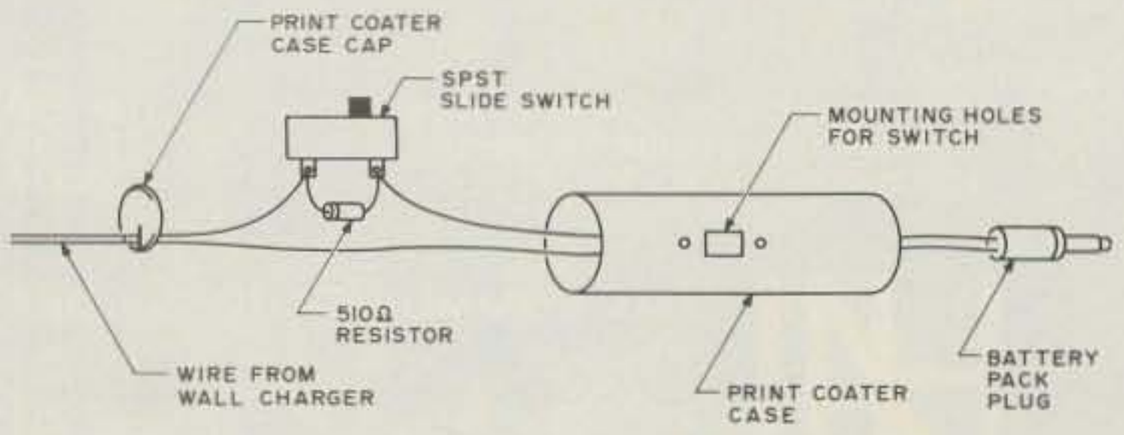


Fig. 2. Wall charger trickle adapter.

(available at any hardware or drug store). Also, fill in any extra gap in the case with the Silastic compound.

Finally, mount the subminiature microphone connector supplied with the IC-2A on the free end of the guitar cable. Voila! You now have a great remote microphone. Pushing the PTT switch both completes the microphone circuit and causes the IC-2A to switch to transmit. This is accomplished by a clever bias circuit within the IC-2A which permits a remote microphone with push-to-talk using just a center conductor and ground. This remote microphone sure makes mobile operation easier and the price is right!

Trickle Charger

The wall charger that comes with your IC-2A charges the batteries at a 50-milliamp/hour rate. However, like any nicad battery, battery damage can occur if you overcharge the batteries. The recommended charge time is 16 hours for a completely discharged battery. It is also recommended that you discharge the batteries completely each time since nicads can develop a memory based on less than full discharges. Since minor things like work and sleep sometimes keep me from being around at the end of a 16-hour period, I felt that it would be beneficial to be able to trickle-charge the batteries during these times. Since trickle-charging will not harm a nicad, you can leave an extra battery pack on a constant trickle-charge to ensure a fully-charged battery pack when you need it. The recommended trickle-charging rate is approximately one percent of the battery Ampere-hour capacity. For the standard 250 mAh IC-2A nicad pack, this will be 2.5 milliamps. Your IC-2A wall charger can be converted to a switchable trickle/normal charger for less than one dollar. You will need the following: one 510-Ohm ¼- or ½-Watt resistor, a miniature SPST slide switch (Radio Shack sells two for 79 cents), and a Polaroid Print Coater case (remember this?).

First, wash out the Print Coater case with soap and water. Next, cut a cross in the bottom of the case and push through the wall charger connecter. Pull about a foot or so of cord through the case. Now notch the case cap so as to pass the cord. The mounting holes for the miniature slide switch are now cut in the side of the Print Coater case. The switch will mount from the inside of the case, but don't mount it yet. First cut one of the wires of the charging cable. Now wire the 510-Ohm resistor, SPST switch, and charging cable as shown in Fig. 2. Slide the SPST switch into the Print Coater case and snap the case cap in place. The SPST switch now either shorts out the 510-Ohm resistor for normal charging or permits the 510-Ohm resistor to stay in the line for a 3-milliamp trickle-charge rate. The LED charging indicator in the 250-mAh battery pack will not light with the 3-milliamp trickle-charge rate, so I use the status of this indicator to tell me if the charge switch is set to the normal or trickle state. I think that you will find this to be a very worthwhile modification to the wall charger. The total time required for this modification is less than ½ hour.

12 V dc Power Cord

An inexpensive 12 V dc charging cord which includes a cigarette lighter plug on one end and the same plug which mates with the IC-2A battery pack on the other end is available from Radio Shack. It is an RS 270-1533 and sells for $2.99. A useful addition to this cord is the trickle/normal switch modification just described. This permits you to keep a battery pack trickle-charging in the car all the time.

K-Mart Karrying Kase

Finally, I found an Instamatic camera carrying case at K-Mart which fits the IC-2A almost perfectly. The only size problem had to do with the camera case being three-fourths of an inch too long. I compensated for this with a ¾-inch wood spacer. The beauty of this is that the IC-BP4 450-mAh battery pack will extend the length of the IC-2A by exactly ¾" permitting this case to be used with either battery pack. A little care with an X-acto® knife over a period of about one hour will leave you with a very professional looking case complete with all cutouts. In addition, I also sewed a couple of leather loops to the side of the case to hold both the flex antenna and a collapsible 19-inch antenna purchased separately. The PTT switch is easily pressed by squeezing the case. Incidentally, the price of this case was $3.67!

I've described several inexpensive accessories for the IC-2A. I am sure that you can continue along this line with others. For example, a real speaker/mike complete with touch-tone™ pad built into an old CB microphone is in the planning stages. I'm also working on an inexpensive remote speaker/amplifier box for mobile operation. I'll have more on these at a later date. I think that you will find that with a little work, you can easily build many of the desired accessories for your IC-2A. ■

See List of Advertisers on page 114

2300 MHz

NEW LOW PRICE

READY TO INSTALL . . 89.95

CONVERTER KIT 29.95
NEC NEO2137 TRANSISTOR . . . . 3 for 7.95
CONVERTER KIT ASSEMBLED 38.95
POWER SUPPLY ASSEMBLED 19.95
CIGAR ANTENNA 19.95
HOUSING, MTG BRKT, 50 COAX 19.95

TERMS: CHECK, VISA, MASTER CARD

IN STOCK - READY TO SHIP

2012 15th Av. • Ft. Worth, Tx. 76102

817-332-2994

AUGUST SALE

BONUS 2% discount for prepaid orders
(cashier's check or money order)

ege, 453 inc.

TOLL FREE HOURS: 1-800-336-4799 ORDERS ONLY M-F 11-8; SAT 9-3 EDT CLOSED TUESDAYS

MFJ PRODUCTS	**COMPLETE LINE IN STOCK**
989 New 3KW Tuner	244.95
962 1.5KW Tuner mtr/switch	174.95
949B 300 watt deluxe tuner	122.00
941C 300 watt tuner switch/mtr	78.42
940 300 watt tuner switch/mtr	69.70
484 Grandmaster memory keyer 12 msg	121.72
482 4 msg Memory keyer	87.96
422 Pacesetter Keyer w/Bencher BY1	87.15
410 Professor Morse keyer	113.95
408 Deluxe Keyer with speed mtr	69.69
406 Deluxe Keyer	58.95
752B Dual tunable filter	78.42
102 24-hour clock	30.95
260/262 Dry Dummy Loads	23.50/43.55
250 2KW PEP Dummy Load	28.25
820 SWR/Watt Meter + one sensor	58.95
825 Dual SWR/Watt Meter + one sensor	101.95
BENCHER PADDLES Black/Chrome	35.90/43.75
ASTRON POWER SUPPLIES (13.8 VDC)	
RS7A 5 amps continuous, 7 amp ICS	48.60
RS12A 9 amps continuous, 12 amps ICS	66.35
RS20A 16 amps continuous, 20 amp ICS	87.20
RS20M same as RS20A + meters	105.50
RS35A 25 amps continuous, 35 amp ICS	131.95
RS35M same as RS30A + meters	149.95
TELEX HEADSETS-HEADPHONES	
C1210/C1320 Headphones	22.95/32.95
PROCOM 200 Headset/dual Imp. MIC	77.50
PROCOM 300 lt/wt Headset/dual Imp. mic	69.95
B & W 370-15 Allband dipole	123.45
VoCom Antennas/2m Amps	
5/8 wave 2m hand held Ant.	18.95
2 watts in, 25 watts out 2m Amp	69.95
200 mw in, 25 watts out 2m Amp	82.95
2 watts in, 50 watts out 2m Amp	108.95
MIRAGE AMPS & WATT METERS	
MP-1 HF SWR/Watt Meter	101.95
MP-2 VHF SWR/Watt Meter	101.95
B23 2 in, 30 out, All Mode	76.95
B108 10 in, 80 out, All Mode, Pre Amp	151.95
B1060 10 in, 160 out, All Mode, Pre Amp	235.95
KENWOOD, ICOM, YAESU, TEN-TEC, AZDEN, SANTEC Call for quotes.	

HY-GAIN ANTENNAS	
TH6DXX Triband Beam	238.95
TH3MK3 3-Element Beam	179.95
TH3JR 3-Element Triband	138.95
18AVT/WB 10-80 Vertical	82.95
14AVQ/WB 10-40 Vertical	50.77
CUSHCRAFT ANTENNAS	
A4 New Triband Beam 10-15-20m	206.95
A3 New Triband Beam 10-15-20m	169.95
AV3 New 10-15-20m Vertical	41.50
AV5 New 10-80m Vertical	89.75
ARX 2B New Ringo Ranger 2m	34.00
A32-19 2m "Boomer" DX Beam	75.95
220B 220 MHz "Boomer"	68.95
214B Jr. Boomer 144-146 MHz	62.10
214FB Jr. Boomer 144.5-148 MHz	62.10
A147-11 11-Element 2m	34.50
MINIQUAD HQ-1	129.95
ALLIANCE HD73 Rotor	91.95
CDE HAM IV ROTOR	178.20
CABLE RG8/U Foam 95% Shield	25¢/ft.
8 wire Rotor 2 #18, 6 #22	17¢/ft.
BUTTERNUT HF-5V-III 10-80m Vertical	84.95
KLM ANTENNAS	
160V 160 Meter Vertical	84.95
KT34A 4-Element Triband Beam	320.75
KT34XA 6-Element Triband Beam	469.50
144-148 13LB 2m 13-Element with balun	77.95
144-148 16C 2m 16-Element for oscar	93.55
420-450 14 420-450 MHz 14-Element Beam	37.54
420-450 18C 420-450 MHz 18-Element oscar	58.70
432 16LB 16 elem. 430-434 MHz beam/balun	60.70
HUSTLER 5BTV 10-80m Vertical	87.50
4BTV 10-40m Vertical	69.50
3TBA New 10-15-20m Beam	161.95

HF Mobile Resonators	**Standard**	**Super**
10 and 15 meter	7.25	12.50
20 meters	9.95	14.95
40 meters	11.95	16.50
75 meters	12.95	26.95

Avanti AP 151.3G 2m on glass ant 26.95

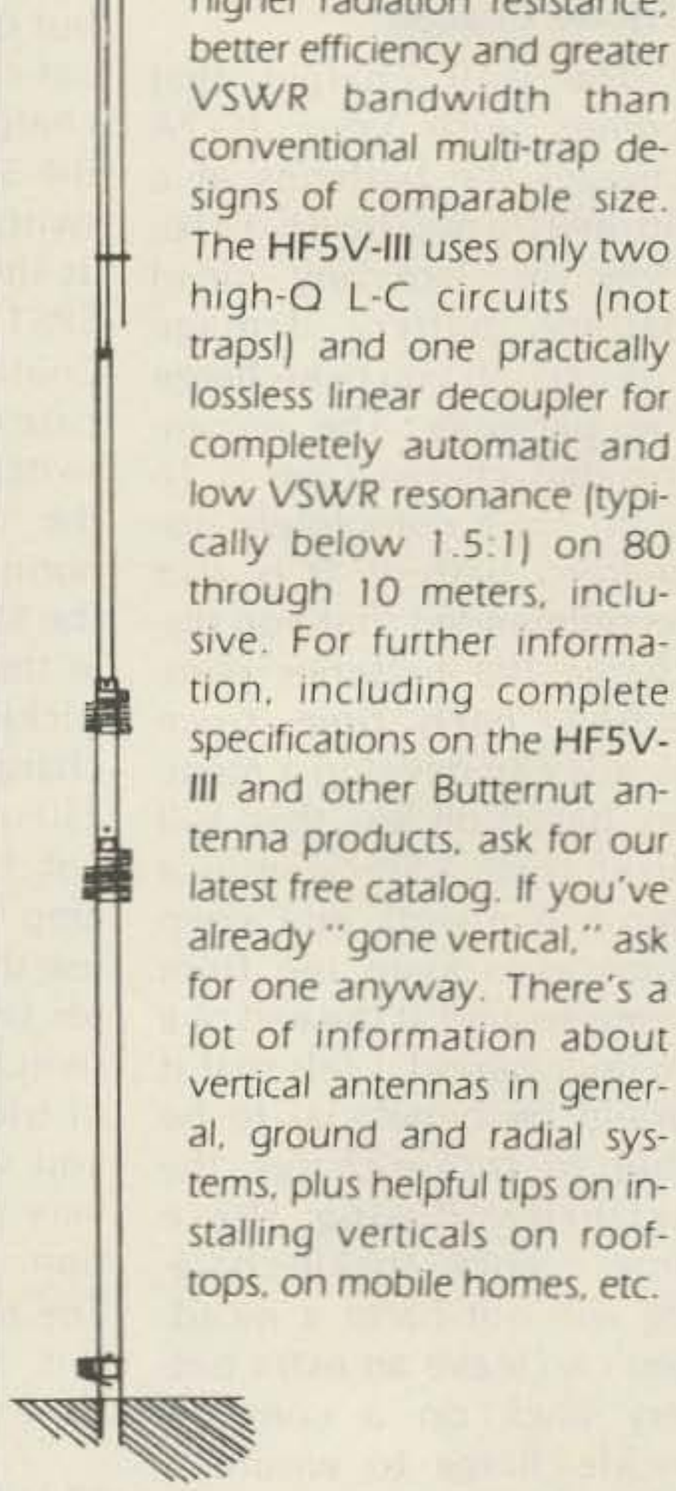
— CALL FOR QUOTES —

Send stamp for a flyer. Terms: Prices do not include shipping. VISA and Master Charge accepted. 2% discount for prepaid orders (cashier's check or money order). COD fee $2.00 per order. Prices subject to change without notice or obligation.

2410 Drexel Street
Woodbridge, VA 22192
Information: (703) 643-1063 Orders: 1-800-336-4799

WHY PAY

FULL PRICE FOR AN 80-10 METER VERTICAL



. . . if you can use only 1/3 of it on 10?
. . . or only 1/2 of it on 20?
. . . or only 3/4 of it on 40?

Only Butternut's new **HF5V-III** lets you use the entire 26-foot radiator on 80, 40, 20 and 10 meters (plus a full unloaded quarter-wavelength on 15) for higher radiation resistance, better efficiency and greater VSWR bandwidth than conventional multi-trap designs of comparable size. The **HF5V-III** uses only two high-Q L-C circuits (not traps!) and one practically lossless linear decoupler for completely automatic and low VSWR resonance (typically below 1.5:1) on 80 through 10 meters, inclusive. For further information, including complete specifications on the **HF5V-III** and other Butternut antenna products, ask for our latest free catalog. If you've already "gone vertical," ask for one anyway. There's a lot of information about vertical antennas in general, ground and radial systems, plus helpful tips on installing verticals on rooftops, on mobile homes, etc.

BUTTERNUT ELECTRONICS CO.

P.O. Box #1411
San Marcos, Texas 78666
Phone: (512) 396-4111

RTTY READER--NEW LOW PRICES!

Decodes RTTY signals directly from your receiver's loudspeaker. * **Ideal** for SWLs, novices & seasoned amateurs. * **Completely** solid state and self-contained. Compact size fits almost anywhere. No CRT or demodulator required . . . Nothing extra to buy! * **Built-in** active mark & space filters with tuning LEDs for 170, 425 & 850 Hz FSK. * **Copies** 60, 67, 75, & 100 WPM Baudot & 100 WPM ASCII. * **NOW** you can tune in RTTY signals from amateurs, news sources & weather bulletins. The RTTY READER converts RTTY signals into alphanumeric symbols on an eight-character moving LED readout. Write for details or order factory direct.

RTTY READER KIT, model RRK $169.95
RTTY READER wired and tested, model RRF $249.95

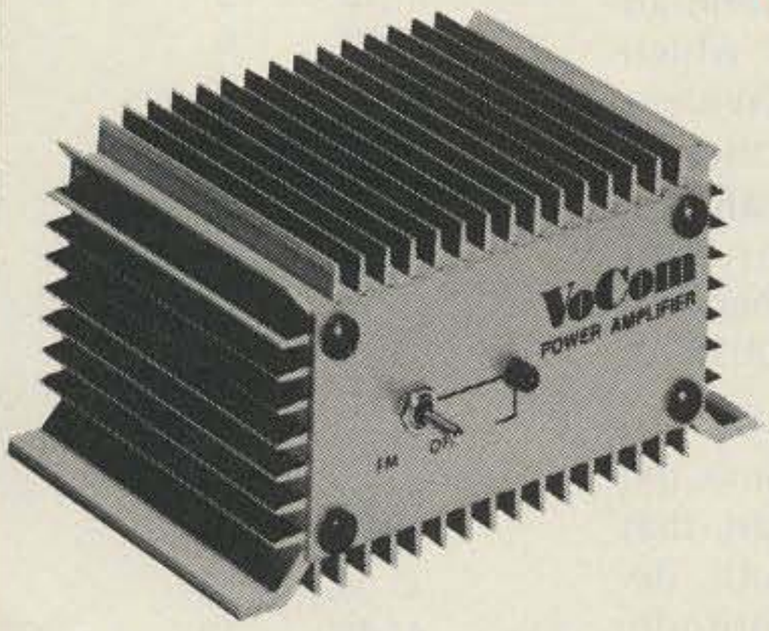
Send check or money order. Use your VISA or MasterCard. Add $5.00 shipping and handling for continental U.S. Wisconsin residents add 4% Wisconsin State Sales Tax.

Microcraft Corporation ✓50 Telephone: (414) 241-8144
Post Office Box 513G, Thiensville, Wisconsin 53092

Handful of POWER

Give your low-power 2-meter rig real punch by delivering a potent 25-watt signal with only two watts of drive (also available set up for 200 milliwatts drive). Compact and convenient to mount, VoCom's Model 2C025 is ideal for car, boat or anywhere you've got a 12 VDC source. At only $84.95 ($99.95 for 200 mW drive), it's the perfect companion for your Drake, Encomm, Henry, Icom, Kenwood, Motorola, Standard, Wilson, Yaesu or other 2-meter FM portable!

- **.2 or 2 watt nominal drive (specify)**
- **2 watt model delivers 15-20 watts with only one watt of drive**
- **10 MHz bandwidth for CAP or MARS**
- **Meets all applicable FCC specifications**
- **200 mW drive model permits operating Icom IC-2A or Yaesu FT-207R on their battery-saving low-power mode**
- **Only $84.95 ($99.95 for 200 mW drive)**



Even More POWER

Give your 2-meter hand-held 50 watts of punch with the Model 2C050, or 100 watts with the Model 2C100 amplifiers. Or use the Model 2C100 with your 25-watt output 2-meter rig, by plugging in the appropriate drive-programming module.

Compact and reliable, all VoCom power amplifiers feature front-panel on-off switching for convenient shut down when they're not needed for short hauls, plus an LED status indicator.

See your dealer or contact VoCom today for a copy of our detailed four-page catalog.

ANTENNAS for 2-meter Hand-Helds

5/8-Wave Gain Antenna

Provides nearly 10-dB gain over a rubber ducky when extended to its full 47", yet telescopes to only 8" for listening or carrying. Works with any BNC equipped radio... **Only $24.95**

NEW! Short, Compact "UGLY DUCKLING"

Only 4⅛" short, yet performs like a "full size" ducky. Available for either BNC or threaded mounts.
Only $14.95 (BNC), $12.95 (threaded)

Available now from your local amateur radio dealer or order direct:

VoCom PRODUCTS CORPORATION ✓90
65 East Palatine Road, Suite 111, Prospect Heights, IL 60070
(312) 459-3680

✓See List of Advertisers on page 114

INTRODUCING THE

CES 500SA SIMPLEX AUTOPATCH

The First Affordable Private Phone Patch

As described in 73 Magazine, 6/81.

Now, for the first time! Every amateur operator can enjoy the unparallelled freedom of a private phone patch in an economical package.

The dramatic new CES 500SA Autopatch is all the equipment you need to patch an FM base station to your home or other telephone line, without expensive repeaters, cavities, or other equipment. Connections with any standard FM base station are rapid and simple.

Bypass the congestion and expense of shared repeaters — break through to greater privacy and convenience with the new CES 500SA Autopatch.

COHERENCE IN COMMUNICATIONS TECHNOLOGY

CES

COMMUNICATIONS ELECTRONICS SPECIALTIES, Inc.

P.O. Box 507
Winter Park, Florida 32790
Telephone: (305) 645-0474

✓462

Louis Berman K6BW
1020 Laguna Avenue
Burlingame CA 94010

Solar-Powered Alignment Tool

—using Old Sol to find true North

Two common methods of calibrating the direction of a beam antenna with respect to true north (or south) are: to align the boom in the direction of the polestar, or to apply the variation correction to the magnetic north (or south) reading of a compass. Unfortunately, there is no accommodating star at the south celestial pole for observers in the Southern Hemisphere. The variation correction depends upon one's latitude and longitude.

The method I shall describe here is simpler; it is based upon the sun's meridian passage at any locality in the world. All one needs to know is one's approximate longitude obtained from a world map and the local mean time (LMT) of the sun's meridian transit. At this moment, the sun is at its maximum altitude and is on a north-south line. Table 1 lists the LMT of the sun's meridian passage on the first, tenth, and twentieth of each month. These values do not vary by more than about one minute from year to year.

Since our clocks are based on standard or zone time and not on local time, it is necessary to apply a longitude correction, converted to time units. Table 2 allows this, to the nearest standard meridian. The standard meridians theoretically are spaced 15° apart to the east or west of the Greenwich prime meridian. If the station longitude is east of the standard meridian, subtract the difference in longitude in time units between your station and the nearest standard meridian from the LMT; if the station longitude is west of the standard meridian, add the longitude difference in time units to the LMT. Thus, standard or zone time = LMT plus or minus the difference. Because the time zones have ragged boundaries, it may be necessary to add or subtract one hour, and, in some instances, one-half hour, as the custom dictates.

To demonstrate the simplicity of the solar method, two examples are chosen.

(1) What is the standard time of meridian passage of the sun at longitude 114° 20′ W on October 15? From Table 1 we interpolate a value of 1145 LMT. The nearest standard meridian is 120° W. The difference in longitude between the station and the nearest standard meridian is 5° 40′. From Table 2, this amounts to 23 minutes. Since the station is *east* of the standard meridian, the Pacific standard time of the sun's meridian passage is 1145 − 0023 = 1122 PST.

(2) What is the standard time of meridian passage of the sun at longitude 25° 40′ E on March 25? From Table 1, LMT = 1205. The difference in longitude between the station and the nearest standard meridian of 30° E is 4° 20′, which from Table 2 is equivalent to 17 minutes. Since the station is *west* of the standard meridian, the standard time of the sun's meridian passage is 1205 + 0017 = 1222.

At the standard time the sun is on the meridian, that is, due north or south, depending on your latitude, line up the antenna boom with the sun or parallel to any shadow cast by a vertical structure (pole, tower, etc.). An error of 4 minutes in time amounts to a change in the direction of the sun of only 1°. Set the direction indicator of your rotator to 0°. Make certain that the radiating element of the antenna is on the correct side of the boom—otherwise you could be 180° off. That's all there is to it! ■

Date	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1202	1213	1211	1203	1156	1157	1203	1205	1159	1149	1143	1148
10	1207	1213	1209	1200	1155	1159	1204	1204	1156	1146	1143	1152
20	1210	1213	1207	1158	1156	1201	1205	1202	1153	1144	1145	1157

Table 1. LMTs of sun's meridian passage. These times basically correspond to the sun's transit over the Greenwich meridian, taken from the American Ephemeris and Nautical Almanac. *Because the sun's apparent eastward daily motion is of the order of 1° or less, the slight difference between the Greenwich and the local mean time of the sun's meridian transit may be neglected.*

Arc	Time (minutes)
0° 00′	0
0° 15′	1
0° 30′	2
0° 45′	3
1° 00′	4
1° 15′	5
1° 30′	6
1° 45′	7
2° 00′	8
2° 15′	9
2° 30′	10
2° 45′	11
3° 00′	12
3° 15′	13
3° 30′	14
3° 45′	15
4° 00′	16
4° 15′	17
4° 30′	18
4° 45′	19
5° 00′	20
5° 15′	21
5° 30′	22
5° 45′	23
6° 00′	24
6° 15′	25
6° 30′	26
6° 45′	27
7° 00′	28
7° 15′	29
7° 30′	30

Table 2. Difference of longitude conversion.

hy-gain

Specials & Closeouts, etc.

Tower & Antenna Deal

Get in on **HY-GAIN'S SUPER 5-Bander Promotion.** Once-in-a-lifetime Package Deal available good until August 31st. Call **AES** today and order yours, the complete package will be shipped to you promptly with NO DELIVERY CHARGE within the contiguous 48 States.

Here's what you get!...

HY-GAIN HG52SS 52' Self-Supporting Crank-Up Tower for antennas up to 9 ft² @ 50 mph. All steel with improved guide system for close-tolerance structural support, hand-cranked winch. Inside and outside surfaces hot-dipped galvanized. Requires no guying at rated load, retracts to 21' for weather or service. With base & rotator plates, 10' mast & (3) coax supports.

HY-GAIN TH5DX Thunderbird 5 element triband beam for 20, 15 & 10 meters. Three active elements on 15 & 20m; four active on 10 meters. High average gain and front-to-back ratio; handles maximum legal power. Boom length 18', longest element 31', turning radius 18', wind area 6.4 ft², wt. 50 lbs. Includes BN-86 balun.

HY-GAIN 2BDQ Trap Doublet for 40 & 80 meters. pretuned traps, true half-wave length performance on both bands. Overall length 101'. Includes weatherproof center insulator, end insulators and BN-86 balun.

HY-GAIN HDR300 Heavy-Duty/Digital Readout Rotor. A rugged, dependable rotor with a digital readout console control. Rated for 25 ft² of antenna area, tower mounted. Stall torque: 5000 in/lbs., Braking torque: 7500 in/lbs. Readout out accurate to ± 1°. Mast sizes 1¼"to 3" O.D., requires 8-conductor control cable.

Here's what it costs!...

Model & Description	Ham Net
HG52SS Crank-up Tower	$990.00
HG10 10' mast	56.00
HGCOA Coax Arms (3)	39.00
TH5DX Tri-Band Antenna	289.95
2BDQ Trap Doublet	59.95
BN-86 Baluns (2)	31.90
HDR300 Rotator	499.95
Total Ham Net Value	1966.75
You Pay Only	1366.75

YOU SAVE $600.00

PLUS FREE DELIVERY

master charge THE INTERBANK CARD

VISA

✓467

Order now as quantities limited & prices subject to change without notice. Send Check, Money Order or Call TOLL FREE and use MASTERCARD or VISA. Except on the HY-GAIN tower deal, Sale Prices DO NOT include Shipping Charges.

Collins KWM-380

SAVE up to $1000

on certain serial numbered units.

Call for Price - Quantity Limited

ENCOMM

Santec HT-1200

SAVE $60.00

Regular $379 - ***Sale $319***

ACCESSORIES:

ST-LC Leather case	$29.95
ST-5BC 5-hour base quick charger & stand	69.95
SM-1 Remote speaker micropnone	29.95
ST-500B Extra 500ma nicad battery	24.95
ST-MC Mobile charge/power cord	9.95
ST-EC External charge adaptor	4.95
SS-32 Subaudible tone generator	29.95
MC-50S Remote speaker	14.95
ST-EMC External microphone connector	6.95

SAVE at least $300

Limited Quantity

on DRAKE TR-7 Transceiver

Call Today for Special Sale Price!

SWAN WATTMETERS

SWAN WM-1500 (left) In-Line Wattmeter. Four scales read zero to 5, 50, 500 or 1500 Watts, forward or reverse. Full scale accuracy better than +-10%, 2-30 Mhz; usable with reduced accuracy up to 50 Mhz. 50 ohms, SO-239's. 6"h × 6"w × 4½"d, 2 lb. *(Regular $74)*..... ***Now $59***

SWAN WM-6200 (right) Through-Line type Wattmeter for 50-150 Mhz. Reads zero to 20 or 200 Watts & VSWR 1:1 to 3:1. Accuracy: +-7% Power, +-5% VSWR. SO-239's. 4"h × 8"w × 5½"d, 3 lb. *(Regular $87)* ..... ***Now $59***

DenTron W-2 Wattmeter. For 1.8 to 30 MHz. Dual meters simultaneously show forward & reflected power. FWD scale 200/2000w, REF scale 200w; 5% accuracy. Remote sensor box. 3½"h × 7"w × 6"d. *(Regular $129)* ..... ***Now $99***

DenTron W2-PEP PEP (peak) or average power in-line wattmeter. For 1.8 to 30 Mhz. Dual meters simultaneously show forward and reflected power. FWD scale 200/2000w, REF scales 50/500w. Push button functions with LED indicators. Remote sensor. Requires 117Vac. 3½"h × 7"w × 5½"d. *(Regular $159)*..... ***Now $119***

DenTron Multi-PS-10 A complete 10 K Ohm per volt VOM that doubles as a 20/200w RF wattmeter and SWR bridge. 3.5 to 150 Mhz, 2½" scale. *(Regular $49)* .. ***Now $29***

Shakespeare 2m Antennas

5600-1 2m Trunk mount mobile fiberglass antenna. Base loaded ⅝ wave gain, 500 watts. Mounts on trunk lip with out drilling or in ¾" hole in body. 20' of coax & connector. *Regular $35* ..... **Sale $15.95**

5600-3 2m Magnetic mount mobile fiberglass antenna. Base loaded ⅝ wave gain, 500 watts. Powerful magnetic base adheres to any ferrous surface. 20' of coax & connector. *Regular $36* ..... ***Sale $25.95***

5601-A 72" 2m fiberglass mobile whip antenna. A colinear full wave stacked array with phasing network. Additional gain over a ⅝ wave for increased range. Has ⅜"-24 stud that fits most standard ball & bumper mounts. *Regular $15* ..... ***Sale $9.95***

5701 2m Economy fiberglass ground plane. Base loaded ⅝ wave gain design, 100 watts. Use 1¼"-1½" mast, hardware incl. *Regular $29*..... ***Sale $19.95***

5703 9½' 2m vertical fiberglass base antenna Two ⅝ wave elements in phase with a ¼ wave isolating sleeve, provides a substantial amount of gain. Choke sleeve isolates feed line. U-bolts provided for mounting to a 1¼" to 1½" mast. *Regular $64* ..... ***Sale $45***

STORE HOURS: Mon, Tue Wed & Fri 9-5:30; Thurs 9-8 (Vegas 9-6); Sat 9-3 • Milw WATS line open for orders until 8 pm CDST, Mon thru Thurs.

Call Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio Wats 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO Florida 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. Wats 1-800-432-9424
Outside Fla. 1-800-327-1917

LAS VEGAS, Nevada 89106
1072 N. Rancho Drive
Phone (702) 647-3114
Pete, WA8PZA & Squeak, AD7K
Outside Nev. 1-800-634-6227

ASSOCIATE STORE

ERICKSON COMMUNICATIONS
CHICAGO, Illinois 60630
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside ILL. 1-800-621-5802

R. Stanley Dicks W8YA
c/o English Department
Wheeling College
Wheeling WV 26003

The DX Primer

—low power plus low antennas plus good technique equals 300 countries

One of the things that many amateurs look forward to the most when they upgrade is the prospect of being able to work some DX with their new privileges. Novices especially look forward to being able to operate on better DX frequencies and on 20 meters. However, many of these would-be DXers are discouraged right from the start.

Because they have heard that 20 is the best DX band, they listen to the stations in the "kilowatt alley" on that band from about 14.200-250 MHz. These stations all seem to be running a full kilowatt (at least) and a four- or five-element beam at about 70 feet or more. They are always giving out 59+20-dB reports to DX stations which the newcomer can't even hear with his modest transceiver and dipole at 25 feet. The newcomer listens for awhile, decides that DXing is a game for wealthy fanatics, and heads for two meters or for a rag-chew on 75 SSB.

He has been too hasty, though, for it is quite easy to work DX with that 100-Watt transceiver and a low-slung dipole. It takes some patience and some special techniques, but it can be done. I worked my first 100 countries with 20- and 15-meter dipoles 10 feet high and a barefoot transceiver. I worked 262 countries before I got an amplifier and worked 310 countries before any of my antennas were higher than 29 feet.

In many European countries, amateurs are limited to about 200 Watts of power, and yet stations from those countries constantly show up on the honor roll. So, it is possible.

Equipment

Before discussing some of the techniques for low-power DX chasing, at least a little should be said about equipment and antennas. The most important parts of your station when it comes to working DX are, in order: antenna, receiver, transmitter. The antenna is by far the most important factor in determining how successful you will be at DXing. It does not matter how expensive or marvelous your receiver is, it can't receive signals that aren't fed into it, and it is the job of the antenna to pick those signals up and to send them to the receiver. Likewise, it doesn't matter how much power your transmitter runs and how clean and pure your signal is; if your antenna won't radiate that signal out of your backyard, then you aren't going to work any DX.

So, you should put up the best antenna you possibly can. We are already assuming here that you cannot get an antenna up very high. If that is so, then what antenna is best? There is no single answer to that question, and this is not meant to be an article on antennas. I do have some general advice, however. If at all possible,

We proudly announce our Amateur Communications Terminal, the ACT-1. It's the best value in the Amateur Radio market for your RTTY/CW requirements. Check the combination of features and proven MICROLOG quality. You'll agree, the ACT-1 is a "Tough ACT to follow." Microlog Corp. 4 Professional Dr. Suite 119, Gaithersburg, MD 20760, Tel. 301-948-5307 Telex 908778.

Sales through your local dealer

MICROLOG 51

INNOVATORS IN DIGITAL COMMUNICATION

• SIMPLE DIRECT CONNECTION to your Transceiver. • COMPLETE SYSTEM, built-in Demodulator & AFSK Modulator with keyboard programmable tone pairs from 500 to 3000 Hz. • SPLIT-SCREEN operation with keyboard selectable line location • 1400 character text buffer. • TEN, 40 CHAR. programmable message memories, plus ID's WRU & SELCALs. • RANDOM CODE generator & hand key input for practice. • Baudot 60 to 132 WPM. • ASCII 110 & 300 baud. • SYNC-LOCK & NON standard speed ASCII operation from 10 to 200 baud, (slow speed = noise immunity). • RECORDER INTERFACE for "BRAG-TAPE" or recording off-the-air. • CODE CONVERTED Printer output in Baudot or ASCII. • SSTV/GRAPHICS transmit. • FULL 63 KEY Computer grade keyboard.

*9" monitor $199.

put up a gain antenna, and put it up as high as you possibly can. I worked my first 310 countries on dipoles and a three-element 20m yagi that I bought for $27 and put up on a TV tower at 29 feet. Look through the antenna books and the magazines and find articles on gain antennas you can construct. If necessary, use a fixed wire antenna, but get some gain if you can. For 10, you can pick up "retired" CB antennas for a song and recut them so they'll work on 10. In most cases, that involves cutting a few inches off the elements until you get the antenna resonant on 28 MHz.

Many old-timers will tell you that if you can't get an antenna up high, you should use a vertical because it has a lower angle of radiation and is, therefore, better for DX work. While this may hold true on 40 and on 80, where a dipole a half-wavelength high has to be 60 or 120 feet, respectively, it is not true on 20, 15, and 10. On 10, a dipole one-half wavelength high has to be only about 15 feet up. I had a good friend in Texas who worked the world on 10 with a little four-element yagi eight feet off the ground. My advice for the "higher" bands is that you put up a gain antenna if at all possible, and if not, put up a dipole as high and as clear as you can. Verticals will work fine on these bands for DX, sometimes better than a dipole, but they have two main disadvantages: 1) they are susceptible to QRM from all directions, and 2) they are considerably more susceptible to man-made noise—line noise, auto ignition, your neighbor's hair dryer, etc. I like verticals for 160, 80, and 40, but on the higher bands, dipoles seem to do the job as well or better.

Regardless of what type of antenna you put up, it should be carefully tuned so that it is resonant on the frequency you will be using most often. Also, it should be put together carefully. Wire connections and coax connectors should be soldered, tubing and pipes should be scraped and bonded together, etc. In short, anywhere where metal joins metal, the connection should be clean and solid. If you are going to use an antenna at a low height, you must ensure that it radiates and receives every Watt possible, rather than losing that precious power in bad connections, leaks to ground, faulty coax, etc.

Once you have your antennas in good shape outside, you should then concentrate on the gear you have inside. Even the most modest equipment is capable of working DX, but not if it is out of alignment or full of "soft" tubes. Unless you are sure that your gear, especially the receiver, is in perfect alignment, realign it yourself (the manual should tell you how), have a friend do it, or return it to the factory.

If you have tube-type equipment, replace at least the most critical tubes for receiving: the rf amplifier tube and the i-f stage tubes. Even though your receiver may sound like it's working OK, you might be surprised at how much "hotter" it becomes with new tubes. Save the old ones for spares.

Make sure that all of the contacts and interconnections in your shack are clean and well-soldered, especially those having to do with antenna and ground connections. An oxidized antenna connector might let rf through when you transmit and, thus, not show up on your swr meter, but it can seriously degrade receiver sensitivity, especially with weak DX signals.

There are several station accessories that you should consider if you want to chase DX. One is a good pair of headphones. Not only will they help ensure domestic tranquility, they will also help you hear weak signals under poor conditions better than you can through a speaker. You can get a good pair of 8-Ohm stereo headphones fairly inexpensively these days.

If you hear a lot of hum and hiss when you plug them into your receiver, you probably have an impedance mismatch. Many receivers have headphone jacks with impedances in the 500-2000-Ohm range. To match these to 8-Ohm headphones, you can buy an audio transformer at Radio Shack for a buck or two. Put it in the audio line so the 8-Ohm side goes to the phones and the higher impedance side goes into your headphone jack (you can even wire the transformer internally onto the jack). This should eliminate the mismatch-induced noise and will make headphone reception much more pleasant.

While we're on the subject of audio, you should also consider an audio filter for reception. Audio filters are available for as low as $30, and they can greatly improve the performance of a receiver, especially an inexpensive or moderately priced one. If you contemplate using mostly CW, you can get one of the CW-only filters; if you're going to work SSB, too, then you should consider one of the continuously variable filters. An audio filter will help improve your receiver's selectivity and will allow you to notch out QRM and to pull through those weak ones.

Yet another valuable accessory is an automatic keyer. Most DX pileups on CW are conducted at high speed (don't let that worry you; all you have to send and receive is your callsign and report). It is tough to send 20-30 wpm with a straight key for an hour or two in a pileup, and a keyer makes it much easier.

Finally, you might consider a speech processor of some kind. If you are running barefoot, the processing will give you several dBs of average gain, and this will definitely help under weak-signal conditions and in pileups. However, do not adjust the processing level too high (as most people do). It is tempting, but you will create splatter on adjacent frequencies, rob your audio of intelligibility, and possibly damage your transmitter.

Techniques

Now, you've got your antennas and your equipment ready. How do you work the DX? There are three main variables you need to consider: What mode will you operate? What band will you operate on? What time of day should you operate?

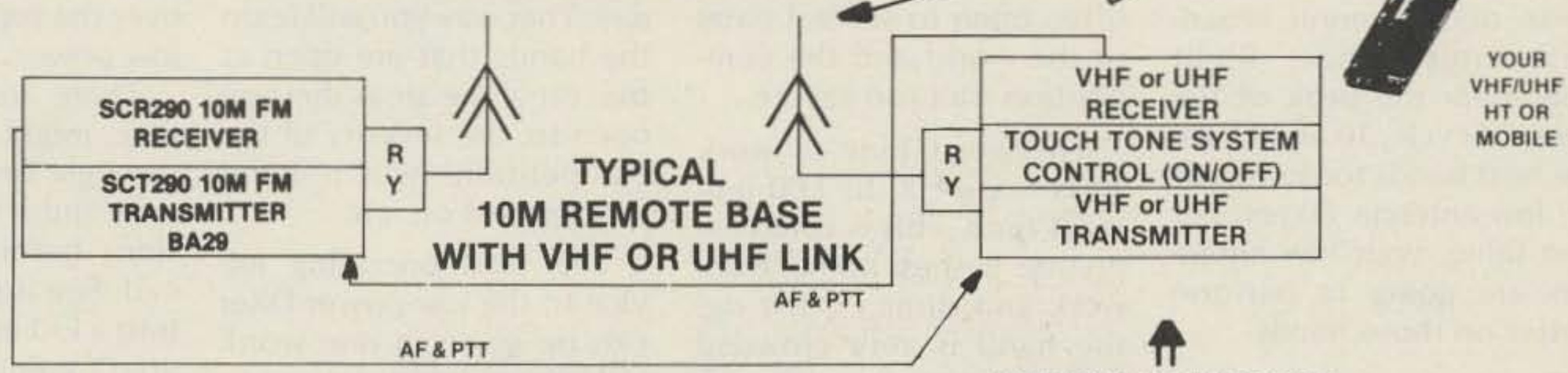
In general, the beginning DXer or the low-power DXer will do much better on CW than on SSB. There are two major reasons why this is true. First, CW is the better mode under weak-signal conditions, and it tends to be something of an equalizer under good conditions. On bands that are only marginally open, you can often make CW contacts when SSB contacts are virtually impossible. And, because of variations in the receiving station's frequency and pitch, your chances of getting through on CW when conditions are good will be better. Second, there is less competition on CW. There are fewer people tuning the band looking for DX than on SSB, and, thus, your chances are much greater of finding a rare one without anyone else calling. And the pileups are generally smaller and much easier

NEW

From Spec Comm

10M FM Receiver & Transmitter Boards or, Complete Shielded Subassemblies!

For 10M FM REMOTE BASES, REPEATERS, OR TRANSCEIVERS!



SCR290 BOARD

● *Totally New Advanced Design!*

SCT290 XMTR. ASSY.
SCT290 Xmtr/Exciter Board

SCR290 Receiver Board

- Wide dynamic range! Reduces overload, 'desense,' and IM.
- Sens. 0.3 uV/12dB SINAD typ.
- Sel. -6dB @ ±6 KHz, -104dB @ ±15 KHz. (8 Pole Crystal Fltr & 4 Pole Ceramic Fltr.!
- 5 Pole Front End Fltr.
- 'S Meter,' Discriminator & Deviation Mtr. Outputs
- Exc. audio quality! Fast squelch! w/0.0005% Crystal. $169.95.

SCR290 Receiver Assembly

- SCR290 mounted in shielded housing
- Completely asmbld. w/F.T. caps, SO239 conn., $235.00

- 2 or 35 Wt. Units. 100% Duty Cycle
- Infinite VSWR proof
- 1 chan.—expandable up to 6
- New Design—specifically for continuous rptr. or remote base service.
- Spurious −70 dB
- With, 0005% xtal. $139.95—2W.Bd.
- 35 W. Unit includes Heat Sink, 3 sec. L.P. Filter & rel. pwr. sensor. $215.00

SCT290 Transmitter Assembly

- SCT290 mounted in shielded housing
- Ready to "drop into" your system!
- Completely assembld. w/F.T. caps, SO239 conn.
- 2 or 35 Wt. unit. $235./290.00

- **JOIN THE FUN ON 10M FM!** This new phase of Amateur Radio is growing every day *and is one of the most exciting new modes of operation in years!*
- **10M FM COMBINES ALL OF THE BENEFITS OF VHF FM OPERATION WITH HF "LOW BAND" OPERATION**; i.e., the quiet, noise-free QSOs of 2M FM *except better ground wave range*, with less mobile fading and flutter due to hills and trees, etc. *Plus—occasional "Skip" contacts all over the country and around the world* ——— with all of the "solidness" and ease of cross-town channelized 2M FM contacts!
- **ON 10M FM,** you can use low cost, cutdown CB antennas and accessories. And, low cost 10M FM Transceivers are now available from other manufacturers, which will help to increase activity.
- **ON 10M FM,** you can avoid the crowded conditions on other bands!

Now you have a complete source for all of your 10M FM Remote Base, Repeater, Link or Transceiver needs! Spectrum can supply you with a complete set of *fully wired & tested* Rcvr. & Xmtr. Boards for 10M FM, (or 2M, 220 or 440MHz Links)! Also available are our **COR, ID** and **Touch Tone Control boards** which have been used by the thousands in Repeater systems throughout the world.

Or, if you wish, we'll build the complete system for you! 10M FM Remote Base with VHF/UHF Link, or Complete Split Site Repeater with Touch Tone and/or CTCSS control. ($2995.00). Note that all of our equipment is of the highest Professional "Commercial Grade" quality as opposed to the "low cost kits" on the market.

Write or Call for Details.

Also available—the finest in VHF/UHF repeaters!

✓68

SPECTRUM COMMUNICATIONS

1055 W. Germantown Pk, Dept. S8 • Morristown PA 19401 • (215) 631-1710

to get through. So, at least to begin with, you are probably going to do better on CW than on SSB.

Which band do you work? A good rule of thumb is to operate on the highest band that is open at any given time. The higher you get in frequency the less trouble there is with QRN, solar absorption, man-made noise, and harmonic broadcast interference. Right now, near the peak of the sunspot cycle, 10 and 15 are the best bands for low-power, low-antenna DXers. For one thing, your low antennas are going to perform better on those bands.

To be of optimum effectiveness, a gain antenna usually needs to be one wavelength high. This is 66 feet on 20, but it is only about 33 feet on 10. You are going to have a lower angle of radiation on 10 and 15 than on 20, and, therefore, you are going to work DX better. There is less competition on 10 and 15 than on 20, and these bands tend to be "equalizers." For some reason, the difference between a kW and a barefoot exciter is often almost negligible on 10.

So, each time you get on to chase DX, check 10 and 15 first; if they're open, stay there. These bands tend to be best in the wintertime; conditions slack off a little in the summer. Also, they are primarily daytime bands, especially 10. You will rarely work DX on 10 and 15 before sunrise or for very long after sunset, although it does happen occasionally, especially on 15. For a year or two at the sunspot maximum (where we are now), these bands are often open all night.

Year in and year out, sunspot cycle in and out, 20 is the best all-around band for DX. It is open to somewhere in the world almost 24 hours a day. Because of this, it is probably the most crowded amateur band, and the competition for DX is often fierce. Nonetheless, you can work DX on 20. Your best bet is to work CW and to do so early in the morning (about 5:00 to 8:00 am local time) or late at night, when there aren't so many stateside stations on. At these times, depending on the time of year and the sunspot cycle, the band is often open to several parts of the world and the competition isn't too severe.

The worst time to work 20 is from 4:00 to 7:00 pm, local time. This is when everyone rushes home from work and turns on the rig; the band is very crowded and very chaotic, although it's not as bad on CW as it is on SSB.

You will not do very well on 40 and 80 with low power and low antennas. Because of heavy broadcast QRM, most of the DX work on 40 is done on CW below 7025, so you need an Extra class license. And on 80, most of the DX work on SSB is below 3800 and the CW below 3525, again requiring an Extra. These bands are highly seasonal; in the summer months heavy static makes DXing very difficult, so winter is the time to listen. If you have up good antennas for these bands, you should listen occasionally; DX contacts are possible with low power, especially right at sunrise and at sunset.

Obviously, the time of day you are going to operate depends on many variables: the band you want to use, the time of year, your work schedule, your spouse's sleeping habits, etc. In general, though, your best bet is to pick times when the bands you want to work are open and the competition isn't too tough. Usually, this means late at night and early in the morning.

Another thing to remember about times is that there is the least competition on a band when it is just opening. When 15 opens in the morning, you can often hear many DX stations calling CQ and not getting answers; a couple of hours later, when the crowd has gotten up and discovered that the band is open, the competition becomes fiercer.

Try finding a time period that you can operate every day. That way you will learn the bands that are open at that time, the areas they are open to, the severity of the competition, which band you do best on, etc.

The best operating advice to the low-power DXer can be given in one word: Listen! You are not going to get many answers to your "CQ DX"s; they are usually a waste of time and spectrum. When you first get on a band, tune across it slowly. Write down the calls and frequencies of the DX you hear. You can then learn whether the band is open, and, if so, to what direction.

Keep tuning across the band until you hear a station you need or want to work. If the band is open to an area where you need several countries, don't get involved in a rag chew with a country you don't need (unless rag chewing with DX is your main interest). While you are telling a G3 about the great weather you've been having, an LX1 or a C31 might be calling CQ 5 kHz away.

When you hear one you need calling CQ or finishing a QSO, you should call him on his own frequency, unless he designates otherwise. If no one else is calling him, you need only give his callsign once (he knows what it is) and your own two or three times. It is generally better to give short, frequent calls than to make long ones, unless that's the only way to get through.

Once you have worked your first 50-100 countries, you will find that it becomes increasingly difficult to work new ones without getting into pileups. So, like it or not, you'll need to develop some pileup strategies. Most of the time, you are not going to bust through a pileup with sheer force (you don't have enough). You should try it a couple of times, nonetheless; sometimes selective propagation will put you over the top even with your low power.

There are several tactics that might help you get through faster. One is to wait until the pileup subsides before sending your call. See if you can sneak it into a lull in the pileup. You aren't going to get through if you give your callsign two or three times right after the DX station stands by—everyone else is doing the same thing.

Another tactic is to try calling off frequency a little, even on SSB. If a station is listening off of his own frequency, call him on the fringes of the pileup. If he is listening, say, from 14.025 to 14.030, call him at .030 or .031; you probably aren't going to make it at .027.

Though a dangerous one, tail-ending is another tactic. Here you send your callsign quickly just as the station working the DX signs his call or just afterwards. If the pileup is small and the DX station doesn't seem to mind, tail-ending is OK. Otherwise, don't do it.

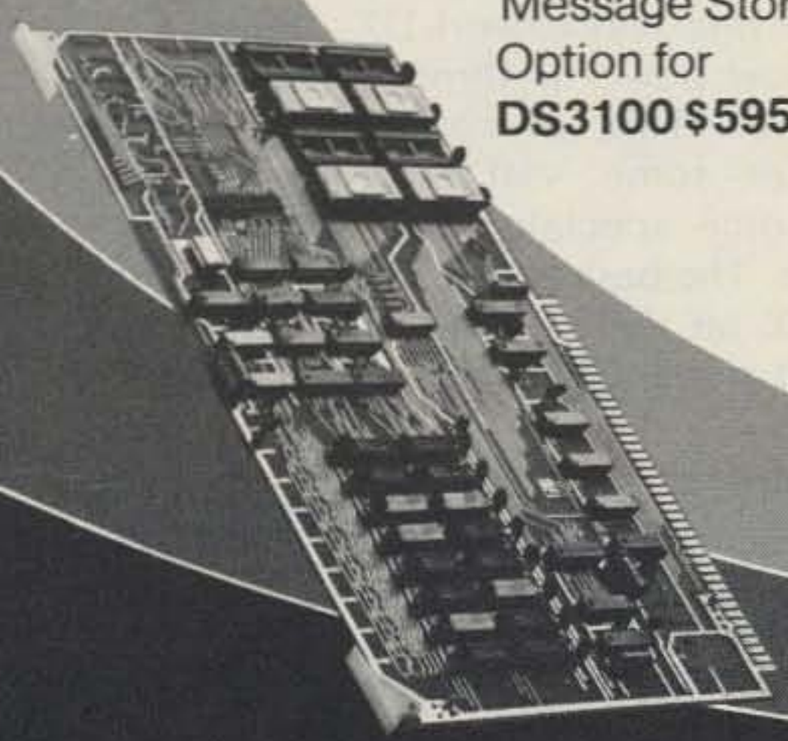
Another technique which sometimes works on SSB is to say something besides your callsigns; a station who is saying something else often stands out. You might try things like "W8YA in West Virginia" (works well from rare states), "W8YA for a new one," or "W8YA running low power." Even if the DX station doesn't hear you, some of the big guns in the pileup who hear you might mention to the DX station that there is a low-power station or a "W8 who needs you for

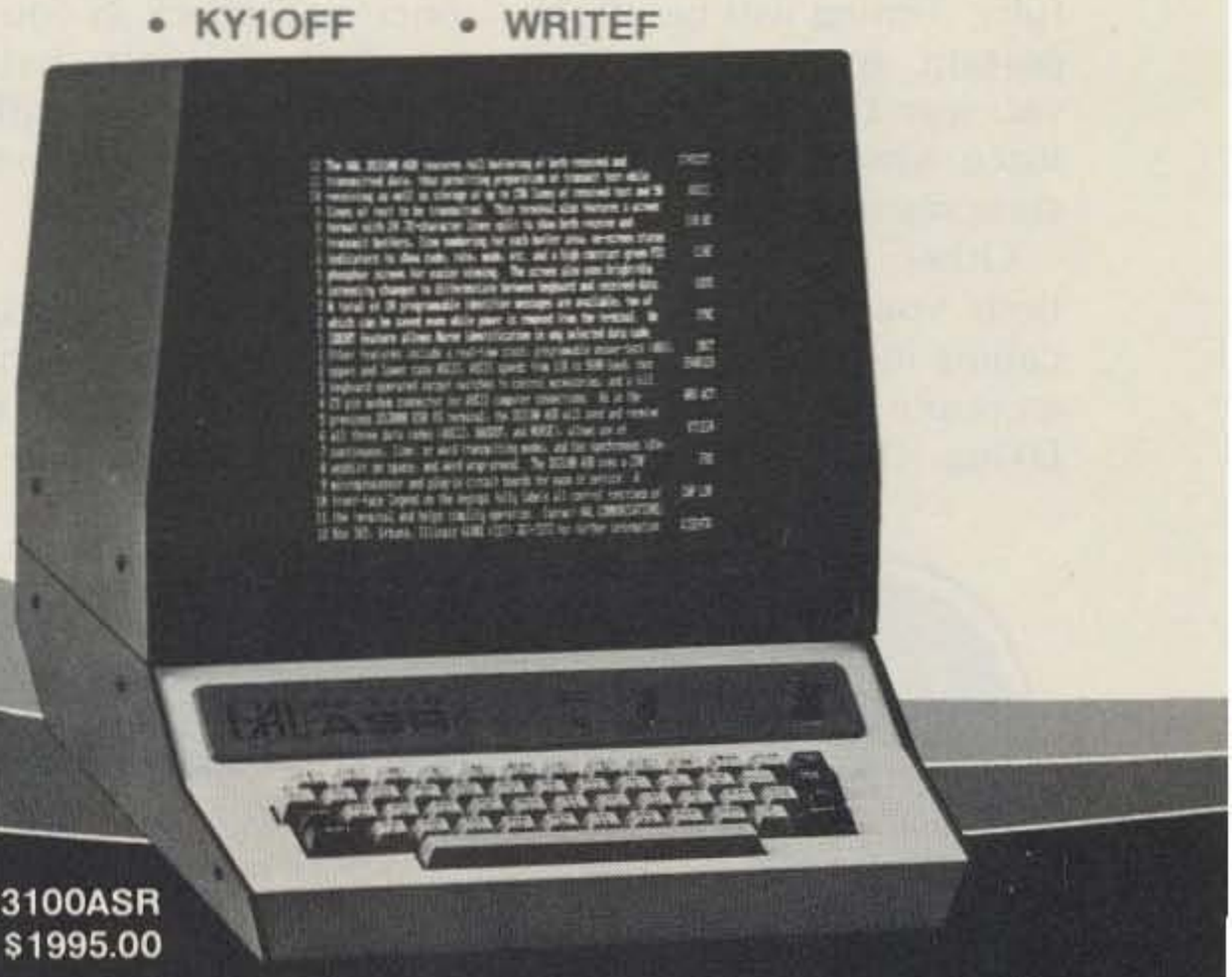
NEW FROM HAL

ELECTRONIC MAILBOX FOR RTTY

- DELETEF
- DIR
- ENDFILE
- EXIT
- FILEHELP
- HELP
- KY1ON
- KY1OFF
- KY2ON
- KY2OFF
- PRINTON
- PRINTOFF
- QBF
- READF
- RYS
- WRITEF

MSO-3100
Message Storage
Option for
DS3100 $595.00





DS3100ASR
$1995.00

The DS3100 Super Terminal is now even more versatile with the addition of the new MSO-3100.

The Message Storage Option (MSO) adds mass storage to the DS3100 so that relatively long messages may now be stored and replayed at will. For example, the MSO-3100 will provide more than 32,000 characters of additional storage—approximately 450 lines for messages. Messages are stored in variable length files with user-assigned file names and pass-words for file protection if desired.

The MSO feature may be accessed from either the DS3100 keyboard or by other users through the WRU feature of the ASR terminal. Thus, messages can be written, played, and relayed with either remote or local control.

Automatic TX/RX relay control, CW ID, and user help messages make the "electronic mailbox" easy for all to use. This factory installed option may also be used for brag-tape and net bulletin preparation and storage.

Write or call us for more details.

When our customers talk . . . we listen.

HAL COMMUNICATIONS CORP.
Urbana, Illinois 61801 Box 365 217-367-7373

For our European customers, contact: Richter & Co. D 3000 Hannover 1 • Transradio SA, 6816 Bissone/Lugano • Radio Shack, Ltd., London NW6 3AY ↙345

a new one."

Incidentally, use standard phonetics when calling DX. Most DX ops know the standard English phonetics, but they won't understand "Walrus Dionysus Two Long Yellow Underwear." Another tactic, though sometimes questionable, is to ask for help. If you have a friend nearby or you know someone in the pileup who is likely to get through, ask him to pass along your call. This shouldn't be done when the DX is rare, but for common and semi-rare DX it's OK. The best advice in a pileup is to listen and send carefully. Timing will be all important for you because you won't make it on sheer force. Always follow the DX station's requests.

Other than calling stations you tune across and calling in pileups, there are a couple more methods for DXing. One is "piggybacking." Here, the guy across town who runs 5 kW to a 32-element beam at 1000 feet calls CQ DX or calls a specific DX station with you (who have carefully cultivated his friendship) standing by. After he exchanges reports with the DX, he calls you into the QSO and you become part of the roundtable. This is definitely OK unless there is a big pileup or an extremely rare DX station, in which case you will probably get clobbered.

Another method is to check into DX nets. There are several on the bands, mostly on 20 and 15, and once you check in you will be allowed to call whatever DX is on frequency without QRM. One good net to try is the YL International SSB Net at around 14.330. This is a very friendly group of people who are willing to help out low-power stations trying to work their DX check-ins. Because they often have a large number of check-ins, you might have to wait awhile before you get to call.

An increasingly popular and controversial DX method is the list. Here, a strong stateside or foreign "emcee" takes a list of stateside calls and passes them on to the DX station, who then calls the stations one by one. This is fine, as long as the DX station has not had the list forced on him. If you need the country, get on the list if you can. Personally, I have never derived much satisfaction from working DX via a list, but if it's the only way to work a new one, I will do it.

One final way to work DX with low power is through satellites. This, of course, requires some VHF gear and some specialized antennas. The best time to try for DX on the satellites is just at acquisition time as they come over the horizon. In the near future, constant orbit satellites will be sent up and will make it possible to work DX consistently for many hours a day with a few Watts and a small VHF antenna.

Using the preceding techniques and methods, and a few of your own that you will acquire through experience, it is quite possible to work DX, lots of it, with low power and low antennas. It is, in many ways, more challenging and more rewarding than it is to the high-power, big-antenna boys who become somewhat blasé about DX after awhile. The main things you need to remember are patience, listening, and timing. If you work on those three things, you can work a logbook full of DX. Spend most of your time on CW on 10 and 15, and on 20 when those bands are not open. Good luck!■

MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

Ham Radio's most popular antenna tuner. Improved, too.

$89.95

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.

Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+$4), like 941C less balun. **MFJ-945, $79.95** (+$4), like 941C less antenna switch. **MFJ-944, $79.95** (+$4), like 945, less SWR/Wattmeter. **MFJ-943, $69.95** (+$4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER

MFJ-900

$44.95 (+$4)

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient air-wound inductor gives more watts out. 5x2x6"

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $54.95 (+$4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $34.95 (+$4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B

$139.95 (+$4)

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load, SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962

$199.95 (+$4)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

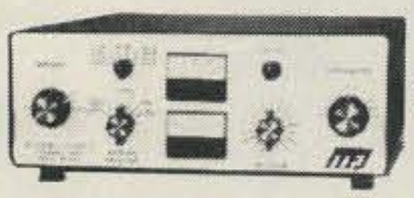
Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

6 position antenna switch handles 2 coax lines, direct or through tuner, plus wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $179.95 (+$10), similar but less SWR/Wattmeter.

MFJ-984 VERSA TUNER IV



MFJ-984

$299.95 (+$10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $209.95 (+$10), like 984 less ant. switch, ammeter. **MFJ-982, $209.95** (+$10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $179.95** (+$10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V

MFJ-989

$319.95 (+$10)

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf-6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

To order or for your nearest dealer

master charge — **CALL TOLL FREE** — VISA

800-647-1800

For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

- **All MFJ products unconditionally guaranteed for one year (except as noted).**
- **Products ordered from MFJ are returnable within 30 days for full refund (less shipping).**
- **Add shipping & handling charges in amounts shown in parentheses.**

Write for FREE catalog, over 80 products

MFJ ENTERPRISES, INCORPORATED

Box 494, Mississippi State, MS 39762

See List of Advertisers on page 114

Jim Weir WB6BHI
Radio Systems Technology
10985 Grass Valley Ave.
Grass Valley CA 95945

A Flier's Guide to the Airwaves

—off we go into the wild blue yonder

How many hams can claim to have carried on a 5-state simultaneous QSO on 2 meters, without repeaters, mobile, where two of the stations were 400 miles apart? It's easy—all you have to do is get your antenna 12,000 feet in the air! A difficult task, you say? Not at all, if you go *aeronautical mobile*.

I'm not going to get into a discussion of the old "handie-talkie in an airliner" trick, except to say that no airline captain or airline radio shop people in their right minds are going to give you permission to play with your toy while their ten-million-dollar jet is boring holes in the sky 5 miles up. If you somehow sneak your hand-held on board without permission, you risk a $10,000 fine and 5 years in stony lonesomeness, loss of license, and the chance of putting 120 people plus yourself into the side of a vertical granite runway.

No, I much prefer to hook my radio onto a small general-aviation type of airplane. Here, the only permission you need to operate your rig is a nod of the head from the guy flying the left front seat.

By now, 95% of you may have one, two, or three misconceptions about aeronautical mobile:

1. It is against FCC amateur rules to operate aeronautical mobile.

2. It is against FAA rules to operate an amateur station in an airplane.

3. No pilot is going to take me joyriding just so I

Photo A. Connecting the antenna onto the mount and running the coaxial cable down the trailing edge of the strut.

Photo B. Installing a temporary antenna mount onto the tie-down ring.

16K Memory 8/$16.95

4116 300ns

ALL MERCHANDISE 100% GUARANTEED — **CALL US FOR VOLUME QUOTES**

LS SERIES

74LS00	.25	74LS163	.95
74LS01	.25	74LS164	.95
74LS02	.25	74LS165	.95
74LS03	.25	74LS166	2.40
74LS04	.25	74LS168	1.75
74LS05	.25	74LS169	1.75
74LS08	.35	74LS170	1.75
74LS09	.25	74LS173	.80
74LS10	.25	74LS174	.95
74LS11	.35	74LS175	.95
74LS12	.35	74LS181	2.15
74LS13	.45	74LS189	9.95
74LS14	1.00	74LS190	1.00
74LS15	.35	74LS191	1.00
74LS20	.25	74LS192	.85
74LS21	.35	74LS193	.95
74LS22	.25	74LS194	1.00
74LS26	.35	74LS195	.95
74LS27	.35	74LS196	.85
74LS28	.35	74LS197	.85
74LS30	.25	74LS221	1.20
74LS32	.35	74LS240	1.85
74LS33	.55	74LS241	1.85
74LS37	.55	74LS242	1.85
74LS38	.35	74LS243	1.85
74LS40	.25	74LS244	1.75
74LS42	.55	74LS245	2.85
74LS47	.75	74LS247	.76
74LS48	.75	74LS248	1.25
74LS49	.75	74LS249	.99
74LS51	.25	74LS251	1.30
74LS54	.35	74LS253	.85
74LS55	.35	74LS257	.85
74LS63	1.25	74LS258	.85
74LS73	.40	74LS259	2.85
74LS74	.45	74LS260	.65
74LS75	.50	74LS266	.55
74LS76	.40	74LS273	1.65
74LS78	.50	74LS275	3.35
74LS83	.75	74LS279	.55
74LS85	1.15	74LS280	1.98
74LS86	.40	74LS283	1.00
74LS90	.65	74LS290	1.25
74LS91	.89	74LS293	1.85
74LS92	.70	74LS295	1.05
74LS93	.65	74LS298	1.20
74LS95	.85	74LS352	1.55
74LS96	.95	74LS353	1.55
74LS107	.40	74LS363	1.35
74LS109	.40	74LS365	.95
74LS112	.45	74LS366	.95
74LS113	.45	74LS367	.70
74LS114	.50	74LS368	.70
74LS122	.45	74LS373	1.85
74LS123	.95	74LS374	1.80
74LS124	2.99	74LS377	1.45
74LS125	.95	74LS378	1.18
74LS126	.85	74LS379	1.35
74LS132	.75	74LS385	1.90
74LS136	.55	74LS386	.65
74LS137	.99	74LS390	1.90
74LS138	.75	74LS393	1.90
74LS139	.75	74LS395	1.65
74LS145	1.20	74LS399	1.70
74LS147	2.49	74LS447	.37
74LS148	1.35	74LS490	1.95
74LS151	.75	74LS668	1.69
74LS153	.75	74LS669	1.89
74LS154	2.35	74LS670	2.20
74LS155	1.15	74LS674	9.65
74LS156	.95	74LS682	3.20
74LS157	.75	74LS683	2.30
74LS158	.75	74LS684	2.40
74LS160	.90	74LS685	2.40
74LS161	.95	74LS688	2.40
74LS162	.95	74LS689	2.40

7400 SERIES

7400	.19	74128	.55
7401	.19	74132	.45
7402	.19	74136	.50
7403	.19	74141	.65
7404	.19	74142	2.95
7405	.22	74143	2.95
7406	.22	74144	2.95
7407	.22	74145	.60
7408	.24	74147	1.75
7409	.19	74148	1.20
7410	.19	74150	1.35
7411	.25	74151	.65
7412	.30	74152	.65
7413	.35	74153	.55
7414	.55	74154	1.40
7416	.25	74155	.75
7417	.25	74156	.65
7420	.19	74157	.55
7421	.35	74159	1.65
7422	.29	74160	.85
7423	.29	74161	.70
7425	.29	74162	.85
7426	.29	74163	.85
7427	.29	74164	.85
7428	.45	74165	.85
7430	.19	74166	1.00
7432	.29	74167	1.95
7433	.45	74170	1.65
7437	.29	74172	5.95
7438	.29	74173	.75
7440	.19	74174	.89
7442	.49	74175	.89
7443	.65	74176	.89
7444	.69	74177	.75
7445	.69	74178	1.15
7446	.59	74179	1.75
7447	.69	74180	.75
7448	.69	74181	2.25
7450	.19	74182	.75
7451	.23	74184	2.00
7453	.23	74185	2.00
7454	.23	74186	18.50
7460	.23	74190	1.15
7464	.39	74191	1.15
7465	.39	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.35	74196	.79
7475	.49	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7484	.50	74248	1.85
7485	.65	74249	1.95
7486	.35	74251	.75
7489	4.95	74259	2.25
7490	.35	74265	1.35
7491	.40	74273	1.95
7492	.50	74276	1.25
7493	.49	74279	.75
7494	.65	74283	2.00
7495	.55	74284	3.75
7496	.70	74285	3.75
7497	2.75	74290	.95
74100	1.00	74293	.75
74107	.30	74298	.85
74109	.45	74351	2.25
74110	.45	74365	.65
74111	.55	74366	.65
74116	1.55	74367	.65
74120	1.20	74368	.65
74121	.29	74376	2.20
74122	.45	74390	1.75
74123	.55	74393	1.35
74125	.45	74425	3.15
74126	.45	74426	.85
		74490	2.55

T.V. CIRCUITS

MC1330	1.89
MC1350	1.29
MC1358	1.79
LM380	1.29
LM386	1.50
LM565	.99
LM741	.29
LM1310	2.90
LM1800	2.99
LM1889	2.49

MISC.

8T26	1.69	3242	9.95
8T28	2.49	AY5-1013	3.95
8T95	.99	TR1602	4.95
8T96	.99	IM6402	7.95
8T97	.99	1771	24.95
8T98	.99	1791	36.95
1488	.99	UPD765	39.95
1489	.99	8272	39.95
DM8131	2.95		

CMOS

74C00	.35	74C373	2.75	4018	.95	4093	.95
74C02	.35	74C374	2.75	4019	.45	4099	1.95
74C04	.35	74C901	.80	4020	.95	14409	8.95
74C08	.35	74C902	.85	4021	.95	14410	8.95
74C10	.35	74C903	.85	4022	1.15	14411	9.95
74C14	1.50	74C905	10.95	4023	.35	14412	12.95
74C20	.35	74C906	.95	4024	.75	14419	2.95
74C30	.35	74C907	1.00	4025	.35	4502	.95
74C32	.50	74C908	2.00	4026	1.65	4503	.65
74C42	1.75	74C909	2.75	4027	.65	4508	1.95
74C48	2.10	74C910	9.95	4028	.80	4510	.95
74C73	.65	74C911	10.00	4029	.95	4511	.95
74C74	.85	74C912	10.00	4030	.45	4512	.95
74C76	.80	74C914	1.95	4034	2.95	4514	1.25
74C83	1.95	74C915	2.00	4035	.85	4515	2.25
74C85	1.95	74C918	2.75	4040	.95	4516	1.55
74C86	.95	74C920	17.95	4041	1.25	4518	1.25
74C89	4.50	74C921	15.95	4042	.75	4519	1.25
74C90	1.75	74C922	5.95	4043	.85	4520	1.25
74C93	1.75	74C923	5.95	4044	.85	4522	1.25
74C95	1.75	74C925	6.75	4046	.95	4526	1.25
74C107	1.00	74C926	7.95	4047	.95	4527	1.95
74C150	5.75	74C927	7.95	4049	.55	4528	1.25
74C151	2.25	74C928	7.95	4050	.55	4531	.95
74C154	3.25	74C929	19.95	4051	.95	4532	1.95
74C157	1.75	74C930	19.95	4053	.95	4538	1.95
74C160	2.00	4000	.35	4060	1.45	4539	1.95
74C161	2.00	4001	.35	4066	.75	4543	2.70
74C162	2.00	4002	.25	4068	.40	4555	.95
74C163	2.00	4006	.95	4069	.35	4556	.95
74C164	2.00	4007	.29	4070	.35	4581	1.95
74C165	2.00	4008	.95	4071	.30	4582	1.95
74C173	2.00	4009	.45	4072	.30	4584	.95
74C174	2.25	4010	.45	4073	.30	4585	.95
74C175	2.25	4011	.35	4075	.30	4702	12.95
74C192	2.25	4012	.25	4076	.95	4724	1.50
74C193	2.25	4013	.45	4078	.30	80C07	.95
74C195	2.25	4014	.95	4081	.30	80C95	.85
74C200	5.75	4015	.95	4082	.30	80C96	.95
74C221	2.25	4016	.45	4085	.95	80C97	.95
		4017	1.15	4086	.95	80C98	1.20

DIP SWITCHES

4 position	.85
5 position	.90
6 position	.90
7 position	.95
8 position	.95

CONNECTORS

RS232 MALE	3.25
RS232 FEMALE	3.75
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

TRANSISTORS

PN2222	10/1.00	100/8.99
2N3904	10/1.00	100/8.99
2N3906	10/1.00	100/8.99
2N3055	.79	10/6.99
IN4148		25/1.00
IN4004		10/1.00

74S00 SERIES

74S00	.44	74S74	.69	74S163	3.75	74S258	1.49
74S02	.48	74S85	2.39	74S168	4.65	74S260	1.83
74S03	.48	74S86	1.44	74S169	5.44	74S274	19.95
74S04	.79	74S112	1.59	74S174	1.09	74S275	19.95
74S05	.79	74S113	1.98	74S175	1.09	74S280	2.90
74S08	.48	74S114	1.50	74S181	4.47	74S287	4.75
74S09	.98	74S124	2.77	74S182	2.95	74S288	4.45
74S10	.69	74S132	1.24	74S188	3.95	74S289	6.98
74S11	.88	74S133	.98	74S189	14.95	74S301	6.95
74S15	.70	74S134	.69	74S194	2.95	74S373	3.45
74S20	.68	74S135	1.48	74S195	1.89	74S374	3.45
74S22	.98	74S138	1.08	74S196	4.90	74S381	7.95
74S30	.48	74S139	1.25	74S197	4.25	74S387	5.75
74S32	.98	74S140	1.45	74S201	14.95	74S412	2.98
74S37	1.87	74S151	1.19	74S225	8.95	74S471	9.95
74S38	1.68	74S153	1.19	74S240	3.98	74S472	16.85
74S40	.44	74S157	1.19	74S241	3.75	74S474	17.85
74S51	.78	74S158	1.45	74S251	1.90	74S482	15.60
74S64	.79	74S161	2.85	74S253	7.45	74S570	7.80
74S65	1.25	74S162	3.70	74S257	1.39	74S571	7.80

VOLTAGE REG'S

7805T	.89	7905T	.99
7808T	.99	7912T	.99
7812T	.89	7915T	1.19
7815T	.99	7924T	1.19
7824T	.99		
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39		
78L05	.69	79L05	.79
78L12	.69	79L12	.79
78L15	.69	79L15	.79
LM309K	1.49	LM323K	4.95
LM317T	1.95	LM337K	3.95
LM317K	3.95		

T = TO-220 K = TO-3 L = TO-92

LINEAR

LM301V	.34	LM741V	.29
LM308V	.98	LM747	.79
LM309K	1.49	LM748V	.59
LM311	.64	LM1310	2.90
LM317T	1.95	MC1330	1.89
LM317K	3.95	MC1350	1.29
LM318	1.49	MC1358	1.79
LM323K	4.95	LM1414	1.59
LM324	.59	LM1458V	.69
LM337K	3.95	LM1488	1.39
LM339	.99	LM1489	1.39
LM377	2.29	LM1800	2.99
LM380	1.29	LM1889	2.49
LM386V	1.50	LM3900	.59
LM555V	.39	LM3909V	.98
LM556	.69	LM3914	3.95
LM565	.99	LM3915	3.95
LM566V	1.49	LM3916	3.95
LM567V	1.29	75451V	.39
LM723	.49	75452V	.39
LM733	.98	75453V	.39

T=TO-220 V=8 PIN K=TO-3

master charge — VISA

JDR MICRODEVICES, INC.
1101 South Winchester Blvd. ↙409
San Jose, California 95128
800-538-5000 800-662-6263 (Calif.)
408-247-4852

TERMS: For shipping include $2.00 for UPS Ground; $3.00 for UPS Blue Label Air; $10.00 minimum order. Bay Area Residents add 6½% sales tax Calif. Residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice.

↙See List of Advertisers on page 114

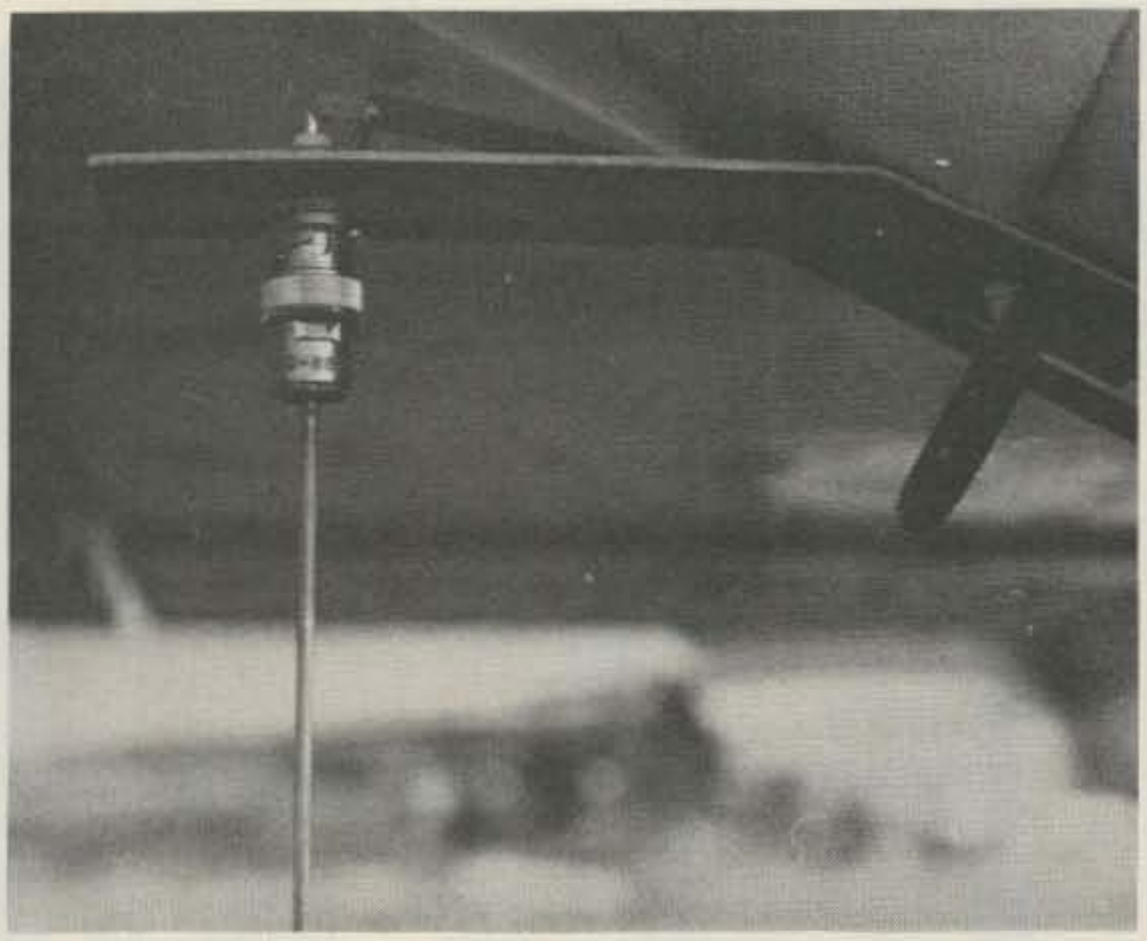


Photo C. Detail of the antenna mount and tiedown ring. The antenna is a 48-cm length of brass brazing rod.

Photo D. The author enjoying a Saturday afternoon aeronautical mobile (at rest) QSO.

can get my antenna 2 miles up.

Now let's pop these bubbles in order.

1. "It is against FCC amateur rules to operate aeronautical mobile." Rubbish. FCC rules (part 97) allow the amateur to operate mobile. Period. They do not restrict you to automobile, boat, snowmobile, submarine, or airplane. You may operate aeronautical mobile under exactly the same rules as if you were operating your automobile station in the same area.

2. "It is against FAA rules to operate an amateur station in an airplane." I wish I had a nickel for every time I've heard this ridiculous statement. FAA rule 91.19 *clearly* states that any electronic device that the pilot feels will not interfere with the safe operation of the flight is authorized for use. As a matter of fact, there was so much confusion over this rule that the FAA went out of its way to issue a clarification of the rule to permit not only hand-held rigs but also permanently-mounted amateur sets for the ham pilot. More about this later.

3. "No pilot is going to take me joyriding..." Would you turn down a phone-patch request from one of your neighbors? Wouldn't you give of your time and equipment to someone who wanted to become a ham? Pilots are pretty much the same. Generally, they are quite happy to show off their hobby (or profession) to an interested neighbor. Nor is flying all that expensive. An hour's fuel goes for about $6; if the pilot has to rent the plane, figure on $20 an hour, tops.

One good way of getting to know a pilot is to offer him (or her) a few phone patches to relatives, or invite him over for an afternoon of 20-meter DX work. Gradually lead into the subject of aeronautical mobile, an I'll bet that within the week you'll have your rig in the airplane.

Where do you hang the antenna? Well, if the airplane isn't yours, you're probably going to have to stick to the 2-meter and above bands. I've done my fair share of aeronautical mobile, and I can almost guarantee that an indoor whip or rubber duckie will produce poor results, if any. Even near a window, you are still inside an almost completely enclosed, metallic "screen room," and "getting out" will be difficult, if not impossible.

This situation dictates an outside antenna of some sort, but hanging a whip out in the breeze will also present a fairly difficult mechanical problem. Yes, mechanical—not electrical. Forget the 3-dB-gain long whips, the longwires, and the arrays. A good old quarter-wave whip is more than adequate for aeronautical work. Now the problem will be getting a quarter-wave wire outside the plane, and this is *not* an easily solved problem.

You see, drilling a mounting hole in an airplane requires a tinker's license from Uncle Sammy, and most airplane owners take a dim view of someone punching unnecessary holes in their birds. Also, that wire will have 120 mph winds buffeting it all the time you are airborne, and the last thing you want to do is drop a metal object onto someone's head below. I mean, that kind of thing could ruin his whole day! And for those of you thinking of using a magnetic mount, forget it. That bird's skin is aluminum and besides, the pilot's compass is more than happy to lock onto the antenna base magnet rather than the North Pole, and there are better ways than this of getting lost.

About the only good place for an antenna on OPA (other people's airplanes) is the trunk-lip mount base attached to the baggage (or cargo) door opening. Remember to put in a rubber shim so that the airplane paint job doesn't get marred. If the airplane doesn't have a cargo door, the passenger door may be used, being careful to damage the weather stripping as little as possible.

Another good idea (on high-wing aircraft) is to remove the bolt that attaches the tiedown ring (non-structural) to the strut, insert a home-made whip mounting plate, and reinsert the bolt. Run the coax from this plate into the cabin via the strut, and lace it in place with nylon lacing tie, plastic tie-wraps, or (as a last resort) heavy duct tape. (Photos A, B, and C show construction and installation details of a tiedown-ring mount on the author's Cessna 172.)

If you own the airplane, things are a little easier. I will pass on to you a trick that lets you hang the antenna on the best spot on the airplane—the belly; yet, if and when you decide to sell the airplane, you can remove the antenna mount with no sign of it ever hav-

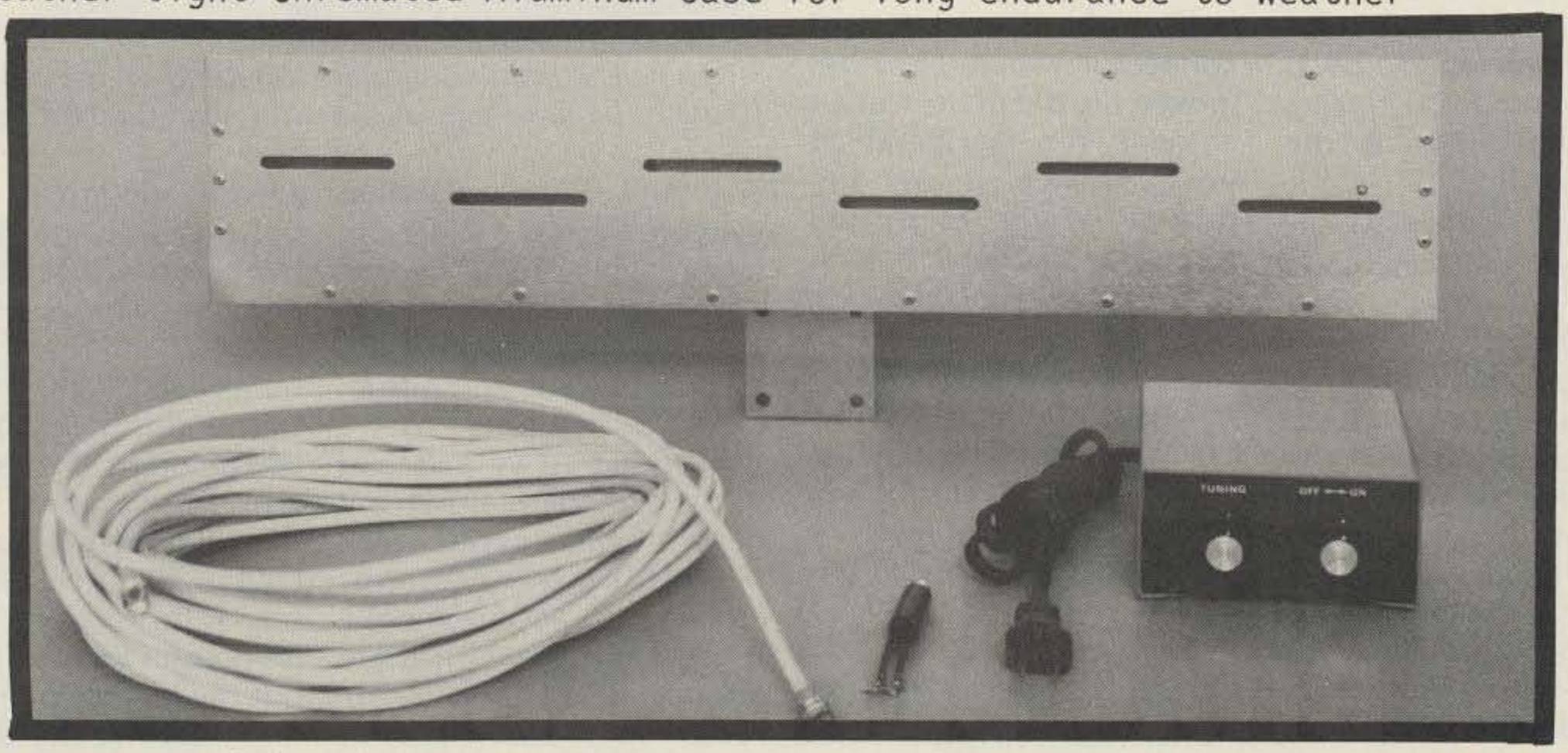
COMPLETE - ASSEMBLED AND TESTED - READY TO INSTALL - NOT A KIT

AMATEUR TELEVISION
MICROWAVE RECEIVER DOWNCONVERTER

ELECTRONIC HOBBY INNOVATIONS is proud to present to the Amateur Radio Market a high gain, low noise,modern technology S-Band Microwave receiver converter. This converter will let you explore the unknown frontier of Amateur and commercial radio, for your personal enjoyment. In this region of line-of-sight reception, tune in the band of Amateur,digital, FM, AM, or TV modes of transmission using the downconverter and your own television set. This unit was designed for Amateur use, reception of other TV signals is the responsibility of the owner.

COMPARE THESE SPECS!

Cavity tuned front end - Hewlett-Packard low noise transistor -fully tested
Hewlett-Packard 5082-2835,quality Hot Carrier Microwave Mixer Diodes
Stable, Voltage Tuned Oscillator, for smooth tuning range
Single, light weight unit,completely self contained for easy installation.
Weather tight Chromated Aluminum Case for long endurance to weather



Tunes 2.10 GHz. through 2.40 GHz.

Preamplifier has 10 dB nominal gain with a 2.5 dB noise figure

Output tunes TV channels 2 to 6, Output Impedence 75 or 300 Ohms

Performance Guaranteed or your money fully refunded,Full Year Warranty

AMATEUR SPECIAL $179.95 Including shipping (UPS)

VISA and MASTERCARD charges accepted, Call (804) 489-2156, COD's OK
Call refunded on all orders , Virginia residents please add 4% state sales tax

Available Separately

Preamplifier - Fully Assembled and tested - $59.95
Slotted Array Antenna - 15 dB nominal gain - $29.95
Power Supply - Fully Assembled and tested - $34.95
Downconverter Board - Fully Assembled and tested - $69.95

ELECTRONIC HOBBY INNOVATIONS

447

7510 GRANBY STREET SUITE 207

NORFOLK, VIRGINIA 23505

See List of Advertisers on page 114

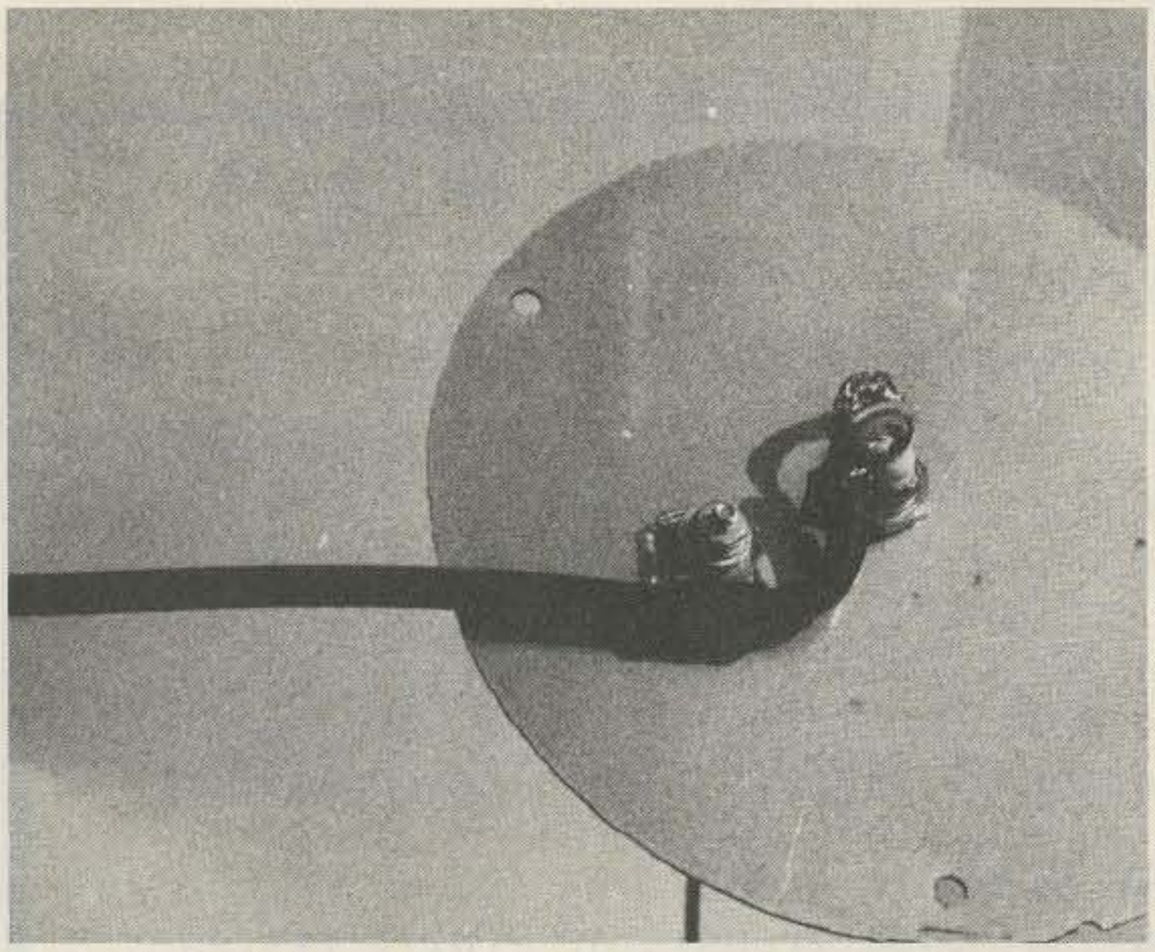


Photo E. Mounting the BNC connector to a spare belly inspection plate. Note that the cable is securely clamped.

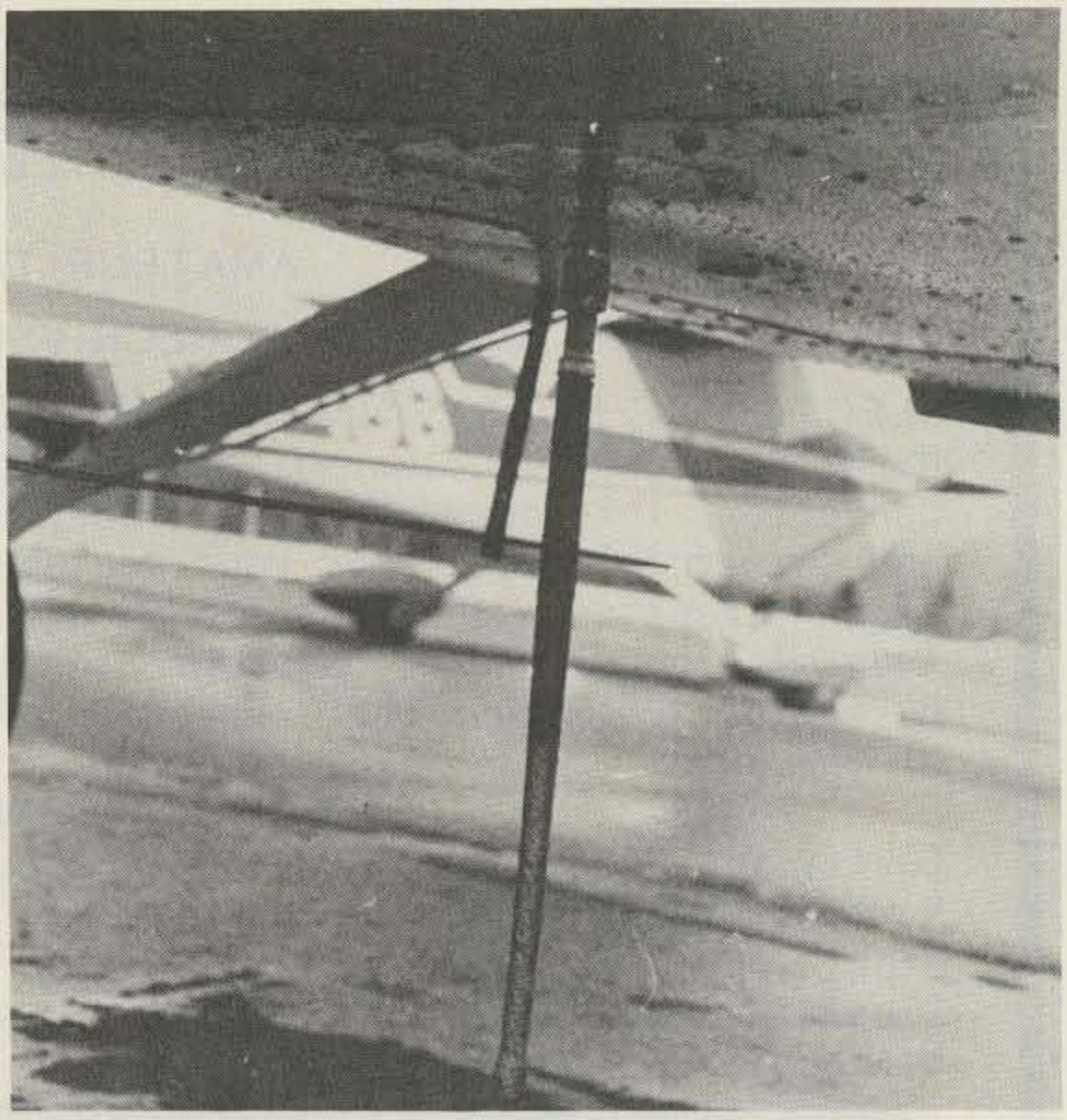


Photo F. The inspection plate mounted on the belly with a 10-meter band rubber duckie antenna attached.

ing been on the airplane. Not only that, you will be able to operate any band you wish simply by using plug-in antennas for the various bands.

The trick is this: Go to your friendly airplane parts store and buy an extra "belly inspection-hole cover plate" for your airplane. Drill this extra plate to accommodate a BNC female connector. Mount this connector onto the plate with the female connector portion on the *outside* of the plate. Remove your present belly inspection plate and store it in a safe place, because you will need it if you ever want to take the ham antenna connector off. Connect your coax cable to the inside of the connector, and string the coax up to where the rig is going to be installed. (This last step really should be inspected by a licensed airframe mechanic.) Now bolt on the new plate and connector where you removed the old plate. Cut an antenna for the band of your choice using the quarter-wave formulas from the *Handbook*. Attach it to a BNC male connector, making sure that you fill the connector body with epoxy to keep the antenna rod mechanically attached to the connector. Connect this antenna to the belly plate, fire up the rig, and you are on the air.

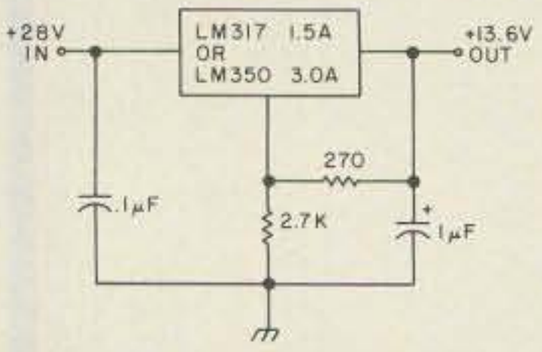


Fig. 1. Schematic of 24-to-12-volt converter.

Before flight, though, have your airframe mechanic make a logbook entry in accordance with Advisory Circular 20-98, "Auxiliary Two-Way Airborne Radio System Installations." In some cases, you may have to get a copy of this AC from your general aviation district office and give it to the mechanic, as most of them have never seen this document. I highly recommend that you tell the mechanic exactly *why* and *how* you plan on installing your antenna—before you start. Hell hath no fury like a ticked-off inspector, and one sure way to torque his jaws is to do your work without telling him, and then ask him to "sign off" your brainchild. (See Photos E, F, and G for a detailed view of this belly-plate antenna installation.)

We now come to the subject of power, because you sure don't want to run from nicads all the time. Well, I have good news and bad news. Ninety-five percent of all light aircraft have 12-volt battery systems identical to an automobile battery supply. With these aircraft, you can plug directly into the cigarette lighter, or have your mechanic put in a separate circuit breaker or fuse (not expensive) just to run your ham rig. If you choose to have the breaker installed, I strongly suggest that you have a molex type of pigtail connector installed in both the airplane and on the rig. Aircraft vibration is a mortal enemy, and "Jones," "octal," and "ribbon" connectors have a nasty tendency to vibrate apart. You might also check your local auto parts store for polarized "bullet" connectors which are also relatively vibration-proof.

Now for the bad news. Since 1978, Cessna and a few others have been using 28-volt electrical sytems, but they still use the *same size* cigarette lighter plug and the *same size* circuit breakers and fuses. There is no more sickening smell in this world than $300 worth of French-fried silicon. The answer, of course, is to ask the pilot beforehand what kind of electrical system he has in his airplane—and if he doesn't know, then he is not the kind of pilot I especially like to fly with! At any rate, if the aircraft you are using has a 28-volt electrical system, I recommend that you use one of the new 3-terminal regulators to drop the 28 volts down to 12. Remember during transmit, your rig will be drawing about 2 or 3 Amps. That means that your regulator will be dissipating up to 50 Watts, as a good heat sink is mandatory. Fig. 1 shows an easy-to-make 12-volt regulator for use with 28-volt aircraft.

Well, I've told you how to get the power in and how to get the power out. The only thing left for me to do is pass along a few tips I've found useful in some hun-

↙See List of Advertisers on page 162

dreds of hours of aeronautical mobile.

● Flying is hours and hours of fun punctuated by moments of stark terror. If the pilot motions for you to "cool it"—*shut up*. Do *not* make one more transmission to pass along 73s. A curt "QRT—Stand by" is preferable to lousing up approach control's message about the coverging 707. You always can pick up the conversation after the "aluminum overcast" misses you.

● Remember that at altitude, 10 Watts will travel up to 300 miles, and when you hit the button on .34/.94 over Vermont, you will bring up every machine from Maine to New York, including some that may not be too happy about it. Remember that you have fantastic range at this altitude, so work simplex where possible.

● Working 80 through 10 is possible—but not easy. Unless you own the airplane and are willing to make your ADF sense antenna double in brass for a *very* short whip (matched, of course, with an antenna tuner), then I suggest you do your aeronautical mobile on a band that requries a short antenna.

● Spikes on the 12-volt aircraft supply are not unknown, especially when the flaps, landing gear, landing lights, or other high-current draw items are switched on and off. A 16-volt zener or "transzorb"-style spike suppressor inside the radio will go a long way towards keeping your radio out of the auto-destruct mode.

● DO NOT take this article as license to string wires and cable hither and yon about the airframe without the advice of a pro. The few bucks (or a case of beer) you may have to pay a licensed expert to check your installation is cheap insurance when it comes to betting your fanny.

● And last, but not least, QSL if asked. Some hams go their whole careers without one single /AM on their walls. Above all, have fun. Aeronautical mobile is the least used yet most rewarding mode of operation. I hope to meet you someday in my *first* AM/AM QSO. ■

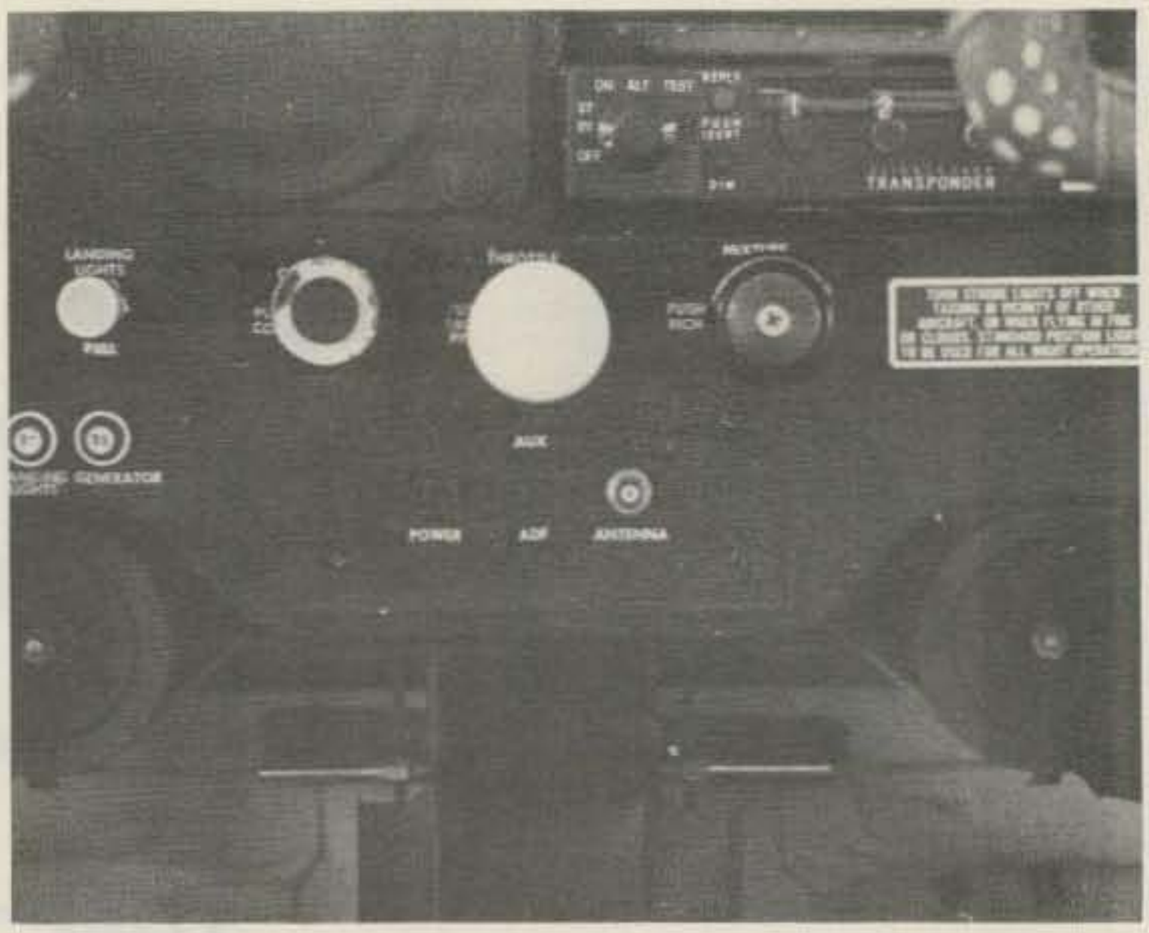


Photo G. A power and antenna patch panel mounted in a Cessna 172.

AMATEUR ELECTRONIC SUPPLY *Amplifier Round-up Sale*

HENRY 1KD-5 80-15m Linear Amplifier 1200w PEP input, 700w PEP nominal output. Single Eimac 3-500Z, tuned input. ALC, conservative rated power supply, built-in antenna relay. Size: 8¾"h × 14"w × 15"d, 48 lbs.

Regular $695 - ***Sale Price $649.95***

HENRY 2K Classic 80-15m Linear Amplifier. 2000 watts PEP SSB - 1000 watts CW, RTTY & AM. Two Eimac 3-500Zs, 80-150 watts drive, tuned input. ALC circuit, heavy duty power supply, fully metered, air cooled, built-in antenna relay. Size: 32¾"h × 16½"w × 15"d. Wt. 125 lbs.

Regular $1295 - ***Sale Price $1229***

HENRY 2KD-5 80-15m Linear Amplifier. 2000 watts PEP input, 1200w PEP nominal output on SSB, 1000 watts CW, RTTY & AM. Two Eimac 3-500Zs, 100 watts drive, tuned input. ALC, heavy-duty power supply, full metering, built-in antenna relay. Size: 10½"h × 15"w × 17½"d. Wt. 62 lbs.

Regular $945 - ***Sale Price $895***

HENRY 3K Classic 80-15m Linear Amplifier. All of the famous Henry amplifier features, a rugged 8877 tube, rugged heavy duty power supply components & special antenna relay for semi break-in CW. ***Tentative - $2695***

MIRAGE B-23 All mode Solid State VHF Power Amplifier for Hand-helds & low power FM/SSB transceivers. For 144 to 148 MHz, 100mw to 5w in/30w out @ 2w, RF relay. Size: 4¾"w × 2¼"h × 2¼"d. Wt. 1¼ lbs. 13.6 Vdc @ 5 Amps.

Regular $89.95 - ***Sale Price $79.95***

MIRAGE B-108 Solid State VHF Power Amplifier with built-in switchable 10db gain/2.5db N.F. receive preamplifier. For 144-148 MHz, 5-15w in/80w out @ 10w. Operates with as little as 1w; 1-2w in gives 15-30w out. Linear, for FM, CW and SSB with external or automatic internal relay keying with adjustable delay. Size: 5⅜"w × 3"h × 8"d. Wt. 3 lbs. Requires 13.6 Vdc @ 10-12 Amps.

Regular $179.95 - ***Sale Price $159.95***

MIRAGE B-1016 Similar to B-108, except 5-15w in/160w nominal out @ 10w; 1-2w in gives 30-60w out. Size: 5⅜"w × 3"h × 12"d, Wt. 5 lbs. 13.6 Vdc @ 20-25 Amps.

Regular $279.95 - ***Sale Price $249.95***

MIRAGE B-3016 Same as B-1016, except rated 15-45w in/160w out @ 30w input. Requires 13.6 Vdc @ 20-25A.

Regular $239.95 - ***Sale Price $209.95***

MIRAGE D-1010 430 to 450 Mhz All Mode Amplifier. .5-15w in/100w out @ 10w; 1w in/25w out, 3w in/75w out. Size: 3"h × 5½"w × 12"d. Wt. 5 lbs. 13.6 Vdc @ 12 AMPS.

Regular $319.95 - ***Sale Price $289.95***

- New from DRAKE -

DRAKE L-75 160-15m Linear Amplifier. 1200 watts PEP, SSB, 1000 watts CW, AM, RTTY & SSTV. Single 3-500Z, 60 watts drive, tuned input. Built-in power supply, relative power output indication, adjustable AGC, 2-speed fan & bypass switching. Size: 13¾"w × 6¾"h × 14½"d, 42 lbs.

Regular $819.95 - ***Sale Price $729.95***
including 3-500Z tube

DRAKE L-7 160-15m Linear Amplifier. 2000 watts PEP, SSB & AM, 1000 watts CW, RTTY, SSTV; continuous duty. Two 3-500Zs, 100 watts drive, tuned input. Separate power supply, fully metered, RF wattmeter, adjustable AGC, 2-speed fan & bypass switch. Size: (rf) 13¾"w × 6¾"h × 14½"d, 27 lbs; (ps) 6¾"w × 7⅞"h × 11"d, 42½ lbs.

Regular $1330 - ***Sale Price $1149***
including (2) 3-500Z tubes

KENWOOD TL-922A 160-15m Linear Amplifier. 2000 watts PEP SSB, 1000 watts CW, RTTY. Two 3-500Zs, tuned input, 80 watts drive. ALC, blower with automatic delay, fully metered. Size: 15½"w × 7½"h × 16⅜"d. Wt. 68 lbs.

Regular $1199 - ***Sale Price $1069***

Order now as quantities are limited & prices subject to change without notice. Send Check, Money Order or Call TOLL FREE and use MASTERCARD or VISA. Prices DO NOT include Shipping Charges.

STORE HOURS: Mon, Tues, Wed & Fri 9-5:30; Thurs 9-8 (Las Vegas 9-6); Sat 9-3. • Milwaukee WATS line **1-800-558-0411**, open for orders until 8 pm CDST Monday thru Thursday.

master charge THE INTERBANK CARD

VISA

Call Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® *Inc.*

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio Wats 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO Florida 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. Wats 1-800-432-9424
Outside Fla. 1-800-327-1917

LAS VEGAS, Nevada 89106
1072 N. Rancho Drive
Phone (702) 647-3114
Pete, WA8PZA & Squeak, AD7K
Outside Nev. 1-800-634-6227

ASSOCIATE STORE

ERICKSON COMMUNICATIONS
CHICAGO, Illinois 60630
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside ILL. 1-800-621-5802

John J. LaMartina K3NXU
105 Skyview Drive
Shrewsbury PA 17361

Cybernet Ten-Meter Offset

— If you've gone CB to 10, why not go all the way? Add the repeater offset, too!

The CB to 10 FM conversion in the January, 1980, *73*[1] has reheated many cold soldering pencils in the past few months. Some of us were lucky enough to find new or working units in the corner of "Ye Olde CB Shoppe" while others either purchased circuit boards from one of the surplus houses[2] or one of the 10 FM transceiver kits available.[3] This growth in activity has led to an increase in the use of both remote bases and repeaters.

What is described here is a simple way to add a repeater offset to any conversion utilizing the Cybernet board (PTBM033, 036, 039AOX) for not much more than the price of the offset crystal required.

The method used incorporates diode switching of the reference crystal oscillator when transmitting. The theory of operation is basic. There are two points on the motherboard that alternate voltages when switching from transmit to receive. When in the receive mode, TP11 produces 7 volts, while TP14 carries 8.5 volts on transmit. By switching these voltages to the proper offset crystal, either simplex or repeater operation can be selected.

The first consideration must be the selection of the proper reference crystal. If the 11.8066-MHz crystal were replaced by one cut for 12.65167 MHz, as discussed in the *73* conversion article, an offset crystal for 12.61833 MHz must be obtained. Some conversions, however, utilized a crystal for 12.57166 MHz, allowing 29.500 through 29.700 to fall between channels 20 through 40. For these, a crystal for 12.53833 MHz is required to provide for the 100-kHz shift.

The entire circuit shown in Fig. 1(a) can be mounted on a piece of Vectorboard® approximately ½" × 1" as illustrated in Fig. 1(b).

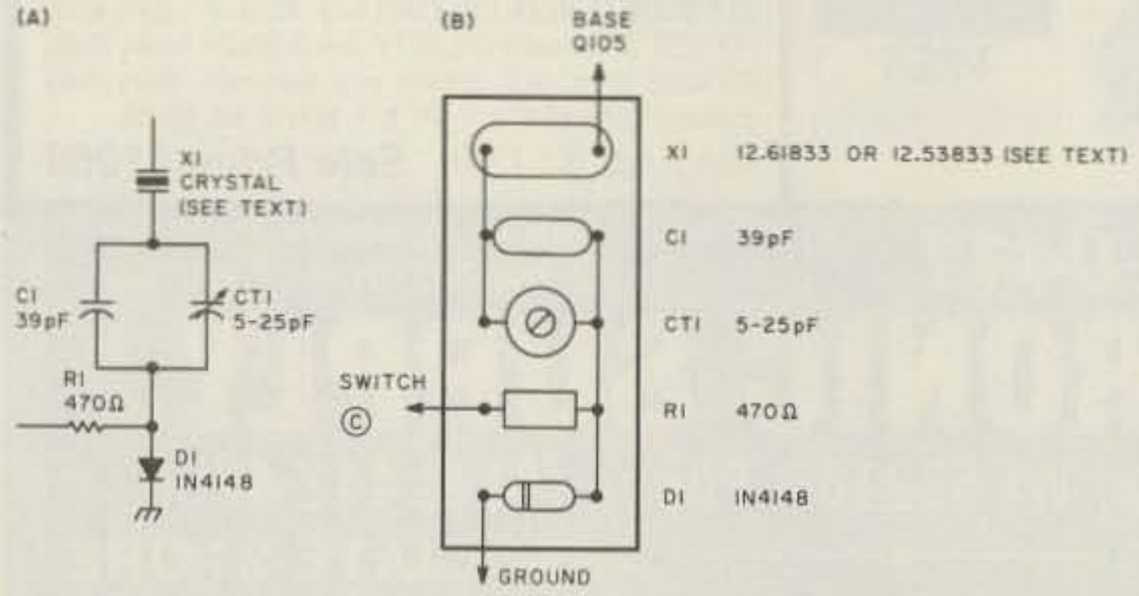


Fig. 1. (a) Repeater offset switching schematic. (b) Component arrangement.

Motherboard Preparation

Complete the following steps:

1) The circuit board track must be cut to separate where C118 (39 pF) and trimmer CT101 connect to ground, as diagrammed in Fig. 2.

2) To maintain continuity around the severed track, a ground jumper must be added near the edge of the board as indicated.

3) On the foil side of the board, insert a 1N4148 switching diode from the isolated area to the ground track.

4) On the component side of the board, insert a 470-Ohm resistor at the

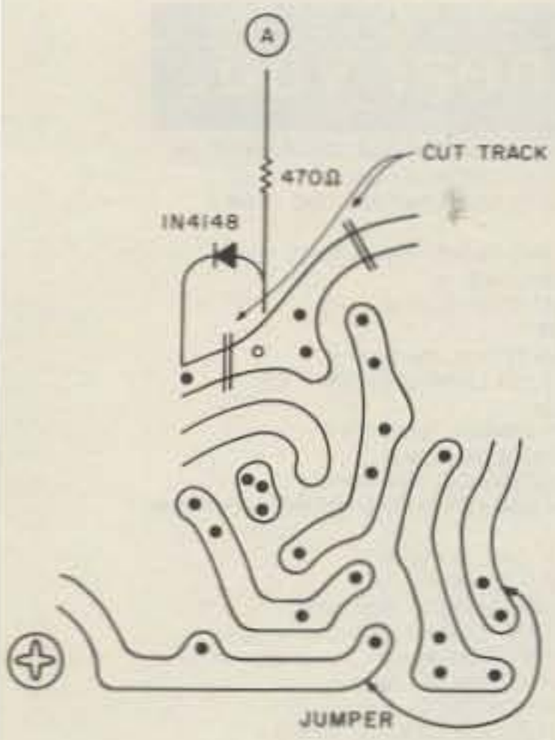


Fig. 2. A 1N4148 diode mounts on the foil side, while the 470-Ohm resistor mounts on component side next to J103.

cold end of this diode. This can be done by inserting one end of the resistor in the hole found between jumper J103 and R108 (1500 Ohms). Mount this resistor vertically from the board.

5) Locate TP11 near the 10.695-MHz crystal oscillator, and mount a 1N4148 diode vertically with the cold end down to the board.

6) Locate TP14 (near TP11) and mount another 1N4148 diode in the same manner (cold end down).

7) Connect the hot end of the diode at TP14 to the common position of a SPDT switch (see Fig. 3).

8) Connect the hot end of the diode at TP11 to the open side of the 470-Ohm resistor mounted vertically on the main board and continue this connection to the SPDT switch at the simplex terminal.

Mounting the Crystal Board

To mount the crystal board, complete the following steps:

1) Run a short length of wire (1") from the crystal output end of the crystal board to the base of transistor Q105. It is usually best to solder this directly to the lead of the transistor. (Go easy on the heat. They're durable, but don't push it.)

2) For ease of mounting, solder the hot end of the diode on the crystal board to the top of transformer T101. This will not only serve as a good ground connection, but will elevate the crystal board approximately ½" above the main board.

3) Connect the open end of the 470-Ohm resistor on the crystal board to the offset terminal of the SPDT switch.

Now, all that remains to be done is to adjust the offset crystal to frequency using your favorite counter and you're ready to work into those machines that you've been hearing.

If you or your club are interested, information on items such as receiver conversion kits and direct replacement 6-kHz NBFM i-f filters are available from me by sending an SASE.

See you on 29.6 FM.■

References

1. "CB to 10 FM," *73 Magazine*, January, 1980, p. 117.
2. Surplus Electronics, 7494 NW 54 Street, Miami FL 33166.
3. Melco 10 FM Transceiver Kits, PO Box 26, Marissa IL 62257.

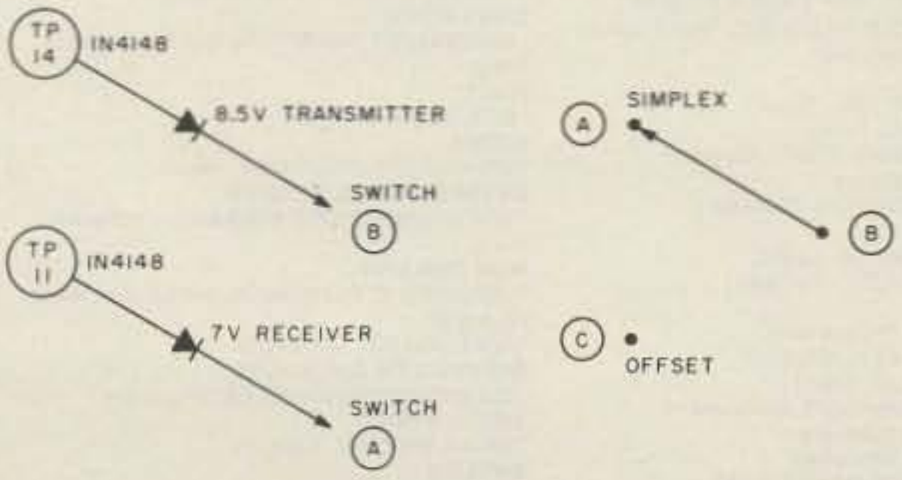


Fig. 3. Cold ends of diodes are connected to board. Hot ends connect to SPDT switches.

↙See List of Advertisers on page 114

Ask for Instant Software at a computer store near you.

ALABAMA
ANDERSON COMPUTERS, Huntsville
COMPUTER CENTER, Tuscaloosa
COMPUTERLAND, Huntsville
OLENSKY BROTHERS, INC., Mobile
ALASKA
COMPUTER TALK, Anchorage
JUNEAU ELECTRONICS, Juneau
ARIZONA
COMMERCIAL & HOME SYSTEMS, Tucson
COMPUTER STORE, Phoenix
M & M ELECTRONICS, Safford
MESA ELECTRONICS, Mesa
MILLET'S ELECTRONICS, Mesa
PERSONAL COMPUTER PLACE, Mesa
PROFESSIONAL DATA SYSTEMS, Phoenix
RUSALEM ELECTRONICS, Sun City
SIMUTEK, Tucson
SOFTWARE STATION, Tempe
ARKANSAS
DR. JAMES A. CAPPS, JR., Springdale
CALIFORNIA
ADVANCE RADIO (R/S Dealer), Grass Valley
ADVANCED COMPUTER PRODUCTS, Santa Ana
AMCO ELECTRONIC SUPPLY, Azusa
BYTE INDUSTRIES, Hayward
BYTE SHOP, Cerritos
BYTE SHOP, Citrus Heights
BYTE SHOP, Mountain View
BYTE SHOP, Placentia
BYTE SHOP OF SOUTH SAN JOSE, San Jose
CAPITOL COMPUTER SYSTEMS, Sacramento
COAST ELECTRONICS, Morro Bay
COMPUTER HORIZONS, Camarillo
COMPUTER MART OF CALIFORNIA, INC., Diamond Bar
COMPUTER MERCHANT, San Diego
COMPUTER STORE, San Leandro
COMPUTER WORLD, Lawndale
COMPUTER WORLD, Westminster
COMPUTERLAND, El Cerrito
COMPUTERLAND, San Diego
COMPUTERLAND SOUTH BAY, Lawndale
DIMENSIONAL SOFTWARE, San Diego
ELECTRONIC SYSTEMS, San Jose
GRASS VALLEY COMPUTER SYSTEMS, Penn Valley
HOBBI-TRONICS, San Jose
HOBBY WORLD ELECTRONICS, Northridge
HOUSE OF 80, Artesia
HUNTINGTON COMPUTING, Corcoran
MALIBU MICROCOMPUTING, Malibu
MARFAM, San Jose
MICROCOMPUTER WAREHOUSE, Sacramento
MN & T INDUSTRIES, Lompoc
OPAMP/TECHNICAL BOOKS, Los Angeles
OPPORTUNITIES FOR LEARNING, Chatsworth
PC COMPUTERS, El Cerrito
Q I COMPUTER, INC., Lawndale
R&V SOUND (R/S Dealer), Fortuna
RADIO SHACK, San Diego
SILVER SPUR ELECTRONICS, Chino
SOFTWARE PLUS, El Toro
STRAWFLOWER ELECTRONICS (R/S Dealer), Half Moon Bay
WABASH APPLE, El Toro
WENNER BUSINESS SYSTEMS, Los Altos
COLORADO
APPARAT, INC., Denver
COLORADO COMPUTER SYSTEMS, Westminster
COMPUTER SHACK, Pueblo
COMPUTERLAND-NORTH DENVER, Arvada
POOR RICHARD'S CALCULATORS, Fort Collins
SOFTWARE GOURMET, Denver
CONNECTICUT
AM COMPUTER PRODUCTS, Southington
AMERICAN BUSINESS COMPUTERS, Groton
BYTE ME COMPUTER SHOP, New London
COMPUTER LAB, New London
COMPUTER STORE, Windsor Locks
COMPUTERLAND, Fairfield
COMPUTERLAND, Hamden
COMPUTERWORKS, INC., Westport
DIVERSIFIED ELECTRONICS, New Haven
EAB ENTERPRISES, Old Greenwich
INSTRUCTIONAL SYSTEMS COMPUTERS, Manchester
TECHNOLOGY SYSTEMS, Bethel
DELAWARE
MICRO PRODUCTS, Wilmington
OMNIFAX, Wilmington
DISTRICT OF COLUMBIA
THE PROGRAM STORE, Washington, D.C.
FLORIDA
ADVENTURE INTERNATIONAL, Casselberry
AMF MICROCOMPUTER CENTER, Tampa
ATLANTIC SALES, Miami
COMPUTER JUNCTION, Fort Lauderdale
COMPUTER SHACK, INC., Jacksonville
COMPUTER STORE, Clearwater
COMPUTER SYSTEM RESOURCES, Gainesville
COMPUTER WORLDS, Clearwater
COMPUTERLAND, Boca Raton
COMPUTERLAND, Fort Lauderdale
COMPUTERLAND, Jacksonville
COMPUTERLAND, Sarasota
COMPUTERLAND, Tampa
COMPUTERLAND, West Palm Beach
HEATHKIT ELECTRONIC CENTER, Hialeah
H.I.S. COMPUTERMATION, Melbourne
MICROCOMPUTER SYSTEMS, INC., Tampa
SOUND IDEAS, Gainesville
SOUTH EAST MICRO DATA, Orlando
WILLIAMS RADIO & T.V., Jacksonville
YOUR BASIC COMPUTER CENTER, Fort Pierce
GEORGIA
ATLANTA COMPUTER MART, Atlanta
BAILEY'S COMPUTER SHOP, Augusta
DELTA DATA DYNAMICS, Atlanta
FLEMING DRUG CO., Wrens
MICRO COMPUTER SYSTEMS, Atlanta
HAWAII
COMPUTER CENTER, Honolulu
COMPUTERLAND OF HAWAII, Honolulu
RADIO SHACK ASSOC. STORE, Honolulu
IDAHO
DENNIS STONE ENTERPRISES, Fruitland
ELECTRONIC SPECIALTIES, Boise
R & L DATA SYSTEMS, Idaho Falls
ILLINOIS
ALPINE COMPUTER CENTER, Rockford
BYTE SHOP, LaGrange
CHICAGO MAIN NEWSTAND, Evanston
COMPUTER STATION, Granite City
COMPUTER STORE, Rockford
COMPUTERLAND, Mundelein
COMPUTERLAND, Niles
COMPUTERLAND, Peoria
GARCIA AND ASSOCIATES, Chicago
ICOM, Lombard
MAIN STREET COMPUTER CO., Decatur
MIDWEST MICRO COMPUTERS, Lombard
WALLACE COMPUTERS, Peoria
INDIANA
COMPU-TECH MICROCOMPUTER SYSTEMS, Dunkirk
COMPUTER CENTER, South Bend
DIGITAL TECHNOLOGY, Lafayette
FALL CREEK ELECTRONICS, Pendleton
IOWA
BUSINESS DATA PROCESSING, Des Moines
CYBERIA, INC., Ames
MEMORY BANK, INC., Bettendorf
KANSAS
CENTRAL KANSAS COMPUTERS, Herington
LOUISIANA
ACME BOOK CO., Baton Rouge
MAINE
MAINE COMPUTRONICS, Bangor
MAINE MICRO SYSTEMS INC., Auburn
MID-MAINE COMPUTER COMPANY, Auburn
RADIO SHACK, South Portland
MARYLAND
CLAYTON ELECTRONICS, Towson
COMM CENTER, Laurel
COMPUTER AGE, Silver Springs
COMPUTERS ETC., Towson
JACK FIVES ELECTRONICS INC., Pikesville
PROGRAM STORE, Baltimore
SOLON SOFTWARE, Rockville
MASSACHUSETTS
COMPUTER CITY, Charlestown
COMPUTER PACKAGES UNLIMITED, West Boylston
COMPUTER VILLAGE, W. Springfield
LAND OF ELECTRONICS, Lynn
LIGHTHOUSE COMPUTER SOFTWARE, Rehoboth
MARK GORDON COMPUTERS, Cambridge
SMALL BUSINESS SYSTEMS GROUP, Dunstable
SOUND COMPANY, Springfield
TUFTS RADIO ELECTRONICS, Medford
MICHIGAN
ALL FOR LEARNING, W. Bloomfield
ALTERNATE SOURCE, Lansing
A.M. ELECTRONICS, Ann Arbor
COMIC KINGDOM, Detroit
COMPUTER CENTER, Garden City
COMPUTER CONNECTION, Farmington Hills
COMPUTER MART, Clawson
COMPUTER ROOM, Kalamazoo
COMPUTERLAND, Kentwood
COMPUTERLAND, Southfield
COMPUTRONIX, Midland
EIGHT BIT CORNER, Muskegon
FERRIS RADIO, Hazel Park
GOLDEN ANVIL, South Haven
HOBBY HOUSE, Battle Creek
LEVEL IV PRODUCTS, INC., Livonia
LYCEUM, INC., Warren
MAIN SYSTEMS, INC., Flint
MID-MICHIGAN MEMORY, Dimondale
NEWMAN COMPUTER EXCHANGE, Ann Arbor
TRI-COUNTY ELECTRONICS & SOUND CENTER, Fenton
WIZARD'S ARSENAL, East Lansing
YE OLDE TEACHERS SHOPPE, Ypsilanti
MINNESOTA
CODE ROOM, Eden Prairie
DIGITAL DEN, Burnsville
MINNESOTA SOFTWARE, White Bear Lake
PERSONAL BUSINESS SYSTEMS, Minneapolis
ZIM COMPUTERS, Brooklyn Center
MISSISSIPPI
C-COM, Jackson
DYER'S, INC., West Point
SOFTWAREHOUSE, Jackson
MISSOURI
CENTURY NEXT COMPUTERS, Columbia
COMPUTER CENTER, Joplin
COMPUTERMART, Springfield
CRC COMPUTERS, Joplin
PERSONAL COMPUTER, Carl Junction
RADIO SHACK, Warsaw
SOFTWARE SHACK, Belton
UNITED COMPUTER STORES, St. Charles
MONTANA
COMPUTER STORE, Billings
INTERMOUNTAIN COMPUTER, Livingston
NEBRASKA
APPLETREE SOFTWARE, Battle Creek
COMPUTERLAND, Omaha
COMPUTERS WEST, Omaha
MIDWEST COMPUTER CO., INC., Omaha
SCOTTSBLUFF TYPEWRITER & OFFICE PRODUCTS, Scottsbluff
NEVADA
BYTE SHOP, Reno
CENTURY 23, Las Vegas
HOME COMPUTERS, Las Vegas
HURLEY ELECTRONICS, Las Vegas
NEW HAMPSHIRE
BITSNBYTES COMPUTER CENTER, Concord
COMPUTER TOWN, Salem
COMPUTERLAND, Nashua
PAUL'S TV, Fremont
PORTSMOUTH COMPUTER CENTER, Portsmouth
RADIO SHACK ASSOC. STORE, Keene
STURDIVANT AND DUNN, Conway
NEW JERSEY
ABE'S TV SALES & SERVICE, Glassboro
BARGAIN BROTHERS, West Trenton
COMPUTER CORNER OF NJ, Pompton Plains
COMPUTER ENCOUNTER, Princeton
COMPUTER FORUM, Redbank
COMPUTER MADNESS, Englishtown
COMPUTER MART OF NJ, INC., Iselin
COMPUTERLAND, Cherry Hill
COMPUTERLAND, Paramus
CROWLEY'S, Whitehouse Station
DAVE'S ELECTRONICS, INC., Pennsville
ELECTRONIC WORLD, Mantua
G.S.B. ELECTRONICS, INC., Maple Shade
J & J ELECTRONICS, INC. (R/S Dealer), Hackettstown
LASHEN ELECTRONICS, INC., Denville
MIDAS DATA SYSTEMS INC., Marlton
OMNIFAX, Cherry Hill
RADIO SHACK ASSOC. STORE, Moorestown
SILENT PARTNER, Fort Lee
NEW MEXICO
AUTEL ELECTRONICS CO., Albuquerque
J&W ENTERPRISES, Clovis
MITCHELL MUSIC, Carlsbad
THOMAS E. CARR JEWELER, Alamogordo
WARGAMES WEST, Albuquerque
NEW YORK
A WORLD OF COMPUTERS, Port Chester
ARISTO CRAFT DISTINCTIVE MINIATURES, New York
ASD HOME COMPUTER CENTER, Poughkeepsie
BERLINER COMPUTER CENTER, New Hyde Park
C HABILD OF NEW DORP, Staten Island
COMPUTER CORNER, White Plains
COMPUTER ERA, New York
COMPUTER FACTORY, New York
COMPUTER RESOURCES, Williamsville
COMPUTER SHOP, Kingston
COMPUTER STORE, Rochester
COMPUTER TREE, INC., Endwell
COMPUTERLAND, Carle Place
COMPUTERLAND, White Plains
COMPUTERLAND OF NYC, New York
DIGIBYTE SYSTEMS, New York
80-MICROCOMPUTER SERVICES, Cohoes
FUTURE VISIONS COMPUTER STORE, Melville
HOME COMPUTER CENTER, Rochester
LONG ISLAND COMPUTER GENERAL STORE, Lynbrook
MR. COMPUTER, Wappingers Falls
OMNIFAX, DeWitt
SOFTRON SYSTEMS, Rensselaer
UPSTATE COMPUTER SHOP, New Hartford
NORTH CAROLINA
BYTE SHOP, Greensboro
SOUND MILL, Havelock
TD'S RECORD SHOP, Sylva
OHIO
ABACUS II, Toledo
ALTAIR SYSTEMS, INC., Dayton
ASTRO VIDEO ELECTRONICS, INC., Lancaster
BUS COMPUTER, Mentor
CINCINNATI COMPUTER STORE, Cincinnati
COMPUTER STORE, Toledo
COMPUTERLAND, Columbus
COMPUTERLAND, Mayfield Heights
COMPUTERLAND, North Olmsted
COMPUTERLAND, Warren
CUSTOM SOFT, INC., Louisville
H. GABRIEL & CO., Madison
JOBAR ENTERPRISES, Middlefield
MICROAGE, Columbus
MICRO COMPUTER CENTER, Centerville
MICRO ELECTRONICS INC., Columbus
MICRO-MINI COMPUTER WORLD, Columbus
TWENTY-FIRST CENTURY SHOP, Cincinnati
UNIVERSAL AMATEUR RADIO INC., Reynoldsburg
WANNA PLAY, Cincinnati
OKLAHOMA
COMPUTER STORE, INC., Tulsa
COMPUTER WORLD, Tulsa
RADIO SHACK ASSOC. STORE, Guymon
SOUNDS, ETC., Watonga
VERN STREET PRODUCTS, Sapulpa
OREGON
COMPUTER PATHWAYS, Salem
TRS-80 PRODUCTS LTD., Portland
PENNSYLVANIA
ALLIED HOBBIES, Philadelphia
ARTCO ELECTRONICS, Kingston
BELL ELECTRONICS, Girard
COMPUTER WORKSHOPPE, Monroeville
COMPUTERLAND, Gibsonia
COMPUTERLAND, Whitehall
COMPUTERLAND OF HARRISBURG, Mechanicsburg
ERIE COMPUTER, Erie
J & E COMMUNICATIONS, Duncansville
MIGHTY BYTE COMPUTER CENTER, Horsham
OMNIFAX, Feasterville
OMNIFAX, Philadelphia
PITTSBURGH COMPUTER STORE, Pittsburgh
STEVENS RADIO SHACK DEALER, Phoenixville
ROUTE 30 ELECTRONICS, Latrobe
TELEVISION PARTS COMPANY INC., New Brighton
WAYNESBURG RADIO, Waynesburg
SOUTH CAROLINA
OMNI ELECTRONICS, Charleston
TENNESSEE
ACE MINI SYSTEMS, Clarksville
CHATTANOOGA COMPUTER CENTER, Chattanooga
COMPUTER WORLD, Nashville
COMPUTERLAB, Memphis
H & H ELECTRONICS, Tullahoma
WEBB'S PHARMACY & ELECTRONICS, Harriman
TEXAS
CODEDATA, INC., Arlington
COMPUSHOP, Bellaire
COMPUSHOPiFM1960W, Houston
COMPUSHOP/N Fwy, Houston
COMPUSHOP, Richardson
COMPUTER 'N THINGS, Austin
COMPUTER CONCEPTS, Beaumont
COMPUTER HOBBY CENTER, Austin
COMPUTER PORT, Arlington
COMPUTER SALES AND SERVICE, Fort Worth
COMPUTER SOLUTIONS, San Antonio
COMPUTER TECH ASSOCIATES, El Paso
COMPUTERLAND OF SW HOUSTON, Houston
COMPUTERS BY O'NEILL, Lake Jackson
COMPUTEX, Webster
GATEWAY ELECTRONICS, Houston
KA ELECTRONICS, Dallas
MARYMAC INDUSTRIES (R/S Dealer), Houston
PAN AMERICAN ELECTRONICS (R/S Dealer), Mission
R.L. COLE'S ELECTRONICS, San Antonio
WAGHALTER BOOKS, INC., Houston
UTAH
COMPUTERLAND, Salt Lake City
CTI, Provo
QUALITY TECHNOLOGY, Salt Lake City
VIRGINIA
COMPUTER SOLUTIONS, Leesburg
COMPUTER WORKS, INC., Harrisonburg
HOME COMPUTER CENTER INC., Virginia Beach
LITTLE SOLDIER, Alexandria
WASHINGTON
AMERICAN MERCANTILE COMPANY, Seattle
BYTE SHOP, Bellevue
COMPUTER CONNECTION, Silverdale
COMPUTERLAND, Bellevue
COMPUTERLAND, Federal Way
EMPIRE ELECTRONICS, Seattle
LORDS, Port Angeles
MAGNOLIA MICRO SYSTEMS, Seattle
PERSONAL COMPUTERS, INC., Spokane
UNIVERSITY VILLAGE MUSIC, Seattle
WESTERN MICROCOMPUTER CENTER, Bellingham
WEST VIRGINIA
COMPUTER CORNER, Morgantown
COMPUTER STORE, Huntington
SOUND & ELECTRONIC SPECIALTIES, Morgantown
WISCONSIN
BYTE SHOP, Milwaukee
COLORTRON COMPUTER DIVISION, Racine
COMPUTER WORLD, Appleton
COMPUTERLAND, Madison
COMPUTERLAND, Milwaukee
COMPUTERLAND OF FOX RIVER VALLEY, Oshkosh
MAGIC LANTERN COMPUTER, Madison
PETTED MICROSYSTEMS, Milwaukee
RADIO SHACK, Mauston
S & O TV SALES, Monroe
SOFTWARE CASSETTES, Madison
WYOMING
COMPUTER CONCEPTS, Cheyenne
PUERTO RICO
MICRO COMPUTER STORE, Caparra Terrace

AUSTRALIA
*DeFOREST SOFTWARE, Nunawading, Vic.
CANADA
*MICRON DISTRIBUTING, Toronto, Ont.
Compumart, Ottawa, Ont.
Micromatic Systems Inc., Vancouver, B.C.
Micro Shack of W. Canada, Regina, Sask.
Orthon Holdings Ltd., Edmonton, Alb.
Total Computer Systems, Ajax, Ont.
CARIBBEAN ISLANDS, CENTRAL AND SOUTH AMERICA
*WEST INDIES SALES CO. LTD., Hialeah, FL, USA
FRANCE
*DANIEL P. LUCET, Alfortville
GREECE
*CARITATO TECHNICAL, Athens
HONG KONG
*ASSOCIATED INDUSTRIAL SUPPLIES, Hong Kong
ITALY
*BITS & BYTES, Milan
KOREA
*SIN HAN TRADING CORP., Seoul
NETHERLANDS & BELGIUM
*SOFTWARE IMPORT BRABANT, Eindhoven, Neth.
NEW ZEALAND
*VISCOUNT ELECTRONICS, Palmerston North
NORWAY
*A/S SORLUND, Vedavagen
REPUBLIC OF SINGAPORE
*OG BUSINESS COMPUTER, Singapore
SOUTH AFRICA
*BRIAN VICKERS, Sandton
SWEDEN
*SENTEC AB, Jarfalla
UNITED KINGDOM
*CALISTO COMPUTERS, Birmingham, Eng.
WEST GERMANY
*MICROSTUFF, Frankfurt
*REINHARD NEDELA, Markdorf

*Instant Software Distributor

Instant Software™

Peterborough, N.H. 03458

Instant Software Does It With Frequency

Electronics I

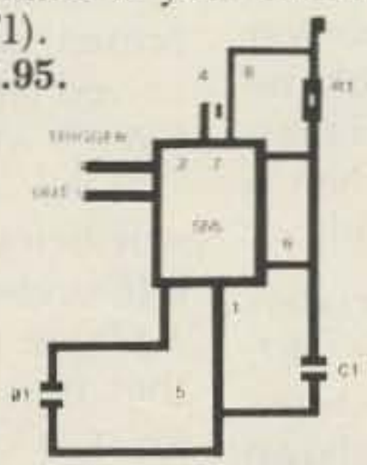
If you're still designing circuits the old-fashioned way, let the Electronics I package introduce the latest way to go:

Tuned Circuits & Coil Winding—Design tuned circuits for audio and radio frequencies. This two-part program will find the two missing values from any two of the following: frequency, capacitance, inductance, or reactance. The coil-winding section will calculate the number of turns and wire gauge required for a close-wound, air-, or slug-tuned coil from the inductance, diameter, length, and permeability of the coil.

555 Timer Circuits—Timers, both monostable (one-shot) and astable (oscillator), can be easily designed with this two-part program. The program will also draw a complete schematic on the screen of your TRS-80.

LM 381 Pre-Amp Design—You too can quickly design an IC preamp. With this program all you need to do is enter the parameters of the performance you want, and the program does the rest—right down to drawing a detailed schematic of your circuit on the screen! (T1).

No. 0008R $7.95.



All these programs are Model III compatible except Dynamic Device Drivers.

QSL Manager

Did you remember to send a QSL card to the op you worked last week? Maybe you sent a QSL, but can't recall getting one in return. The QSL Manager program will help you set up a computerized log book for instant access to your records.

Make complete log entries which include: date, time, callsign, name, band, both the Sent and Received signal reports, the mode, QSL sent/received, and any remarks you may want to add.

No more fumbling with index cards during a QSO, because the QSL Manager has a built-in search function to locate and display information on *any* callsign in your records. You can even list all the QSO's for a particular date, time, band worked, mode or a specific signal report. Up to 1400 entries can be accessed from your disk (depending on how many disk drives you have).

The program has built-in editing features that help you keep your log book up-to-date.

There's also a command that lets you output your log entries to a printer for hard copy.

In that next QSO, knock their socks off with your infallible memory. (T2)

No. 0151RD $19.95 Disk.

Dynamic Device Drivers

Are you tired of working around all of the little "obstacles" that are built into your TRS-80? Ever wish that there was some way to "repair" those imperfections?

Well here it is! The Dynamic Device Drivers package has all of these features:

Programmable Key Debounce—Your keyboard can be "tuned" to your typing style.

Programmable Repeating Key Function—Every key has a repeat function.

Lowercase Modification Support—You have a choice of standard or shift-for-lowercase letters. (A lowercase hardware modification must be installed.)

Better Than Nothing Graphics—Graphics characters will be converted to the closest ASCII character.

Printer/Screen Auto Switching—If your printer is accidentally turned off, your program won't bomb.

Programmable Printer Forms Control—You control the format for printer output.

Programmable Keyboard Lock—Only you will know the secret code to unlock your keaboard.

With the Dynamic Device Drivers package, you can look forward to working WITH your TRS-80, instead of against it! (T1)

No. 0228R $19.95.

(T1) = TRS-80 Model I, Level II, 16K RAM
(T2) = TRS-80 Model I, Level II, 16K, Expansion Interface 16K + 1 disk drive

TO ORDER:

See your local Instant Software dealer If these packages are unavailable, order direct.

Call Toll-Free
1-800-258-5473

Orders Only
In New Hampshire Dial
1-603-924-7296

Instant Software™

PETERBOROUGH, N.H. 03458 ↙445

TRS-80 is a trademark of Tandy Corporation

↙See List of Advertisers on page 114

A Stout Heart for a Simplex Autopatch — put your KIM-1 to work

Steven G. Erdei WD8CHH
16005 Ramage Avenue
Maple Heights OH 44137

A simplex autopatch is an automatic phone patch which requires only one frequency for both transmitting and receiving. The simplex autopatch is a time-division type of phone patch; a phone patch whose transmitter is turned off for brief periods of time and whose receiver is turned on, letting the radio user access the phone line. A good discussion of the various types of phone patches has been published in *73 Magazine*.*

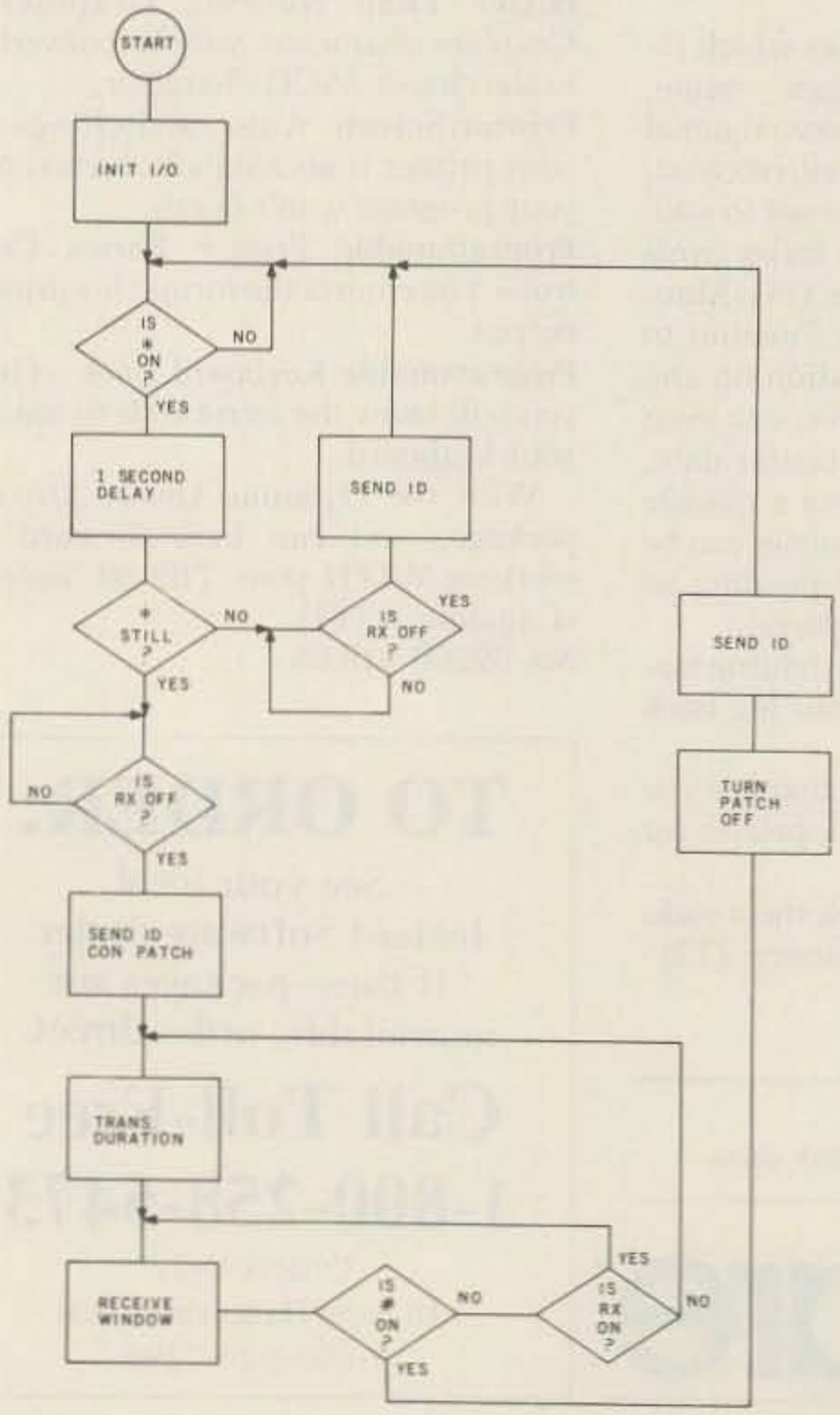


Fig. 1.

The only hardware needed to build this simplex autopatch is a VHF transceiver, three touchtone™ decoders, a phone patch, a touchtone phone line, and a MOS Technology KIM-1 microcomputer.

The KIM-1 computer is the heart of this simplex autopatch since it controls both the transceiver and the phone patch. The VHF transceiver must have a carrier-operated switch connected to the receiver section. This line should be a logic 1 with no signal present and a logic 0 when a signal is being received.

The touchtone decoders that I used are the 567, phase-locked loop type. (This circuitry is not shown since there have been many articles on these decoders in *73 Magazine*.)

The phone patch itself can be any method of coupling audio to and from the phone line. To be able to dial calls directly, the phone line you connect to this system must be able to recognize touchtone digits.

This program uses less than .5K of memory on the KIM-1. The program's starting location is 0300. When started, the program first initializes the I/O ports. PA0-7 and PB0 are assigned as outputs. PB1-7 are assigned as inputs. Next, the program waits until it receives an access command. This command consists of a received signal and the * digit being decoded. After the initial access command has been decoded, the program will wait for about 1 second and check for the access command again. If the access command is not present, as soon as the received signal goes away, a CW ID will be sent.

If the access command is still being decoded, this is interpreted as a request for a phone patch. As soon as the received signal goes away, a CW ID will be sent, the phone patch connected, and a dial tone broadcast. The program then continues on into the transmit delay section. This is where all audio from the phone line is transmitted.

After the transmit delay, the transmitter is turned off and the receiver is turned on. The receiver is then polled for a signal or command. If no signal is received, the transmitter and

*"Phone Patching '76," *73 Magazine*, June, 1976.

WORLD TIME WATCH

the first microprocessor watch made especially for hams

24 hr. timer

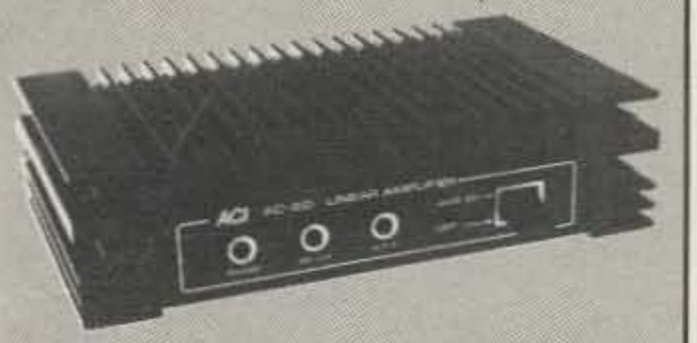
microprocessor water resistant

solar assist

New Low Price —$59.95

The HAM-1 functions include local time, world time, (G.M.T. too) count-up and count down chronometer, day, month, date, alarm and hourly chime. It's ideal for log-keeping, DX time conversion and 10 minute I.D. timing. The HAM-1 features a high contrast Seiko display and solar cell battery assist. Battery life is better than 4 years. The HAM-1 is water resistant to 20 meters, the case is 100% solid stainless steel and the crystal is scratch resistant mineral glass. The HAM-1 is rugged and durable and has a 1 year warranty.

2 METER AMPLIFIER



• 1-2 Watts In, 10-16 Watts Out • $59.95 • V.S.W.R. Protected • Can be Used for F.M. & S.S.B. • Led Status Indicators • Low Loss SO-239 Connectors • Current Drain Less Than 2.5A at 13.6 V.D.C. • Massive Heatsink

TEMPO S-1 UPGRADE KITS $39.95

Upgrade your early Tempo S-1 to current Production Specifications, kits include: • 450 M.A.H. Battery Pack • New Case Assembly • All New Escutcheons • Spkr./Mic. Jack w/Dust Cap • New Earphone & Jack • P.C.B. and Parts for Easy Installation • Detailed Instruction Manual • For Radios With & Without T.T. Pad.

Other Accessories Available:

Spkr/Mic. Designed for S-1's. . .	$24.95
Heavy Duty Belt Clip.	7.50
Flex Antenna	6.00

To Order Call or Write to:

ADVANCED COMMUNICATIONS INTERNATIONAL
2411 Lincoln Avenue
Belmont, CA. 94002 U.S.A.
(415) 595-3949

Add $3.00 per order for shipping & handling. California residents add 6% sales tax. Visa, Master Charge accepted.

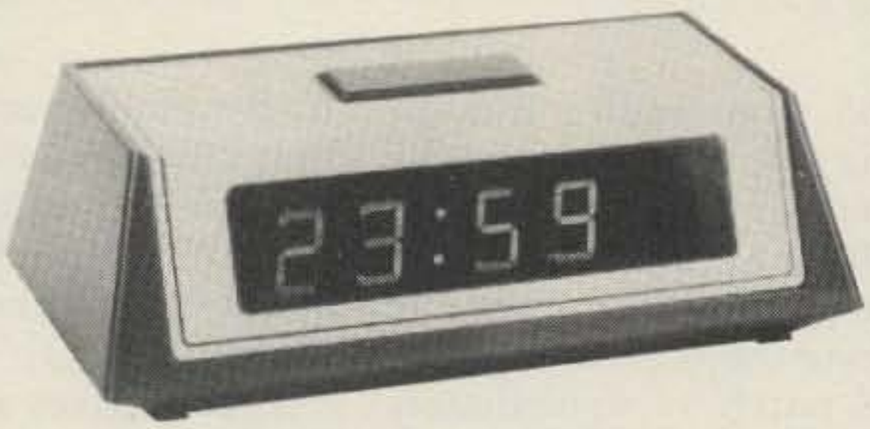
✓See List of Advertisers on page 114

✓448

NEW MFJ-102 SOLID STATE

24 HOUR DIGITAL CLOCK

Switchable to 24 hour GMT or 12 hour format. ID timer. Seconds readout. Bright BLUE .6" digits. Alarm, snooze, lock functions. Power out, alarm on indicators. Assembled.



Switch to 24 hour GMT or 12 hour format!
ID timer. Seconds readout. Bright BLUE .6 inch digits.

$32.95

Now you can switch to either 24 hour GMT time or 12 hour format! Double usefulness.

Switchable "Seconds" readout for accuracy.

ID timer. Alerts every 9 minutes after you tap the button. Also use as snooze alarm.

"Observed" timer. Just start clock from zero and note end time of event up to 24 hours.

Alarm. For skeds reminder or wake-up use.

Synchronizable with WWV.

Fast/Slow set buttons for easy setting.

Big, bright, blue digits (vacuum fluorescent) are 0.6" for easy-on-the-eyes, across-the-room viewing.

Lock function prevents missetting.

Operates on 110 VAC, 60 Hz (50 Hz with simple modification). UL approved.

Handsome styling with rugged black plastic case with brushed aluminum top and front. Sloping front for easy viewing. 6x2x3".

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for refund (less shipping). One year limited warranty by MFJ.

Order today. Call toll free 800-647-1800. Charge VISA, MC or mail check, money order for $32.95 plus $4.00 shipping/handling for MFJ-102.

Put this new improved MFJ digital clock to work in your shack. Order today.

CALL TOLL FREE . . . 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi. ✓47

MFJ ENTERPRISES, INCORPORATED
Box 494, Mississippi State, MS 39762

New from BLACKCAT

Antenna Sw./Wattmeter/SWR Meter $169.50 ppd.

BlackCat JB-4000SW—every shack needs it, every ham can afford it.

4-position Antenna Switch. Heavy duty coax switch rated at 2 kW PEP. Three positions for antennas (AUX may be used for dummy load). Fourth position parallels positions 1 and 2 for receive use only.

Dual-reading RF Power Meter. Switch to RMS or Peak. Three ranges: 20, 200, and 2000 watts, full scale.

Built-in SWR Meter. Shows SWR from 1:1 to 7:1. Two-position "Set/SWR" switch plus RF level control. Calibrated for 80-10 meters, 50 ohm non-inductive load.

And more! Those of us who still enjoy occasionally operating AM appreciate the Modulation-Percent meter scale and earphone monitor jack. And the rugged metal cabinet with black vinyl-clad steel cover and black anodized aluminum panel has white nomenclature for easy reading. Size: 9½"W x6"H x5½"D.

JB-1000 KW Dummy Load

50 ohm oil-cooled, temperature-stable, resistive load handles up to 1 kW with low SWR. Less oil. **$29.95 ppd.**

WAWASEE ELECTRONICS ✓398
Dept. 782 Box 36, Syracuse, IN 46567
Phone: 219/457-3191
Enclosed is $_____ (UPS shipping prepaid)
(No CODs. Indiana res. add 4% sales tax.)
Please send Model(s)_____
Charge It: ☐ Visa ☐ Mastercard
Exp. Date:_____ Card No._____
Name_____ (please print)
Address_____
City_____
State_____ Zip_____

Ltr	Code	Ltr	Code	Ltr	Code	Ltr	Code	Ltr	Code
A	6O	B	88	C	A8	D	9O	E	4O
F	28	G	DO	H	O8	I	2O	J	78
K	BO	L	48	M	EO	N	AO	O	FO
P	68	Q	D8	R	5O	S	1O	T	CO
U	3O	V	18	W	7O	X	98	Y	B8
Z	C8	0	FC	1	7C	2	3C	3	1C
4	OC	5	O4	6	84	7	C4	8	E4
9	F4	/	94	SPACE	OO	END OF MESSAGE			FF

Table 1. ID code table.

autopatch audio are turned back on and the transmit delay repeated. The receiver on-time (or window) is on for only short periods of time, so the audio from the phone is degraded only slightly.

The transmitter delay time can be changed by altering the value in location 0363. The receive window time can be changed by altering locations 0371 and 0376. If a # digit is decoded (the disconnect command) during the receive window, the patch is immediately disconnected and an ID sent. The ID program is located at 0200 and is called as a subroutine. The ID data table starts at location 0068 and can be programmed using the data in Table 1. A flowchart of the autopatch program is shown in Fig. 1.

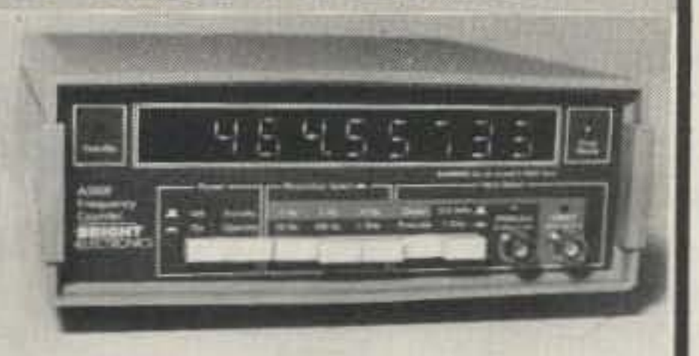
Table 2 gives a complete list of all connections to and from the KIM-1. All outputs are a logic 1 when on; all inputs are a logic 0 when on. All input connections should be logic levels and connected to the input pins. The touchtone decoders can be tuned to the proper tones as listed in Table 2, or to other frequencies if you want your system to respond to other digits.

The interfacing of the output lines is left up to the reader because of the differences in the devices that you must control. The best way to interface these control lines is to bring them out to a 7406 hex inverter and have the inverter control relays. You would need to do this for the transmitter keying line, the patch connect line, and the patch

Program listing for simplex autopatch.

```
0300   A9 FF      LDA #$FF      SET PA FOR OUTPUT
0302   8D 01 17   STA 1701
0305   A9 01      LDA #$01      SET PBØ FOR OUTPUT
0307   8D 03 17   STA 1703      SET PB1-7 FOR INPUT
030A   AD 02 17   LDA 1702      LOAD AND MASK FOR RECEIVER
030D   29 2A      AND #$2A      ON AND * DECODED
030F   F0 03      BEQ 0314
0311   4C 0A 03   JMP 030A      NO, LOOK AGAIN
0314   A0 00      LDY #$00      PATCH REQUEST DELAY
0316   A2 00      LDX #$00
0318   E8         INX
0319   E0 FF      CPX #$FF
031B   D0 FB      BNE 0318
031D   C8         INY
031E   C0 FF      CPY #$FF
0320   D0 F6      BNE 0318
0322   AD 02 17   LDA 1702      SEE IF * IS STILL BEING
0325   29 2A      AND #$2A      DECODED (PATCH REQUEST)
0327   F0 07      BEQ 0330
0329   A9 FF      LDA #$FF      NO, SET NO REQUEST FLAG
032B   85 D0      STA D0
032D   4C 34 03   JMP 0334      WAIT FOR RECEIVER TO TURN OFF
0330   A9 00      LDA #$00      YES, SET REQUEST FLAG
0332   85 D0      STA D0
0334   AD 02 17   LDA 1702      WAIT FOR RECEIVER TO TURN OFF
0337   29 20      AND #$20
0339   F0 F9      BEQ 0334      RECEIVER STILL ON
033B   20 00 02   JSR 0200      RECEIVER OFF, SEND ID
033E   A5 D0      LDA D0        SEE IF PATCH WAS REQUESTED
0340   C9 00      CMP #$00
0342   F0 03      BEQ 0347
0344   4C 0A 03   JMP 030A      NO, WAIT FOR NEXT ACTIVATION
0347   A9 34      LDA #$34      YES, CONNECT PATCH
0349   8D 00 17   STA 1700
034C   A9 00      LDA #$00      TRANSMIT DURATION TIMER
034E   85 EE      STA EE
0350   A0 00      LDY #$00
0352   A2 00      LDX #$00
0354   E8         INX
0355   E0 FF      CPX #$FF
0357   D0 FB      BNE 0354
0359   C8         INY
035A   C0 FF      CPY #$FF
035C   D0 F6      BNE 0354
035E   E6 EE      INC EE
0360   A5 EE      LDA EE
0362   C9 05      CMP #$05
0364   D0 EE      BNE 0354
0366   A9 20      LDA #$20      RECEIVE WINDOW TIMER
0368   8D 00 17   STA 1700
036B   A0 00      LDY #$00
036D   A2 00      LDX #$00
036F   E8         INX
0370   E0 20      CPX #$20
0372   D0 FB      BNE 036F
0374   C8         INY
0375   C0 05      CPY #$05
0377   D0 F6      BNE 036F
0379   AD 02 17   LDA 1702      RECEIVE WINDOW
037C   29 26      AND #$26      IS # (DISCONNECT) DECODED
037E   D0 0B      BNE 038B
0380   A9 00      LDA #$00      YES, DISCONNECT PATCH
0382   8D 00 17   STA 1700
0385   20 00 02   JSR 0200      SEND ID
0388   4C 0A 03   JMP 030A      GO LOOK FOR NEXT USER
038B   29 20      AND #$20      NO, WAIT FOR RECEIVER OFF
038D   F0 03      BEQ 0392
038F   4C 47 03   JMP 0347      RETURN TO TRANSMIT
0392   4C 79 03   JMP 0379      KEEP RECEIVE WINDOW ON
```

BRIGHT FREQUENCY COUNTERS



*NOW WITH VFA

A500 $229.00 (complete with accessories) Extended range 1.1Ghz and Commercial versions available

- Measure all bands
- Use with any transmitter
- High accuracy 10MHz timebase
- Fully tested & calibrated
- **Voice Frequency Annunciation**

***(VFA) option now available. (Repeater operators and sightless hams call for details).**

Remember the days we used to wonder what frequency we were on? Then, with Collins and Drake, frequency could be read to 1KC. Times have changed and now we say Hertz. Today with a BRIGHT counter you can be on freq to 1 Hz at HF or 10Hz at VHF/UHF.

BRIGHT counters are more than their name implies. BRIGHT invests in high performance components. The A500 series is so sensitive, it will read a 2 meter hand-held from 20' away or a 100 watt HF rig from 50' without any direct connection.

Check these features • 10Mhz shielded timebase to reduce interference • Easy operation with color keying and input select indicators • 3 sample rates (gate-times) • 8 big digits, plus overflow • Full factory testing • NBS traceable calibration.

Be bright, buy a BRIGHT counter.

Parameter	A500	A500E
Frequency range	50Hz-500Mhz	50Hz-1100Mhz
Sensitivity	10Mv-50Mv	10Mv-100Mv
Accuracy (17-30°C)	.1PPM	.1PPM
Timebase type	Proportional oven	Proportional oven
Price	$229.00	$259.00

OPTION: Nicad Pack (29.95).
Commercial models: A500C (295.00) A500EC (349.00)

TO ORDER CALL 404-952-0968

TERMS: MC, VISA, AMEX, UPS-COD. Add 7.50 shipping.
WE REPAIR DSI COUNTERS.
WRITE FOR INFO PACKAGE.

BRIGHT ELECTRONICS
P.O. BOX 76972
ATLANTA, GA 30328

More Than A Name

✓428

NEW MFJ-312 VHF Converter lets you

HEAR POLICE/FIRE CALLS

and Weather Band on 2 meter rigs. Covers nearly all FCC allocated police/fire VHF-hi freq. (154-158 MHz). Direct freq. readout on synthesized, VFO 144-148 MHz FM rigs.

Now with weather band coverage!

Scanning rigs become police/fire scanner.
Direct freq. readout on synthesized and VFO rigs.

$59.95

Hear exciting police/fire calls, weather band, maritime costal and more on your 2 meter rig!

Scanning rigs become police/fire scanner.

This ingenious MFJ VHF Converter turns your synthesized or VFO 144-148 MHz FM rig into a hot police/fire receiver (154-158 MHz) with direct frequency readout on your rig.

Receive weather plus more on 160-164 MHz.

Feedthru allows simultaneous scanning of both 2 meters and police/fire band. No missed calls.

Enjoy all benefits of your rig such as squelch, excellent sensitivity, selectivity, stability, limiting, AM rejection. For handhelds, too.

Two MOSFETS (tuned RF amp, mixer), bipolar crystal oscillator gives excellent performance.

Bypass/off switch allows transmitting. Won't burn out if you transmit (up to 25 watts) with converter on. Low insertion SWR.

"On" LED. 9-18 VDC. SO-239. Mtg bkt. 3x4x1". **MFJ-311, $49.95.** Like MFJ-312 less WX band.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for refund (less shipping). One year unconditional guarantee.

Order today. Call toll free 800-647-1800. Charge VISA, MC or mail check, money order for $59.95 for MFJ-312, $49.95 for MFJ-311 plus $4.00 each shipping/handling.

Enjoy exciting police and fire calls, order now.

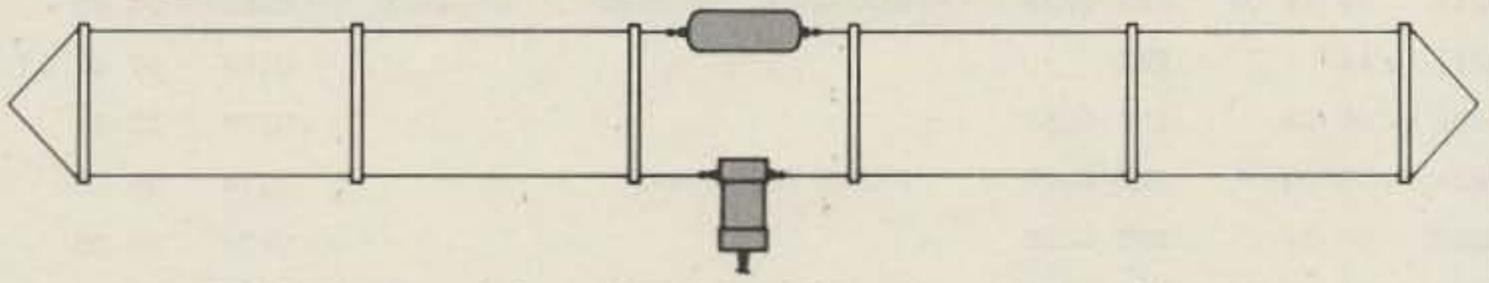
CALL TOLL FREE . . . 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi. ✓47

MFJ ENTERPRISES, INCORPORATED
Box 494, Mississippi State, MS 39762

BROAD BAND FOLDED DIPOLE

BARKER & WILLIAMSON'S MODEL 370-15



B & W's Broad Band Folded Dipole covers all amateur bands including the new 12, 17, and 30 meter bands. Also covers CAP frequencies, MARS, Military or any frequency from 3.5–30 MHz. Being used throughout the world! Total length only 90 feet long—spreader spacing 19 inches.
SWR—Less than 2:1 from 3.5–30 MHz
Supplied completely assembled with 50 feet RG 8U type coax and PL259.
Rugged construction for long life.
Can be installed as a flat top—inverted "V" or sloper
Also available for 2–22 MHz
Power handling capability 2 KW–4 KW PEP
PATENT PENDING
See your dealer or write:

B&W

Barker & Williamson, Inc. ✓11
10 Canal Street
Bristol, Pa. 19007
Phone #215-788-5581

✓See List of Advertisers on page 114

transmit/receive line, if this line is used. If you want to interface these lines in another manner, remember not to draw more than 1 mA from an output pin.

The simplex autopatch is compatible with normal simplex use on the same frequency. Only transmissions with an access digit are responded to; all other signals are ignored. The following describes how to use the autopatch.

First, to see if you are in range of the autopatch, key your transmitter and momentarily press the * on the touchtone pad. When you release your mike, you should hear the autopatch ID. Second, if you want to use the patch, follow the above procedure, but hold the * down for a couple of seconds. This time, you will hear an ID followed by a dial tone. You can now use the patch just like an autopatch connected to a repeater, with one exception: You must wait about a second before you dial or talk so that your first digit or word isn't missed.

When using the simplex patch, you will notice ticking sounds in the patch audio. This ticking is the receive window that lets you control the patch. When you are finished with your call, send a # and the patch will disconnect and send a final ID.

If you have a problem with the receive window interfering with the quality of the audio from the phone line, the squelch tail on your receiver is probably too long. You can eliminate this problem by removing the electrolytic capacitor following the diodes in your receiver's noise amp. This cured the problem in my system. For what would seem to be a difficult project, the use of the KIM-1 microcomputer turned this autopatch into a relatively easy task. If you have any difficulties in getting your system on the air, feel free to contact me. ■

Inputs	Outputs
PB1— 941-Hz decoder output	PA2—Transmitter keying
PB2—1477-Hz decoder output	PA4—Patch connect
PB3—1209-Hz decoder output	PA5—Patch send/receive switch
PB5—Receiver carrier-operated switch	PB0—CW ID audio output

Table 2. KIM-1 I/O connections.

CW ID subroutine.

```
0200   A9 04      LDA #$04      TURN TRANSMITTER ON
0202   8D 00 17   STA 1700
020C   BD 8F 02   LDA 028F,X
020F   95 E2      STA 00E2,X
0211   CA         DEX
0212   10 F8      BPL 020C
0214   A2 08      LDX #$08      SEND LEADING SPACE
0216   20 79 02   JSR 0279
0219   A2 03      LDX #$03      SPACE BETWEEN CHARS.
021B   20 79 02   JSR 0279
021E   20 8A 02   JSR 028A      GET CHAR. TO SEND
0221   AA         TAX
0222   E6 E2      INC 00E2
0224   C9 00      CMP #$00      CHECK FOR SPACE
0226   D0 03      BNE 022B
0228   4C 19 02   JMP 0219
022B   C9 FF      CMP #$FF      END OF MESSAGE?
022D   D0 03      BNE 0232
022F   4C 50 02   JMP 0250
0232   8A         TXA
0233   85 DF      STA 00DF
0235   06 DF      ASL 00DF
0237   F0 E0      BEQ 0219      DONE WITH CHAR?
0239   B0 0D      BCS 0248
023B   A2 01      LDX #$01
0242   20 79 02   JSR 0279      SEND SPC.
0245   18         CLC
0246   90 ED      BCC 0235
0248   A2 03      LDX #$03      SEND DASH
024A   20 5B 02   JSR 025B
024D   18         CLC
024E   90 F0      BCC 0246
0250   A2 08      LDX #$08      SEND TRAILING SPACE
0252   20 79 02   JSR 0279
0255   A9 00      LDA #$00
0257   8D 00 17   STA 1700      TURN TRANSMITTER OFF
025A   60         RTS
025B   86 DD      STX 00DD      MARK SUBROUTINE
025D   A5 E6      LDA 00E6
025F   8D 47 17   STA 1747
0262   EA EA EA   NOP'S
0265   EA EA      NOP'S
0267   EE 02 17   STA 1702      PBØ IS CW AUDIO OUTPUT
026A   A6 E7      LDX 00E7
026C   CA         DEX
026D   D0 FD      BNE 026C
026F   2C 47 17   BIT 1747
0272   10 F3      BPL 0267
0274   C6 DD      DEC 00DD
0276   D0 E5      BNE 025D
0278   60         RTS
0279   86 DD      STX 00DD      SPACE SUBROUTINE
027B   A5 E6      LDA 00E6
027D   8D 47 17   STA 1747
0280   2C 47 17   BIT 1747
0283   10 FB      BPL 0280
0285   C6 DD      DEC 00DD
0287   D0 F2      BNE 027B
0289   60         RTS
028A   A6 E2      LDX 00E2
028C   B5 68      LDA 0068,X
028E   60         RTS

Code Initialization

028F   00 05 3B 03 44 D0 C0 C0 C0 C0 C0 00

Sample ID (DE WD8CHH)

0068   90 40 00 70 90 E4 A8 08 08 FF
```

hey look here

call toll free:nights

(800) 231-3057

6-10 PM CDST, M.W.F.
days: 713 658-0268

ICOM	IC 720/AC	$1298
	IC 730	729
	IC 2AT	249
	IC 22U	269
Santec	HT 1200	299
ETO	Alpha 78	2707
	374	2036
	76A	1585
	76PA	1866
Telrex	TB 5EM	425
Drake	TR7 DR7	1349
	R7/DR7	1299
AEA	Morse matic	169

Order **KWM 380** Now
OLD PRICE
Rockwell Accessories in Stock

Bash Books	9.95
Amphenol Silver Plate PL-259	1.00
Antique/Rare Tubes	Call
GE 572	38
Timex 24 hour Wallclock	24.95
Robot 800A	749
Cubic 103	1195
Bird 43 SLUGS	
Portable **VJ** Amplifier 2 watts in 33 watts out	$89.95
Belden 9405 Heavy Duty Rotor Cable 2#16, 6#18	45¢/ft
Belden 8214 RG-8 Foam	36¢/ft
Belden 9258 RG-8X Mini-coax	19¢/ft
Alliance HD73 Rotor	109.95

Call for **TS830S, TS130S, TS-530** plus accessories

MASTERCARD VISA

All prices fob Houston except where indicated. Prices subject to change without notice, all items guaranteed. Some items subject prior sale. Send letterhead for Dealer price list. Texas residents add 6% tax. Please add sufficient postage, balance collect.

MADISON

Electronics Supply, Inc.

1508 McKinney ✓45
Houston, Texas 77010

This MFJ RF Noise Bridge . . .

lets you adjust your antenna quickly for maximum performance. Measure resonant frequency, radiation resistance and reactance. Exclusive range extender and expanded capacitance range gives you much extended measuring range.

• Exclusive range extender • Expanded capacitance range • Series Bridge

$54.95

This new MFJ-202 RF Noise Bridge lets you quickly adjust your single or multiband dipole, inverted Vee, beam, vertical, mobile whip or random system for maximum performance.

Tells resonant frequency and whether to shorten or lengthen your antenna for minimum SWR over any portion of a band.

MFJ's exclusive range extender, expanded capacitance range (±150 pf) gives unparalleled impedance measurements, 1 to 100 MHz. Simple to use. Comprehensive computer proven manual.

Works with any receiver or transceiver. SO-239 connectors. 2 x 3 x 4 inches. 9 volt battery.

Other uses: tune transmatch; adjust tuned circuits; measure inductance, RF impedance of amplifiers, baluns, transformers; electrical length, velocity factor, impedance of coax; synthesize RF impedances with transmatch and dummy load.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for a refund (less shipping). This bridge is unconditionally guaranteed for one year.

To order, simply call us toll free 800-647-1800 and charge it on your VISA or MasterCharge or mail us a check or money order for $54.95 plus $3.00 for shipping and handling.

Don't wait any longer to enjoy maximum antenna performance. Order today.

CALL TOLL FREE . . . 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi. ✓47

MFJ ENTERPRISES, INC.

BOX 494, MISSISSIPPI STATE, MS 39762

Check your signal.

BLACKCAT Monitor Scope $209.95 ppd.

Blackcat JB-4001S—for continuous monitoring of your transmitting quality at low cost.

The dedicated monitor. Leave it in the line and you'll always know what's happening with your rig. Operates from 160-10 meters.

Versatile. With familiarity you'll be able to interpret the scope patterns to determine power output, distortion, audio noise, ALC action, carrier suppression, SWR effects, linearity, spurious signals, flat topping, plus AM modulation characteristics. Provides both sine and trapezoid patterns. Built-in audio generator for modulation and transmitter testing purposes.

3" green phospher scope tube with printed reference graticule (useful for calculating percentages). Black vinyl-clad steel case with black anodized aluminum panel with white nomenclature. Size: 10½"W x6¼"H x11½"D.

2 KW Coax Antenna Switch

4-positions (three for ants. & dummy load, fourth for receive only). Coax connectors, black case with white nomenclature measures 3-7/16"H x 4-3/32"W x 4"D. **Model JB-1007SW, only $24.95 ppd.**

WAWASEE ELECTRONICS ✓398

Dept. 781 Box 36, Syracuse, IN 46567
Phone: 219/457-3191
Enclosed is $_____ (UPS shipping prepaid)
(No CODs. Indiana res. add 4% sales tax.)
Please send Model(s) _____
Charge It: ☐ Visa ☐ Mastercard
Exp. Date:_____ Card No._____
Name_____ (please print)
Address_____
City_____
State_____ Zip_____

✓See List of Advertisers on page 114

pace

CLOSEOUT

PACE Communicator MX (left)
Compact, 2m hand-held FM Transceiver. 144-148 Mhz, 1 watt, 6 channels with 18 channel capability (6 simplex, 6 at +600 KHz, 6 at -600 KHz), 1 channel installed (146.52 simplex). Only one crystal per channel. Complete with flexible rubber antenna, nicad battery & charger. Size: 2⅜"w×6⅛"h×1¾"d, Wt. 16 oz ... **CLOSEOUT $129.95**
Crystal Certificates ..... each **5.00**

PACE Communicator I (right)
Hand-held 2m FM Transceiver. 144-148 Mhz, 3 watts with 6 channel capability. 1 channel installed (146.52 simplex). Complete with flexible rubber antenna and battery tray. Nicads and charger **not** included. Size: 8½"h×2⅜"w ×1¾"d, Wt. 1.8 lbs ..... **CLOSEOUT $129.95**
Accessories for Communicator I:
B-1 Nicad Battery Pack (10 AA batteries)..... **$24.95**
C-1 Desk top AC Charger..... **39.95**
Crystal Certificates ..... each **5.00**

PACE Communicator II
25 watt, 800 channel 2m FM Transceiver for 144-147.995 Mhz. Simplex, ± 600 KHz & + 1 MHz offsets. Requires 13.8VDC @ 5 AMPS. Complete with hand microphone, mobile bracket, base stand & power cables. Size: 2.8"h× 6.4"w× 11.2"d, Wt. 6.6 lbs ..... **CLOSEOUT $249.95**

Quantities on items shown in this ad are limited. Hurry and order now! Send Check or Money Order. To expedite prompt shipment CALL TOLL FREE and use MASTERCARD or VISA; phone COD orders also accepted. For each major item, allow $5.00 for UPS charges in the 48 States.

AES Store Hours: Mon, Tue, Wed & Fri 9-5:30; Thurs 9-8 (Vegas 9-6); Sat 9-3.

master charge THE INTERBANK CARD

VISA

✓467

SAVE $100

ICOM

IC-22S
Synthesized 2m transceiver. No crystals required. Program 22 channels selected from 132 channels on 15 Khz spacing 146.010 to 147.990 MHz by installing diodes on matrix board. Simplex and ± 600KHz offsets. Output 10w or 1w, selectable. Microphone w/clip, mobile mount, DC cord, plugs and diodes supplied. Size: 2⅜"h×6⅛"w×8¾"d, Wt. 4¼ lbs. (Regular $299)..... **CLOSEOUT $199**

HY-GAIN Antenna Specials:
Model 707 2m, ⅝-wave stainless base loaded trunk lip mount mobile antenna. Trims 136.5 to 174 Mhz. No-hole installation with 2 set screws. With 16' coax & hardware..... **$9.95**
Model 563/MR-5 2m, ⅝-wave type, trunk lip mount antenna for Similar to Model 707 but labeled as a monitor ant. **$9.95**
Model 536/MR-10 Magnetic mount, 450 Mhz ½-wave stainless base loaded mobile antenna. Mounts without drilling a hole. Labeled as a monitor antenna but O.K. for Ham use **$9.95**

SAVE $296

YAESU FT-625RD All-Mode 6 meter Transceiver. 1-25w output (variable), 50-54 Mhz; SSB, CW, FM & AM (8w). Digital plus analog readout. Built-in ±1 mHz offset, noise blanker & AC-DC supplies. Size: 11⅛"w×5"h×12¾"d, Wt. 20 lbs. (Regular $895)..... **CLOSEOUT $599**

MIDLAND 13-509 12v, 10w, 12 channel 220 mHz FM transceiver. Crystals for 223.50 mHz simplex installed, mobile mount & microphone included ... **SALE $179.95**
Crystal certificates.....**each 5.00**

SR **Standard C7800**

New for 450 MHz!

Incorporates a brand-new LSI 8 bit microcomputer that memorizes, thinks, and makes decisions for quick and correct channel control. Select 10 watts or 1 watt output and 480 channels in 25 kHz steps, 438 to 449.975 mHz. Coverage is divided in to 12 steps of 1 mHz which can be scanned up and down at 25 or 50 kHz intervals, fast or slow, automatically searching for busy or vacant channels. Instant push button access to two priority call channels. Capable of memorizing or programming any 5 frequencies and scanning them up and down. Memory back-up feature maintains pre-programmed frequencies even when power is switched OFF. Low supply voltage triggers an internal DC-DC converter to maintain the back-up voltage at a constant level. Double superhet receiver; IF: 21.4 mHz/455kHz; Sensitivity: 0.5uv/20db; Bandwidth: ± 7.5 kHz; Selectivity: better than 60db at ± 25kHz. Microphone has a built-in up-down frequency control for convenient channel selection. Big, four digit LED frequency readout and unique 9 LED signal strength & power indicator. CTCSS encoder provisions. Requires 13.8v DC @ 4.5 A (10w, transmit), 0.6A (receive). Size: 6⅜"w×2⅜"h×6⅝"d; Wt. 6½ lbs. With mobile mount, hardware & DC cord..... **Low AES Price $399.95**

Call Toll Free: 1-800-558-0411
In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio Wats 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO Florida 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. Wats 1-800-432-9424
Outside Fla. 1-800-327-1917

LAS VEGAS, Nevada 89106
1072 N. Rancho Drive
Phone (702) 647-3114
Pete, WA8PZA & Squeak, AD7K
Outside Nev. 1-800-634-6227

ASSOCIATE STORE

ERICKSON COMMUNICATIONS
CHICAGO, Illinois 60630
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside ILL. 1-800-621-5802

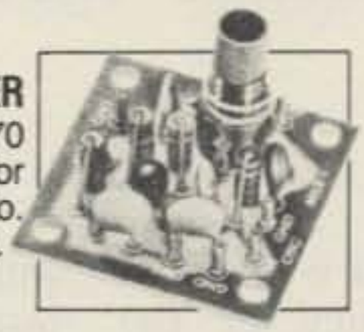
FOR THE EXPERIMENTER

CRYSTALS & KITS/OSCILLATORS • RF MIXERS • RF AMPLIFIER • POWER AMPLIFIER

OX OSCILLATOR

Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101.

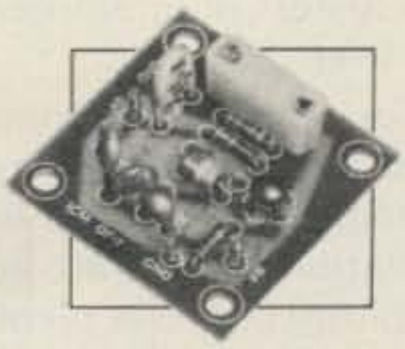
Specify when ordering. $6.31 ea.



MXX-1 TRANSISTOR RF MIXER

A single tuned circuit intended for signal conversion in the 3 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 170 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.

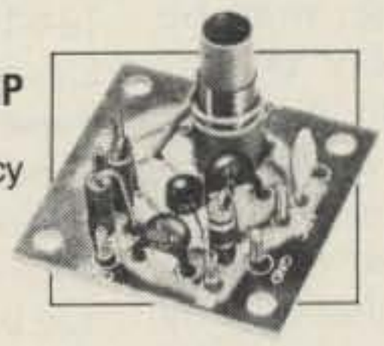
Specify when ordering. $7.02 ea.



OF-1 OSCILLATOR

Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 03t108, 18 to 60 MHz, OF-1 H Cat. No. 035109.

Specify when ordering. $5.42 ea.



PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104.

Specify when ordering. $7.34 ea.

SAX-1 TRANSISTOR RF AMP

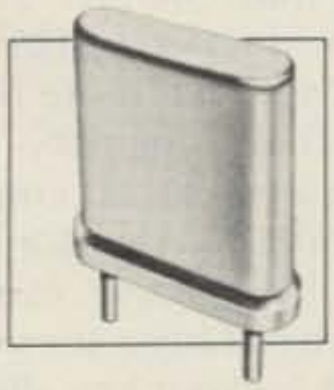
A small signal amplifier to drive the MXX-1 Mixer, Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 03512. 20 to 170 MHz, Hi Kit, Cat. No. 035103.

Specify when ordering. $7.02 ea.

BAX-1 BROADBAND AMP

General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat. No. 035107.

Specify when ordering. $7.34 ea.



.02% Calibration Tolerance

EXPERIMENTER CRYSTALS (HC 6/U Holder)

Cat. No.	Specifications	
031080 *3 to 20 MHz	— For use in OX OSC Lo	$6.88 ea.
031081 *20 to 60 MHz	— For use in OX OSC Hi	$6.88 ea.
031300 *3 to 20 MHz	— For use in OF-1L OSC	$6.88 ea.
031310 *20 to 60 MHz	— For use in OF-1H OSC	$6.88 ea.

**Specify when ordering*

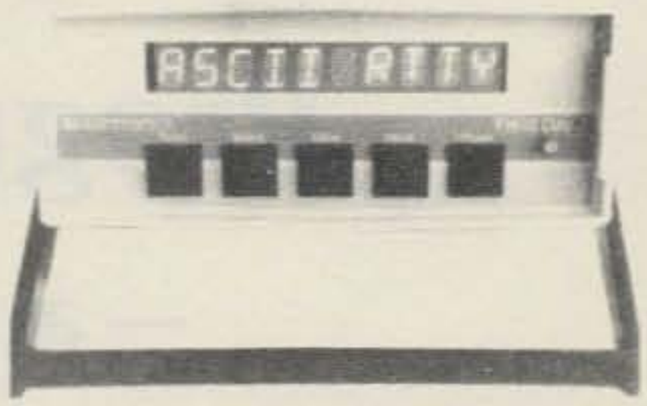
Shipping and postage (inside U.S., Canada and Mexico only) will be prepaid by International Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request.

ICM

INTERNATIONAL CRYSTAL MFG. CO., INC.
10 North Lee / Oklahoma City, Okla. 73102

✓36

Code reading makes ham radio more fun!



Field Day 2

A code reader can add to the fun of ham radio by allowing you to copy many signals that are too complex or too fast to decode by ear.

You can get in on such things as news-wire service transmissions, weather information and financial reports that are sent by radioteletype (RTTY), ASCII computer language or Morse code.

Some code readers only copy one or two types of signals, but the **Kantronics Field Day 2** ™ allows you to copy RTTY at 60, 67, 75 and 100 WPM, ASCII at 110 and 300 (if sent as it is typed) Baud and Morse at 3 to 80 WPM.

The **Field Day 2** even has an editing program to improve sloppy Morse. You get more of the message and fewer illegal character signs than with other code readers. With a **Field Day 2** you also get a 24-hour clock, code speed display and TTL compatible demodulator output.

The **Field Day 2** is a complete unit in one package with a large, easy-to-read, 10-character display and is backed with a full-year limited warranty.

Code reading makes ham radio more fun, and now you can get started with one compact, versatile unit, at $449.95, suggested price, the **Field Day 2.**

Call or visit your Authorized Kantronics Dealer for a demonstration!

Kantronics

(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044

✓See List of Advertisers on page 114

Robert B. Grove WA4PYQ
Grove Enterprises, Inc.
Rt. 1, Box 156
Brasstown NC 28902

The Bearcat 350 Programmable Scanner

— a first-class act from Electra

It's hard to believe that only four years have gone by since Electra released their first keyboard-entry programmable scanner, the venerable BC-210. This eminently-usable little scanner was followed in rapid succession by a flurry of new products: the BCs 250, 220, 211, 300, 160—and now, the BC-350.

This new entry from Electra sports one radical innovation: a fully-alphanumeric display. No longer does the listener have to remember that 155.505 is his local police frequency or the 147.045 is the Robbinsville repeater. He can use the keyboard to write in "Police," "Fire," or "RVL RPTR." Up to 8 characters, alpha or numeric, may be entered for display on any channel. Readout is a brilliant fluorescent display.

The alphanumeric function is not in lieu of a frequency entry; either display may be called up alternately by toggling the A/N key.

Another feature which will be well-received is the faster scan/search rate—20 channels per second (10 on slow speed).

Frequency ranges covered are typical of the new Bearcats: 30-50, 118-136, 144-174, and 421-512 MHz. Electra chooses to break these ranges into seven subbands for advertising purposes. It is significant to note that low-band coverage is now advertised as full 30-50 MHz rather than 32-50 MHz as in previous products. Although the earlier units went down to 30 MHz, performance and parameters were not always repeatable.

The 350 is not tiny; in fact, in spite of the photo, it is the largest unit yet produced by Electra: 12" W × 4" H × 9" D. It was definitely not produced with the mobile listener in mind! However, the BC-350 does have a 12-volt input for those with room.

Sensitivity and selectivity are excellent. 0.4 uV on low and high bands and 0.8 uV on UHF are typical. −60 dB rejection ±25 kHz discriminates against adjacent channel interference.

As with some previous models, 50 channels of memory are allocated to 10 bands, allowing selective call-up of various frequency clusters programmed by the user.

For noisy environments such as those encountered in industrial or mobile installations, a 2-Watt audio amplifier provides plenty of sound from the internal speaker. A rear-apron jack is provided for an external speaker or de-scrambler.

Selective scan delay (an Electra patent) allows for immediate resumption of scan or search after the carrier goes off the air, or it may be toggled to wait 2 seconds for responses on that channel.

A priority feature allows sampling of channel one every two seconds if desired to be sure not to miss a call on that channel. An auxiliary function can be used to activate a remote recorder. A count memory permits the user to determine the number of times a channel has been active, even if you have not been there to hear it. A lockout key allows you to temporarily exclude any channels you wish during scan.

The display is divided into two readouts. The left-hand window provides call-

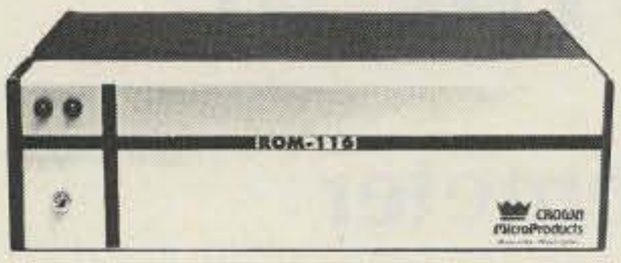
The Bearcat 350 programmable scanner.

Continued on page 101

RTTY/CW FOR THE TRS-80*

ROM-116

RTTY/CW Operating System



FEATURING:

- ASCII-BAUDOT-CW
- SPLIT-SCREEN VIDEO
- REAL TIME CLOCK

PLUS:

- Word-wrapping
- Two serial ports
  45.45 to 9600 Baud
- Serial ports use USARTS
- Automatic CW/ID
- Program status
  continuously displayed
- Instantly change:
  program status
  Baud rates
  ASCII/Baudot modes
- Transmitter under
  program control
- Self tracking CW speed
- LLIST & LPRINT usable
  on any serial printer
- All software easily
  transferred to disk
- Requires LEVEL II 16K RAM
  Model I or Model III,
  external terminal unit
- Includes pc board, cabinet,
  software & manual
- Unconditionally guaranteed
  for 30 days
- Limited parts & labor
  warranty for 90 days
- ASSEMBLED & TESTED **$325**

Washington residents add 5.3% sales tax

VISA mastercharge

*A Trademark of the Tandy Corp

CROWN MicroProducts

P O Box 892
Marysville, Washington 98270
(206) 659-4279

Compare the TU-170

Interested in RTTY?

$169.95 buys a terminal unit kit with the features you need most for enjoyable RTTY. Our 3-stage active input filters, built-in AFSK and 60 mA loop supply make the TU-170 a great buy regardless of the rig or printer you prefer.

Sound interesting? Call or write for details about our full line of RTTY equipment backed by a complete factory support program.

Flesher Corporation ✓23

P.O. Box 976 Topeka, KS 66601 913•234•0198

Distributors in Canada and Australia

CALL TOLL FREE

For the best deal on

•AEA•Alliance•Ameco•Apple•ASP
•Avanti•Belden•Bencher•Bird•CDE
•CES•Communications Specialists
•Collins•Cushcraft•Daiwa•DenTron
•Drake•Hustler•Hy-Gain•Icom•IRL•KLM
•Kenwood•Larsen•Macrotronics•MFJ
•Midland•Mini-Products•Mirage•Mosley
•NPC•Newtronics•Nye•Panasonic
•Palomar Engineers•Regency•Robot
•Shure•Standard•Swan•Tempo
•Ten-Tec•Transcom•Yaesu

Hot Buys for August!

ICOM IC-720A all-band Xcvr...
Now in stock! _____ $1299

TENTEC ARGOSY all-band HF
Xcvr, only _____ $495.95

ICOM IC-2A Hand Held...
Limited special ___ $219.50
IC-2AT with pad __ $249.50

MIRAGE B-23 2-meter 2/30 W
FM/SSB linear ____ $79.95

APPLE Disk Based System:
Apple II or II Plus with 48k RAM installed, Disk II with controller, DOS 3.3 _$1869

APPLE Game Paddles available

Quantities limited... all prices subject to change without notice

We always have an excellent assortment of fine used equipment in stock... Come in or call

Erickson is accepting late model amateur radio equipment for service: full time technician on duty

CALL TOLL FREE
(outside Illinois only)

(800) 621-5802

HOURS: 9:30-5:30 Mon., Tues., Wed. & Fri.
9:30-9:00 Thursday
9:00-3:00 Saturday

VISA mastercharge

ERICKSON COMMUNICATIONS
Chicago, IL 60630
5456 North Milwaukee Ave.
(312) 631-5181 (within Illinois)

✓See List of Advertisers on page 114

Karl T. Thurber, Jr. W8FX
317 Poplar Drive
Millbrook AL 36054

The Calectro Multi-Tester

— a full-size, lab-type multimeter for fans of analog operation

The most common items of test equipment needed in the ham shack or home electronics workshop are rf and af signal generators, oscilloscopes, frequency counters, dummy load/wattmeters, grid-dip oscillators, and—perhaps the *primary* instrument—the multi-tester or multimeter.

Little need be said about the utility of the multimeter on the bench or in the home workshop. This versatile instrument allows one to make basic current, voltage, and resistance readings (as a minimum), and for this reason it is indispensable for even the non-technical amateur or SWL—if for no other purpose than to be able to detect open and short circuits or to check one's ac line voltage. For the home-brewer, experimenter, and kit-builder, the multimeter is invaluable in circuit design and development as well as in troubleshooting applications.

The Calectro 20-205 multimeter.

The basic multimeter, or VOM, is an analog device that has four, five, or more scales, each representing a different type of measurement, such as ac, dc, Ohms, decibels (dBs), and possibly other parameters. The input arrangement and number of ranges depends on the degree of sophistication and cost of the unit. A primary "driver" of quality and cost (they go together, of course!) is the meter's internal resistance—the higher the better, since units with relatively high internal circuit resistance (20,000 Ohms-per-volt or greater) will tend not to unduly distort readings as a result of loading of the circuit under test by the meter itself.

There is little question that the industry is moving toward the digital-readout multimeter. Frankly, this type of tester can enable a greater degree of *overall* accuracy for the average user, just as the digital watch can permit more precise timekeeping than can the two-hands type. For example, a good digital multimeter's accuracy may be on the order of 0.1 to 0.5% of basic dc scale, whereas good analog meters boast precisions of but 2-5%, not to mention such additional problems as interpolation and parallax errors.

Despite the superior accuracy of the digital instrument, there's still a good deal of room for the analog multimeter for general-purpose electronic usage. The better grade instruments are still a good deal less expensive than equivalent digitals. In addition, for general troubleshooting, the smooth analog meter action is often much preferred over trying to interpret running, flashing digits when working with highly dynamic or unstable circuits. Too, movement trends of the parameter being measured are much more clearly discerned on the analog meter.

There's no shortage of analog multimeters in the marketplace. However, one of the better meters I have encountered is the new Calectro (GC Electronics) model 20-205, formerly known as the H3-361. This high quality, "lab-type" instrument is a multi-purpose multimeter that's a good example of what a better analog model can do. The 100,000 Ohms-per-volt dc internal resistance ensures that most circuits under test will be unaffected by

the meter's presence. I found it to be a very rugged, reliable all-purpose measuring device capable of handling a wide range of ac and dc voltages, resistances, dc currents, and dBs.

The Calectro instrument has a large (4") clear plastic-front meter with a two-color mirrored scale for good visibility and ease of interpolation. The 18-position range switch, when coupled with the four front-panel input jacks, enables selection of 22 ranges. Dc voltage ranges run from 0-500 millivolts to 0-1000 volts. Ac measurements of from 0-2.5 volts to 0-1000 volts are available; VUs are measurable in five ranges from −20 to +62 dB; dc resistance scales run from 0-2000 Ohms to 0-20 megohms; dc current scales run from 0-10 microamperes to 0-10 Amperes. Batteries are required only for the Ohms function (two AA-size 1.5-volt penlight cells will do the trick—use alkaline cells for long life), which incidentally in the R×1 range has a center-scale position of 16 Ohms. This enables convenient and accurate resistance measurements down to a mere fraction of an Ohm.

Meter protection is a particularly important feature of any item of test gear. The Calectro unit is well protected by dual silicon diodes. The protection circuit worked well for me, since through operator error I managed to goof in checking out the unit by making several gross mistakes in range switch selection, including inadvertently placing raw 120-V ac line current across the meter when using one of the low Ohms ranges. No damage was experienced.

The unit's accuracy seemed adequate for most in-shack uses and appeared to be better than the rated dc ±3% and ac ±5% (of full scale) accuracy. The double-jeweled ± 2% meter and temperature-stabilized resistors in the innards undoubtedly contributed to the tester's overall excellent accuracy.

The Calectro device is a large instrument as far as multimeters go, being 7¼" H × 6" W × 2¾" D. It comes with standard color-coded test leads and prods and is list priced at $59.95. There are no accessories advertised for use with it.

While one may easily purchase a much less expensive, miniature multimeter, one will likely find the latter to be but a mere toy beside a higher-quality instrument such as the lab-grade unit I've highlighted here. A good analog instrument can be made to do yeoman duty for a multitude of tasks, including battery testing, transistor or diode checking, and field-strength measuring (when used in conjunction with a diode or rf probe). It can even be used as an S-meter for an older receiver. An rf probe, or a set of extra-long coiled test cables with easy-grip clips, would also represent money well spent.

Sure, I know that the future is digital, but analog has its rightful place, and that place just may lie in your workshop. It certainly does in mine!

The 20-205 is sold primarily through general electronic supply houses. This Japanese-made import is distributed by GC Electronics, 400 South Wyman St., Rockford IL 61101. Reader Service number 479. ■

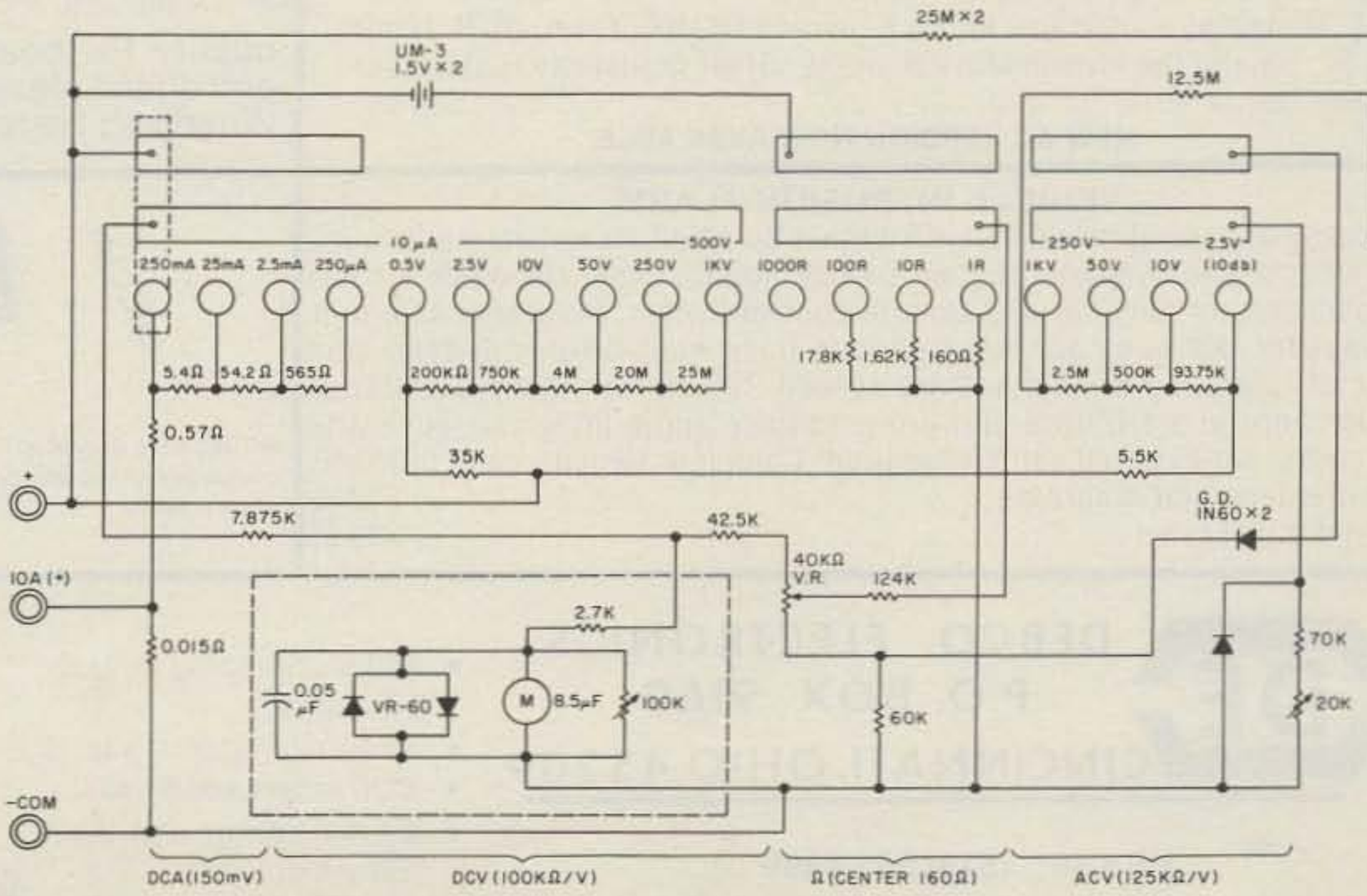


Fig. 1. Schematic for the Calectro multimeter.

See List of Advertisers on page 114

NEW PRODUCTS FROM HAL-TRONIX

2304 MHz DOWNCONVERTERS

Frequency Range 2000–2500 MHz

2304 Model 1: Basic three-stage, less case and connectors.....**$49.95**

2304 Model 2: Three-stage, includes preamp, with die-cast case and connectors.....**$59.95**

2304 Model 3: With high-gain preamp, die-cast case and connectors.....**$69.95**

The above models complete with high-quality drilled PC boards, all electronic components, etc., with 15-page manual.

Note: Any of the above, factory wired, $50 additional

POWER SUPPLIES FOR THE DOWNCONVERTERS:

Power supply kit #1, less case and connectors.....**$19.95**

Power supply kit #2, includes case & connectors.....**$24.95**

Power supply—already built, complete.....**$34.95**

PARTS FOR THE NTSC RF MODULATOR FOR CHANNELS 3, 4, or 5. This is **not** a complete kit. The hard-to-get parts include the LM-1889, the .08 microhenry tank coil, the 7-14 microhenry adjustable coil, the 10 microhenry RF coil, with schematic (no PC board) as used in Bob Cooper's satellite TV receiver. Real buy at.....**$5.95**

SHIPPING INFORMATION

ORDERS OVER $20.00 WILL BE SHIPPED POSTPAID EXCEPT ON ITEMS WHERE ADDITIONAL CHARGES ARE REQUESTED. ON ORDERS LESS THAN $20.00 PLEASE INCLUDE ADDITIONAL $1.50 FOR HANDLING AND MAILING CHARGES. SEND SASE FOR FREE FLYER

"HAL" HAROLD NOWLAND

W8ZXH

TOUCHTONE DECODER KITS

HAL 567-12: single line in, 12 lines out, complete with 2-sided plated-through G-10 board and all components. Uses seven 567's and three 7402's.....**$39.95**

HAL 567-16: single line in, 16 lines out, complete with 2-sided plated-through G-10 board and all components; includes 22-pin edge connector. Uses eight 567's and four 7402's. (See construction article in April 1981 Radio & Electronics for complete writeup.).....**$69.95**

TOUCHTONE ENCODER KITS

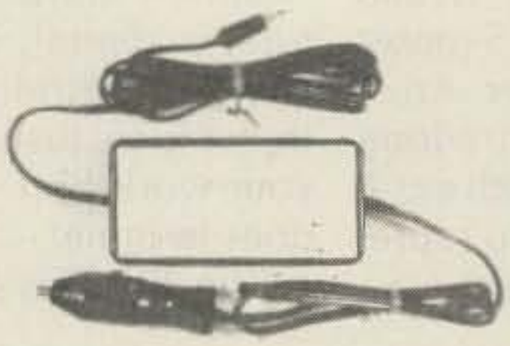
HAL ECD-12: 3 x 4 twelve-character encoder utilizing the ICM 7206 Intersil chip. Kit comes complete with both LED and audio-coupled outputs (speaker included). With aluminum anodized case.....**$24.95**

HAL ECD-16: 4 x 4 sixteen-character encoder utilizing the ICM 7206 Intersil chip. Kit comes complete with LED and audio-coupled outputs (speaker included). With aluminum anodized case.....**$39.95**

✓31 **HAL-TRONIX**

P. O. BOX 1101
SOUTHGATE, MICH. 48195
PHONE (313) 285-1782

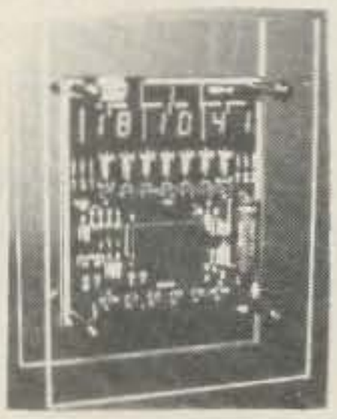
RAPID MOBILE CHARGER



The DEB-TED Rapid Mobile Charger is a constant voltage charger that will charge your batteries off a 12 Volt source in 4-6 hours. You may use the charger at all times. this includes transmit and receive periods. It is equipped with a cigarette lighter plug on the input side and the appropriate charging plug on the output side. Models available now for the Kenwood TR2400, Yaesu 207R, Tempo S1, S2, S5 and the Wilson Mark II and IV. Other models available also please call or write for info..... $34.95.

NEW AC VERSION NOW AVAILABLE

"SEE THE WORKS" CLOCK



OUR EASIEST CLOCK TO ASSEMBLE!

6 Digits 12 or 24 Hour Format Clock rests between two pieces of clear plesiglas A GREAT CONVERSATION PIECE! Kit is complete including top quality PC board, all components pre-cut and drilled plexiglas and all hardware.$29.95
Wired and Tested.....$39.95

VEHICLE INTRUSION ALARM

An easy to assemble and install kit that offers options not normally found in other alarm systems. Hidden switch mounts under the dash. Kit has provisions for sensors and remote control switch. Programmable time delays for exit, entry and alarm periods. Basic hook-up utilizes dome light circuit activating when doors are opened. The alarm will drive a siren or pulse horn at a 1HZ rate. Not prone to false alarm do to reliable CMOS circuitry. No external switch required! Complete kit with easy to follow instructions and diagrams $12.95
Wired and Tested $19.95

SPECIAL

SPECIAL

MODEL 5314 CLOCK KIT 12 or 24 hour format 6 large .5 Digits. Kit is complete with all parts, pc board and custom designed cabinet. (specify white or black)..... $29.95

DEBCO ELECTRONICS
P.O. BOX 9169
CINCINNATI, OHIO 45209

✓330 Phone: **(513) 531-4499**

- Add 5% Shipping for U.S. & Canada
- All foreign orders add 10%
- **COD orders add $1.40**
- Master Cnarge and Visa Welcome
- Orders under $20.00 add $1.00 handling
- **Ohio residents add 5½% Tax**

CALL OR WRITE FOR CATALOG

STOP RF SPILL-OVER!

You may be losing up to half the available output from your vertical gain antenna because of RF spillover. The amazing AEA Isopole with unique decoupling design, virtually eliminates RF spillover and can help you multiply your power in all directions on the horizon relative to an ideal half-wave dipole, or end-fed non-decoupled "gain" antennas.

CALL TODAY

ROSS DISTRIBUTING COMPANY

78 South State Street
Preston, Idaho 83263
Telephone: (208) 852-0830

AEA
Brings you the Breakthrough!

PRICE REDUCTION
plus **$30 Discount**

YAESU

FT-207R

NEW LOW AES PRICE

$269.00

with nicad battery and wall charger.

FT-207R	2m FM HT.....	REGULAR $299.00
NC-1A	15-hr desk charger	51.00
NC-3	3-hr quick desk charger/AC ps....	90.00
FBA-1	Battery sleeve for NC-1A/NC-3....	9.40
NBP-9	Extra nicad battery pack	23.00
NC-9B	Extra 15-hr wall charger.....	10.00
LCC-7	Leather carrying case	35.00
MMB-10	Mobile bracket.....	15.00
PA-2	Mobile adapter & charger.....	39.00
TA-2	19" telescoping whip ant.....	9.40
YM-24	Speaker/microphone	32.00
FTS-32E	32 tone CTCSS encoder	40.00
FTS-32ED	32 tone CTCSS enc/dec	75.00

Call TOLL FREE

1-800-558-0411

master charge THE INTERBANK CARD

VISA

AMATEUR ✓467
ELECTRONIC SUPPLY®

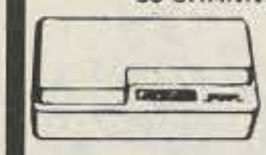
4828 W. Fond du Lac Avenue
Milwaukee, Wisconsin 53216
Phone: (414) 442-4200
Wisconsin WATS: 1-800-242-5195
Nationwide WATS: 1-800-558-0411

AES Branch Stores In:
Orlando, FL • Wickliffe, OH • Las Vegas, NV

ETCO

CABLE TV CONVERTERS AND OTHER GOOD STUFF!

SMASHING ALL SALES RECORDS – OUR NEW 30 CHANNEL CABLE TV CONVERTER!



Converts mid & super band cable channels for viewing on your TV set! **No. 351AE47**

39.95 $34.95 ea./5

HOT NEW IMPORT! REMOTE CONTROL 30 CHANNEL CABLE TV CONVERTER!

89.95 $79.95 ea./5 $74.95 ea./10

Includes remote TV on/off switch and fine tuning control! **No. 351VA275**

ETCO MKII WIRELESS – THE ULTIMATE CABLE TV CONVERTER!

Set TV to channel 3 and the hand-held remote control does it all! **No. 3512A008**

189.00

VIDCOR 2000 CONVERTER ELIMINATES PROBLEMS WHEN VIDEOTAPING FROM CABLE TV

89.95

Restores your VCR's capability for programming. Restores remote channel control. Enables videotaping of one cable program while watching another. **No. 351VA95C**

UNUSUAL FACTORY SURPLUS MID-BAND – SUPER-BAND CABLE TV TUNER

Converts cable channels to a common IF frequency. Experimenters—build cable converters, decoders, etc. With schematic. **No. 351VA342**

19.95 $17.50 ea./10

351VA389—Detailed schematic & spec. sheet—$1.50

FACTORY SURPLUS UHF TUNERS

4.95 $3.95 ea./10

Brand new production surplus. All solid state. Ideal for experimental work building, cable TV converters, etc. **No. 351SU099**

MINIATURE FM WIRELESS MICROPHONE

Hides in the palm of your hand. Reception on any standard FM radio or receiver. **No. 351VA482**

29.95 $27.50 ea./5 $24.95 ea./10

QUARTER-MILE WIRELESS MICROPHONE & RECEIVER SYSTEM

69.95 $49.95 ea./5

FCC approved crystal controlled wireless mike & receiver. All battery operated. Electret wide-range response. VU meter. **No. 351VA093**

FACTORY SURPLUS VHF / UHF "TWIN" VARACTOR TUNERS!

Admiral No. NC 3143-1 BRAND NEW! Ideal for building or repairing electronically tuned TV "**FRONT ENDS.**" A hard-to-find item at a sensational price! **No. 351VC308**

39.95 $34.95 ea./5

DUMPING! NORELCO ENDLESS LOOP CASSETTES!

4.95 $4.49 ea./10

Impossible to find at any price!
3 minutes—No. 351VA605
6 minutes—No. 351VA606

IN STOCK – THE MURA CORDLESS TELEPHONE SYSTEM!

Answer & originate calls with this wireless pocket phone. 400 ft. range! Rechargable! Last number recall! Paging feature! Use with rotary, touch systems! **No. 351VA274**

144.88 $129.95 ea./5

SALE OF QUARTZ BATTERY-OPERATED CLOCK MOVEMENTS!

9.95 $8.95 ea./5

Accuracy of 1 min./year up to 4 years operation on 1 alkaline "C" cell. Imported from West Germany. **No. 351VA561**

351VA565 Matching hands—$2.49/set. $1.95/set/5

20 AMP REGULATED 12VDC POWER SUPPLY!

13.8 vdc no load. 12.5 vdc full load. Easily handles ham station, marine radio, SSB linears up to 400 W P.E.P. Brand new, factory sealed. 110 VAC **No. 351VA394**

69.88 $59.88 ea./5

351VA395 as above, 10 amps—$54.95, $49.95 ea./5.

Key #351

FREE ✓91

OUR LATEST 98 PAGE FASCINATING CATALOG —jam packed with unique items, electronic bargains and unusual offers. Write or circle the information card number below.

ETCO ELECTRONICS
NORTH COUNTRY SHOPPING CENTER
PLATTSBURGH, N.Y. 12901

Check with order, please. Visa & Mastercard OK. Sorry, no C.O.D.s add 15% for UPS & Handling (Excess refunded) N.Y. State residents add 7% sales tax Dealer & Export inquiries invited. Our telephone order desk never closes.

call 1 518 561 8700

Radio World

CENTRAL NEW YORK'S MOST COMPLETE HAM DEALER

Featuring Kenwood, Yaesu, Icom, Drake, Ten-Tec, Swan, Dentron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Gain, Mosley, Larsen, Cushcraft, Hustler, Mini Products, Bird, Mirage, Vibroplex, Bencher, Info-Tech, Universal Towers, Callbook, ARRL, Astatic, Shure. *We service everything we sell!*

VISA

Write or call for quote. **You Won't Be Disappointed.**
We are just a few minutes off the NYS Thruway (I-90) Exit 32

master charge

OUT OF STATE CALL TOLL FREE
800-448-9338

ONEIDA COUNTY AIRPORT TERMINAL BUILDING
ORISKANY, NEW YORK 13424
N.Y. Res. Call (315) 337-0203 or 736-0470
✓397

Warren - K2IXN
Bob - WA2MSH

WHY BUY IMITATIONS

INTERNATIONAL
FOX-TANGO CLUB

WHEN YOU CAN BUY THE ORIGINAL AND BEST CRYSTAL FILTERS FROM FOX-TANGO? INTEGRITY DEMANDS THAT YOU BUY THE REAL THING. . .FROM US!

Send for descriptive brochure and information

FOX-TANGO OWNERS: JOIN FOX-TANGO CLUB

✓323

$8.00 US, $9.00 CANADA—$12 OVERSEAS

Dealer Inquiries Welcomed

Full FT Catalog $1.00 Refundable

INTERNATIONAL
FOX-TANGO CLUB

FOX-TANGO CORPORATION
Box 15944S, West Palm Beach, Florida 33406

HAM-KEY® ✓30

RADIO TELEGRAPH SENDING DEVICES

New Lower Prices

Model **HK-3M** ~~$19.95~~

Now $15.95

Add $2.00 Shipping & Handling. (U.S.A.)

* Deluxe straight key
* Anti-tip bracket. Can't tip
* Heavy base. No need to attach to desk
* Navy type knob
* Smooth action

Model AT-B anti-tip bracket only, to convert any HK-3 to HK-3M. **$1.50** Postpaid

CC-3P shielded cable & plug for HK-3M **$1.50**
Add $ .50 Shipping & Handling.

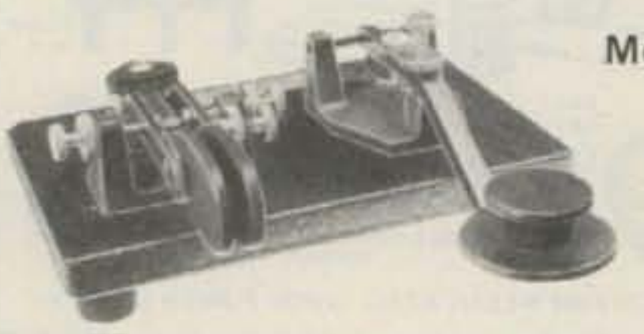
Model **HK-1** ~~$29.95~~ **Now $24.95**

Add $2.00 Shipping & Handling. (U.S.A.)

* Dual lever squeeze paddle
* For use with all electronic keyers
* Heavy base with non-slip rubber feet
* Paddles reversible for wide or close finger spacing

Model HK-2, same as HK-1 but less base for incorporation in your own keyer. **$16.95**
Add $1.00 Shipping & Handling

CC-1P shielded cable & plug for HK-1 **$2.00**
Add $ .50 Shipping & Handling.



Model **HK-4** ~~$44.95~~

Now $37.95

Add $2.00 Shipping & Handling. (U.S.A.)

* Combination HK-1 & HK-3 on same base
* Straight key may be used conventionally or as a switch to trigger a memory.

CC-1/3P Shielded cable with plugs for HK-4 **$3.50**
Add $1.00 Shipping & Handling

Model **HK-5A** Electronic Keyer

~~$89.95~~ **Now $54.95**

Add $2.00 Shipping & Handling. (U.S.A.)

* Iambic circuit for squeeze keying
* Self completing dots & dashes
* Dot & dash memory
* Built-in sidetone
* Battery operated with provisions for external power
* Uses Curtis 8044 keyer chip
* Grid block or direct keying
* Speed, volume, tone & weight controls on front panel
* Use with HK-1 or HK-4

IF NOT IN STOCK AT YOUR DEALER, ORDER DIRECT FROM

master charge

P.O. Box 28271 **The HAM-KEY Co.** St. Louis, MO 63132

Phone (314) 993-6060

VISA

Tim Daniel N8RK
73 Magazine *Staff*

How To Defend Yourself Against Radar

How To Defend Yourself Against Radar *by Bruce Bogner and James Bodnar. The Brehn Corporation, 1980.*

When it comes to police radar, it seems like the public can't win. In one camp there are the police, backed by the radar manufacturers. On the other side you'll find the people that sell radar detectors and the high-speed buffs that buy them. The information that these two groups provide usually consists of a few facts mixed with a liberal dose of misinformation. The result is a very confused public. The myths, exaggerated claims, and outright lies that are associated with radar are laid to rest in a book called *How To Defend Yourself Against Radar.*

Published by the Brehn Corporation, *How To Defend Yourself Against Radar* is authored by Bruce Bogner, an engineer, and James Bodnar, an attorney. Their combined efforts result in a book that allows you to understand radar without having an engineering degree. Nor will you always need a lawyer to successfully defend yourself against a radar charge.

Most of this 100-page softbound book is devoted to the details of how radar works. You will find out what pitfalls make radar questionable and how a police officer can inadvertently arrest a non-speeder. By the time you digest the first five chapters, you'll probably know more about the subject than most policemen or judges.

The last three chapters outline how to defend yourself against a speeding ticket. You must make painstaking observations at the time of apprehension and careful measures must be used to obtain testimony from the arresting officer. Even if you are not up to defending yourself, this information will be helpful to your lawyer.

No book can guarantee that you will beat a radar rap, but the $6.95 cost for *How To Defend Yourself Against Radar* is a small price to pay compared to a fine and higher insurance rates. *How To Defend Yourself Against Radar* is available from *73*'s Radio Bookshop, Peterborough NH 03458. ■

✓See List of Advertisers on page 114

STOP RF SPILL-OVER!

You may be losing up to half the available output from your vertical gain antenna because of RF spillover. The amazing AEA Isopole with unique decoupling design, virtually eliminates RF spillover and can help you multiply your power in all directions on the horizon relative to an ideal half-wave dipole, or end-fed non-decoupled "gain" antennas.

CALL TODAY

Portland Radio Supply Co.

1234 S.W. Stark
Portland, Oregon
97205
503-228-8647

AEA

Brings you the Breakthrough!

✓403

GOT A BATTERY EATER?? !!!!!

YOU NEED A BATTERY-BEATER!!!

(Radio not included)

BEAT YOUR BATTERIES!

OPERATE your SYNTHESIZED HT CONTINUOUSLY from any 12-30v D.C. source: Auto, Truck, RV, Light Aircraft (12 or 28v system), Home D.C. Power Supply!!! STEWART's New "BATTERY-BEATER" provides the proper REGULATED voltage for your rig and plenty of current for CONTINUOUS FULL POWER TRANSMIT! All day travel, all evening Simplex Net with NO QRT TO RE-CHARGE! TRANSMIT EVEN WITH DEAD NiCads!!!!

- NOT a battery charger but a FULL POWER SOURCE with TWO PROTECTION CIRCUITS!
- RUGGED ALUMINUM CASE! NEW, IMPROVED MODEL FOR ICOM! SO TOUGH THE AVERAGE MAN CAN STAND ON IT!
- YOUR NiCads REMAIN IN PLACE! Simply unplug for INSTANT PORTABILITY!!
- DESIGNED by an engineer from NASA's Jet Propulsion Laboratory with components rated 50% beyond requirements!
- PRE-WIRED JACK for your radio with detailed, step-by-step installation instructions.
- TWO 5 FT. POWER CORDS - 10 FT. TOTAL REACH! VELCRO pads to mount anywhere! 1 FULL YEAR WARRANTY!!
- NO INTERFERENCE with PL's! LONGER LIFE FOR NiCads!
- The ONLY accessory power supply that can claim all these exciting features, and more!!
- NOW AVAILABLE for TEMPO S-1,2,5; YAESU FT-207R; ICOM IC-2A/T; WILSON MK II, MK IV; SANTEC HT-1200! (MEMORY RIGS RETAIN MEMORY!!)
- PRICE: ALL MODELS- $30.00 Post Paid. Ca. Res. add $1.80 Tax. C.O.D.'s- You pay Postage and COD fees.
- PHONE: 1-213-357-7875 for C.O.D.

STEWART QUADS P.O. Box 2335 IRWINDALE, CA. 91706

DUPLEXERS

US PATENT 4080601

✓79

OUR NEW BANDPASS-REJECT DUPLEXERS WITH OUR EXCLUSIVE

BpBr CIRCUIT*

. . . provides superior performance, especially at close frequency spacing.

Models available for all Ham bands. Special price for Amateur Repeater Clubs

CALL OR WRITE FOR DETAILS:

WACOM PRODUCTS, INC.

P. O. Box 7127
Waco, Texas 76710
817/848-4435 ✓79

. . . at last . . .

your shack organized!

A beautiful piece of furniture — your XYL will love it!

$164.50 S-F RADIO DESK

Deluxe - Ready to Assemble

Designed with **angled** rear shelf for your viewing comfort and ease of operation.

FINISHES: Walnut or Teak Stain.

Floor Space: 39" Wide by 30" Deep

Additional Information on Request.

Checks, Money Orders, BankAmericard and Master Charge Accepted.

F.O.B. Culver City. (In Calif. Add 6% Sales Tax.)

DEALER INQUIRIES INVITED

Radio equipment not included

Also Available . . . .
Floor Space: 51" Wide by 30" Deep
$192.50

S-f Amateur Radio Services

✓65

4384 KEYSTONE AVENUE • CULVER CITY, CALIF. 90230 — PHONE (213) 837-4870

VANI–PLATE

WA1AIC

VEHICLE
CALL SIGN PLATE
– WEATHERPROOF –
– DURABLE PLEXIGLAS –

YOUR CALL OR NAME IN ATTRACTIVE RAISED PLEXIGLAS LETTERS (SPECIFY BLACK OR WHITE) UP TO EIGHT WELDED ON A BLUE, WHITE, BLACK, RED OR BROWN PLEXIGLAS MOUNTING PLATE. OR CHOOSE THE ATTRACTIVE FLECK MOUNTING PLATE; SELECT FROM RED, GREEN, GOLD, BLUE OR SILVER COLOR.

STD. VANI-PLATE - $9.95 FLECK PLATE, ADD $3.00
HEAVY CHROME FRAME - $2.99
DELUXE CHROME FRAME - $7.99
UPS CHARGE - $1.95
24-HOUR DELIVERY

– SEND 25¢ FOR 1981 CATALOG –

VANI-PLATE COMPANY
P.O. Box 136, W. Yarmouth, MA 02673 ✓437
(617) 394-8595

ALL BAND TRAP ANTENNAS!

PRETUNED - COMPLETELY ASSEMBLED - ONLY ONE NEAT SMALL ANTENNA FOR UP TO 7 BANDS! EXCELLENT FOR CONGESTED HOUSING AREAS - APARTMENTS LIGHT - STRONG - ALMOST INVISIBLE!

FOR ALL MAKES & MODELS OF AMATEUR TRANSCEIVERS - TRANSMITTERS - GUARANTEED FOR 2000 WATTS SSB 1000 WATTS CW. INPUT FOR NOVICE AND ALL CLASS AMATEURS!

COMPLETE AS SHOWN with 90 ft. RG58U-52 ohm feedline, and PL259 connector, insulators, 30 ft. 300 lb. test dacron end supports, center connector with built in lightning arrester and static discharge - molded, sealed, weatherproof, resonant traps 1"X6" - you just switch to band desired for excellent worldwide operation - transmitting and recieving! Low SWR over all bands - Tuners usually NOT NEEDED! Can be used as inverted V's - slopers - in attics, on building tops or narrow lots. The ONLY ANTENNA YOU WILL EVER NEED FOR ALL DESIRED BANDS - WITH ANY TRANSCEIVER - NEW - EXCLUSIVE! NO BALUNS NEEDED!

80-40-20-15-10-6 meter - 2 trap --- 104 ft. with 90 ft. RG58U - connector - Model 998BUA . . . $79.95
40-20-15-10 meter --- 2 trap --- 54 ft. with 90 ft. RG58U - connector - Model 1001BUA $78.95
20-15-10 meter --- 2 trap --- 26 ft. with 90 ft. RG58U - connector - Model 1007BUA $77.95

SEND FULL PRICE FOR POSTPAID INSURED. DEL. IN USA. (Canada is $5.00 extra for postage - clerical - customs etc.) or order using VISA - MASTER CHARGE - CARD - AMER. EXPRESS. Give number and ex. date. Ph 1-308-236-5333 9AM - 6PM week days. We ship in 2-3 days. ALL PRICES WILL INCREASE . . SAVE - ORDER NOW! All antennas guaranteed for 1 year. 10 day money back trial if returned in new condition! Made in USA. FREE INFO. AVAILABLE ONLY FROM WESTERN ELECTRONICS Dept. A7-8 ✓80 Kearney, Nebraska, 68847

ALL BAND TRAP ANTENNAS!

Dennis G. Brewer K8DIU/4
240 Dellwood Drive
Greenville NC 27834

Guide to RTTY Frequencies

Guide to RTTY Frequencies, *by Oliver P. Ferrell. 1st Edition, 1980. 96 pages, 6" × 9", paperback, $8.95. Gilfer Associates (PO Box 239, 52 Park Avenue, Park Ridge NJ 07656).*

If you are a ham or SWL, you're probably familiar with the well-known book, *Confidential Frequency List.* The *CFL*, by Oliver P. Ferrell, lists a plethora of "utility" stations (nearly everything except hams and broadcast) from 4001 to 25,590 kHz. It covers AM, SSB, ISB, CW, and facsimile modes of transmission.

Mr. Ferrell has compiled a new book, dedicated to radio-teletypewriter (RTTY) stations. The *Guide to RTTY Frequencies* is similar to the *CFL*, but is exclusively about RTTY. Stations are listed in ascending order of frequency from 4003 to 26,860 kHz. Listed, in most cases, are the frequency, callsign, location, type of service, shift, speed, power, and useful remarks (such as language).

Many of the book's entries are positively tantalizing. Nearly every country is represented with news services, military, aeronautical, marine, or point-to-point stations. This could be a fun way to practice your foreign-language skills! It's also a good way to see "what's goin' on" in distant lands. For that matter, it is interesting to see just what's going on in our *own* land—with USCG, USN, FBI, FCC, MARS, and UPI.

As fascinating (and as useful) as the station listings is the book's "Introduction to RTTY Identification" by Webb Linzmayer. Explained, in detail, are the various types of RTTY signals encountered in the high-frequency spectrum. If you've ever used a "multispeed any-shift" RTTY receiving setup, you've probably wondered about the RTTY signals that you *couldn't* copy. Mr. Linzmayer explains it all. He describes the various teleprinter codes and multiplex systems in use. Mentioned, too, are various privacy measures designed to frustrate the unauthorized receiver (or printer)! While truly encrypted transmissions probably will not be decoded on the basis of this book's information, it's probable that computer buffs will be able to crack the bit-inversion and bit-transposition privacy schemes. Of course, if you are an amateur cryptographer, RTTY will supply you with endless encrypted material. If you should happen to find a way to decode any U.S. military encrypted material, you might call an intelligence officer and mention the fact!

The *Guide to RTTY Frequencies* should be a valuable addition to any RTTY shack or computerized shortwave station.

Hey, look. . .there's Interpol talking about my brother again! ■

✓See List of Advertisers on page 114

Eric Shalkhauser W9CI
527 Spring Creek Road
Washington IL 61517

The History of Ham Radio
— part XVII

Reprinted from *QCC News*, a publication of the Chicago Area Chapter of the QCWA.

EARLY ACTION ON DILL RADIO BILL EXPECTED

Measure Would Create Independent Commission to Operate Broadcasting

WASHINGTON, April 29.(AP)—The Dill radio bill, which set up an independent commission with complete power over broadcasting, was approved today by the senate interstate commerce commission with indications pointing to an early favorable report to the senate.

Taken in the face of repeated warnings from President Coolidge against establishment of any more separate government agencies, the action had the effect of sidetracking the White bill, backed by the administration, providing for an advisory committee to work with the commerce department in controlling the industry. This bill has passed the house.

Meanwhile Secretary Hoover, whose department recently lost in the federal courts the right to assign wave length to radio stations, took exception to statements recently made in congress to the effect that he was attempting to become "dictator" of the radio world.

"It's the last responsibility I want," he asserted.

He reiterated his opposition to any plan leaving to any one official the responsibility of determining who shall broadcast and on what wave lengths, because of the expense and bureaucracy tendencies involved.

These duties, he said, should be placed in a semijudicial board of commission as provided in the White bill, and the administrative or enforcement end left to an existing government department.

A news story published on April 29, 1926.

From 1912, as wireless was just emerging from its cocoon and Congress first enacted a radio law, until 1927, developments in radio were nurtured by the Department of Commerce under the guidance of then-Secretary Herbert Hoover. Radio was destined to go through many convulsions during those fifteen years . . . the task of prescribing wavelengths . . . issuing licenses . . . specifying power and time on the air . . . legislating. For some 700 applicants, the privilege to broadcast proved chaotic. With the passage of the compromised White-Dill radio bill signed by President Calvin Coolidge on February 23, 1927, the first meaningful legislation on radio control in the United States was accomplished.

Industry Problems

Toward the end of 1926, because of the mounting problems which constantly arose in the broadcast field, the President was compelled to sign into law an emergency measure. Congressional Joint Resolution 125 became effective December 16, 1926. The law required that any applicant for a new or renewal radio broadcast license "waive any right of claim of right as against the United States to any wavelength, or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof."

The Radio Commission, after a visit with President Coolidge. Left to right, H. A. Bellows of Minnesota, J. F. Dillon of California, E. O. Sykes of Mississippi, and O. H. Caldwell of New York.

The New Law

Sections 2 and 3 of "An Act For the regulation of radio communications, and for other purposes" specified that:

1) The United States be divided into five zones;

2) A Commission be created consisting of five commissioners appointed by the President, each commissioner a resident of the zone represented; and

3) The members of the Commission have terms of two, three, four, five, and six years, respectively, and shall meet from time to time as required by public convenience, interest, and necessity.

Section 4 authorized the Commission to:

1) Classify radio stations;

2) Prescribe the nature of the services to be rendered;

3) Assign bands of frequencies for each individual station;

Organize your shack with a

CLUTTERFREE MODULAR CONSOLE $203.35

- Large, 42" H x 57" W x 29"D
- Strong groove-construction
- Mar-resistant wood grain finish
- Options, drawers & face plate
- For ham or home computer
- Visa and Master Charge

CLUTTERFREE MODULAR CONSOLES

P.O. Box 5103 Tacoma, WA 98405
(206) 759-1611 ↙89

GOTHAM ANTENNAS
(813) 584-8489

master charge VISA

SMALL LOT TRAP DIPOLES ↙417

MODEL	BANDS	LGTH	PRICE
TSL 8040	80,40	78'	$49.95
TSL 4020	40,20,15	40'	$47.95

SMALL LOT SHORTENED DIPOLES

SL-8010	80,40,20,15,10	75'	$59.95
SL-160	160	130'	$36.95
SL-80	80	63'	$35.95
SL-40	40,15	33'	$34.95

FULL SIZE PARALLEL DIPOLES

FPD-8010	80,40,20,15,10	130'	$49.95
FPD-4010	40,20,15,10	63'	$44.95

NEW! PORTABLE VERTICAL! IDEAL FOR APARTMENTS, CAMPING, TRAILERS!

Folds to 5' Package. No Radials. Required. Fully Assembled. Full Legal Limit. 1:1 VSWR

MODEL	BANDS	HGHT	PRICE
PV-8010	80-10	13'	$59.95

PROVEN DESIGN · GOTHAM ALL BAND VERTICALS

V-160	160,80,40,20,15,10,6	23'	$39.95
V-80	80,40,20,15,10,6	23'	$37.95
V-40	40,20,15,10,6	23'	$35.95

FAMOUS GOTHAM QUADS
2 Elements — 3 Bands Complete $119.95

CHAMPIONSHIP GOTHAM BEAMS
Full Size Complete from $79.95

CALL OR SEND LARGE SASE FOR CATALOG. Shipping: Dipoles & Verticals $2.50 USA;$7.00 Canada; $5.00 FPO, APO Beams & Quads Shipped UPS or Freight Collect. Fla. add 4% Sales Tax

P.O. Box 776 • Largo, FL 33540

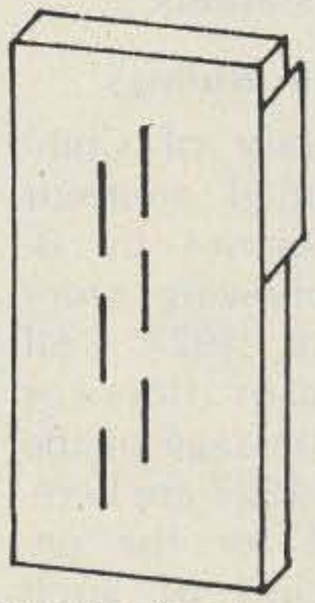
2300 MHZ MICROWAVE DOWNCONVERTERS

DOWNCONVERTERS
KIT **35.00**
ASSEMBLED BOARDS **65.00**

COMMERCIAL SYSTEMS
ASSEMBLED ONLY **250.00**

SLOTTED ARRAY ANTENNA
18 D.B. GAIN
WITH ENCLOSURE BOX OR
TYPE N. CONNECTOR . . . **35.00**

POWER SUPPLY
ASSEMBLED **45.00**



[with box for down converter]

PLEASE ADD: 3.00 SHIPPING & HANDLING — 2.00 FOR C.O.D.

SATELLITE T.V. SYSTEMS
ANTENNAS — RECEIVERS — L.N.A.'s

P.B. Radio Service
1950 E. Park Row ↙404 • **Arlington, TX 76010**

Call Order Dept. Toll Free
1-800-433-5169

VISA master charge

For Information Call
1-817-460-7071

Copy RTTY, ASCII and Morse from the palm of your hand.

Have you waited to get into code reading until you found out what this latest fad was about? You can stop waiting, because it's no longer a fad.

Amateurs everywhere are tossing the gigantic clanking monsters of yesteryear that once performed the job of reading radioteletype. They are trading them in for state-of-the-art code-reading devices that are incredibly small, noiseless if desired and infinitely more versatile than their antique predecessors.

Kantronics, the leader in code-reading development, has just introduced the latest and most-advanced breakthrough in the copying of Morse code, radioteletype and ASCII computer language.

The **Kantronics Mini-Reader** reads all three types of code, displays code speed, keeps a 24-hour clock, acts as a radioteletype demodulator and reads all of its decoded information out on a traveling display of 10 easy-to-read characters. It is so compact that it fits in a hand-held, calculator-size enclosure.

At $314.95, the **Mini-Reader** outperforms anything within another $400 of its price range.

Call or visit your Authorized Kantronics Dealer now to find out what the latest in technology has done to code-reading.

Kantronics
(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044

↙See List of Advertisers on page 114

4) Determine the power and the time on the air;

5) Determine the location, and regulate the kind of apparatus used to prevent excessive interference;

6) Have authority to establish areas to be served and make special regulations applicable to radio stations engaged in chain broadcasting; and

7) Have authority to make general rules and regulations requiring stations to keep such records of progress, transmission of energy, communications, or signals as it may deem desirable. (Radio amateurs to keep a log.)

Commissioners Initiate Course of Action

As early as March, 1927, the following steps were taken by the Commission in General Order #1: Broadcast stations were given authorized channels with even 10-kilocycles separation, original assigned frequencies to Canadian stations were cleared of interfering United States stations, and all amateur and ship station licenses were extended indefinitely as of March 15th.

Time-sharing for all broadcast stations was a major problem. Stations which had deliberately jammed power and had deviated from previously assigned wavelengths came under greatest criticism and penalty.

The Commission immediately set about to reallocate stations in the interest of the listener. By June, 1927, local stations within a given locality were assigned frequencies 50 kilocycles apart. Other stations, especially the higher powered ones, were given assigned frequencies depending on location, public service, and previous time on the air so as to minimize heterodyne interference. In many instances, actual experience and cooperation between stations served as a guide.

The law as enacted applied to all radio stations—ship, land, experimental, amateur, coastal, etc.—with the exception of those operated by the United States Government. Even with the ether lanes crowded, there were over 250 applicants for broadcast-transmitting-station licenses pending at the State Department prior to the effective date of the 1927 Act.

Section 5 of the Act specified that from and after one year after the first meeting of the Commissioners, "all powers and authority vested in the Commission, except as to revocation of license, shall be vested in and exercised by the Secretary of Commerce. The Secretary is to designate call letters of all stations."

Section 9 provided for granting licenses by the Secretary and renewals for three-year periods for broadcast stations, and up to five-year periods for other classes of stations.

Radio Amateur Rulings

The secretary of Commerce extended amateur operators' licenses by issuing the following order on March 16, 1927: "All radio operator licenses valid at the passage of the Radio Act of 1927 are hereby extended for the unexpired period of such licenses."

As these new regulations were issued, the amateur first-grade license was changed to "radio operator Extra Class," and the amateur second grade changed to "Temporary Amateur License." The amateur Extra First, Experimental, and Instruction Grades were eliminated.

On March 26, 1927, the Commission ordered all supervisors in the various regions to issue temporary amateur station licenses pending the review and issuance of new amateur regulations.

To obtain an amateur operator's license, the applicant was requried to pass a code test in sending and receiving Continental Morse code at a speed of at least ten words per minute. Also required was successful completion of a written examination in the theory, construction, and operation of radio equipment.

At the time of renewal, the applicant was required to report satisfactory activity during the last six months of the license term in lieu of taking another examination.

With the passage of the Radio Act of 1927, all concerned with radio prepared for the forthcoming convention of all nations to the International Radio Telegraphic Conference scheduled to take place in Washington, DC, in October, 1927.■

THE NEW RADIO LAW as of FEBRUARY 23,1927

[PUBLIC—No. 632- 69TH CONGRESS]
[H. R. 9971]

An Act For the regulation of radio communications, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act is intended to regulate all forms of interstate and foreign radio transmissions and communications within the United States, its Territories and possessions; to maintain the control of the United States over all the channels of interstate and foreign radio transmission; and to provide for the use of such channels, but not the ownership thereof, by individuals, firms, or corporations, for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. That no person, firm, company, or corporation shall use or operate any apparatus for the transmission of energy or communications or signals by radio (a) from one place in any Territory or possession of the United States or in the District of Columbia to another place in the same Territory, possession, or District; or (b) from any State, Territory, or possession of the United States, or from the District of Columbia to any other State, Territory, or possession of the United States; or (c) from any place in any State, Territory, or possession of the United States, or in the District of Columbia, to any place in any foreign country or to any vessel; or (d) within any State when the effects of such use extend beyond the borders of said State, or when interference is caused by such use or operation with the transmission of such energy, communications, or signals from within said State to any place beyond its borders, or from any place beyond its borders to any place within said State, or with the transmission or reception of such energy, communications, or signals from and/or to places beyond the borders of said State; or (e) upon any vessel of the United States; or (f) upon any aircraft or other mobile stations within the United States, except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act.

SEC. 2. For the purposes of this Act, the United States is divided into five zones, as follows: The first zone shall embrace the St[illegible] Maine, New Hampshire, Vermont, Massachusetts [illegible] Rhode Island, New York, New Jersey, Del[illegible] District of Columbia, Porto Rico, and t[illegible] zone shall embrace the State[illegible] or any right Virginia, Ohio, Michi[illegible] commenced in any civil embrace the S[illegible] ...nalities under said laws shall Florid[illegible] ...ed in the same manner as if committed; T[illegible] ...forfeitures, or liabilities incurred prior to taking ...ect, under any law embraced in, changed, modified, or repealed by this Act, may be prosecuted and punished in the same manner and with the same effect as if this Act had not been passed.

Nothing in this section shall be construed as authorizing any person now using or operating any apparatus for the transmission of radio energy or radio communications or signals to continue such use except under and in accordance with this Act and with a license granted in accordance with the authority hereinbefore conferred.

SEC. 40. This Act shall take effect and be in force upon its passage and approval, except that for and during a period of sixty days after such approval no holder of a license or an extension thereof issued by the Secretary of Commerce under said Act of August 13, 1912, shall be subject to the penalties provided herein for operating a station without the license herein required.

SEC. 41. This Act may be referred to and cited as the Radio Act of 1927.

Approved, February 23, 1927.

The new radio law as of February 23, 1927.

We lead! For information call (817) 265-0391 TOLL FREE — ORDERS ONLY (800) 433-5172

others follow

SUPERVERTER I **$109.95**
The ultimate in converter technology! Dual stage selective preamp, mixer, i.f. amplifier and no-drift crystal controlled oscillator. This unit is better than any commercial unit in use today.

SUPERVERTER II **$79.95**
Time tested and field proven STOP-SIGN converter with added on, high performance preamp.

SELECTIVE PREAMP **$49.50**
This new unit is not like the competitor's wide band preamps. This unit really works! Can be used with any converter to significantly improve reception. Easily adapted to our competitor's boards or added on to our board.

TERMS: COD, Money Order, Bank Cards
HOURS: 8:30-4:30 CDST

MRF-901 Transistor ..... **$2.75 ea.**

2300 MHz CONVERTER KIT **$38.50**
complete with PC board, parts and 10 page instruction book.

2300 MHz COMPLETE CONVERTER BOARD **$65.00**
assembled and tested.

POWER SUPPLY, 3 "F" Connectors **$24.95**
Deluxe metal case with overlays antenna switch and all other components.

2300 MHz YAGI CIGAR ANTENNA **$28.50**
33 elements. Stronger than the loop Yagi, equal in gain.

BOGNER, COMMERCIAL QUALITY, ASSEMBLED UNIT $188.00
complete with hardware.

COMING SOON
SUPERVERTER ATV TRANSMITTER FOR 2300 MHZ AND OUR OWN DESIGN SATELLITE TV RECEIVERS WITH A COMPLETE LINE OF HIGH PERFORMANCE ACCESSORIES.

Our product may be copied, but the performance is never equalled.

UNIVERSAL COMMUNICATIONS
P.O. Box 339
Arlington, TX 76010

The HAM SHACK
✓449

808 N. Main
Evansville, IN 47711

TEN-TEC

546	Omni C	$1060.00
580	Delta	760.00
525	Argosy	485.00
280	Power Supply	150.00
255	Power Supply/Spkr.	170.00
243	Vfo—Omni	169.00
283	Vfo—Delta	169.00
444	Hercules Amp.	1340.00

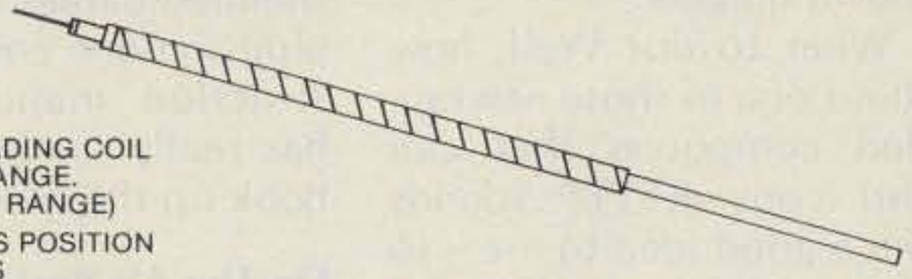
HY-GAIN
Antenna/tower special — call

Azden PCS 3000/TTP kit		$315
CUBIC Astro 103		1175.00
SANTEC HT 1200		310.00
540 TenTec		500.00
MFJ 496 Keyboard		295.00
ALLIANCE HD 73 rotator		99.00
HY-GAIN	TH6DXX	240.00
	TH5DX	210.00
	TH3MK3	180.00
	TH3JR	140.00
KANTRONICS Mini-reader		279.00

Write for our new and used equipment list

812-422-0231
MON-FRI 9AM-6PM • SAT 9AM-4PM
Write for our new and used equipment list

ANTECK, INC.



STAINLESS STEEL WHIP—FIBERGLASS LOADING COIL
— PATENT APPLIED. NO COILS TO CHANGE.
— LESS THAN 1.5 VSWR (ENTIRE TUNING RANGE)
TUNE 3.2 TO 30 MHz FROM THE OPERATORS POSITION
— FAST AND SLOW SCAN RATES

The Model MT-1RT mobile antenna tunes 3.2 to 30 MHz inclusive. 750 watts CW, 1500 watts PEP for hams, military, MARS, CAP, and commercial service. Center loaded for high efficiency. Enables tuning to exact resonance to wanted frequency. Allows full output from solid state finals. No worry about reduced output from shut down circuits. Output is unaffected by moisture and the elements. Tuned by a control box at the operator's position. Mast section contains a double action hydraulic cylinder driven by two miniature hydraulic pumps and 12 volt DC motors for positive control. No creeping during operation or mobile motion. Can be remoted up to 500 ft. from antenna.

MT-1RT amateur net $240.00	9.00 UPS shipping in U.S.
MT-1RTR (retro kit for all MT-1's) $118.00	7.00 UPS in U.S.
MT-1 amateur net 129.95	7.00 UPS in U.S.
MT-1A (marine) stainless steel $179.95	7.00 UPS in U.S.

VISA master charge THE INTERBANK CARD

✓356

ANTECK, INC. **Route 1, Box 415**
Hansen, Idaho 83334 **208-423-4100**

PCS-3000 AZDEN TOUCHTONE KIT INFORMATION

(1) For **$25.00** we will assemble your kit and install it in the back of your mike. READY TO USE. Send us your mike and TT kit **only** and $25.00.
(2) For **$8.00** we will prepare the back of your mike to accept the Touchtone Pad including moving the mike hanger. Send us the back of your mike **only** and $8.00.
(3) For **$12.50** we will install the TT Pad in the back of your mike. Send us the back of your mike and TT Pad **only** and $12.50.
(4) For **$12.50** we will assemble **your** TT kit. Send us TT kit **only** and $12.50.

✓468

NPS
N.P.S. INC.
1138 BOXWOOD RD.
JENKINTOWN, PA. 19046

A 24 HR. ANSWER'G MACHINE (215)884-6010

ALL WORK RETURNED NEXT DAY VIA FIRST CLASS MAIL

✓See List of Advertisers on page 114

Wayne E. Elseth WB9PKD
208 South Oakland
Carbondale IL 62901

The Robot 800H

—a specialty terminal for RTTY/Morse/SSTV and you

The clanking of the Model 15 shatters yet another quiet evening with its growl and clatter. Autostart at 2 am certainly makes its shortcomings known quickly.

What to do? Well, how about one of those newfangled computers that can also copy RTTY? Sounds like a good idea to me—so it's over to the back issues of the ham magazines to see what is available. I discovered that there are new models coming out almost every day! Decisions, decisions, decisions. Hmmm, Robot offers a new model, the 800H. It sends and receives Baudot, ASCII, and Morse, and it also has an SSTV character generator. Sounds interesting, indeed, so I call the local Robot dealer to order the Robot Model 800 Super Terminal.

It Arrives

The seemingly endless hours of waiting for the new rig finally came to an end. The UPS man delivers the Robot in perfect condition. I excitedly unwrap it and begin hooking it up in the shack. Included with the terminal are: 1 Model 800 keyboard, 1 six-foot shielded cable with RCA phono plugs on each end, 1 six-foot coax cable with BNC plugs on each end, 2 six-foot three-conductor shielded cables with phone plugs on one end, and 1 instruction manual. Robot has really made it easy to hook up the Model 800!

On-The-Air Performance

The Robot Model 800H is designed to receive and transmit Baudot, ASCII, and Morse code. It will also send SSTV block letters, but will not receive SSTV without using a separate converter.

The Robot Model 800H works wonderfully on RTTY. A status indicator line is provided at the top of the display which gives information about how the terminal is configured, such as receive or transmit, speed, polarity, autostart, Selcal, selcom, and a tuning indicator.

A signal is tuned in by adjusting the vfo until the tuning indicator is at its longest position and is flickering the least. This corresponds to the maximum signal through the filters and to both tones (mark and space) being passed equally well. There are connectors on the rear panel for connecting an oscilloscope if you wish to use one to tune in your signals. The terminal can be configured to receive in one of three modes: normal, autostart, or selcom.

Normal-mode receive allows any signal which makes it through the filters to be printed on the screen. This mode works very well on signals that vary in strength. Were one of the other modes to be used, such as autostart, characters would be lost when the signal dropped out and the autostart delay had not yet allowed the resumption of displaying the received RTTY information.

Autostart mode prevents the display of unwanted characters on the screen without a RTTY carrier being present. There is a built-in 3-second delay before characters will be displayed during which a valid carrier must be present.

Selcom mode is a dual-function mode. It supports WRU ("Who are you") automatic answer-back and automatic message recording (Selcal, or selective calling). The WRU code is user programmable by merely typing in the desired 8-character code, as in the Selcal code. The status line on the display will show the codes as you type them and will allow corrections to be made without any fuss. Merely hit the delete key and the last character entered vanishes from the screen.

There are three transmit modes which are selectable by the user. They are continuous, line, and word modes. Continuous mode is similar to RTTY operation using a teletype™ machine. Your carrier is keyed on and remains on while you hunt and peck for the proper keys. Line mode does not transmit anything until the Model 800 detects a carriage return. It then sends the entire line while still allowing you to type in the next line of text. Word mode sends each word as it is completed and the Model 800 detects a space. This allows the correction of spelling errors before sending the word.

Speeds may be changed between any of six available speeds. They are: 60, 66, 75, 100, and 132 wpm (Baudot) and 110 baud ASCII. Speeds may be changed by merely typing one command. The terminal toggles between the various speeds available in the terminal.

There are three shifts that the Model 800 can copy. The terminal can be toggled between 170 Hz and 850 Hz. By straddle-tuning the signal, 425 Hz can be copied. Each time the CTL-Shift key is depressed, the terminal changes shifts. Should you run into a situation where the received signal is reverse polarity, the polarity may be inverted by pressing CTL-Reverse. Typing CTL-Reverse again will toggle the Model 800 back and forth from normal to inverted modes.

There are RY and Quick Brown Fox test messages available by pressing a key. An automatic CW ID is provided for use in RTTY mode. You can fill up the buffer (up to 511 characters) with any combination of messages and IDs and they will be sent automatically when you switch the Model 800 into transmit mode.

The Model 800 word-wrap feature makes reading the received copy much easier. If a received word will not fit entirely on the present line being typed, the program will erase the unfinished word and move it in its entirety to the next line down. In this way words retain their meaning much better by not being written on two separate lines.

RTTY Performance

The Robot Model 800H is outstanding when used on RTTY. Signals can be tuned in easily by using the status line tuning indicator. The built-in demodulator easily equals the performance of many stand-alone terminal units.

One possible problem exists, though. When ordering the Model 800, be sure to specify that high tones are to be installed in your unit if you want to work 2m RTTY. The standard unit is supplied only with low tones which will work fine on HF but will not be compatible with VHF mark and space tones. My unit was supplied with the low tones, and a trip back to the factory was required to modify it to work on VHF.

Morse Code Operation

The Robot Model 800 also has provisions for Morse Code reception. A very narrow audio filter is built in which helps select the particular signal of interest. The narrow filter also makes it extremely difficult to tune in the signal.

When receiving Morse code, the signal is tuned until the terminal regenerates the code on its internal speaker. The tuning indicator in the status line helps in tuning by indicating the signal level passing through the filter. Merely tune for maximum indication.

Problems arise if you expect the terminal to provide perfect copy under field (read "real life") conditions. It won't. The terminal hopes to see perfect machine-sent code. How could you expect otherwise? It is a machine, too. Its program has some provision for sloppy fists, but when combined with the touchy audio level adjustments and the critical tuning adjustments required for copy, the program tends to let you down.

When the terminal does not understand the character sent, it types an asterisk. International Morse code A-Z, 0-9, .,?:;-/, AR, AS, BT, KN, and SK are all recognized and printed by the terminal.

The terminal will also send Morse from 3 to 99 words per minute. The 511-character buffer is functional when sending code as well as RTTY. Here, too, the buffer allows you to type and edit your message while the buffer is being sent.

The terminal can also be used as a Morse code trainer. It will generate random characters which can be copied by utilizing the split screen. Received practice copy is printed on the bottom half of the screen, and sent copy is typed on the upper half of the screen. Your accuracy can then be checked by comparing the two versions.

SSTV

The Robot Model 800 also supports SSTV. It will send up to a 6 × 6 character message using block letters. This can be a help to contest operators who normally use a menu board to pass QSL information. By merely typing the desired information on the terminal, it will be sent via SSTV.

The terminal also will send a gray scale, checkerboard, reversed black/white characters, large characters, and partial frames. Cursor control is available to help with formatting your message. Home up, line feed, delete, repeat, and return functions are supported in SSTV mode. This allows a greater flexibility in formatting your messages.

Documentation

The Robot Model 800 is supplied with a very attractive three-ring binder to hold the system information and instructions. I consider this to be a plus. Being able to put my finger on the system information quickly helps to learn the commands faster and helps me to find my errors in operating the system faster. The only problem is that my unit, which is one of the earliest with the high tones/split-screen options installed, does not have a complete set of documentation. I find myself looking at advertisements to see just what my terminal can actually do and then experimenting in order to discover the commands required to perform the various "new" functions. What with the rush to get the product into the marketplace, an omission here and there is expected. By the time you read this, Robot will have everything working fine and will be able to supply all the information you might require.

Conclusion

The Robot Model 800H is a very useful piece of equipment to have in your shack. It will provide RTTY, Morse, and SSTV capabilities to you while being packaged in a small neat enclosure. The keyboard provides a good "feel" to the touch typist, which is a real plus when reading the incoming RTTY message and formatting your reply in the buffer.

The terminal has problems copying Morse code, but you must keep in mind that the filter that is as good as the human ear has not yet been designed. The human ear can discern subtle tone differences which can differentiate between two signals on virtually the same frequency. My four years of electronic warfare experience make my standards for copying Morse very stringent. I know of *no* terminal or program that can equal an experienced operator when copying code. I heartily recommend the Robot Model 800 for the enthusiast who needs a very high quality silent RTTY/Morse/SSTV terminal.

For more information, contact *Robot Research, 7519 Convoy Court, San Diego CA 92111.* Reader Service number 478. ■

Paul Pauliukonis WD9AHH
741 Sixty-First St.
Downers Grove IL 60516

The Better Vertical

—elevated feed means low angle of radiation

How would you like to be a proud owner and user of an inexpensive (around $60-$70) vertical DX antenna which—

- Is self-supporting.
- Is attractive in appearance.
- Can be installed in a limited space.
- Gives a low vertical radiation angle even when it is one wavelength long.
- Can be used on all present and future amateur bands.
- Minimizes TVI because its radiation is vertically polarized and because harmonics are radiated at high vertical angles.
- Is safe from shock hazards because its base is grounded.
- Has a built-in lightning protection system.

If you answered in the affirmative, then this antenna is for you. This article describes how to build, install, and tune a 33-foot, elevated-feed vertical antenna.

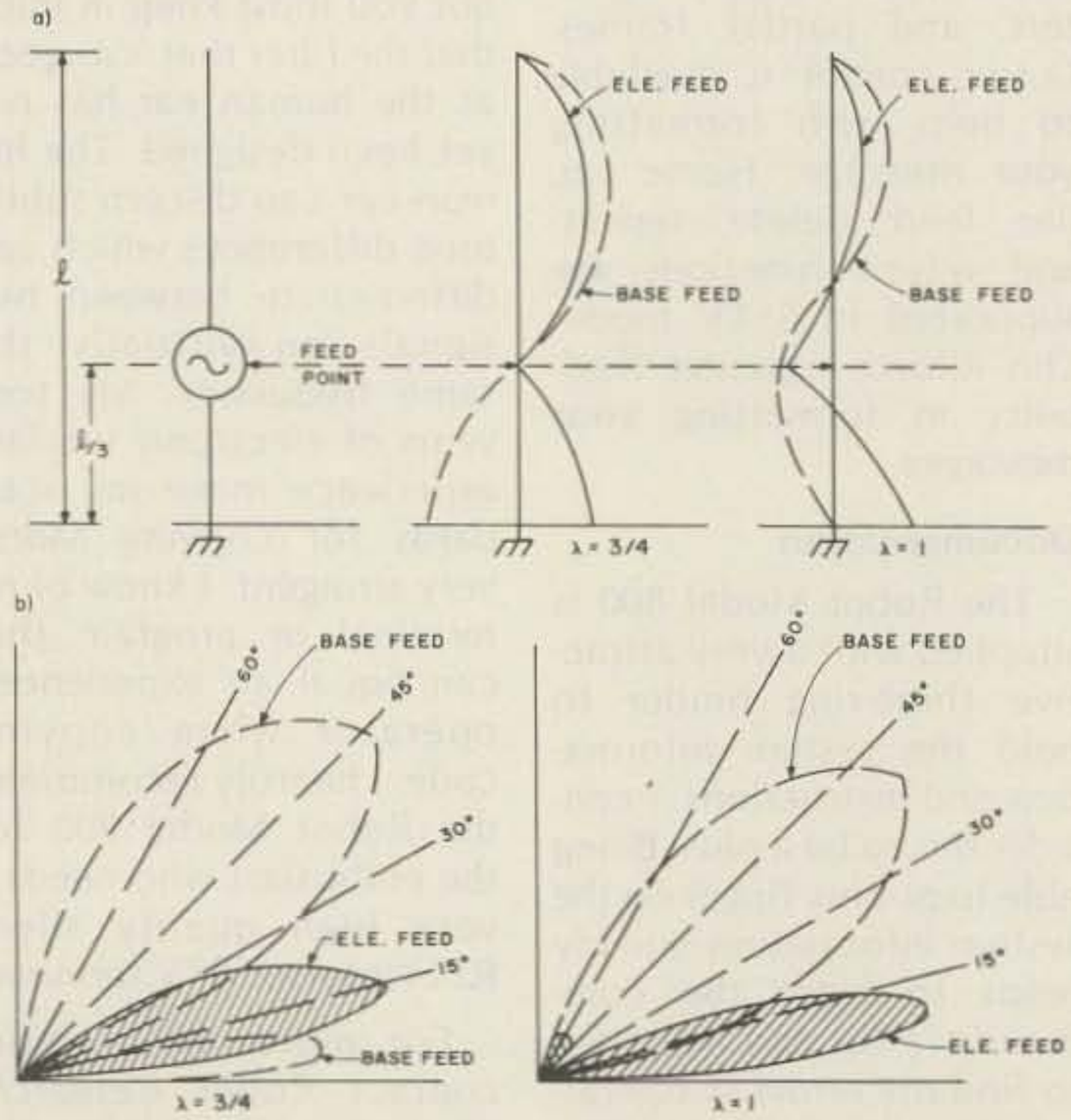


Fig. 1. (a) Current distribution and (b) vertical radiation patterns for 3/4λ and 1λ elevated-feed vertical antennas.

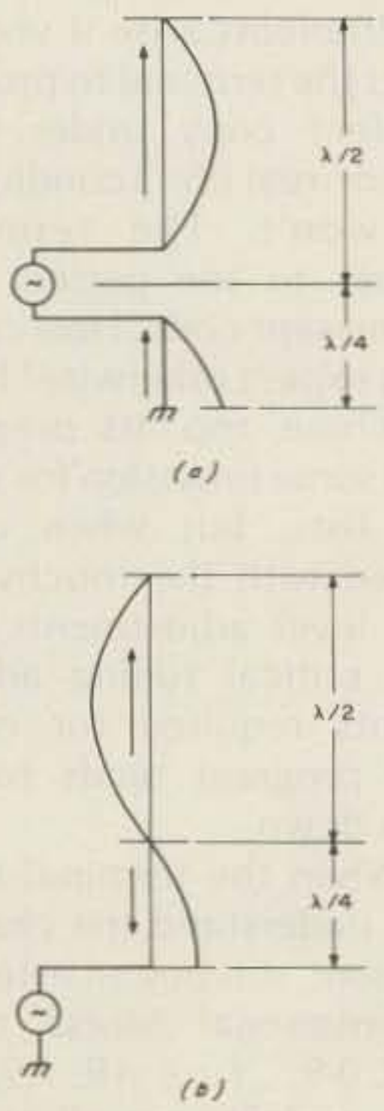


Fig. 2. Currents along antenna element for 3/4λ, elevated feed (a) and base feed (b).

Theory

An elevated-feed vertical antenna is not a vertical antenna which is elevated. It is a vertical antenna which is fed at a point which is 1/3 of its height from the ground—see Fig. 1(a).

I first came across the discussion of this antenna in *Amateur Radio Techniques*.[1] It contains a discussion of how an elevated-feed vertical antenna can be applied to amateur work to obtain "...low-angle radiation, without unwanted high-angle lobes, from vertical aerials of appreciable electrical length."[2] It explains how feeding a vertical antenna at the 1/3 point produces a current distribution different from that of a base-fed antenna. This is true only in cases where the antenna element is 3/4λ or 1λ long. If element length is 1/2λ or less, the elevated feed will perform approximately the same as a base-fed vertical antenna of the same height.

The comparisons of the current distributions and approximate vertical-radiation patterns for the base-

fed and elevated-feed antennas are shown in Fig. 1. To understand how a low vertical radiation angle is achieved in the elevated-feed antenna, one should study the current distribution along an antenna element. *The ARRL Antenna Book* states that current is reversed every 1/2λ along the element.[3] Fig. 2(a) shows how this results in an in-phase collinear array in the elevated-feed antenna which is 3/4λ long. This in-phase current distribution along the antenna element is the reason for its low vertical angle of radiation. If the same antenna were fed at the base, the current distribution would not be in phase —see Fig. 2(b)— and an unwanted high-angle lobe would appear in the vertical plane as shown in Fig. 1(b).

Design Considerations

In the design, I gave priority to the following considerations:

(1) Limiting the design to a reasonable height.

(2) Incorporating a top hat to dissipate static charge.

(3) Positioning the tuning unit near the ground.

(4) Designing and building a strong yet inexpensive center insulator from readily available materials.

(5) Designing the antenna strong enough to be self-supporting.

I chose an overall antenna length of 33 feet as this would give me a full wavelength—the longest practical length for DX operation —on 10 meters. The 33-foot length meant that the upper section must be 22 feet because the antenna is fed 1/3 of the length from the ground. This would make it 1/2λ from the feedpoint on 15 meters, so I detuned it slightly to lower the impedance at that point. The optimum length of the upper section, as determined by 15-meter and 20-meter band impedance curves, was found to be 24.5 feet.

Because aluminum tubing comes in 8-foot sections, and because I would lose 2-feet in the bushings and overlap, the available length from three sections was reduced to 22 feet. To get around this limitation, I decided to enlarge the considered top-hat section to achieve the desired effective length. Four top-hat radials, each 1.3 feet long, were experimentally found to provide the missing link.

The prospect of climbing a stepladder to adjust the tuning unit did not appeal to me. To avoid this, I chose to place the tuning unit near the ground and to use a 12.5-foot section of RG-8 foam coaxial cable to carry the power from the tuning unit to the feedpoint. Theoretical approximation showed that, at the worst, an swr of 7:1 would be present. The additional power loss for a 12.5-foot section of RG-8 foam cable with an swr of 7:1 was found to be 0.25 dB. I preferred this to climbing the ladder.

Power limit at an swr of 7:1 is found by dividing the power rating of the cable at an swr of 1:1 by the swr under operating conditions.[4] For this application, this is 2200/7 = 314.3 Watts. The output from a kW linear should be approximately 500-600 Watts. For intermittent duty, the average power would be half of this figure, or some 300 Watts. This does not give much of a safety factor, but I decided to go ahead and worry about it when and if I acquired a linear.

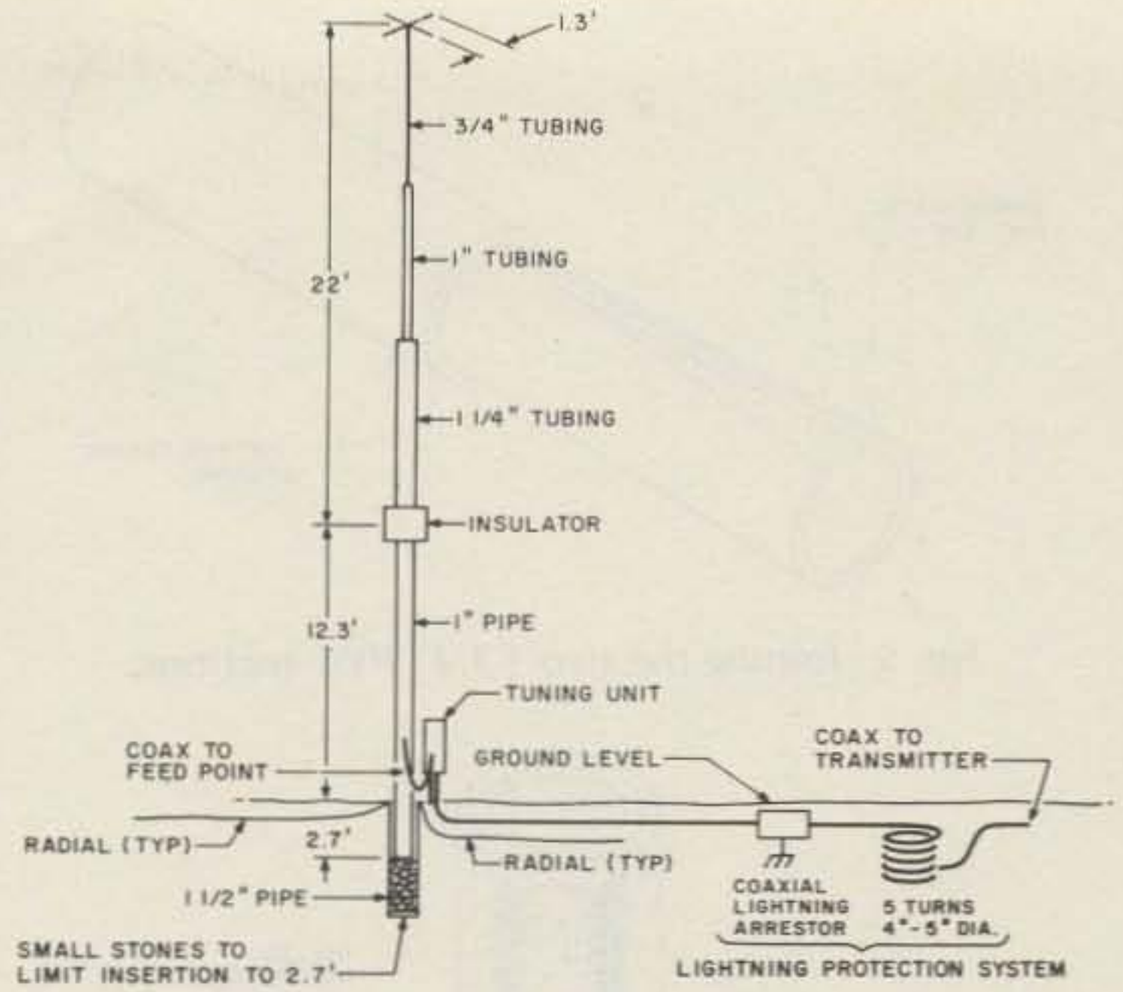


Fig. 3. Final design of the elevated-feed vertical antenna.

To make the antenna as attractive as possible, I designed it strong enough to be self-supporting. This presented no great problem except for the center insulator, which proved to be the greatest challenge of the whole project. It must be strong enough to support the upper 2/3 of the antenna without guying. I finally settled on building the insulator from PVC pipe reinforced with plexiglas™ panels and nylon cord, the whole thing held together with silicone rubber bathroom caulk and epoxy. I calculated the insulator's strength to be much greater than that of the aluminum tubing right above it. So, theoretically at least, the antenna should break at the tubing and not at the insulator.

By calculating stress values for the whole antenna, I found that if I used 1" steel pipe for the bottom 1/3 section and 1-1/4", 1", and 3/4" aluminum tubing for the 3-piece upper 2/3 section, the antenna would be strong enough to be self-

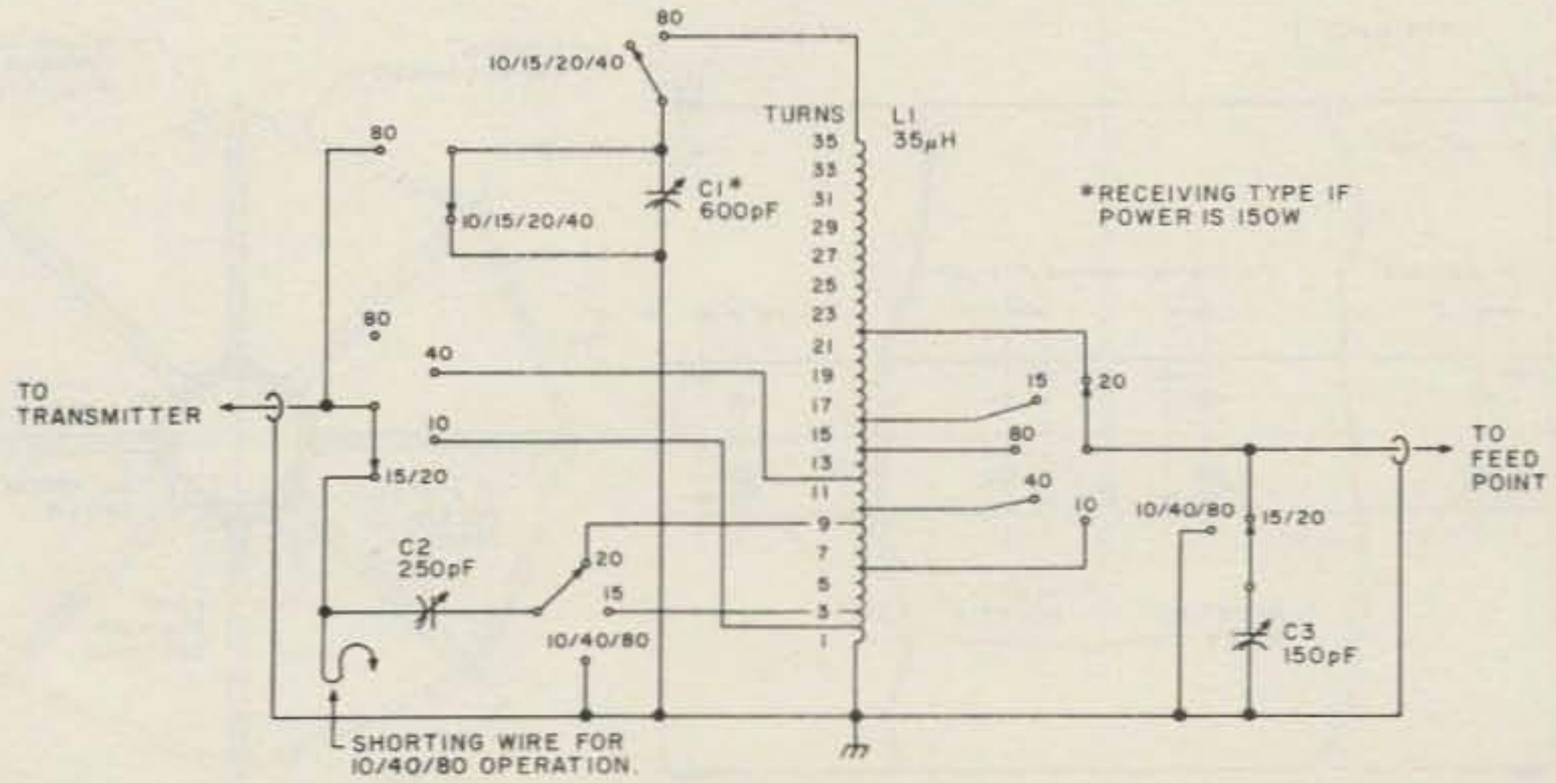


Fig. 4. Antenna tuning unit set for 20 meters. All air variables not in use are shorted and grounded.

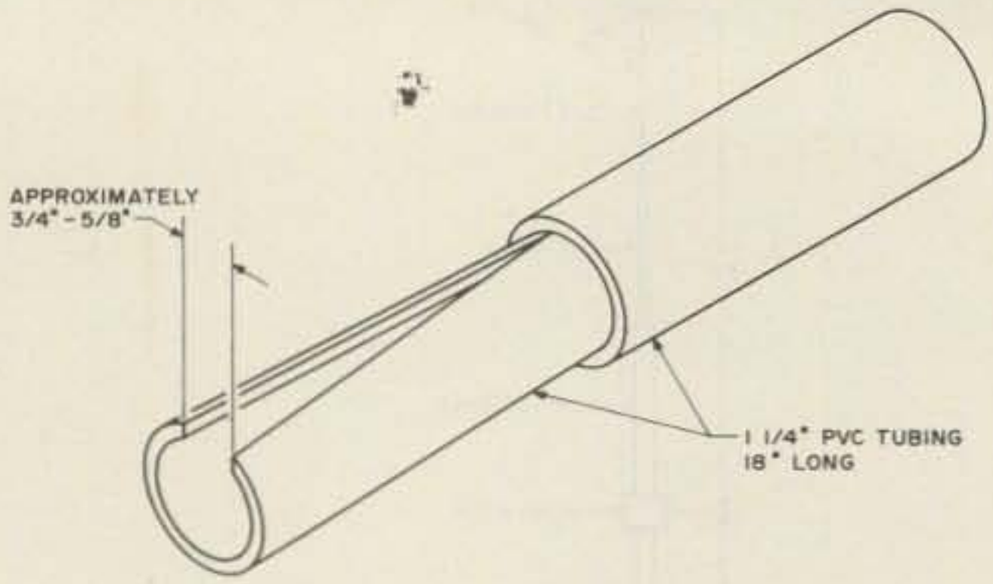


Fig. 5. Joining the two 1-1/4" PVC sections.

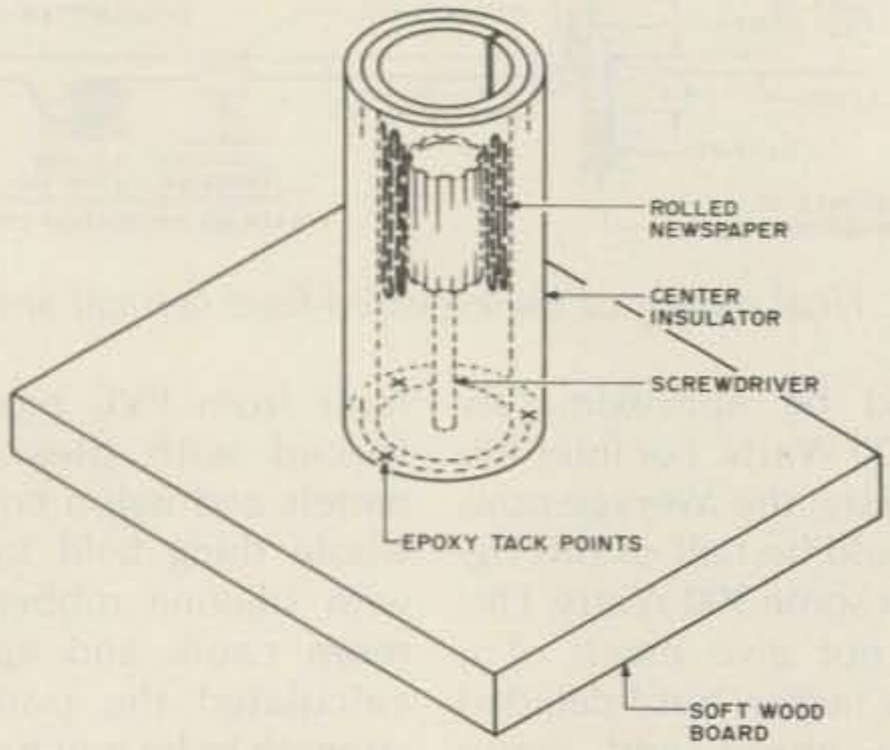


Fig. 6. Jig for the construction of the center insulator.

supporting. The weakest link would be the 1-1/4" aluminum tubing section. Moral support for this decision came from Capt. P. H. Lee's excellent book, *The Amateur Radio Vertical Antenna Handbook*, where he used this size tubing to construct his Mark II antenna.[5] He claimed that the antenna was flexible; it bent with a high wind and did not break.

The final design of this antenna is shown in Fig. 3, and the tuning unit is shown in Fig. 4.

Construction Procedure

The construction is started by the assembly of the center insulator. Fig. 5 shows how one piece is cut and inserted into the other piece. Use PVC pipe cement to bond the two pieces together.

Fig. 6 shows how an inexpensive jig can be constructed from a screwdriver and a piece of soft wood. This jig will hold the cemented PVC pipe in a vertical position to ease the task of cementing the plexiglas panels. The panels can be epoxied to the pipe first so that they will stay in place when applying the silicone rubber bathroom caulk.

Before cementing the plexiglas panels, insert the steel pipe and aluminum tubing into the PVC pipe to the dimensions shown in Fig. 8, i.e., to within 1/2" from each other, centered at the center of the insulator. Mark the radial direction on the pipe, aluminum tubing, and insulator. Drill holes 90° apart in the pipe and tubing for the mounting bolts, drilling through the PVC pipe. When drilling in pipe, *use a 1/4-20 tap drill* and enlarge the hole to 1/4" when the pipe is removed. The position of all holes is shown in Fig. 7. To avoid weakening the pipe, stagger the tap holes. This procedure will align all the holes and assist in the final assembly.

When the bathroom caulk has cured, wind five bands around the panels as shown in Fig. 7. Use nylon or dacron line approximately 1/8" in diameter and space the bands evenly. Epoxy the line for extra strength and to prevent it from unwinding. Drill the two vent holes between the panels in the center of the insulator. Build a little roof over the vent by using caulk. This will prevent moisture from seeping into the insulator.

The three sections of the aluminum tubing are assembled as shown in Fig 9. The bushing is made by cutting 6" from the smaller of the two pieces at the junction, splitting it and forcing it over the shortened piece.

The top hat is made by cutting a 3-foot length from aluminum clothesline, bending it in the center, and bolting it in place as shown in Fig. 10. After it is bolted in place, bend it until it is perpendicular to the tubing. After bending, cut it to the dimension shown (1'4") and spread the two wires until they are 90° apart. Install the top button and seal the whole area with bathroom caulk.

If possible, obtain a piece of 1" Schedule 40 pipe which is 15 feet long. If this cannot be obtained, use one 10-foot and one 5-foot section. Position the 5-foot section next to the insulator and join the two pieces together by using a 12-inch piece of 1-1/4" Schedule 40 pipe and 1/4-20 bolts. Use aluminum sheet between the pipes for a tight fit. Drill and tap the holes at this junction by following the same procedure as outlined previously when drilling holes in the center insulator. Drill one 7/16" hole approximately 4-5 feet from the bottom end of the pipe. This is the exit hole for the coaxial cable.

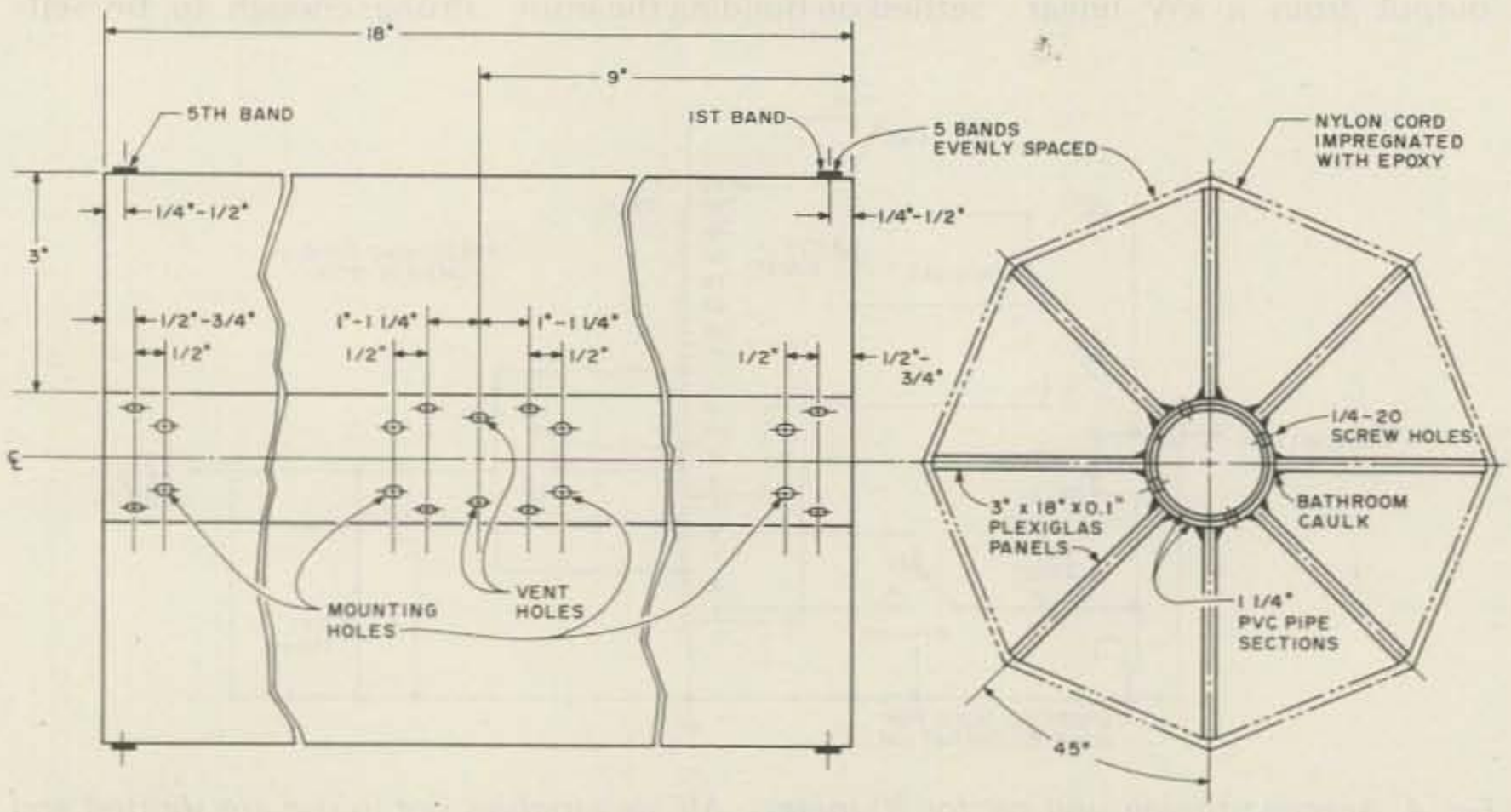


Fig. 7. Construction of the center insulator.

Cut a piece of RG-8 foam

coaxial cable 15 feet long. Strip one end as shown in Fig. 8. Allow sufficient length of shield to produce the slack. During assembly, the pipe and aluminum tubing will come together across the 1/2" gap forcing the coax down. The slack is needed to prevent bending or damaging the center conductor. Impregnate the center conductor and the shield with solder so that about 1/4" of soldered length will protrude from the silicone rubber caulk when applied. Apply silicone rubber caulk as shown in Fig. 8 to seal the cable from moisture.

Thread the cable from the insulator end to the 7/16" exit hole by using a length of wire taped to the cable. Exercise caution in taping the cable since the hole does not allow too much clearance for the RG-8 cable.

Fig. 11 shows the position of the three components prior to assembly. Use electrical tape and aluminum sheet wrapped around the tubing and the pipe as necessary to ensure a tight fit for the center insulator. Cut holes in them for the bolts to pass through and smooth all edges so that the center insulator slides smoothly over the aluminum tubing and the steel pipe.

Slide the center insulator over the aluminum tubing. Verify the markings which were made during the drilling to avoid hole alignment problems.

Attach the shield of the coaxial cable to the pipe first. To do it, drill and tap a 1/4-20 hole in the pipe about 1/2" from the end, as shown in Fig. 8. Screw a 1/4-20 bolt from the outside of the pipe. Secure the shield to the bolt inside the pipe with a nut. Tighten the nut. Cut the bolt flush with the outside of the pipe wall.

Bend one edge of aluminum tubing and drill a 10-32 clearance hole in the bent section, as shown in Fig. 8. Attach the center conductor to the tubing by using 10-32 hardware.

Slide the aluminum tubing until it butts against the pipe. If the slack in the shield is of correct length, the two pieces should butt without any problem. If they do not butt properly, more slack in the shield will be required.

With the two sections butted, slide the whole antenna until it rests against a wall or other stationary object. Slide the center insulator over the pipe until the mounting holes are in alignment. Secure the insulator to the pipe by using 1/4-20 ×1/2 bolts. Gently slide the aluminum tubing out of the insulator until the mounting holes are in alignment. Secure the insulator to the tubing using 1/4-20 × 2 bolts and nuts.

Install the antenna in a 1-1/2" pipe, 5 feet long, which is driven into the ground to a depth of 4-1/2 feet. Small stones are dropped into the pipe to limit the depth of insertion. Aluminum or hardware shims are used to hold the antenna in place.

A ground radial system is needed for optimum performance, especially on the 80- and 40-meter bands. I have five radials, each 33 feet long, and I plan to install eight more. As with every vertical antenna installation, a low ground resistance is necessary for good performance. A high ground resistance (few or no radials) results in high power losses because the ground resistance is in series with the radiation resistance of the antenna.

For this installation, I attached the ground radials to the 1-1/2" buried pipe. I grounded the antenna to the pipe by using a 1/2" × 1/8" aluminum grounding strap.

Tuning Unit Construction

The schematic of the tuning unit is shown in Fig. 4.

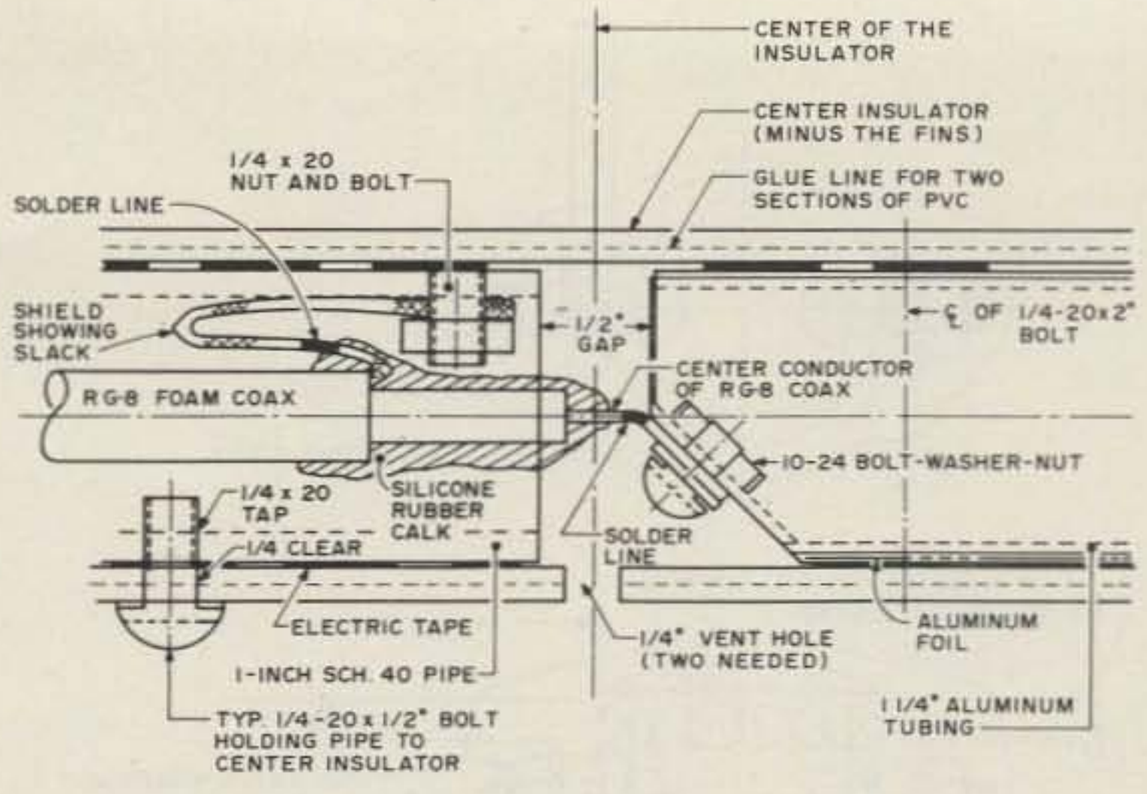


Fig. 8. Locations of the pipe and tubing within the center insulator.

The unit is installed next to the antenna, but not grounded to it. It is grounded only to the shield of the coaxial cable.

I constructed my tuning unit on a piece of plexiglas 7-1/2" × 16-1/2" and mounted it inside a watertight cabinet. Since I had enough air-variable capacitors in my junk box, I decided to be extravagant and use separate C2 and C3 air variables for the 15-meter and 20-meter bands.

One word of encouragement: The construction of this unit is not complicated. The cost to build it need not be high. I obtained all the parts and the cabinet for about six to seven dollars at two hamfests held in my local area. The real bargain find was an old Army surplus tuning unit which was priced at $5.00. This unit yielded two air variables, the coil, and the enclosure. To those of you reading this article who have not been to a hamfest, my advice is to go to one! It is lots of fun plus being a place for some real bargains.

Once the tuning unit is built, connect it to the coax feeding the antenna and to the transceiver placed next to the unit. Follow the procedure below to obtain tap points for your coil.

Tuning Procedure Using Swr Meter

(1) Connect the swr meter in the line between the transceiver and a dummy load.

(2) Tune the transceiver as usual for maximum output on the 80-meter band. Adjust the swr meter sensitivity for a full-scale forward power indication.

(3) Do not change any of the transceiver or swr meter settings. Switch the swr meter to read reflected power.

(4) Disconnect the dummy load and connect the tuning unit in its place.

(5) Using the turns ratio in

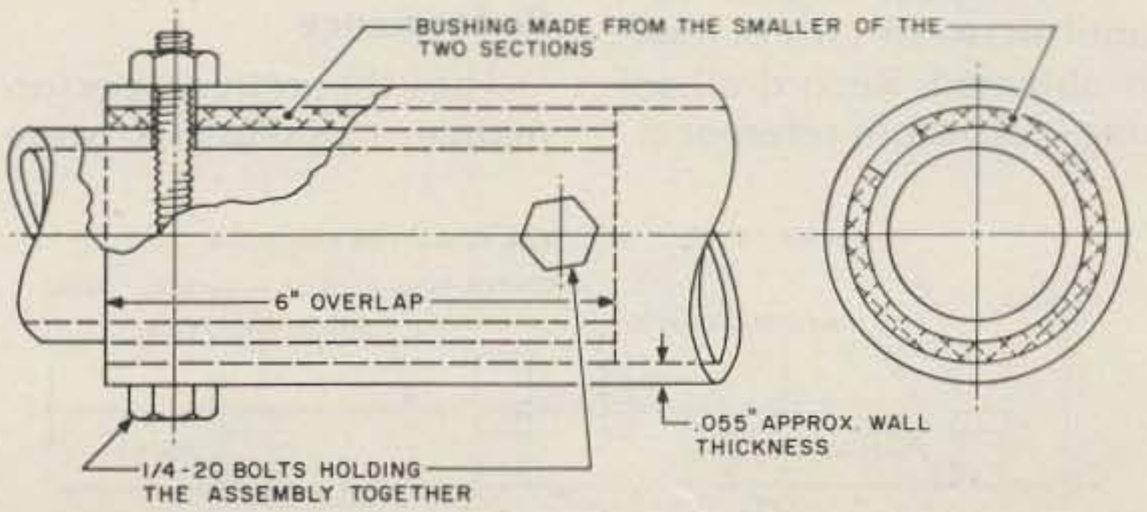


Fig. 9. Assembly of the aluminum tubing sections.

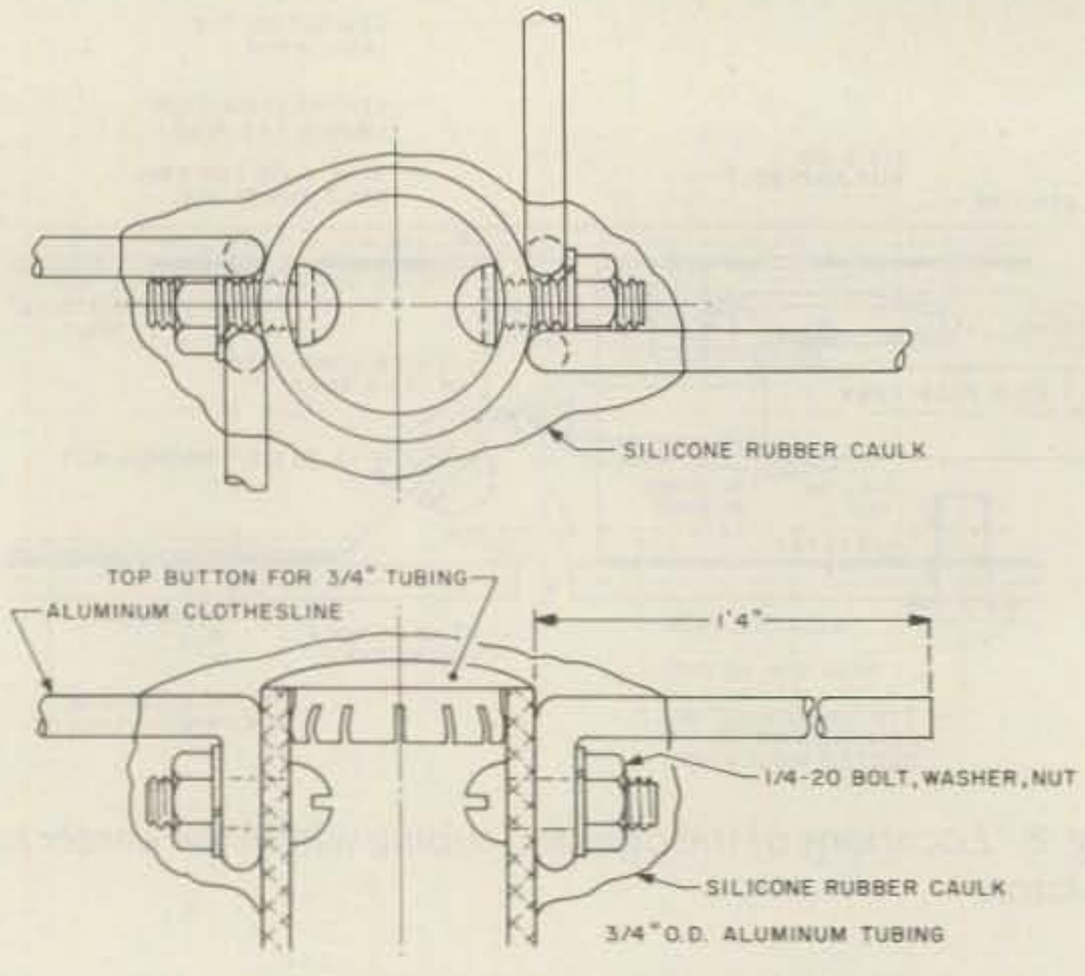


Fig. 10. Top-hat assembly.

Fig. 4 as a guide, connect the appropriate wires to the coil using alligator clips or equivalent.

(6) Position all tuning unit switches to 80 meters and adjust all air variables to *minimum* capacitance.

(7) Watching the swr meter, place the transceiver in the transmit mode. The swr meter may show anything from an off-scale reading to an swr of 1:1.

(8) Not changing any of the settings on the transceiver or the swr meter, note the swr reading. Place the transceiver in the standby mode.

(9) If the swr was high, adjust the taps on the coil and repeat steps 7 and 8. If the swr was low (swr meter deflection is 1/2-2/3 scale, equivalent to an swr of about 3:1 to 5:1), leave the taps alone and adjust the air variable for an swr of 1.3:1 or lower.

(10) Repeat steps 7 to 9 until an swr of 1.3:1 or lower is obtained. Record all settings for future reference.

(11) Repeat this procedure for the other bands.

The procedure is designed to obtain the best possible match by adjusting the turns on the coil first. Once this is accomplished, air variables are used to reduce the swr still further. Always adjust one component at a time and fight the temptation to tinker with knobs. It took me two days to learn this lesson.

Connecting the Antenna To the Shack

After installation and tuning, connect the antenna to the shack by using buried RG-8 coaxial cable. Install the lightning protection system as shown in Fig. 3. It consists of a coaxial lightning arrestor grounded to a 5'-6' ground rod, followed by the turns in the coax. Tape the arrestor well with electrical tape to prevent moisture damage.

Performance

The theoretical performance calculations were hammered out with N9CR during various coffee breaks. He has a newly installed three-element tribander atop a 60' tower. We chose to compare the relative merits of the elevated-feed vertical antenna to those of the beam 60 feet in the air.

Theoretical data for this comparison came from *The ARRL Antenna Book* and and P. H. Lee's book, *The Amateur Radio Vertical Antenna Handbook*.[6,7] The summary is presented below. We chose the 20-meter band for this comparison.

A three-element beam 1λ above ground has a vertical pattern consisting of two lobes. Only the lower lobe is good for DX. It has a horizontal beamwidth of about 60° (−3-dB points) and a vertical beam width of about 15° in the lower of the two lobes. Judging by the published patterns, we assumed that the power going into the antenna is divided equally between the two vertical lobes.

The beamwidth of the elevated-feed vertical antenna on 20 meters is approximately 20° in the vertical plane. Since it is non-directional, the horizontal beamwidth is 360°.

For DX operation, the spherical area illuminated by the beam is $60° \times 15° = 900$ "square degrees." The spherical area illuminated by the elevated-feed antenna is $20° \times 360° = 7200$ "square degrees." The power gain of the beam relative to that of the elevated-feed antenna can be calculated theoretically as

$$\text{Gain (dB)} = 10 \log P_1/P_2$$
$$10 \log 7200/900$$
$$9.03 \text{ dB over elevated feed}$$

Because only half of the power (3 dB down) goes into the "useful lobe," the actual gain that the beam realizes over the elevated-feed vertical antenna is 9.03 dB −3.0 dB = 6.03 dB, or 1 S-unit.

Jokingly, we both agreed that although N9CR's tribander at 60 feet had a gain of 6 dB over my elevated-feed vertical, I held a 13.3 dB "gain advantage" in cost.

On the air, the antenna performed beautifully for DX on 28 MHz and 21 MHz where the radiation is at low vertical angles. On 14 MHz, the antenna performed very well over the United States and Canada, and fairly well for DX. On 7 MHz and 3.5 MHz, the antenna lays down a strong ground wave; I had very good signal reports from stations 30 to 40 miles away. Many fine 80- and 40-meter QSOs were also had with stations as far as 800 miles away.

Conclusion

I wish to express my thanks to K9CGD to whom this project was first presented and who encouraged me to proceed with it. Thanks are also due N9CR who nursed the project from the beginning to the end and who, having tried the antenna on the air, pronounced that "...it worked as expected." I feel that the elevated-feed principle has much to offer to the amateur radio operator. In fact, I like this antenna so much that I am planning to optimize performance on 20 and 40 meters by designing and building one which will be 66 feet tall. But that's another project. ■

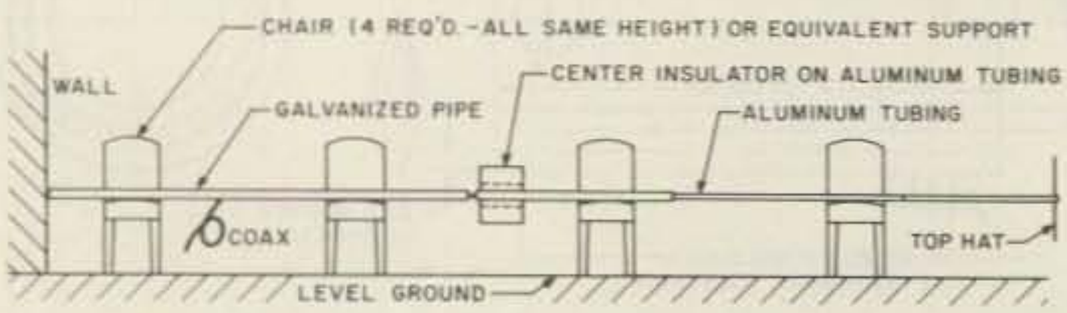


Fig. 11. Assembly of the elevated-feed antenna.

References

1. *Amateur Radio Techniques*, an RSGB Publication, Fifth Edition, 1974, pp. 233-234.
2. *Ibid.*, p. 233.
3. *The ARRL Antenna Book*, 1968 edition, pp. 32-33.
4. *Ibid.*, p. 100.
5. *The Amateur Radio Vertical Antenna Handbook*, Capt. Paul H. Lee, USNR, K6TS, Cowan Publishing Corporation, 1974 edition, p. 94.
6. *The ARRL Antenna Book*, pp. 46-48 and 56-58.
7. *The Amateur Radio Vertical Antenna Handbook*, pp. 11-13 and 18-19.

Paul Grupp KA1LR
73 Magazine Staff

The TET SQ-22 Antenna

—walking the dog with a two-meter quad

The HB9CV Swiss quad designs have been around for quite a while, but they have seen relatively little commercial exploitation in the USA. Available and quite popular in Japan for several years, they are now offered here by TET USA of Norman, Oklahoma.

The TET SQ-22 two-meter antenna is a vertically-polarized Swiss quad antenna that follows the HB9CV design. It consists of two two-element assemblies in a phased configuration, with all four elements driven. The antenna is very compact, yet the gain and front-to-back ratio figures claimed are impressive—16 dB forward gain and 20 dB front-to-back ratio. Without a test range, these figures are impossible to either confirm or deny, although they do seem slightly optimistic. Nevertheless, with the antenna mounted six feet atop a house and turned with a small TV-type rotator, gain and F/B ratio appear to be excellent.

Assembly presented no problems. The parts were carefully marked and packed, and the quality of materials used is higher than average. Assembled exactly according to instructions, the center frequency of resonance was about 146 MHz, a reasonable compromise. Since I rarely operate FM below 146 MHz, I retuned the antenna for a slightly higher center frequency.

After several months of operation, the SQ-22 has given no cause for complaint. I use it constantly for accessing repeaters and simplex operation and have never wished for more gain. If you're in the market for an antenna for two-meter FM and want something a little beyond the ordinary, you might want to look into the SQ-22. For the truly adventurous, an eight-element Swiss quad for two meters is available from TET, as well as Swiss quads for several other bands from 20 meters to 432 MHz.

For more information, contact *TET USA, 425 Highland Parkway, Norman OK 73069.* Reader Service number 476. ■

N1BEJ with the TET SQ-22 two-meter antenna.

Glenn Malme W6OJF
9337 Gotham Street
Downey CA 90241

Newcomer to Nicads?

—you'll get a charge out of this informative overview

The following covers some of the more common problems encountered by users of nicad batteries. The last section of this article explains some of the technical aspects of the nicad cell.

Virtually all problems involving batteries come with complaints like: "Battery life too short"; "Won't hold a charge"; or perhaps, "Battery too weak." Sometimes there is a real problem—and sometimes the battery is not getting what it must to do a good job.

Here are some practical tips:

1. Fully charge the battery. Some chargers have a NORMAL-TRICKLE switch. In the TRICKLE position, it would take 24 to 60 hours to fully charge a dead battery. On NORMAL, it would take 12 to 14 hours. Nicad batteries can be charged continuously at the NORMAL rate with absolutely no damage to the batteries whatsoever. Leaving the radio on while charging will cause the charging rate to be longer.

2. Don't over-discharge the batteries. Turn OFF the radio when the batteries become low (the SQUELCH control usually won't silence the radio).

3. Never insert batteries backwards. This will almost certainly ruin something.

4. Inspect your batteries occasionally for any indication of rust or corrosion. A white, powdery deposit around the rubber seal at the positve end of the cell or an oily discoloration on the label may be the first sign of an upcoming failure.

5. If your batteries have a short life, check the battery-charging system. Two simple checks will be enough to find the problem. First, check to see if the charger is putting out enough current. Second, check to see if the radio draws too much current. If the charger and radio are OK and you are allowing enough time on charge, then the battery is probably at fault.

Fully discharged, open-circuit	*1.2 V
Fully charged, open-circuit	*1.27 V
Fully charged, charging at 0.1 C	1.45 V
Freshly charged, begin discharging at C	1.4 V
Fully discharged, discharging at C	1.0 V

*These voltages are reached slowly as the cell is allowed to stand for a time.

Table 1. Cell Voltages at 20°C.

What is a Nicad Battery?

The nicad battery is two or more nicad cells connected together. The nicad cell is called a secondary (storage) cell and is used to store electrical energy until needed. It may be recharged many times during its life. The cell may be described electrically by its voltage and capacity.

Cell voltage is determined solely by the materials from which the cell is made. Nickel and cadmium in a potassium-hydroxide electrolyte produce a cell with a nominal voltage of 1.2 volts. There is only a relatively small change in cell voltage from fully-charged to discharged conditions. Refer to the section on battery-testing (following) for cell voltage-measuring techniques. Cell voltage varies from 1.4 volts when just charged to 1.0 volts, at which point it is considered discharged. Nominal cell voltage is 1.2 volts since the cell is very near 1.2 volts for most of the time it is in use. (Of course, if you have a 10-cell battery, the battery voltage is nominally 12 volts.)

Cell capacity is defined as the maximum current the cell will deliver continuously for one hour. This capacity is given by the battery manufacturer in milliampere-hours (mAh) for small cells, and Ampere-hours (Ah) for large cells. Capacity is determined by the size of the cell. For example, an AA-size cell is rated around 350 to 500 mAh and a D-size cell is rated at 2.0 to 4.09 Ah. A very important figure associated with cell capacity is the one-hour discharge rate (C) which is numerically equal to the capacity. For example, for a quantity, C, we can discuss the charge and discharge of nicad cells conveniently without concern for actual cell capacity.

Temperature

Battery operation should be at temperatures between minus 20 and plus 40 degrees C. They may, however, be stored indefinitely at temperatures between minus 60 and plus 60 degrees C. Most batteries will self-discharge at rates dependent upon the storage temperature involved. At 0° C, discharge amounts to 90% in 60 days. At 20° C, it is 50% in about 55 days, and at 50° C, it is 50% in about 20 days.

Life

Generally, batteries may be expected to last several years under normal use. A minimum of 300 cycles of complete charge and discharge is to be expected. If only a partial (say, 20%) discharge is used, the life may extend to 5000 cycles. However, if the battery is partially discharged continuously, it should be periodically deep discharged to realize its full capacity.

Charge and Discharge

Most batteries are normally discharged (in-circuit) at rates less than C and charged at a rate of 0.1 C. If a trickle charge option is available, the charge rate is 0.01 to 0.05 C. Most batteries may be left on NORMAL (0.1 C) charge for indefinite periods without damage. At the normal rate, a completely discharged battery will recharge in 12-14 hours. Less time is required for partially discharged batteries. Charge rates above 0.1 tend to overheat the cell and cause damage. Special "Rapid-Charge" cells are required for fast-charging applications.

Table 1 (showing cell voltages) may be of help in understanding battery function during charge and discharge.

Testing

The battery, charger, and radio constitute a small system which is one end of a communication link. When this system fails, testing each element is necessary to determine the proper correction. Based on experience, the charger is the most likely to fail, followed by the battery and then the radio. However, due to ease of testing, test the charger and radio first.

For the 12-volt, hand-held radio chargers, connect a milliammeter using a D'Arsonval movement (such as: Simpson 260 or Triplett 630), capable of measuring 55 mA, in series with a 240-Ohm, 1-Watt resistor. Connect the meter-resistor combination across each and every set of charging contacts for a 12-volt battery. Observe correct polarity. The charger current should be 45-55 milliamperes.

Consult the appropriate data sheet for the radio under test. Measure all applicable maximum current drain on: full squelch receive, full volume receive, and transmit. Readings should not exceed spec maximums.

A quick battery check would be: Charge at normal (0.1 C) rate for 15-30 minutes. Measure battery or cell voltage. Less then 1.2 volts per cell (12.0 volts for a 10-cell battery) indicates possible defective cells.

For a more complete battery test for a hand-held radio battery with 10 AA cells, fully charge the battery for 12-14 hours at the normal (0.1 C) rate. Connect a 27-Ohm, 10-Watt resistor across the battery and monitor the time required to discharge the battery to 1.1 volts per cell. The time should be close to 60 minutes.

This test will vary according to ambient temperatures. The time will run short if the ambient temperature is much over 25 degrees C, or if started with the battery more than slightly warm to the touch.

Conclusions

The nickel-cadmium batteries will perform excellently if used within their limitations. Poor performance usually results when the limits are exceeded. ■

TR-9000 *from page 32*

supply and standby and power switches, as well as provisions for using external headphones. Another source of memory backup power is the BC-1 power adapter. We suspect that a functional equivalent of the BC-1 could be homebrewed for much less than the $20 list price. One accessory that Kenwood does not offer but in our experience is helpful for weak signal work is a receiver preamplifier. A quality unit can really enhance SSB operation without adding to the noise figure.

We liked the compatibility that Kenwood built into the TR-9000. The power cord and touchtone connector are the same as those used with the TR-7600 and the 7625. The microphone is identical to that used with the TR-7800 and can be pressed into service with Kenwood's VS-230 remote digital vfo. One exception to this area is the rather unusual connector used for the backup power supply.

The TR-9000 offers a tremendous number of features for a reasonable if not downright inexpensive price. If you want to take a crack at two-meter SSB and CW operation and still have a radio that allows you to chew the rag with the gang on the local repeater, you'll find a *flexible* answer in the TR-9000.

For further information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton CA 90220.* ■

BC-350 *from page 78*

outs to signal priority, lockout, delay, auxiliary, and channel number. The right-hand display may be manually toggled between digital frequency display and alpha readout.

A Closer Look

A glance inside the custom diecast metal cabinet reveals the complexity of the circuit, but shows the precision of professional design.

Frequency increments searched and programmable vary with the band plan procedure. On low and high band FM, channel spacing is 5 kHz, on aircraft band 25 kHz, and on UHF 12.5 kHz.

An automatic squelch circuit may be called up to respond to any signal level which produces 20 dB SINAD (S + N/N). This is handy for most listening requirements which do not require constant juggling of the squelch sensitivity right at threshold.

Frequency coverage was actually somewhat greater in our evaluation unit than advertised. We programmed 30.0-50.995, 118.0-136.995, 144.0-174.005, and 420.45-512.9875 MHz. This allowed reception of the first megahertz of the six-meter band (FM demodulation only) and a few beeps and whistles from NASA's weather satellites!

As with its predecessor, the advanced BC-300, the BC-350 has a non-volatile memory—no batteries to change.

The BC-350 is advertised for $599.95. For more information, contact *Electra Company, PO Box 29243, Cumberland IN 46229.* Reader Service number 480. ■

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

"Don't you ever run out of material for your column?" is a question that often crosses your FUN! editor's desk. The answer, quite honestly, is "no." Amateur radio is a subject so full of history and interesting bits of information that, quite likely, the well will never run dry. After all, new ham facts are being created every day.

Take our monthly crossword puzzle. Each month a new topic; each month a new puzzle. Oh, occasionally we may repeat a word or clue here and there, but, on the whole, each month's puzzle is entirely different. And we're never really stuck for material.

Do you know where the world's first crossword was printed? Why, in the FUN! column, of course! No, not this FUN!, but one carried in the December 21, 1913, *New York World*. It's nice to be carrying on a tradition.

Now, what has all this to do with this month's topic, emergency communications? Absolutely nothing. It's just that we occasionally like to digress.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) Emergency messages
2) Mobile antenna
7) Box (abbr.)
9) Where third-party info is entered
11) Emergency's cause
14) Distantly activated (abbr.)
15) ARRL state (abbr.)
16) Over
18) Quasi-military service (abbr.)
21) Emergency service (abbr.)
23) Military colors
26) Strong signal needle action
28) Radiogram
31) Tell you later (abbr.)
33) "_____ the traffic"
35) Brick _____
38) 42 across often needs this (abbr.)
40) Plate voltage (abbr.)
42) Emergency ringleader (2 words)

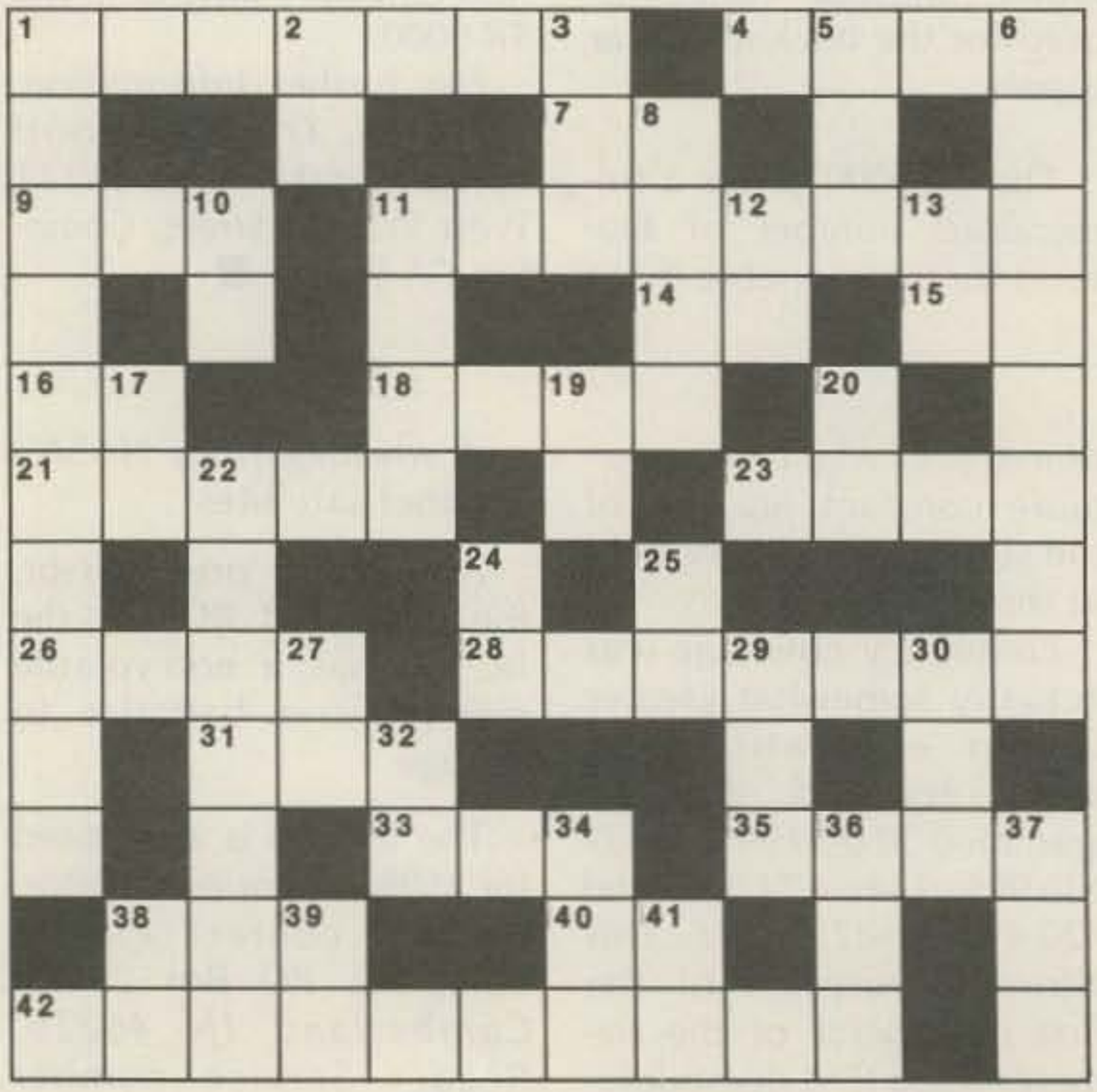


Illustration 1.

Down

1) Dits and dahs
2) Erstwhile training contest (abbr.)
3) Old-style Hertz (abbr.)
5) Active circuit condition
6) Desirable emergency gear is this
8) Flood boat's meager propulsion
10) Emergency workers need this (abbr.)
11) Light-bulb action in many emergencies
12) 4-land state (abbr.)
13) ARRL emergency official (abbr.)
17) Peruvian prefix
19) League post (abbr.)
20) Here (abbr.)
22) Big emergency "nuisance"
24) Mode: most 2-meter CD nets (abbr.)
25) Baloney (abbr.)
27) Popular rig prefix
29) Female version: frequency hog
32) End of message
34) Organized roundtable (abbr.)
36) Automatic noise limiter (abbr.)
37) Jams emergency traffic
38) An engineering degree (abbr.)
39) Board type (abbr.)
41) Many clubs use emergency work to gain this (abbr.)

ELEMENT 2—MULTIPLE CHOICE

1) We all know that $\overline{SOS}$ is the distress signal, but what is the urgency signal, signifying a message concerning the safety of a ship or person?

1) $\overline{TTT}$
2) $\overline{XXX}$
3) $\overline{URG}$
4) There's no such thing as an "urgency" signal.

2) While tuning across the band, you hear someone shouting, "Pan, Pan, Pan." What's happening?

1) He's sending an urgency message
2) He's looking for a kitchen implement to fry his eggs in
3) He's calling for an open frequency
4) He's using an international sign that means he's listening 10 kHz up

3) What does $\overline{SOS}$ stand for?

1) Save our ship
2) Save our souls
3) Secure our safety
4) The individual letters mean absolutely nothing, chosen only for their distinctive sound

4) What were the official Conelrad broadcast frequencies?

1) 540 and 880 kHz
2) 640 and 1240 kHz
3) 710 and 1600 kHz
4) 21.390 and 146.52 MHz

5) How did the word "Conelrad" originate?

1) It's an abbreviation of control of electromagnetic radiation
2) It's an abbreviation of consolidated network for limiting radio
3) From its founder, Joseph Conelrad
4) From the Conelrad video display located at each participating radio station

ELEMENT 3—TRUE-FALSE

		True	False
1)	The original official ARRL station, W1MK, was destroyed by a flood.	_____	_____
2)	RACES is an ARRL organization.	_____	_____
3)	If caught in a life or death situation, you're allowed to operate in any amateur subband, even if it's outside your license privileges.	_____	_____
4)	QRRR was the original amateur distress call.	_____	_____
5)	Before SOS, the international distress call was CQD.	_____	_____
6)	"Mayday" is the phone distress call in honor of Marconi, who was born on May 1, 1870.	_____	_____
7)	MARS used to be called AARS.	_____	_____
8)	Novices may not pass emergency traffic.	_____	_____
9)	In an emergency, the FCC may order all U.S. amateurs off an entire band.	_____	_____
10)	The *Titanic's* SOS was the first ever sent by a ship at sea.	_____	_____
11)	Alaskan amateurs may use 4,383.8 kHz for emergency communications at any time.	_____	_____
12)	In RACES, the amateur controlling on-scene emergency communications is called the "Master of Ceremonies."	_____	_____
13)	The "Transcontinental Corps" is a radio club dedicated to helping hams in need.	_____	_____
14)	ARRL numbered radiograms violate the FCC's rules prohibiting secret codes and ciphers.	_____	_____
15)	If a natural disaster strikes a foreign country, third-party emergency traffic can be passed—even without a formal agreement.	_____	_____

ELEMENT 4—SCRAMBLED WORDS

Unscramble these words dealing with things hams might bring to an emergency site.

rotnegera	toobs	dofo
stranvercei	wobtoar	shalltifgh
nett	loots	hotnicgl
	dicnemie	

ELEMENT 5—HIDDEN WORDS
(Illustration 2)

Hidden in this puzzle are the names of 10 different types of emergencies. The words are formed in any direction—horizontally, vertically, or diagonally, forwards or backwards. As you find each word, circle it.

R	A	C	A	D	R	A	Z	Z	I	L	B	E	F	N
P	Z	A	P	F	M	F	U	A	L	H	E	A	L	D
S	M	L	R	O	V	F	E	R	E	R	S	P	M	J
A	C	E	U	C	B	H	I	E	R	R	I	A	Y	M
U	P	D	R	E	Y	A	O	R	U	G	H	B	R	O
E	A	R	T	H	Q	U	A	K	E	Q	T	A	I	C
H	D	Y	S	U	E	J	U	C	H	E	U	C	S	I
U	T	I	C	R	C	N	D	K	D	L	O	H	E	T
Y	Y	F	E	R	R	I	L	O	I	C	K	E	N	O
D	P	G	H	I	S	I	O	Y	E	K	C	S	D	D
A	H	W	H	C	H	L	C	Y	M	L	A	Y	G	A
Y	O	E	L	A	F	C	I	E	R	U	L	M	T	N
F	O	A	O	N	S	S	H	R	O	N	B	T	O	R
M	N	O	F	E	X	P	L	O	S	I	O	N	U	O
H	N	G	I	B	E	S	A	L	L	K	J	O	H	T

Illustration 2.

FUN! MAILBOX

Just a note letting you know your work is greatly appreciated in *73 Magazine*. I enjoy your writing. I am studying for my General and would like to have an Advanced someday. There is a lot to learn and I am trying to crawl!

Keep up the good work. Thank you very much.

James Ross
Long Beach CA

Thanks a lot, Jim.—J.E.

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1-2 Many hams might send XXX after sitting at their key for more than a few hours. Others just have it written on that jug near their operating station.
2-1 Did we get you again? Of course, he may just be looking for his peanut butter.
3-4 And QSB must mean: "Quickly Sinking Band."
4-2 There you would listen to the president's message—if your receiver wasn't melted by the blast.
5-1 So enemy planes couldn't find our cities via radio. But how would you have shut down the CBers?

Element 3:
1 True—No code practice that night.
2 False—The FCC, when it feels like it.
3 True—If absolutely necessary, you can even operate outside the amateur bands.
4 True—Like SOS, it had a distinctive sound.
5 True—As you may have guessed, it meant "CQ Distress."
6 False—From the French *m'aidez* (help me).
7 True—Back before WWII, when it was the Army Amateur Radio System.
8 False—Why not?
9 True—The FCC, like a 500-pound canary, can do anything it wants to.
10 True—Alternating with CQD.
11 True—As long as they're within 50 nautical miles of the state and are not airborne.
12 False—Only if he has a co-host.
13 False—They're upper-level ARRL traffic handlers.
14 False—Probably not, since the codes are regularly printed. But they're never been challenged on it, either.
15 False—Unfortunately not, and many unwitting amateurs end up violating the law. Usually, however, a temporary agreement permitting emergency traffic is put into place—as in last year's Italian earthquake.

T	R	A	F	F	I	C	■	W	H	I	P	
E	■	■	D	■	■	P	O	■	O	■	O	
L	O	G	■	D	I	S	A	S	T	E	R	
E	■	L	■	I	■	■	R	C	■	C	T	
G	O	■	■	M	A	R	S	■	H	■	A	
R	A	C	E	S	■	M	■	D	R	A	B	
A	■	O	■	■	F	■	B	■	■	■	L	
P	I	N	S	■	M	E	S	S	A	G	E	
H	■	T	B	A	■	■	■	O	■	A	■	
Y	■	E	■	R	U	N	■	W	A	L	L	
■	E	S	P	■	■	E	P	■	N	■	I	
N	E	T	C	O	N	T	R	O	L	■	D	

Illustration 1A.

Element 4:
(Reading from left to right) generator, boots, food; transceiver, rowboat, flashlight; tent, tools, clothing; medicine.

Element 5:
See illustration 2A.

SCORING

Element 1:
Twenty points for the completed puzzle, or ½ point for each question correctly answered.

Element 2:
Four points for each correct answer.

Element 3:
One point for each correct answer.

R A C A D R A Z Z I L B E F N
P Z A P F M F U A L H E A L D
S M L R O V F E R E R S P M J
A C E U C B H I E R R I A Y M
U P D R E Y A O R U G H B R O
E A R T H Q U A K E Q T A I C
H D Y S U E J U C H E U C S I
U T I C R C N D K D L O H E T
Y Y F E R R I L O I C K E N O
D P G H I S I O Y E K C S D D
A H W H C H L C Y M L A Y G A
Y O E L A F C I E R U L M T N
F O A O N S S H R O N B T O R
M N O F E X P L O S I O N U O
H N G I B E S A L L K J O H T

Illustration 2A.

Element 4:
Each word deciphered nets you 2½ points.

Element 5:
Two points for each word found.

So, how well are you prepared?

1-20 points—Emergency? What emergency?
21-40 points—Know someone who passed a message during the great 1951 Philadelphia Hoagie Famine
41-60 points—Regularly checks into local VHF net to "pass a personal"
61-80 points—Spends every night hopping from net to net—your handle is "Sparks"
81-100+ points—Member of RACES, MARS, AREC, NTS, ARPSC, and the National Anagram Society

LEAKY LINES

Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

Perhaps some of you who are reading these lines will have been among the group of twenty-odd hams who happened to be standing around the booth of a company which I prefer to go unnamed. The scene was the recent Dayton Hamvention, and the time was Saturday afternoon at the very height of the afternoon festivities. This particular firm is one of the few remaining American manufacturers engaged in the production of major equipment, that is to say, transceivers, as distinguished from associated items such as microphones, antennas, keyers, and so forth.

Their current model is not new, but has been on the market for some time. But I have had little opportunity to look at it, so this was really the first time for me to see it close up. I was chagrined to see that among other things, they had seen fit to include a pretty shoddy-looking silk-screened knob that probably cost no more than a few pennies to produce. This was the sort of penny-dreadful junk one would only find on inexpensive kits and cheaper rigs. It was certainly grossly out of place on a radio which sells for upwards of 1600 bucks, in my humble opinion. (Actually I've never been humble in my whole life; this figure of speech just happened to issue forth from the typewriter.)

At the precise moment that my eyes happened to light on this misbegotten knob, I was suddenly overcome by an uncontrollable impulse to lash out at someone, and since the only eligible person happened to be the company rep who was manning the booth, he was elected. I said, "You know...you and your company ought to hang your heads in shame. Here we are: The Japanese have their fangs and talons poised at our jugular. We keep talking about the urgent necessity of regaining the markets that foreign business has taken from us. In scores of fields: optics, photography, automobiles, electronics...even pianos and sporting goods such as fishing tackle and baseball gloves...we have lost out, and now we suffer disadvantage, not only to our pocketbook, but our national pride."

The luckless object of my polemic seemed to be looking for a hole to crawl into. His eyes were bugging out of his head. I continued.

"We know that the reason there are so many VWs, Datsuns, and Toyotas on the road is because of the rotten product that Detroit insisted on making.

We drove the car customers right into the arms of the foreign producers. And now what happens? You guys have the gall to do the very same dumb thing that Detroit did, despite the clear and certain knowledge that the American people were sick and tired of getting shafted by our own companies and shifted to imports. You put out a rig that looks as if it were slapped together in someone's garage! You ought to hang your heads in shame!"

I surreptitiously peered at the people standing around the booth and they were all nodding in agreement. I could see that if I continued much longer, this gang might start heating up the tar and ripping open the pillows. So I decided to call a halt to my diatribe, and I walked away, leaving the poor guy swabbing the sweat from his brow.

About a year ago, when I was putting together a little switching arrangement so that I could go from HF to VHF on radioteletype, I needed to get hold of a switch and figured that in the interest of durability and reliable operation I'd better get myself a good American-made one. There were plenty of switches available that would have done an adequate job, but I thought that I would do better with a device of proven reliability. So I spurned all the cute little miniswitches and went to a good store and laid out almost six bucks for an American-made switch. (Again, I will leave the name of the company unspoken.) Well . . . you guessed it. The switch was an absolute dog! It was constantly intermittent, and I could never be certain that it would make contact. I had to spend much time jiggling the damned toggle back and forth to make sure that the thing switched properly. Please bear in mind that there was no appreciable voltage or current involved, since I was merely activating a pair of sensitive relays that operated from the 13.8-volt 2-meter supply, and since the actual switching took only a split second, there was no way that any operational stress could have played a part in the failure of the device. Any light switch in my house gets more use in a single week than this switch would be likely to get in a whole year!

So what did I do? Simple. I ripped the high-falutin' American-made switch out of the gadget and replaced it with a cheap little import picked up in a blister pack from my handy-dandy neighborhood Radio Shack store. It has now been in use for about three months with no sign of any difficulty. And it cost all of 98 cents, as I recall.

I am outraged. I guess it's no secret that there are more foreign rigs being sold in the US than ever, and it's pretty clear that hundreds of millions of hard-earned American dollars are leaving the country and going into foreign pockets. There's no doubt that this constant drain (and you can multiply it by a large factor because the very same situation can be observed in all sorts of manufactured goods, as I indicated earlier) is virtually crippling the American economy. While our national administration struggles to bring the economy into line by increasing productivity and reducing inflation, we are ignoring this fundamental fact: that American productivity must go hand in hand with quality. For if we produce shoddy merchandise, buyers are entitled to go elsewhere. They yearn to be patriotic, but that does not mean that they will hold still while they are being exploited.

Somehow, American manufacturers of ham gear are going to have to find a way to produce top-quality goods at a price which can compete on an equal basis with the imports. It isn't going to be easy.

By the way, while at the Hamvention, I looked at another line of goods, also produced by an American company. In line with my previous demurral, I will not divulge their name. They had removed the covers so that it was possible to see the circuit boards. I can tell you that I was appalled at the shoddy appearance of the workmanship, if you can dignify it with that term. This is supposedly top-line stuff. Mounted components looked as if they had been scrounged from someone's tailgate out in the flea market, and without particular care in selecting them. Cockeyed, poorly-dressed leads and solder splashes were the rule rather than the exception, and some of the visible hardware had been deformed by the careless application of the wrong-sized screwdrivers.

I have often looked carefully at imported equipment, and I must say that even the most inexpensive gear is generally immaculately assembled and good to look at. Is that too much to ask?

RADAR AND LIVES

I swore that after last year's trip, I would never drive to Dayton again, but would fly. But when the time approached, I forgot all about the resolution. Thirteen hours on the road is getting to be a mite exhausting. And I have yet to ride on Interstate 80 without encountering either a horrendous downpour or impenetrable fog.

Last year, we went in a couple of rented Winnebago RVs. The trip was fun, albeit very tiring, not to mention the horrendous cost of the gasoline. This year, we used two cars. The most impressive thing was the performance of the radar detectors mounted in each of the automobiles. They operated flawlessly, and I am convinced that they are a must, particularly if the vehicle is not equipped with cruise control. The gadgets never failed to alert us to the presence of police radar. I am in no position to give you qualitative comparisons of the brands, not having tried a great variety. But Wayne gave a fairly broad evaluation in one of his columns (June, 1980) and it behooves anyone who is anxious to avoid a nasty confrontation with the gendarmes to consider the purchase of one of these devices.

There are still a few places in which radar detectors are considered illegal. I suppose the authorities consider the collection of fines more important than the prevention of highway accidents. It is obvious that the known presence of radar patrols influence drivers to slow down, thus reducing the accident rate. The fact that most cars I saw on this trip were indeed equipped with detectors and the additional fact that few cars were pulled over by the police must be correlative. I am positive that radar detectors are a demonstrably effective deterrent to traffic fatalities.

Indeed, we can all think of far more urgent jobs for the police to be doing than lying in wait for unwary motorists who are "putting the pedal to the metal." While the original impulse to buy and use a radar detector may be ignited by the simple desire to avoid traffic citations, the end result is fewer accidents. And since the use of detectors by the public invariably results in a lessening of the need for high numbers of police patrolling the roads, this will liberate more officers and make them available to track down the ever-increasing population of real criminals who terrorize society and who run amok in our streets, parks, and subways, creating havoc and tragedy.

If that is the consequence, then every car in America ought to be equipped at the factory with a radar detector.

NO-CODE LICENSES

The response to my April piece about code-free licensing has been practically unanimous. Numerous cards and letters have come in, and only three favored a code-free entry level license. In point of fact, the results of a survey (published in *QST*) showed conclusively that the vast and overwhelming majority of amateurs opposed such a change.

Case closed!

HAM HELP

I'm interested in any information on converting an RCA RT-175/PRC-9 27-38.9-MHz receiver/transmitter. My particular interest is in power supplies and schematic information on these radios. Thank you for your trouble.

Dick Howe
2210 Taggert St.
Wesleyville PA 16510

I am interested in obtaining a schematic for a Precision Signal Generator, series E-200 C, manufactured by Precision Apparatus Co., Inc., Elmhurst, LI, New York, serial number 34845. I would appreciate any help that anyone can give me. Thanks.

A. B. Wells WA5COH
PO Box 50
Tunica LA 70782

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

SARTG WORLDWIDE RTTY CONTEST

Contest Periods:

0000 to 0800 GMT August 15
1600 to 2400 GMT August 15
0800 to 1600 GMT August 16

This is the 11th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group (SARTG). Operating classes include: (a) single operator; (b) multi-operator, single transmitter; (c) SWL. Please note that the logs from multi-operator stations must contain the names and callsigns of all operators involved. The same station may be worked once on each band for QSO and multiplier credits. Only 2-way RTTY QSOs will count.

EXCHANGE:

RST and QSO number.

SCORING:

QSOs with your own country count 5 points. Other countries in the same continent are 10 points. Other continents are 15 points. In the USA, Canada, and Australia, each call district will be considered as a separate country. Use the DXCC list and the above-mentioned call areas for multipliers. Note that contacts with a station which would count as a multiplier must be found in at least 5 logs or a contest log must be received from the multiplier station in order to be valid. Final score is the sum of QSO points times the sum of the multipliers. SWLs use the same rules for scoring, but scores are based on stations and messages copied.

AWARDS:

Top stations in each class, country, W/K, VE/VO, and VK call district.

ENTRIES:

Logs must be received by October 10th and should contain: band, date/time in GMT, call-

CALENDAR

Aug 8-9*	**European DX Contest—CW**
Aug 15-16	**SARTG Worldwide RTTY Contest**
Aug 15-17	**Rhode Island QSO Party**
Aug 15-17	**New Jersey QSO Party**
Aug 22-23	**Ohio QSO Party**
Aug 29-30	**Occupation Contest**
Sep 12-13	**European DX Contest—Phone**
Sep 12-13	**G-QRP-Club CW Activity Weekend**
Sep 12-13	**New Mexico QSO Party**
Sep 12-14	**Washington State QSO Party**
Sep 19-20	**Maryland-District of Columbia QSO Party**
Sep 26	**DARC Corona—10-Meter RTTY**
Oct 3-4	**California QSO Party**
Oct 17-18	**Minnesota QSO Party**
Oct 17-18	**Scout Jamboree on the Air**
Oct 24-25	**CQ Worldwide DX Contest—Phone**
Nov 8	**DARC Corona—10-meter RTTY**
Nov 8	**OK DX Contest**
Nov 14-15	**European DX Contest—RTTY**
Nov 28-29	**CQ Worldwide DX Contest—CW**
Dec 26-31	**G-QRP-Club Winter Sports**
Jan 16-17	**73's International 160-Meter Phone Contest**

***see last issue**

RESULTS

1981 SSTV CONTEST RESULTS

This year's SSTV contest may not have been the pinnacle of excitement and fun as it has been in previous years, but it brought several situations into clear focus (no pun intended). As you know, the SSTV Contest and Worldwide DX Contest happened during the same weekend. What you don't know is the problems and entanglements of trying to coordinate with uncoordinative sources. We've outguessed and outmaneuvered obstacles during the past several years, but the law of numbers finally caught us. We have two possible considerations for next year's contest: 1) Conduct the SSTV Contest on either the first or second full weekend of March, whichever one doesn't become scheduled for the DX (phone) Contest. Furthermore, if some "surprise attack" produces contests on both of these weekends, the SSTV Contest will shift to the third weekend of March. If that consideration is accepted, the formal 1982 SSTV Contest announcement will read accordingly. That will necessitate checking with the SSTV Net (Saturdays, 1800 GMT, 14,230 kHz) for specific details. 2) Forego on-the-air operational contesting and conduct a technical achievement contest. If SSTVers as a whole prefer to design, tinker, and construct rather than operate, we're ready to make the change and recognize your efforts. Your opinions and suggestions are vitally important. Please contact Dave Ingram W4TWJ or Brooks Kendall W1JKF during the Saturday SSTV Net with your comments. Now let's look at the results.

1981 SSTV CONTEST COMMENTS

WB4OVX in Virginia was noticed having a ball during the contest, showing his new Collins KWM-380. *N6WQ* related that contacts seemed down approximately 30% and felt this was due to the simultaneous ARRL DX Contest. The most *common comments* heard on the air during the contest related to the two contests (DX and SSTV) falling at the same time. *Fortunately*, however, the SSTV contesters were heard expressing their understanding and sympathy. Although we couldn't get enough forewarning from the ARRL and although 73 coordination was difficult, we still had a good contest. Respect among on-air SSTV contesters was quite commendable. A friendly and relaxed air among all SSTV contesters was apparent. *10* and *20* meters seemed (in that order) the most popular (SSTV) bands.

Thanks to everyone for contest support (whether or not you sent a log!) Congratulations to N9AWR on winning first place in the contest! Bravo!!

Dave Ingram K4TWJ
Brooks Kendall W1JKF

1981 SSTV CONTEST SCORES

Call	Contacts	Countries 5 Points	Continents 5 Points	States/ Prov's	Grand Total
N9AWR	139	16 (80)	6 (30)	36	285
N6WQ	112	14 (70)	5 (25)	29	236
W2GND	38	4 (20)	3 (15)	21	94
XE1HT	15	3 (15)	1 (5)	5	40
XE1AAK	17	3 (15)	1 (5)	7	44
W0KXP	8	2 (10)	2 (10)	2	30

sign, exchanges sent and received, points, multipliers, and final score. Use a separate sheet for each band and enclose a summary sheet showing the scoring, classification, callsign, name, and address. In the case of multi-operator stations, include the names and callsigns of all operators involved. Comments will be very much appreciated by the contest committee. Send logs to: SARTG Contest and Award Manager, C. J. Jensen OZ2CJ, PO Box 717, 8600 Silkeborg, Denmark.

RHODE ISLAND QSO PARTY

1700 GMT August 15 to
0500 GMT August 16
1300 GMT August 16 to
0100 GMT August 17

The Rhode Island QSO Party is sponsored by the East Bay Amateur Wireless Association. RI stations work other RI stations and the rest of the world. Others work RI stations only. The same station may be worked once per band and mode.

EXCHANGE:

Send RS(T) and state, province, country, or RI city.

FREQUENCIES:

Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, 146.52.

CW—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110.

Use of FM simplex is encouraged, but no repeaters are allowed.

SCORING:

All stations score 2 points per phone QSO, 3 points per CW QSO. RI Novice and Technician stations score 5 points per QSO. RI stations score 5 points per QSO. RI stations multiply total QSO points by the number of states, provinces, and DX countries worked. Others multiply total QSO points by the number of RI cities and towns worked. Note that there are 39 cities and towns in Rhode Island.

Certificates will be awarded to the top-scoring station in each RI county, state, province, and DX country; the top-scoring Novice and Technician station in each RI county and state; and the ARC in each state, province, and DX country that submits the highest aggregate score with a minimum of 3 logs per club.

ENTRIES:

Logs must show date/time in GMT, call exchange, band, and mode. On a separate sheet show name, call, mailing address, club affiliation (if any), total QSO points, multiplier claimed, and final score. Entries must be postmarked no later than September 15th. Send logs and summary to: East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for a copy of the results.

NEW JERSEY QSO PARTY

2000 GMT August 15 to
0700 GMT August 16
1300 GMT August 16 to
0200 GMT August 17

The Englewood ARA invites all amateurs worldwide to participate in the 22nd annual NJ QSO Party. Phone and CW are considered the same contest. A station may be contacted once on each band; phone and CW are considered separate "bands" but CW contacts may not be made in phone band segments. NJ stations may work other NJ stations, and NJ stations are requested to identify themselves as "DE NJ".

EXCHANGE:

QSO number, RS(T), and ARRL section, country, or NJ county.

FREQUENCIES:

1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50-50.5, and 144-146.

Suggest phone activity on the even hours; 15 meters on the odd hours (1500 to 2100 GMT); 160 meters at 0500 GMT.

SCORING:

Out-of-state stations multiply the number of complete contacts with NJ stations times the number of NJ counties worked (21 maximum). NJ stations count 1 point per W/K/VE/VO QSO and 3 points per DX QSO. Multiply total QSO points by the number of ARRL sections (including NNJ and SNJ—maximum 74). KP4, KH6, KL7, etc., count as 3-point DX contacts and as section multipliers.

AWARDS:

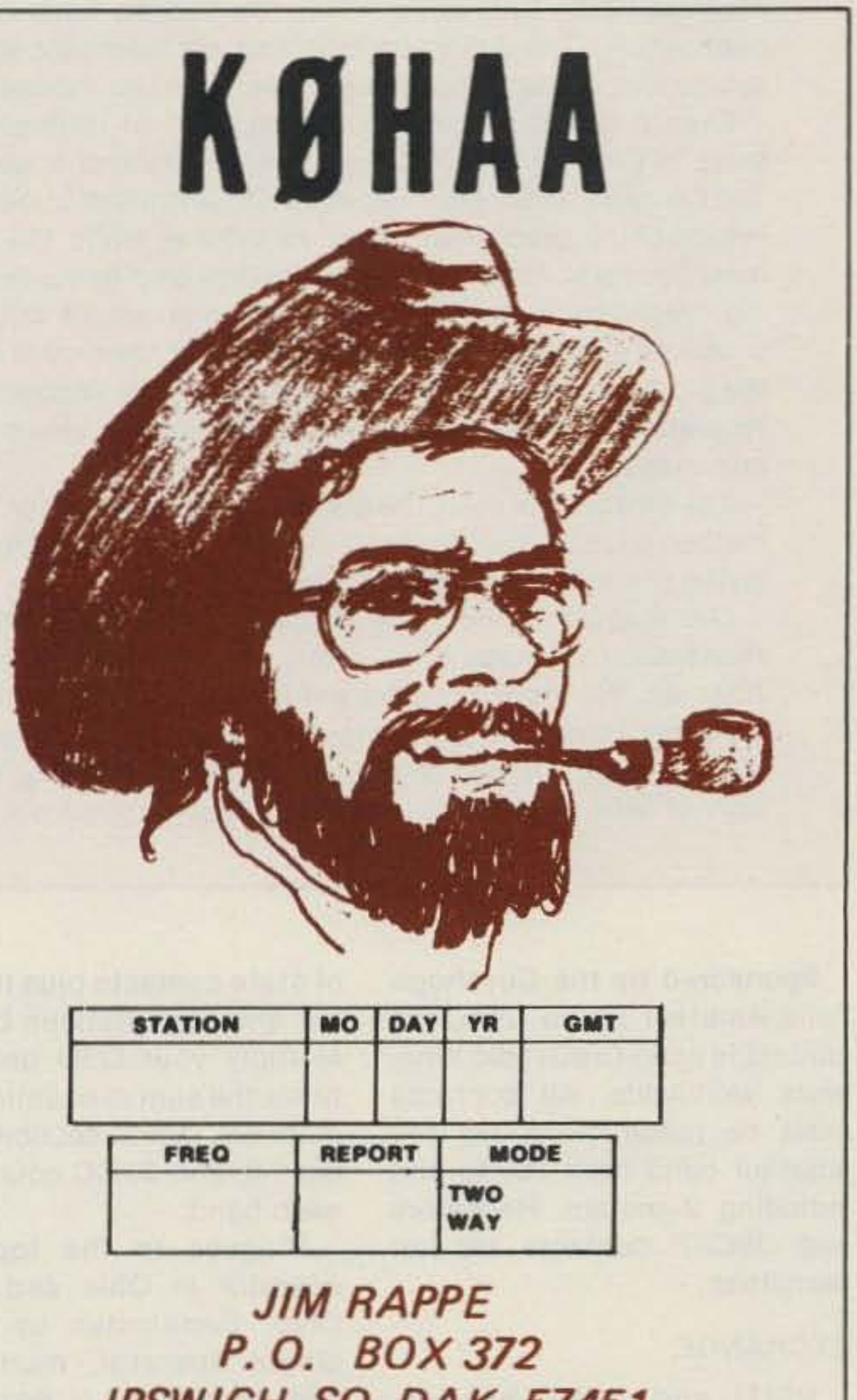
Certificates will be awarded to the first-place station in each NJ county, ARRL section, and country. In addition, a second-place certificate will be awarded when 4 or more logs are received. Novice and Technician certificates will also be awarded.

ENTRIES:

Logs must show date/time in GMT, band, and emission. Logs must be received not later than September 12th. The first contact for each claimed multiplier must be indicated and numbered and a checklist of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to: Englewood Amateur Radio Assoc., Inc., PO Box 528, Englewood NJ 07631. A #10-size SASE should be included for results. Stations planning active participation in NJ are requested to advise the EARA by August 1st of their intentions so that they can plan for full coverage from all counties. Portable and mobile operation is encouraged.

OHIO QSO PARTY

Starts: 0000 GMT August 22
Ends: 2400 GMT August 23



QSL OF THE MONTH

This month's QSL winner was submitted by Jim Rappe KØHAA of Ipswich SD. It's bold and carries that personal touch.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify book choice will not be considered. Sorry.

THE CHAWED RAG.....

NEWSLETTER CONTEST WINNER

We were overwhelmed by the response to the *73 Club Newsletter Contest*. The staff would like to thank the 200+ clubs who submitted material during the first month. Each, in its own way, was a winner. Keep up the good work!

Choosing a winning club newsletter is not an easy task. There are many different kinds of clubs and no two have similar newsletters. How does a judge compare the Abington Amateur Radio Club bulletin with the Kansas Amateur Radio publication? The Abington club has six members while the circulation of the Kansas newsletter is in the thousands.

Even if we could resolve the problem of different sizes, there is the problem of production quality and appearance. The Chicago Autopatch Repeater Organization Limited uses eye-catching graphics in their newsletter while the Minuteman Repeater Association publication employs a slick-looking magazine format. In establishing a set of criteria for choosing a winner in the first month of the newsletter contest, the judges made circulation, style, and looks secondary considerations. What we were looking for was the best source of *information*.

The size of your club, the budget for the newsletter, and the method of reproduction don't matter very much if you are not giving the readers something they can use.

Our August winner, *The Chawed Rag*, published by the Richardson Wireless Klub, offers more than just club news. After all, the members who are interested and involved will probably know all the minute details of what went on at the last meeting. Instead of publishing a rather boring description of who was there and what they argued about, *The Chawed Rag* highlights the club's upcoming activities. The issue we reviewed was full of enthusiastic information about Field Day.

The Richardson Klub's newsletter does not limit itself to local happenings. It offers a look at the DX world, the technical aspects of radio, and the latest FCC actions. Gathering and publishing this kind of information does not need to be a time-consuming job. The savvy newsletter editor relies on someone else to locate, research, and write up the hot ham radio stories. *The Chawed Rag* does this by reprinting material from DX newsletters, *The W5YI Report*, other clubs' bulletins, and even the local grapevine.

There are at least two-dozen specialized ham publications available for a $5- to-$25-a-year subscriptions. You can take advantage of DX tips that are only a few days old by subscribing to a weekly source of DX news. *HR Report* and *The W5YI Report* will supply you with a biweekly roundup of ham radio happenings. You can keep your members informed about the latest satellite news by excerpting material from AMSAT's *Satellite Report*. The gold mine is there; is your club newsletter making the most of it?

Because of the limited appeal of these publications, only a few of your club's members will want to subscribe. But that doesn't stop you from sharing headlines and stories. Club newsletters are in a unique position to share this information because they can print it shortly after it first appears. The major ham magazines, *73* included, have printing deadlines that make much of this material very old news if they try to publish it.

With only a few exceptions, the publications mentioned do not mind if you reprint their material, *provided credit is given.* That way, readers who want to find out more will know whom to contact. You can reprint this material directly or repackage it to fit your newsletter's style; just remember to give credit where credit is due.

Don't be afraid to offer your club members something extra. Your club's newsletter is a valuable tool—use it! Keep those newsletters coming.

Sponsored by the Cuyahoga Falls Amateur Radio Club, the contest is open to all radio amateurs worldwide. All contacts must be made direct on any amateur band from 160 to and including 2 meters. Repeaters and OSCAR contacts are not permitted.

EXCHANGE:

RS(T) and ARRL section, DXCC country, or Ohio county.

FREQUENCIES:

5 kHz up from the low end of each General class band, both on SSB and CW. Club station W8VPV will operate near these frequencies.

SCORING:

Score 2 points for each contact with an Ohio station. Contacts with a Falls member will be worth 10 points and contacts with W9VPV, the club station, will count 25 points. Ohio stations will score 5 points for out-of-state contacts plus the member and club stations bonuses. Multiply your QSO point total times the sum of counties (maximum 88), ARRL sections (maxium 74), and DXCC countries on each band.

Plaques to the top single operator in Ohio and outside Ohio. Certificates to the top single operator, multi-single, and multi-multi in each ARRL section, Ohio county, and DXCC country.

ENTRIES:

Each log must show the date/time in GMT, band and mode, plus the complete exchange. A copy of the official log sheet and reporting form are available from the club by sending an SASE. Dupe sheets must be completed for any stations with more than 300 contacts. Some form of summary sheet showing the scoring and usual signed declaration is also requested. Send a large SASE for a copy of the results. Deadline for logs is September 21st. All entries and requests for forms/logs should be addressed to: The Cuyahoga Falls ARC, PO Box 6, Cuyahoga Falls OH 44222.

OCCUPATION CONTEST

Starts: 1800 GMT August 29
Ends: 2400 GMT August 30

The Radio Association of Erie PA is sponsoring its first contest. The club thought it might be interesting to see what kinds of work or occupations fellow hams are involved in. The contest is open to all amateur radio operators.

EXCHANGE:

RS(T), occupation and state, province, or country.

FREQUENCIES:

CW—50 kHz from the bottom of the ham bands.

Phone—50 kHz from the top of the ham bands.

Repeater contacts are not permitted; however, simplex is permissible.

SCORING:

Count 1 point per QSO with multipliers determined by the number of similar occupations worked. One multiplier point is given for every 5 similar occupations. Also, another multiplier point is given for every 3 retirees worked. Final score is the product of the QSO points times the total multiplier.

AWARDS:

A plaque will be given to the top-scoring station. Certificates for the top stations in each state, province, and country.

ENTRIES:

Mailing deadline for logs is October 1st and they are to be sent to: Chris Robson KB3A, 6950 Kreider Rd., Fairview PA 16415. Please include an SASE for a copy of the results.

MAKE MONEY... $ELL 73 MAGAZINE

Selling 73 Magazine, the ham radio magazine that offers quality and quantity, brings the ham into your store. Once through the door you can sell him anything.

Our dealers are telling us that "73" outsells them all...so call today and join the dealers who make money with 73 Magazine.

For information on selling 73 Magazine call 603-924-7296 and speak with Ginnie Boudrieau, our Bulk Sales Manager. Or write to her at:

73 MAGAZINE
Route 101 and
Corner of Elm Street
Peterborough NH 03458

TRS 80* OWNERS ARISE!

Arise and subscribe to 80 MICROCOMPUTING, the newest and fastest growing microcomputer magazine. This is full of news about programs, accessories and theory on the world's largest selling computer, the TRS-80*. Definitely beginner level and includes lots of program listings. Find out what all the fuss is about.

☐ New subscription ☐ Renewal ☐ 12 issues for $18
☐ Payment enclosed $_____ ☐ 24 issues for $30
☐ VISA ☐ MC ☐ AE ☐ Bill me ☐ 36 issues for $45

Card #_____
Interbank #_____ Exp. date_____
Signature_____
Name_____
Address_____
City_____ State_____ Zip_____

Please allow 6 to 8 weeks for delivery
Canadian: 1 yr. only/$20 in U.S. Funds
Foreign: 1 yr. only/$28 in U.S. Funds

80 microcomputing™
● P.O.B. 981 ● Farmingdale N.Y. 11737

*TRS-80 is a trademark of Tandy Corporation.

318B6

CAN 20% BE WRONG?

A recent survey showed that 20% of the 73 subscribers also read Kilobaud MICROCOMPUTING magazine . . . and enjoy it. This is the best way to learn and keep up with the rapidly developing world of microcomputers. There's nothing to be afraid of, you just have to read an interesting magazine and you'll learn. Try a subscription to Kilobaud MICRCOMPUTING and see for yourself.

☐ New subscription ☐ Renewal ☐ 12 issues for $25.00
☐ Payment enclosed $_____ ☐ 24 issues for $38.00
☐ VISA ☐ MC ☐ AE ☐ Bill me ☐ 36 issues for $53.00

*Card #*_____ *Interbank #*_____
*Signature*_____ *Exp. date*_____
*Name*_____
*Address*_____
*City*_____ *State*_____ *Zip*_____

—for even faster ordering service call toll free (800) 258-5473

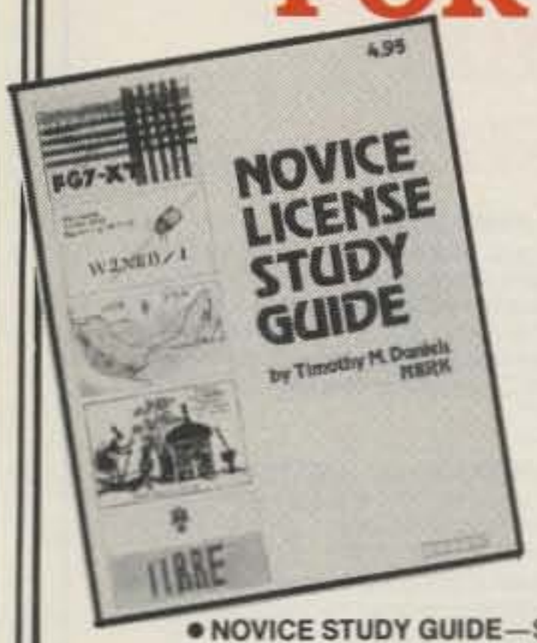
Canadian: $27, one year only, U.S. funds. Other foreign: $35, one year only, U.S. funds. Please allow 6-8 weeks for delivery.

318B6

MICROCOMPUTING ● POB 997 ● Farmingdale NY 11737

RADIO BOOKSHOP

FOR THE NOVICE



NEW, UPDATED EDITIONS OF OUR FAMOUS NOVICE LICENSE STUDY GUIDE AND NOVICE STUDY TAPES

● **NOVICE STUDY GUIDE**—SG7357—by Timothy M. Daniel N8RK. Here is the most up to date novice guide available. It is complete with information about learning Morse Code, has the latest FCC amateur regulations and the current FCC application forms. This guide *is not* a question/answer memorization course but rather it emphasises the practical side of getting a ham license and putting a station on the air. It reflects what the FCC expects a Novice to know without page after page of dull theory. The most current information still available at last year's price. $4.95

● **NOVICE STUDY TAPES**—CT7300—If you are just getting started in ham radio, you'll find these tapes indispensable! This up-to-the-minute revision of the 73 Study Course is the perfect way to learn everything you need to breeze through the Novice written exam. Theory, FCC regulations, and operating skills are all covered, and you'll be amazed at how fast you learn using these tapes!

Once the test is behind you, these tapes will go right on being useful, because they are packed with the latest information on setting up your own ham station, and getting on the air.

Thousands of people have discovered how easy learning from cassette can be—order now and enter the fascinating world of ham radio!—Set of 3—$15.95.*

Scientists have proven that you learn faster by listening than by reading because you can play a cassette tape over and over in your spare time—even while you're driving! You get more and more info each time you hear it. You can't progress without solid fundamentals. These three hour-long tapes give you all the basics you'll need to pass the Novice exam easily. You'll have an understanding of the basics which will be invaluable to you for the rest of your life! Can you afford to take your Novice exam without first listening to these tapes?

SPECIAL OFFER! Both Novice License Study Guide and Novice Study Tapes $19.95. Order NP7300.

73 CODE TAPES

ANY FOUR TAPES FOR $15.95! $4.95 EACH

"GENESIS"

5 WPM—CT7305—This is the beginning tape for people who do not know the code at all. It takes them through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way using the newest blitz teaching techniques. It is almost miraculous! In one hour many people—including kids of ten—are able to master the code. The ease of learning gives confidence to beginners who might otherwise drop out.

"THE STICKLER"

6+ WPM—CT7306—This is the practice tape for the Novice and Technician licenses. It is made up of one solid hour of code, sent at the official FCC standard (no other tape we've heard uses these standards, so many people flunk the code when they are suddenly—under pressure—faced with characters sent at 13 wpm and spaced for 5 wpm). This tape is not memorizable, unlike the zany 5 wpm tape, since the code groups are entirely random characters sent in groups of five.

"BACK BREAKER"

13+ WPM—CT7313—Code groups again, at a brisk 14 per so you will be at ease when you sit down in front of the steely-eyed government inspector and he starts sending you plain language at only 13 per. You need this extra margin to overcome the panic which is universal in the test situations. When you've spent your money and time to take the test, you'll thank heaven you had this back-breaking tape.

"COURAGEOUS"

20+ WPM—CT7320—Code is what gets you when you go for the Extra class license. It is so embarrassing to panic out just because you didn't prepare yourself with this tape. Though this is only one word faster, the code groups are so difficult that you'll almost fall asleep copying the FCC stuff by comparison. Users report that they can't believe how easy 20 per really is with this fantastic one hour tape.

"OUTRAGEOUS"

25+ WPM—CT7325—This is the tape for that small group of overachieving hams who wouldn't be content to simply satisfy the code requirements of the Extra Class license. It's the toughest tape we've got and we keep a permanent file of hams who have mastered it. Let us know when you're up to speed and we'll inscribe your name in 73's CW "Hall of Fame."

OTHER STUDY GUIDES

● **EXTRA CLASS LICENSE STUDY GUIDE**—SG1080—Before going for your 1 × 2 call, it pays to be a master of the Extra class electronics theory. This study guide is the logical extension of the *73* theory course. All the theory necessary to pass the exam is presented. Antennas, transmission lines, swr are discussed, as well as noise, propagation, and specialized communication techniques. This book is not a classroom lecture or memorization guide, but rather a logical presentation of the material that must be *understood* before attempting the Extra exam. Save yourself a return trip to the FCC and try the *73* method first! $5.95.*

● **ADVANCED CLASS LICENSE STUDY GUIDE**—SG1081—Ready to upgrade your license? To prevent retaking the FCC theory exam, you need the *73* Advanced theory guide. SSB, antenna theory, transmitters, and electronics measuring techniques are covered in detail in this easy-to-follow study guide. Special modes and techniques, such as RTTY, are also treated. An engineering degree is *not* necessary to master the Advanced theory—try this book before visiting the examiner's office! $6.95.* (Published by TAB Books previous to recent changes in FCC exam material.)

SSTV TAPE

● **SLOW SCAN TELEVISION TAPE**—CT7350—Prize-winning programs from the 73 SSTV contest. Excellent for Demo! $5.95.*

FOR YOUR HAMSHACK

● **QSL CARDS**—*73* turns out a fantastic series of QSL cards at about half the cost of having them done elsewhere because they are run as a fill-in between printing books and other items in the 73 Print Shop. 250 Style W—QW0250—for $8.95*; 500 Style W—QW0500—for $13.95*; 250 Style X—QX0250—for $8.95*; 500 Style X—QX0500; 250 Style Y—QY0250—for $8.95*; 500 Style Y—QY0500—for $13.95.* Allow 6-12 wks. for delivery.

● **LIBRARY SHELF BOXES**—These sturdy white, corrugated, dirt-resistant boxes each hold a full year of *73*, *Kilobaud Microcomputing* or *80 Microcomputing*. With your order, request self-sticking labels for any of the following: *73*, *Kilobaud Microcomputing*, *80 Microcomputing*, *CQ*, *QST*, *Ham Radio*, *Personal Computing*, *Radio Electronics*, *Interface Age*, and *Byte*. Order 1—BX1000—for $2.00*; order 2-7—BX2002—for $1.50 each*; order 8 or more—BX1002—for $1.25 each*.

Style Y

Style W

Style X

● Preserve and protect your collection for a lifetime! Order these handsome red binders with gold lettering. $7.50 for 1, 3 for $21.75, 6 for $42.00. (Postpaid within USA, please add $2.50 per order outside USA.) *Check or money orders only, no phone or C.O.D. orders.* **73 Binders, P.O. Box 5120, Philadelphia, PA 19141.**

***NOTE—Above address for Binders only.**

BACK ISSUES

● **BACK ISSUES**—Complete your collection; many are prime collectables now, classics in the field! A full collection is an invaluable compendium of radio and electronics knowledge!

ST0000—Single back issue before July 1980	$3.00
ST0250—Single back issue after July 1980	$3.50
ST0500—5 your choice	$8.75
ST1000—10 your choice	$14.00
ST2500—25 our choice	$12.00
ST2501—25 your choice	$25.00

● **FREE BACK ISSUE CATALOGS** are yours for the asking...specify *73 Magazine*, *Kilobaud Microcomputing*, and/or *80 Microcomputing* back issue catalog when you send your name and address to us on a postcard.

73 MAGAZINE BINDERS

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address. (Prices subject to change on books not published by 73 Magazine.)

FOR TOLL FREE ORDERING CALL 1-800-258-5473

RADIO BOOKSHOP

THE 73 TECHNICAL LIBRARY

● **BEHIND THE DIAL**—BK7307—By Bob Grove. Get more fun out of shortwave listening with this interesting guide to receivers, antennas, frequencies and interference. $4.95.*

● **THE CHALLENGE OF 160**—BK7309—is the newest book in the *73* technical library, dedicated to 160 meter operating. Si Dunn provides all necessary information to get started on this unique band. The all-important antenna and ground systems are described in detail. The introduction contains interesting photos of Stew Perry's (the King of 160) shack. This reference is a must for new and experienced "Top Band" operators. Price: $4.95.*

● **SSB . . . THE MISUNDERSTOOD MODE**—BK7351—by James B. Wilson. Single Sideband Transmission . . . thousands of us use it every day, yet it remains one of the least understood facets of amateur radio. J. B. Wilson presents several methods of sideband generation, amply illustrated with charts and schematics, which will enable the ambitious reader to construct his own sideband generator. A must for the technically-serious hams. $5.50.*

● **PROPAGATION WIZARD'S HANDBOOK**—BK7302—by J. H. Nelson. When sunspots riddled the worldwide communications networks of the 1940's, John Henry Nelson looked to the planets for an answer. The result was a theory of propagation forecasting based upon interplanetary alignment that made the author the most reliable forecaster in America today. The book provides an enlightened look at communications past, present, and future, as well as teaching the art of propagation forecasting. $6.95.*

● **TOOLS & TECHNIQUES FOR ELECTRONICS**—BK7348—by A. A. Wicks is an easy-to-understand book written for the beginning kit builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects as well as specialized metal working tools and the chemical aids which are used in repair shops. $4.95.*

FOR THE CONTESTER

● **THE CONTEST COOKBOOK**—BK7308—reveals the secrets of the contest winners (Domestic, DX and specialty contests), complete with photos and diagrams of equipment used by the top scorers. Find out how to make 150 contacts in one hour. $5.95.*

NEW!

● **WORLD PRESS SERVICE FREQUENCIES**—BK1202—by Thomas Harrington. Can't wait to hear the evening news, or are you wondering about the news that you *aren't* hearing? Receive by Radio Teletype (RTTY) *all* the world news and financial happenings from the world capitols on a 24 hour a day basis. This book gives you the frequencies and times of broadcast of such news services as AP, UPI, Reuters, TASS, VOA and London Press. Also included is an introduction to RTTY with information on equipment, antennas, abbreviations—everything you need to get started in RTTY. $5.95*

● **THE NEW WEATHER SATELLITE HANDBOOK**—BK7383—by Dr. Ralph E. Taggart WB8DQT. Here is the completely updated and revised edition containing all the information on the most sophisticated and effective spacecraft now in orbit. This book serves both the experienced amateur satellite enthusiast and the newcomer. It is an introduction to satellite watching, providing all the information required to construct a complete and highly effective ground station. Solid hardware designs and all the instructions necessary to operate the equipment are included. For experimenters who are operating stations, the book details all procedures necessary to modify equipment for the new series of spacecraft. Amateur weather satellite activity represents a unique blend of interests encompassing electronics, meteorology and astronautics. Join the privileged few in watching the spectacle of earth as seen from space on your own monitoring equipment. $8.95.*

● **MASTER HANDBOOK OF HAM RADIO CIRCUITS**—BK1033— This is an encyclopedia of amateur radio circuits, gleaned from past issues of *73 Magazine* and carefully selected according to application. You'll find many you've never seen before, some new twists on the tried and true, and several that have been long forgotten but are well worth remembering. Where your interest ranges from ragchewing to EME, from CW to slow-scan TV, from DX to county nets, this handbook will be a welcome addition to your shack. $8.95.*

● **OWNER REPAIR OF RADIO EQUIPMENT**—BK7310—Frank Glass K6RQ shares over 40 years of operating, servicing, and design experience in this book which ranges from the elementary to the highly technical written for the top engineers in the field. It is written in narrative style on the subjects of electronic servicing, how components work, and how they are combined to provide communication equipment. This book will help you understand the concepts required to service your own station equipment. $7.95.*

● **IC OP-AMP COOKBOOK**—BK1028—by Walter G. Jung. Covers not only the basic theory of the IC op amp in great detail, but also includes over 250 practical circuit applications, liberally illustrated. 592 pages, 5½ x 8½, softbound. $14.95.*

● **THE POWER SUPPLY HANDBOOK**—BK7305—Need a power supply for a gadget you're building? In the **POWER SUPPLY HANDBOOK** there are dozens ready-to-build, plus detailed steps for designing your own. There are circuits and parts lists for all kinds of supplies, ranging from simple DC types to highly stable regulated versions. If you need a circuit to convert a DC voltage to a higher or lower voltage, turn DC into AC, or AC to DC—then this is the book you need. With more than 400 pages, you should be able to find just the circuit you need. Without a doubt one of the best power supply source books available, compiled by the editors of *73*. $9.95.*

HANDBOOKS FOR THE HAMSHACK

● **THE TEN METER FM HANDBOOK**—BK1190—by Bob Heil K9EID. This handbook has been published to help the ten meter enthusiast learn more about the many methods of conversions and tricks that are used to make existing units work better. Join the great "tinkerers" of the world on ten FM and enjoy the fantastic amount of fun in communicating with amateur stations worldwide on ten meter FM. $4.95.*

● **THE PRACTICAL HANDBOOK OF AMATEUR RADIO FM REPEATERS**—BK1185—by Bill Pasternak WA6ITF (author of 73 Magazines monthly column "Looking West") This is the book for the VHF/UHF FMer, compiled from material submitted by over a hundred individuals, clubs, organizations and equipment manufacturers. A "must have" for your ham shack shelf. $12.95.

The 73 Test Equipment Library

● **VOL. I COMPONENT TESTERS**—LB7359—. . . how to build transistor testers (8), diode testers (3), IC testers (3), voltmeters and VTVMs (9), ohmmeters (8 different kinds), inductance (3), capacity (9), Q measurement, crystal checking (6), temperature (2), aural meters for the blind (3) and all sorts of miscellaneous data on meters . . . using them, making them more versatile, making standards. Invaluable book. $4.95.*

● **VOL. II AUDIO FREQUENCY TESTERS**—LB7360—. . . jam packed with all kinds of audio frequency test equipment. If you're into SSB, RTTY, SSTV, etc., this book is a must for you . . . a good book for hi-fi addicts and experimenters, too! $4.95.*

● **VOL. III RADIO FREQUENCY TESTERS**—LB7361—Radio frequency waves, the common denominator of Amateur Radio. Such items as SWR, antenna impedance, line impedance, rf output and field strength; detailed instructions on testing these items includes sections on signal generators, crystal calibrators, grid dip oscillators, noise generators, dummy loads and much more. $4.95.*

● **VOL. IV IC TEST EQUIPMENT**—LB7362—Become a troubleshooting wizard! In this fourth volume of the 73 TEST EQUIPMENT LIBRARY are 42 home construction projects for building test equipment to work with your ham station and in servicing digital equipment. Plus a cumulative index for all four volumes for the 73 TEST EQUIPMENT LIBRARY. $4.95.*

● **RF AND DIGITAL TEST EQUIPMENT YOU CAN BUILD**—BK1044—Rf burst, function, square wave generators, variable length pulse generators—100 kHz marker, i-f and rf sweep generators, audio osc, af/rf signal injector, 146 MHz synthesizer, digital readouts for counters, several counters, prescaler, microwave meter, etc. 252 pages. $5.95.*

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address. (Prices subject to change on books not published by 73 Magazine.)

FOR TOLL FREE ORDERING CALL 1-800-258-5473

RADIO BOOKSHOP

ANTENNA BOOKS

● **VHF ANTENNA HANDBOOK**—BK7368—The NEW VHF Antenna Handbook details the theory, design and construction of hundreds of different VHF and UHF antennas. . . A practical book written for the average amateur who takes joy in building, not full of complex formulas for the design engineer. Packed with fabulous antenna projects you can build. $5.95.*

● **THE GIANT BOOK OF AMATEUR RADIO ANTENNAS**—With the **GIANT Book of Amateur Radio Antennas**—BK1104—by your side, antennas will become the least of your worries. Over 450 pages of design ideas, theory and reference data make this book live up to its title. The 7 chapters cover everything from basic antenna theory through designs for DIY accessories, as well as dozens of antenna designs. Whether planning to build or buy, design or admire, test or enjoy a ham antenna—this is the book for you. From the editors of *73*, published by Tab Books. $9.95.*

● **73 DIPOLE AND LONG-WIRE ANTENNAS**—BK1016—by Edward M. Noll W3FQJ. This is the first collection of virtually every type of wire antenna used by amateurs. Includes dimensions, configurations, and detailed construction data for 73 different antenna types. Appendices describe the construction of noise bridges, line tuners, and data on measuring resonant frequency, velocity factor, and swr. $5.50.*

● **PRACTICAL ANTENNAS FOR THE RADIO AMATEUR**—BK1015—A manual describing how to equip a ham station with a suitable antenna. A wide range of antenna topics, systems, and accessories are presented giving the reader some food for thought and practical data for construction. Designed to aid the experienced ham and novice as well. Only $9.95.*

5 NEW ANTENNA BOOKS

● **ALL ABOUT CUBICAL QUAD ANTENNAS (2nd edition)**—BK1196—The "Classic" on Quad design, theory, construction, and operation. New 2nd edition contains new feed and matching systems and new data. $4.75*

● **BEAM ANTENNA HANDBOOK (New 5th edition)**—BK1197—Yagi beam theory, construction and operation. Information on wire beams, SWR curves and matching systems. A "must" for serious DXers. $5.95*

● **VHF HANDBOOK FOR RADIO AMATEURS**—BK1198—Contains information on FM theory, operation and equipment, VHF antenna design and construction, satellite-EME, and the newest solid-state circuits. $6.95*

● **THE RADIO AMATEUR ANTENNA HANDBOOK**—BK1199—All about wire antennas, beams, tuners, baluns, coax, radials, SWR and towers. Clear and complete information. $6.95*

● **SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS**—BK1200—All new data and everything you want to know about low-cost, multi-band antennas, inexpensive beams, "invisible" antennas for hams in "tough" locations. $6.95*

COOK BOOKS

● **TTL COOKBOOK**—BK1063—by Donald Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. $9.50.

● **CMOS COOKBOOK**—BK1011—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! $10.50.*

● **TVT COOKBOOK**—BK1064—by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. $9.95.*

SPECIAL OFFER

Chart of
UNITED STATES AMATEUR RADIO PRIVILEGES

by class of license, emission type, and frequency from 160 thru 2 meters, including provision for the new 30, 17, and 12 meter bands. This 22 x 28 in, twelve-color chart is the first of its kind to be both informative and decorative. $3.00 value, only $1.95 with the purchase of 1 or more books from the Radio Bookshop. (Supplies limited, order now.)
CH7300 $1.95.

THE WELL EQUIPPED HAM SHACK

● **WORLD REPEATER ATLAS**—BK7315—Completely updated, over 230 pages of repeater listings are indexed by location and frequency. More than 50 maps pinpoint 2000 repeater locations throughout the USA. Foreign listings include Europe, the Middle East, South America, and Africa. $4.95*

● **THE MAGIC OF HAM RADIO**—BK7312—by Jerrold Swank, W8HXR begins with a brief history of amateur radio and of Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdom's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. $4.95.*

● **A GUIDE TO HAM RADIO**—BK7321—by Larry Kahaner WB2NEL. What's Amateur Radio all about? You can learn the basics of this fascinating hobby with this excellent beginner's guide. It answers the most frequently asked questions in an easy-going manner, and it shows the best way to go about getting an FCC license. A Guide to Ham Radio is an ideal introduction to a hobby enjoyed by people around the world. $4.95.*

● **WORLD RADIO TV HANDBOOK 1981, 35TH EDITION**—BK1184—This book is the bible of international broadcasters, providing the only authoritative source of exact information about broadcasting and TV stations world wide. This 1981 edition is completely revised, giving comprehensive coverage of short, medium and long wave, 560 pages of vital aspects of world listening. $16.50.

● **HOW TO DEFEND YOURSELF AGAINST RADAR**—BK1201—by Bruce F. Bogner and James R. Bodnar, a lawyer and radar expert. This book gives you the ammunition to challenge the radar "evidence" that usually leads to a speeding conviction. The major part of the book details the inner workings of radar—you'll become more of an expert than most police officers and judges. The remainder of the book outlines how to defend yourself against a speeding ticket—the observations, measures and testimony you must obtain to defend yourself without the help of a lawyer. The price is a lot less than a fine! $6.95*

MICROCOMPUTER BOOKS FROM 73

● **SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING**—BK7311—A collection of the best articles that have recently appeared in Kilobaud/ MICROCOMPUTING. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardcore hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. $10.95.*

● **40 COMPUTER GAMES**—BK7381—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. $7.95*

● **THE NEW HOBBY COMPUTERS**—BK7340—This book takes it from where "HOBBY COMPUTERS ARE HERE!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a comput r, computer arithmetic, checking memory boards. . . and much, much more! Don't miss this tremendous value! Only $4.95.*

● **UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS**—BK7382—A valuable addition to your computing library. This two-part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of microcomputing. Well-known authors and well-structured text helps the reader get involved. $10.95*

● **HOW TO BUILD A MICROCOMPUTER—AND REALLY UNDERSTAND IT**—BK7325—by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. This book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing and debugging of a complete microcomputer system. Must reading for anyone desiring a true understanding of small computer systems. $9.95.*

● **HOBBY COMPUTERS ARE HERE!**—BK7322—If you want to come up to speed on how computers work. . . hardware and software. . . this is an excellent book. It starts with fundamentals and explains the circuits, and the basics of programming, along with a couple of TVT construction projects, ASCII-Baudot, etc. This book has the highest recommendations as a teaching aid. $4.95.*

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address. (Prices subject to change on books not published by 73 Magazine.)

FOR TOLL FREE ORDERING CALL 1-800-258-5473

List of Advertisers

*Please contact these advertisers directly.

To receive full information from our advertisers please complete the following postage-paid card.

R.S. No.		Page
2	AEA/Advanced Elect. Applications, Inc.	31
448	Advanced Comm. International	71
406	Alaska Microwave Labs.	33
314	Alliance Mfg. Co.	115
429	Amateur Accessories	146
467	Amateur Electronic Supply	49, 65, 76, 83, 139
7	American Crystal Supply	81, 145
334	Amidon Associates	138
356	Anteck	91
*	Appli. & Equipment Co., Inc.	146
*	Associated Radio	64
*	Automated Technology, Inc.	46
469	BG Carl Electronics	143
402	BNF Enterprises	146
11	Barker & Williamson	73
440	Rex Bassett Electronics, Inc.	140
428	Bright Electronic Corp.	73
*	Britt's 2-Way Radio Service/AEA	24
*	Butternut Electronics	46
*	Butternut Electronics	34
455	Chaney Electronics	139
13	Clegg	42
89	Clutterfree Modular Consoles	42, 89
484	Colton Creators	129
382	Comm. Concepts, Inc.	146
377	Communications Electronics	147
462	Communications Electronics Specialties	47
15	Comm. Specialists	10, 11
444	Computer Plus	143, 145
*	Conley Radio Supply/AEA	115
*	Crown Micro Products	79
70	Cubic Comm	18
466	dB + Enterprises	143
330	Debco Electronics	82
411	DGM Electronics, Inc.	118
346	Data Service	145
*	Digital Research Parts	159
425	Doppler Systems	144
487	Dow-Key	128
453	e.g.e., Inc.	46
456	Echo Comm. Division (Joseph's Ltd.)	145
91	ETCO Electronics	83
*	80 Microcomputing	109
480	Electra	78
447	Electronic Hobby Innovations	61
419	Electronic Specialties	141
400	Engineering Consulting Service	144
413	Equipment Exchange	143
*	Erickson Comm.	79
439	Ben Franklin Electronics	146
483	Faxscan, Inc.	129
23	Flesher Corp.	79
323	Fox-Tango Corp.	84
479	GC Electronics	80
482	GRI Industries, Inc.	128
27	G.I.S.M.O.	67
*	Global Electronics	146
393	H. M. Goodwin	144
25	Germantown Amateur Supply	87
417	Gotham Antenna	89
*	Grove Enterprises	125
345	Hal Comm	43, 55
31	Hal-Tronix	82
30	The Ham-Key Co.	84
32	Ham Radio Center	63
*	Ham Radio Outlet	3
449	The Ham Shack	91
33	Hamtronics, NY	157
460	Handi-Tek	145
303	Heath Co.	15
34	Henry Radio	Cov II
*	Henry Radio/AEA	42
446	Home Science Experiments	146
*	Hustler, Inc.	33
316	Hy-Gain Div. of Telex Comm., Inc.	38, 39
486	Hy-Gain Div. of Telex Comm., Inc.	130
*	ICOM	9, 19, 35
*	IRL	29
35	Info-Tech, Inc.	116
414	Inotek Engineering	145
445	Instant Software	68, 69
36	International Crystal Mfg. Co.	77
409	JDR Microdevices	59
38	Jameco Electronics	161
39	Jan Crystals	140
*	KLM Electronics	25
470	Kalglo Electronics	139
*	Kantronics	77, 89
*	KB Microcomputing	109
*	Kenwood	Cov IV, 7, 30
457	Lewis Construction Co.	141
451	MCM Electronics	21
434	M&M Electronics	138
47	MFJ Enterprises	57, 71, 73, 75
48	MHz Electronics	148-151
44	Macrotronics	118
45	Madison Electronics	75
49	Micro Control Specialties	138
313	Micro Management Systems	142
50	Microcraft Corp.	47
51	Microlog Corp.	51
52	MidCom Electronics, Inc.	56
468	N.P.S., Inc.	91
318	National Comm. Group Co.	85
412	Nemal Electronics	144
*	Orbit Magazine	141
452	OrCom Distributors	144
404	P.B. Radio Service	89
*	P.C. Electronics	67
*	Palomar Engineers	4
*	Portland Radio Supply Co., Inc./AEA	86
459	QRO Engineering	141
60	Quest Electronics	152
485	RCA MicroComputer	128
61	Radio Amateur Callbook, Inc.	116
454	Radiokit	139
381	Radio Systems Techn.	144
397	Radio World	83
62	Ramsey Electronics	119, 158
458	Richcraft Engineering, Ltd.	145
463	Ricker Equipment, Inc.	139
478	Robot Research	92
418	Rolin Distributors	116
*	Ross Distributing/AEA	83
376	SMP	140
65	S-F Amateur Radio Services	86
481	Scientific Dimensions, Inc.	130
64	Semiconductors Surplus	153-156
*	73 Magazine	109-114, 117, 125
*	Sherwood Engineering	143
433	Skytec	146
357	Slep Electronics	143
360	Soundpower	140
309	Spacecoast Research	144
*	Spectronics	160
68	Spectrum Comm	53
436	Spectrum International	45
465	Star Trak Systems, Inc.	144
403	Stewart Quads	86
430	TEM Microwave Corp.	144
476	TET, USA	99
316	Telex Comm., Inc.	38, 39
486	Telex Comm., Inc.	130
*	Ten-Tec, Inc.	13, 23
76	Trac Electronics	4
488	Tri-Ex Tower	129
*	Trylon Mfg. Co.	138
77	Tufts Electronics	146
37	UPI Comm. Systems, Inc.	138
*	Universal Communications	91
311	Vanguard Labs	145
373	Van Gorden Engineering	33
437	Vani-Plate Co.	86
464	H. C. VanValzah Co.	139
90	VoCom Products Corp.	47
79	Wacom Products	86
398	Wawasee Electronics	71, 75
80	Western Electronics	86
83	Yaesu Electronics Corp.	Cov III
336	Z Associates	145

73 MAGAZINE

Books, ETC.

To order, complete the following postage-paid card, or itemize your order including detailed credit card information or check and mail to:
73 Magazine/Mail Order Dept./Peterborough NH 03458.

Catalog #	Item	Price
QY0250	QSL CARDS—STYLE Y—250	$ 8.95
QY0500	QSL CARDS—STYLE Y—500	$13.95
BK1199	THE RADIO AMATEUR ANTENNA HANDBOOK	$ 6.95
BK1044	RF & DIGITAL TEST EQUIPMENT	$ 5.95
BK7347	RTTY HANDBOOK	$ 5.95
BK1059	RTL COOKBOOK	$ 6.50
BX1000	SHELF BOX—1	$ 2.00
BX1001	SHELF BOXES—2-7	$1.50 each
BX1002	SHELF BOXES—8 AND UP	$1.25 each
BK1200	SIMPLE, LOWCOST WIRE ANTENNAS FOR RADIO AMATEURS	$ 6.95
BK7311	SOME OF THE BEST FROM KILOBAUD	$10.95
BK7311	SOME OF THE BEST	$ 7.95
BK7351	SSB THE MISUNDERSTOOD MODE	$ 5.50
CT7350	SSTV TAPE	$ 5.95
SG1081	STUDY GUIDE—ADV. CLASS	$ 6.95
SG1080	STUDY GUIDE—EXTRA CLASS	$ 5.95
SG7357	STUDY GUIDE—NOVICE CLASS	$ 4.95
BK1190	THE TEN METER FM HANDBOOK	$ 4.95
LB7359	TEST EQUIP LIB V1—COMPONENT TESTERS	$ 4.95
LB7360	TEST EQUIP LIB V2—AUDIO TESTERS	$ 4.95
LB7361	TEST EQUIP LIB V3—RADIO EQUIP	$ 4.95
LB7362	TEST EQUIP LIB V4—IC TEST EQ	$ 4.95
BK7348	TOOLS & TECHNIQUES	$ 4.95
BK1063	TTL COOKBOOK	$ 9.50
BK1064	TVT COOKBOOK	$ 9.95
BK7382	UNDERSTANDING & PROGRAMMING MICROCOMPUTERS	$10.95
BK1069	VERTICAL BEAM & TRIANGLE ANTNS	$ 5.50
BK7368	VHF ANTENNA HANDBOOK	$ 5.95
BK1198	VHF HANDBOOK FOR RADIO AMATEURS	$ 6.95
BK7370	WEATHER SATELLITE HANDBOOK	$ 2.50
BK1202	WORLD PRESS SERVICE FREQUENCIES	$ 5.95
BK1184	WORLD RADIO TV HANDBOOK	$16.50
BK7315	WORLD REPEATER ATLAS	$ 4.95
BK1016	73 DIPOLE & LONG WIRE ANTENNAS	$ 5.50
ST0000	73 BACK ISSUE	$ 3.00
ST2500	73 BACK ISSUES—25 OUR CHOICE	$12.00
ST0500	73 BACK ISSUES—5 YOUR CHOICE	$ 8.75
ST1000	73 BACK ISSUES—10 YOUR CHOICE	$14.00
ST2501	73 BACK ISSUES—25 YOUR CHOICE	$25.00
BK1196	ALL ABOUT CUBICAL QUAD ANTENNAS	$ 4.75
BK1197	BEAM ANTENNA HANDBOOK	$ 5.95
BK7307	BEHIND THE DIAL	$ 4.95
BK7309	CHALLENGE OF 160	$ 4.95
BK1011	CMOS COOKBOOK	$10.50
CT7305	CODE TAPE—5 WPM	$ 4.95
CT7306	CODE TAPE—6+ WPM	$ 4.95
CT7313	CODE TAPE—13+ WPM	$ 4.95
CT7320	CODE TAPE—20+ WPM	$ 4.95
CT7325	CODE TAPE—25+ WPM	$ 4.95
CT7394	CODE TAPES (ANY FOUR ABOVE)	$15.95
BK7308	THE CONTEST COOKBOOK	$ 5.95
BK7381	40 COMPUTER GAMES	$ 7.95
BK7304	GIANT BOOK OF AMATEUR RADIO ANTENNAS	$12.95
BK7321	A GUIDE TO HAM RADIO	$ 4.95
BK7322	HOBBY COMPUTERS ARE HERE	$ 4.95
BK7325	HOW TO BUILD A MICROCOMPUTER & REALLY UNDERSTAND IT	$ 9.95
BK1201	HOW TO DEFEND YOURSELF AGAINST RADAR	$ 6.95
BK1028	IC OP AMP COOKBOOK	$12.95
BK7312	MAGIC OF HAM RADIO	$ 4.95
BK1033	MASTER HANDBOOK OF HAM RADIO CIRCUITS	$ 8.95
BK7340	THE NEW HOBBY COMPUTERS	$ 4.95
BK7383	THE NEW WEATHER SATELLITE HANDBOOK	$ 8.95
CT7300	NOVICE THEORY TAPES	$15.95
BK7310	OWNER REPAIR OF RADIO EQUIPMENT	$ 7.95
BK7305	POWER SUPPLY HANDBOOK	$ 9.95
BK1015	PRACTICAL ANTENNAS FOR THE RADIO AMATEUR	$ 9.95
BK1185	THE PRACTICAL HANDBOOK OF FM REPEATERS	$ 9.95
BK7302	PROPAGATION WIZARD'S HANDBOOK	$ 6.95
QW0250	QSL CARDS—STYLE W—250	$ 8.95
QW0500	QSL CARDS—STYLE W—500	$13.95
QX0250	QSL CARDS—STYLE X—250	$ 8.95
QX0500	QSL CARDS—STYLE X—500	$13.95

✓See List of Advertisers on page 114

WE'RE ROLIN IN CRYSTALS!

✓418

2 Meter Crystals — $3.95 each
(10 or More — $3.50 each)
Quick Delivery

We Stock Crystals For:

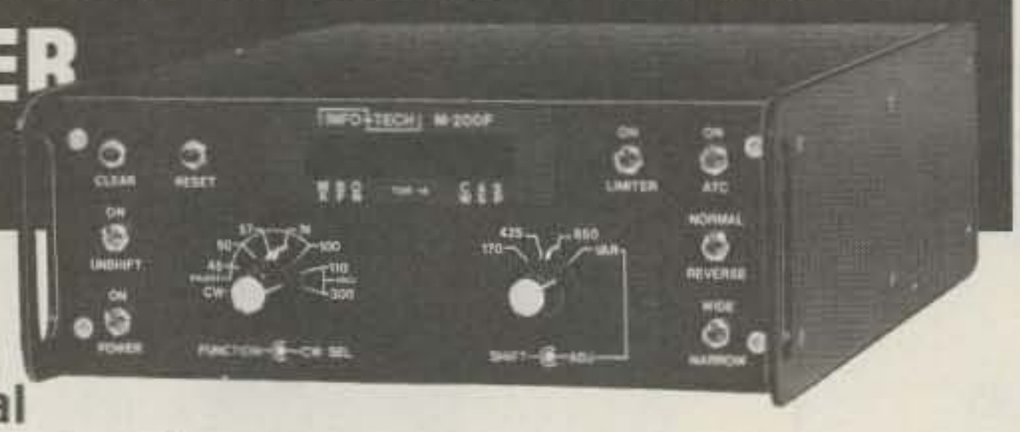
Clegg	Drake	Icom
Kenwood	Midland	Regency
Standard	Wilson	Yaesu
Lafayette	Tempo	VHF Eng

Rolin Distributors
P.O. Box 436 Department 7
Dunellen, N.J. 08812
201-469-1219

(We Also Accept Orders For Custom Crystals.)

The BEST in Code Converters

THE INFO-TECH M200-F TRI-MODE CONVERTER



Converts Morse & RTTY (Baudot & ASCII) to video, *and* serial Baudot or ASCII for hard copy

Morse Reception: 6-55 wpm standard (simple user adjustment for higher speeds). Automatic speed tracking & word space adjustment.

RTTY/ASCII Operation: Decodes RTTY (45, 50, 57, 74, 100 Baud) and ASCII (110 & 300 Baud), Auto CR/LF, automatic threshold control, selectable unshift on space, limiter is switch selectable, solid state tuning "meter". Demodulator has 3 fixed shifts and 1 tunable shift, user selectable printer outputs in ASCII or Baudot for **all** modes with crystal controlled baud rate generator. RS232, TTL & isolated loop outputs. User adjustable autostart.

Video Display Formats
(User Selectable)
16 lines x 32 characters, 16 lines x 72 characters.
25 lines x 32 characters, 25 lines x 72 characters
50 or 60 Hz operation. Cursor, on or off

Built-in 115/230v power supply

Price $595.00
FOB factory

We accept Mastercharge, Visa

or See These Dealers

Cohoon Amateur Supply
307 McLean Avenue
Hopkinsville, Kentucky 42240
(502) 886-4534

Colmay Products
14903 Beachview Ave.
White Rock, B.C. Canada V4B1N8
(604) 536-3058

Dialta Amateur Radio Supply
212 48th Street
Rapid City, South Dakota 57701
(605) 343-6127

Germantown Amateur Supply
3202 Summer Avenue
Memphis, Tennessee 38112
1-800-238-6168

Gilfer Associates, Inc.
52 Park Avenue
Park Ridge, New Jersey 07656
(201) 391-7887

Global Communications
606 Cocoa Isles Blvd.
Cocoa Beach, Florida 32931
(305) 783-3624

Ham Radio Center
8342 Olive Blvd.
St. Louis, Missouri 63132
1-800-325-3636

Michigan Radio
38270 Mast
Mt. Clemens, Michigan 48045
(313) 469-4656

N & G Distributing
7285 NW 12th Street
Miami, Florida 33126
(305) 592-9685, 763-8170

Radio World
Terminal Building
Oneida County Airport
Oriskany, New York 13424
(315) 736-0470
1-800-448-9338

Ray's Amateur Radio
1590 U.S. Highway 19 South
Clearwater, Florida 33516
(813) 535-1416

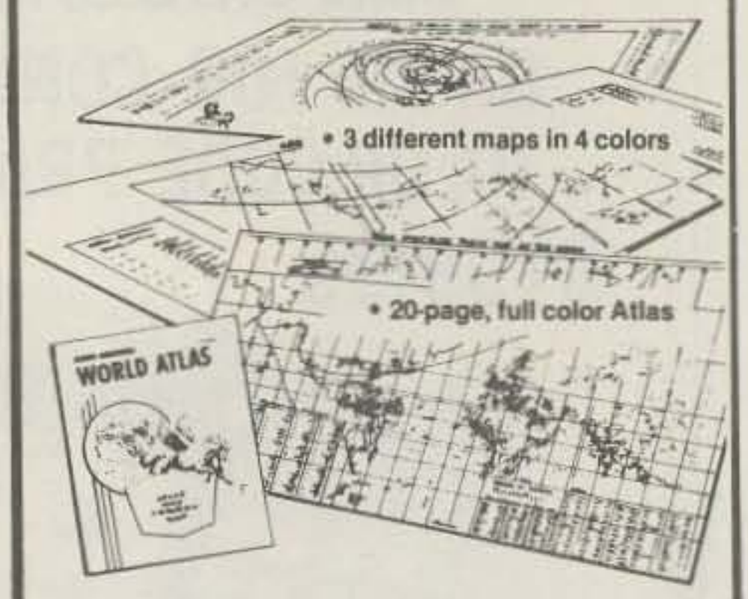
Universal Amateur Radio
1280 Aida Drive
Reynoldsburg, Ohio 43068
(614) 866-4267

✓35

INFO-TECH ELECTRONIC EQUIPMENT

Manufactured by:
DIGITAL ELECTRONIC SYSTEMS, INC.
1633 Wisteria Court • Englewood, Florida 33533 • 813-474-9518

FREE!
RADIO AMATEURS
WORLD ATLAS
with purchase of famous
CALLBOOK
MAP LIBRARY!



Here's an offer you can't refuse! You receive three, information-packed, Amateur Callbook maps, folded, plus the World Atlas for only $4.50 plus $1.50 shipping and handling. If purchased separately, total value of map/atlas offer would be $7.50 plus shipping. You save $3.00 and get these invaluable radio amateur aids!

1. **Prefix Map of the World,** folded. World-wide prefixes. Shows 40-zone map on one side, 90-zone map on the other. Size 40" x 28"
2. **Map of North America,** folded. Includes Central America and Caribbean to the Equator. Shows call areas, zone boundaries, prefixes, etc. Size 30" x 25"
3. **Great Circle Chart of World,** folded Centered on 40°N, 100° W. Shows cities, latitude, longitude, great circle bearings and more! Size 30" x 25"

Plus special FREE bonus!
The Callbook's own **Radio Amateur World Atlas, FREE** with the purchase of the 3 maps. Contains eleven full color maps of the world, looking at things from the radio amateurs point of view.

Callbook Map Library	$4.50
Shipping	1.50
Total	$6.00

Special Offer!
Amateur Radio Emblem Patch
only $2.50 prepaid

Pegasus on blue field, red lettering. 3" wide x 3" high. Great on jackets and caps. Sorry, no call letters.

ORDER TODAY!

Order from your favorite electronics dealer or direct from the publisher. All direct orders add $1.50 for shipping. Illinois residents add 5% Sales Tax.

RADIO AMATEUR **callbook** INC. ✓61
Dept. B
925 Sherwood Drive
Lake Bluff, Ill. 60044

WHAT WILL YOUR NEW RIG BE LIKE?

Read 73 and Find Out

The magic of digital electronics is coming to ham gear . . . and you'll be able to read about these developments in *73*. There probably will be more changes in ham equipment in the next few years than ever before in history. You'll see these changes coming in *73*, where you'll read about the experiments and pioneering. *73* has more articles than any other ham magazine . . . often more than all the others combined.

When sideband got started, it was moved along by the many pioneering articles in *73*. In the 60s it was solid state, with several times as many articles on the subject than in all the other magazines combined. When repeaters and FM got going about ten years ago there were over five times as many articles on the subject published in *73* as in all other ham magazines combined . . . and you can see what changes that brought to hamming. Now we're looking at exciting developments such as narrow band sideband for repeaters . . . which might give us six times as many repeaters in our present bands. We're looking at automatic identification systems which may make it possible for us to read out the call letters of any station tuned in . . . and even the development of self-tuning receivers.

Will stereo double sideband techniques make it possible to have up to 30 times as many stations within a given HF band as is now possible? Hams will be experimenting and reporting on these developments in *73*. *73* is an encyclopedia of hamming . . . present and future . . . and just a bit of the past, too.

Without the endless fillers on station activities and club news, *73* is able to publish far more information . . . valuable information . . . on hamming and ham equipment.

You may or may not be a pioneer, but you certainly will want to keep up with what is happening and what the new rigs are going to be like. And, frankly, your support of *73* is needed to keep this type of information coming.

318B6

Yes, bill me for 1 year of 73 Magazine at $25.00

Name _____

Address _____

City _____ State _____ Zip _____

Canadian $27/1 year only, US funds. Foreign $35/1 year only, US funds
Please allow 4 to 6 weeks for delivery
73 Magazine • PO Box 931 • Farmingdale, NY 11737

ee List of Advertisers on page 114

DX

Yuri Blanarovich VE3BMV
Box 292
Don Mills
Ontario M3C 2S2
Canada

BURMA UNLOCKED

What a surprise! After a few years of effort by various groups that were trying to activate XZ-land, all of a sudden there was a signal that got DXers excited and rushing to their rigs to work that #3 on the most-wanted list.

Station XZ5A started the operation on May 22 on 21270 with an opening to the east coast, and then worked some Europeans and Japan. Wow! No warning or announcement preceded this operation, except the unfilled "promises" of JA8BMK about his VU7-Andaman, 3V8, and other possible African operations. He was conspicuously absent from the bands and those looking for him were rewarded by this juicy catch.

As far as we were able to find out, the operation was carried out by JA8BMK and JA8BKM, plus one Burmese national. Operation was quite sporadic with apparently limited operating time (QRM to the chief of police's TV?) on SSB frequencies of 21270 and 14170 and some CW activity around 14007 and 21007. Propagation was what they would say was below normal, or el stinko—the signals were very weak.

On May 23, a number of west-coast stations had their chance of getting through. The east coast was handicapped by the absence of XZ5A when the bands were open to that area. There was a short (a few minutes) "window" around 1200Z on CW and a few SSB contacts were made in what sounded like, perhaps, a demonstration for the local government officials. Otherwise, thousands of DXers were scanning the bands hoping to get their chance to score. It was a battle of good antennas and persistence. You had to hear the signals before you could work them. Fortunately, there were no list "undertakers" and the operators at XZ were doing a good job under the circumstances.

Judging by the propagation conditions and limited operating time, there would be many unfulfilled hopes of getting this rare one. But there is one very positive sign: Burma finally might be unlocked and activated for future operations by nationals or expeditions. We are looking forward to some pictures from the expedition.

Congratulations to "Jin" Tishihiko Fukuta JA8BMK and company for this historic event. If you were fortunate to work XZ5A, QSL cards go to JA8BMK, PO Box 150, Asahikawa, Hokkaido 070, Japan.

10M BEACONS

28.175	VE3TEN, Ottawa	245	A9XC
200	Common frequency	247	EA2OIZ
205	DLØIGI, Mt. Predigstuhl	250	VE7TEN
207	N4RD, Florida	257	DKØTE
210	3B8MS	275	ZS6PW
212	ZD9GI	277	DLØAAB
215	GB3SX, Crowborough	280	YV5AYV
220	5B4CY	285	VP8ADE, Adelaide Isle
225	VE8AA, Lake Contwoyto	290	VS6HK
230	ZL2MHF	316	ZS6DN
235	VP9BA	888	W6IRT
237	LA5TEN	892	WD9GOE
238	OA4CK	992	DLØNF

ABOLISH RS/RST SYSTEM?

I have read in other magazines about DL7DO's proposal to eliminate our "useless" RS and RST reporting, the reason being that everyone, especially in the contests, is giving out 59 or 599. Apparently it does not mean anything. What is the proposed solution? Use Q1 to Q3, where Q1 would mean: I don't hear you; Q2: I hear you; Q3 (I guess): I hear you too much—you just broke my speaker. This apparently would save a lot of time. Really? I think he is replacing something with "samething." He still has two digits to send, so there is no saving there. Only the *range* is reduced, from the scale of 9 down to 3. So we get *less*-accurate reports and from those who were giving out 59s, we now get Q3s.

So what do we gain? Nothing. We do not save time—we are still exchanging two digits. We eliminate more-accurate reporting for those who still use it. "S" has quite a well-defined meaning: It relates to the scale of about 5 dB per one S-unit.

Let's have a look at the contester who is giving out those "meaningless" 599 reports. The majority of contest stations run more than QRPp and a screwdriver for an antenna. When the bands are good, 80% of stations are coming in well over S9. So should we give out "599plus30-zerofour"? Or should we measure our S-meter and give out 58.7 reports? When you work stations at the rate of eight QSOs/minute, do you read your meter with a magnifying glass? Hell, no! You work them as fast as you can. If the station is weak or QRM is on the frequency, then the smart operator gives a 55 or 35 to tell the other guy that he is not that terribly strong and he should repeat his stuff twice.

Would the Q3 reports look any better in the contest log? Or should we not exchange the reports at all? What else is there to say to complete the contact? I'm quite surprised to see the serious magazines support this type of proposal by even printing it. We have more important things to worry about.

If one wants a comparison report on the antennas, the S-meter reading is meaningful. Then it is also good to know what type of rig the other guy is running because not all S-meters were created equally. Some are as generous as QRM and some were made in GM-land. It should be remembered that all this is relative because there are so many factors affecting the signal strength: antenna, propagation, QSB, balun, etc. It is not unusual, with bands being so hot lately, to have that thing sitting at the end of the scale.

So, let's stop worrying about the good and established things that we have and let's spend more time improving our skills and equipment!

GEOMAGNETIC PREDICTIONS

There is a source of very useful geomagnetic activity predictions available from the Ottawa Magnetic Observatory. These can be obtained easily by phoning 1-(613)-824-5595. This service is available 24 hours a day and the latest forecast is updated every Tuesday and Friday.

During the April 11 through 14 period, the activity of the geomagnetic field was very high. The maximum of this magnetic storm was on April 13 at 0000 to 0900 GMT. The last time the magnetic field was disturbed to such an extent was during a nine-hour period in August, 1972. The aurora borealis was seen extensively across Canada and the USA and as far south as Arizona and the Gulf Coast.

There are three levels or magnitudes of geomagnetic activity used to describe the geomagnetic field: active, unsettled, and quiet, meaning, in terms of propagation, rotten, average, and good to excellent. This is especially useful when planning that expedition or contest operation.

Thank you for all the encouragement and letters. I would like to get the feeling of the makeup of the majority of this column's readers. I would like to tailor this column in such a way that we can satisfy the majority of readers. It is impossible to satisfy everyone. There are some of those who love lists and nets and there are also those who consider it to be in the "multi-operator" category. I will try to elaborate more on various techniques and perhaps the "ideal" situation in working DX without getting too many chasers upset.

I am in the process of setting up an Apple II computer with a word-processing program and some other sorting and filing programs. This should help in

setting up the files, DX info, and QSL manager lists.

We will try to get the fresh information on recent DXpeditions, including some photographs. If you have any pictures, especially color ones, please send them to VE3BMV, Box 292, Don Mills, Ontario M3C 2S2, Canada.

Good DX and see you all in the pileups!

10-METER BEACONS

The 10-meter band is very dependent on solar activity. During the peak of the sunspot cycle, the propagation conditions on the higher bands (10, 15, and 20 meters) are superb. The bands are open just about all the time. All parts of the world are coming through at the same time. It is not unusual to work all six continents within five minutes. When there is a disturbance, however, the band is as dead as a doornail.

Going back a few years, there was quite a bit of interest in studying propagation, especially on the 10m band. There were some openings, but many times everyone was just listening instead of calling. So, if all were just listening, nobody knew when the band was really open. A number of clubs and individuals started beacon stations, transmitting signals on certain frequencies in the 10m band. This proved to be very useful. Many are using the beacon signals to follow the openings to certain areas of the world. Most of them are using about 100 W and a vertical antenna. It is important to remember that not all of them are active all the time. So don't bet on it—the band could be open without a certain beacon being heard.

DX NEWS

C6A Bahamas was on during the CQ WPX CW contest by K5IU, N5RM, and KC4XR. They were on between May 23 and June 2, operating all bands 10 through 80 on CW and SSB. QSL to their home callsigns.

EA9-EC9 Ceuta Novice net meets at 29000 almost daily, with a number of EC9 stations usually available. EA Novices now are allowed to operate in that segment of the 10m band.

FG7BQ St. Barthelemy Island. Charles is a public official on this island, which is situated between Puerto Rico and FG7 and is administered from FS7. He hangs around 28635 almost daily from 2100Z. QSL to Charles Querrand, St. Barthelemy City Hall, via Guadeloupe, F.W.I.

Frank WB3KBZ/VP9 and Dotty Blaylock at their shack in Pembroke Parish, Bermuda. Frank is very active, especially on phone, operating on 15 and 20m and the YL SSB system.

FG0DDV/FS Saint Martin by the members of North Jersey DX Association. Active on 10 through 80 in the usual DX splits plus General portions of US bands; also six-meter operation. QSL via W2QM.

FR7AI/G Glorioso was active until May 11. Showed up on various nets. QSL via FR7AI CBA (*Callbook* address).

HB0 Liechtenstein was activated by DA1WA/HB0, members of Wiesbaden ARC, on May 23 through 31, 6 through 160 CW, SSB, and RTTY. Worldwide QSL via DJ0LC; stateside QSL with an SASE to Stephen Hutchins, Box 4573, APO NY 09109.

HS4ANK. Joel is a recent arrival in Thailand and hopes to fill the void left by the departure of Fred Laun and George Collins. Daily schedules are: 14220 at 1200Z and 21300/350 or 28500 from 1600Z. QSL via Joel Dunlap, PO Box 38, Khonkain, Thailand.

H44RW Solomon Islands. Ron ZL1AMO was active mostly on CW on 10, 15, and 20 during his April to May visit. QSL to his home address.

HZ1AB Saudi Arabia is active with a number of operators around 14230 to 14240 at 1500, 1900, and 2200Z and on 7008 at 0430. QSL cards go via K8PYD.

J5HTL Guinea Bissau. Operator Hillar Loor is a resident and he assisted the J5AG DXpedition in their operation. He will be active on 10 and 15 SSB for about a year. J5AG operators SM3CXS, SM0AGD, and SM3DVN made over 20,000 contacts, with 10,000 on CW, during their nine-day stay. Their operation was hampered by only having electricity 14 hours a day. During the off-periods, they used the car batteries to run their IC-701 rigs.

KA2AA Minami Torishima was supposed to be on again during July. They tried to provide advance word about the operation and to concentrate on 40 and 80.

KH1/KB6 Canton Island was supposed to be activated by an American operator on and after May 20.

KP4/A. Two different groups have filed for the permission to reactivate *Desecheo* in the immediate future.

LU1ZA South Orkneys, Juan Carlos, joins the LU3ZY (S. Sandwich) schedule on occasional Tuesdays and Fridays at 0100Z. QSL via LU2CN. VP8ZR is near 14275 from 1930Z, QSL via G3KTJ.

NN3SI Smithsonian Institution operated during the WPX CW contest within 33 kHz of the band edges. QSL to NN3SI, Smithsonian Institution, Washington DC 20560 USA (indicate

DX INFORMATION
(Day and time in GMT)
Nets

Frequency	Time	When	Net
21355	1800	Dly	Afrikaner
28750	1200	Dly	DK2OC
14220	0630	Dly	VK2BKD, VK5MQ, VK9NS
14250	1500	Dly	W7PHO
14225	2300	Dly	W7PHO
21345	2330	Dly	W7PHO
28510		Dly	10m DX Net
7080	0200	Sun	40m DX Net
3795	0630	Sat/Sun	80m DX Net
14265	0500	Tue/Sat	Pacific DX Net
14250	0500	Fri	JY3ZH Arabian Knight
28616	1600	Sun	JY3ZH Arabian Knight
21416	1530	Sun	Foreign Service Net
7260	1300	Sat	E Coast Apple Net
3790	0030	Mon	VE3 Swap Shop

Bulletins

14001	0200	Mon	W6TI DX Bulletin
14173	1600	Sun	CANADX Net
14220		Dly	DX Exchange Info
1835	0130	Fri	W1AW DX Bulletin
3990	0430		SSB
7290			
14290			
21390			
28590			
1835	0000	Fri	CW 18 wpm
3580	0300		
7080			
14080			
21080			
28080			
3625	0100	Fri	RTTY 60 wpm/170 Hz
7095			
14095			
21095			
28095			

"WPX Contest" on the envelope).

ST0 Southern Sudan. LA1RR/ST0 expects to be there for two years and is usually around 28500/600 kHz from 1000Z. QSL via LA bureau.

S2BTF Bangladesh should have been activated by Peter HS1AMB on June 1-3 and continue on for several months.

TL8CN Central African Republic on CW daily: 7003/7004 from 0400Z and 21020/25 from 1300Z. Tony also runs SSB skeds on 28520/25 from about 1900Z. QSL via W5RU. TL8RC active on low ends of 40 and 80 from 0000Z. QSL via F6EZV.

TY9ER Benin, fired up as planned by DJ2BW and DL8DC, was to be on until May 13. QSL via DL8DC.

UK1PAL Franz Josef Land is expected to be active again. There was activity by the two YL operators, Rita and Natasha, using YL1P and EK1P callsigns. QSL via UP2BBM, Box 88, Moscow. The operators are with the USSR YL Arctic Expedition. Next stop is to be YL0B from Dickson Island.

VK9 Melish Reef is quite possible in the very near future. KB7NW's boat, *Banyandah,* will be refitted in Hawaii for the second leg of the operation by another group of operators. Hopefully, they will have a little bit better signal than the first group had from KH5 and KH5K.

VQ9CCT Chagos is no one other than VK9CCT and is active on 20m SSB.

W8HMI Frank Smith began his *African trip* on May 17. He was to start with EL and then 5Z, 9J2, 5H3, 6O, 5Z, and ST. He planned to operate mainly on 20m SSB. He was to return to the US by June 30. QSL to 6900 Conover Pl., Alexandria VA 22308.

ZA Albania. Very slim chance of getting on. DL7FT was in Dayton and showing his ZA license—but only the old one.

ZD9 Tristan Da Cunha was to be on after May 12 by ZD7AL and ZD7SE, transportation permitting.

ZM7TT Tokelau. Latest news was that Baruch has a license but not the landing permit; expected to get that one around May 20. Also, another group with VK9NS, VK2BJL, was to be on around May 15.

3A0 Monaco DXpedition by the Monaco DX Group (PA0SIM, PA2WLE, PA3AKP, PE1AMC, PE1AUX, and PE1CUG) was planning to be on July 10-20. Will be QRV on VHF, HF, and UHF bands, including OSCAR. No skeds, no lists! QSL via PA3ARM.

3B8AE/3B9 Rodriguez has been showing up on the F6EXV list on 21285 at 1630Z. QSL via Box 18, Rodriguez, via Mauritius. Op is Moussa.

3D6 Swaziland is activated by W6YB/3D6 for two years. He was heard around 21290 on long path. QSL via KA7IJA. Also, ZS6ANL/3D6 is active on 10m CW.

VK4NIC/3X Guinea. Ian is now back in Australia awaiting his next assignment, which he believes will be in Canada. Ian made a very favorable impression on the authorities in Guinea, opening the doors for future operations. PA0FAF expects to be stationed in 3X this summer and hopes to do some operating.

The ten most-wanted countries according to *The DX Bulletin* are: BY, VS9K, XZ, ZA, VU7L, VK Heard, 7O, XU, FB8W, and VU7A.

AWARDS

Since its inception two years ago, *73 Magazine* has absorbed the escalating costs to maintain its world-renowned Awards Program. All expenses directly affecting the program have dramatically shot up in price! As of August 1, 1981, to offset these enormous costs, prices for *73* Awards will become $4.00 each and annual endorsements will become $2.00 each. These prices still will be below other competitive award sponsors in our hobby.

Award applicants are cautioned to be sure their remittance after August 1st reflects the new prices. Unfortunately, any applications received after this date which have the incorrect amount enclosed will have to be delayed while the applicant is notified of the discrepancy. This procedure will cost us both more time and money, so we plead with our readers to have the amount right the first time.

FOREST COUNTY PA

A micro-expedition to Forest County, Pennsylvania, will be held on the 1st and 2nd of August, 1981.

The call will be WB3IQE/3 and the mode is CW only. Frequencies used will be 80, 40, and 15 meters. We will operate on two bands at a time, using the bottom 50 kilohertz of the bands. Exact frequencies and bands will depend on conditions at the time. We will certainly spend some time outside the Extra-only subbands. QSL to WB3IQE, RD1 Box 297, Brockway PA 15824. US stations send a stamped self-addressed envelope. Canadian stations send a self-addressed envelope and unused Canadian stamps good for letter to USA. DX stations include 1 IRC for QSL via ship, 2 IRCs for QSL via air.

THE GREAT ESCAPE EXPEDITION

Members of the Lake County Amateur Radio Club are planning a DXpedition from the jail cell in Crown Point, Indiana, that John Dillinger fled in 1934 during his famous "wooden gun" escape, the final exploit of the notorious bank robber/killer before he was shot to death by FBI agents in front of the Biograph Theater in Chicago.

Dubbed "The Great Escape DXpedition," the operation is scheduled for 1800Z August 29 to 0300 August 30, and from 1400Z to 2300Z August 30.

Operators will be using the club callsign, W9LJ (Leaky Jail), on 14,300 SSB and 7,115 CW, plus or minus QRM.

Each contact will be confirmed, by a special QSL commemorating the escape, upon receipt of a card and a stamped, self-addressed envelope. Send in your QSL to Robert Wiberg WD9EZB, 534 E. 37th Ave., Lot 72, Hobart IN 46342.

The operating site will be the actual cell in which the desperado was held at the time of his breakout.

No longer used as a jail, the old building in which Dillinger was held for murdering an East Chicago policeman during a bank robbery has been restored as part of a commercial complex housing a museum, a restaurant, a ballroom, and a shopping mall.

LITTLE GULL ISLAND

Radio Central ARC will sponsor an unusual 24-hour mini-expedition to Little Gull Island, running August 8th at 1600Z to August 9th at 1600Z. Callsign will be WA2UEC.

Little Gull Island is a small island in Long Island Sound about fifteen miles northeast of Orient Point. They will operate on the lower portions of the General bands, 10 to 80 meters, both CW and SSB. There will also be a Novice station operation. A photo QSL card will supply all information about the trip.

Please QSL via *Callbook* WA2UEC with SASE, the W2 Bureau, or IRCs. This will be the first of a series of mini-expeditions.

For more information, contact Frank Kiefer K2PWG, 1 Sherrill Lane, Port Jefferson Station NY 11776.

PEND OREILLE

On August 27-30, the Pend Oreille Amateur Radio Club will be operating a special event station from the Pend Oreille County Fairgrounds in Cusick, Washington, during the fair. We will be on the air each day from 1600Z to 0500Z using the Newport High School Radio Club's call (WB7TBN). Frequencies will be (SSB) 14.340, 21.400, 28.700, 3945, (CW and RTTY) 3715, 28.090, 21.090, 14.080, and 3650. There will be a special commemorative QSL card available to all amateurs who contact our station and submit an SASE.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

WEST YELLOWSTONE MT
JUL 31-AUG 2

The WIMU (WY-ID-MT-UT) Hamfest will be held from July 31-August 2, 1981, in West Yellowstone MT. Lodging and campgrounds are available. There will be product displays as well as activities for YLs and harmonics. Talk-in on 146.52, 3.920 or 1.250. For further information, contact "WIMU '81," c/o Les Belyea N7AIK, Box 327, Belgrade MT 59714.

JACKSONVILLE FL
AUG 1-2

The Greater Jacksonville Hamfest Association will hold the ninth annual Jacksonville Hamfest and Northern Florida Section ARRL Convention on August 1-2, 1981, at the Orange Park Kennel Club, located at the intersection of I-295 and US 17 just south of Jacksonville. Advance registration is $3.50 and registration at the door is $4.00. Swap tables are $12.00 per table for both days (no one-day tables). All events will be held indoors and will include a full slate of programs as well as meetings of several statewide and regional organizations. Door prizes will be awarded at both hourly and grand prize drawings. Plenty of free parking will be available. The headquarters hotel is the Best Western First National Inn just across from the hamfest site on US 17. Special hamfest rates will be available. Talk-in on 146.16/.76 and 146.07/.67. For advance registration, hotel rates, or more information, contact Robert J. Cutting W2KGI, 1249 Cape Charles Avenue, Atlantic Beach FL 32233, or Andy Burton, Jr., WA4TUB, 5101 Younis Road, Jacksonville FL 32218. For swap tables, contact WA4TUB at the address listed above.

ESCANABA MI
AUG 1-2

The Delta County Repeater Association will hold the 33rd annual Upper Peninsula hamfest on August 1-2, 1981, at the Flat Rock Township Hall, Escanaba MI. Registration is $2.00. The many activities will include a DX forum, an ARPSC workshop, a satellite-TV seminar, net meetings, and a swap and shop. There will be prizes and a banquet on Saturday evening. For more information, contact Aileen Gagnon WA8DHB, co-chairman of the prize committee, Kipling Loc., Mtd. Rte., Gladstone MI 49837.

LEVELLAND TX
AUG 2

The Hockley County Amateur Radio Club and the Northwest Texas Emergency Net will sponsor their 16th annual picnic and swapfest on Sunday, August 2, 1981, beginning at 8:00 am at the city park in Levelland TX. This event is for the entire family. Bring your own picnic basket for lunch at 12:30. A $3.00 registration is requested. There will be swapping all day, with tables provided. Talk-in on .28/.88 (WR5AFX).

MOBERLY MO
AUG 2

The third annual North Central Missouri Hamfest will be held on Sunday, August 2, 1981, at the air-conditioned Municipal Auditorium, 201 West Rollins, Moberly MO. Doors open at 9:00 am. Tickets are $1.50 in advance and $2.00 at the door. Features include commercial dealers, a flea market (no charge for tables), an ARRL display, exhibits, prizes, women's programs, a special forum with Bob Heil K9EID on CB-to-10-meter conversions, and a buffet lunch. Drinks and hot dogs will be available all day. Talk-in on 147.69/.09, 146.52, and 3963. For more information, contact Charles Coy WB0ENV, 601 McKinley, Moberly MO 65270.

ANGOLA IN
AUG 2

The Steuben County Radio Amateurs will hold their 23rd annual FM Picnic and Hamfest on Sunday, August 2, 1981, at Crooked Lake, Angola IN. Admission is $2.50. There will be prizes, picnic-style BBQ chicken, inside tables for exhibitors and vendors, and overnight camping (with a fee charged by the county park). Talk-in on 146.52 and 147.81/.21.

BELVIDERE IL
AUG 2

The annual Big Thunder ARC Hamfest will be held on August 2, 1981, at the Boone County Fairgrounds, Highway 76. Advance tickets are $2.00. Indoor tables are available at a nominal cost and there will be acres of outdoor space available free. Camping is permitted. For advance tickets, send an SASE and check to Bob Anderson K9DCG, 910 W. Locust Street, Belvidere IL 61008.

COLBY KS
AUG 2

The first Northwest Kansas Amateur Radio Swap Meet will be held on Sunday, August 2, 1981, beginning at 9:00 am at the Community Building, Colby KS. Admission is $1.00 and tables are $1.00 each (same for dealers). An auction will be held at 2:00 pm. Other features will include a TVRO demonstration, activities for the ladies, and old-fashioned informal swapping, selling, and visiting. Lunch will be available. Talk-in on 146.22/.82 and .52/.52. For more information, contact WA0GBN or KA0FBQ.

WINCHESTER VA
AUG 2

The Shenandoah Valley Amateur Radio Club will celebrate "31 years without interruption" at its annual hamfest on Sunday, August 2, 1981, at the Clark County Ruritan Fairgrounds in Berryville VA, 10 miles east of Winchester on Route 7. Gates open at 7:00 am for exhibitors and tailgaters, for whom fees will be the same as last year. Registration is $3.00, and wives and young children will be admitted at no charge. Hourly prize drawings; major prizes will include three transceivers. Breakfast and Ruritan's famous barbequed chicken dinners will be available. Talk-in on 146.22/.82, 147.90/.30, and 146.52/.52. For further information, contact Joann Aaron WB2CMV, PO Box 139, Winchester VA 22601.

POMONA CA
AUG 8

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 8, 1981, from 9:00 am to 3:00 pm at the Los Angeles County Fairgrounds (Thummer's Patio), Pomona CA. There is no admission charge. Bring your own picnic lunch. Refreshments will be available. Featured at a noon raffle will be grand prizes of a Quasar 10" TV and a Tempo S-1 handie-talkie. The drawing donation is $1.00 and the winner need not be present. Talk-in on 146.34/.94. For additional information, write TCARA, PO Box 142, Pomona CA 91767.

BEAVERTON OR
AUG 8-9

The Willamette Valley DX Club will hold the 1981 Northwest DX Convention on August 8-9, 1981, at The Greenwood Inn in Beaverton OR, just west of Portland. The grand prize will be an Icom-730. Speakers will include Carl WA4ZNH and Martha WB4FVU. For more information, write PO Box 555, Portland OR 97207.

BURLINGTON VT
AUG 8-9

The Burlington Amateur Radio Club will hold its annual International Hamfest on August 8-9, 1981, at the Old Lantern Campground, Charlotte VT (14 miles south of Burlington, just off Rte. 7). Admission is $4.00 (US funds). Planned events include a flea market, commercial exhibits, a CW contest, a tower-raising contest, an HT transmitter hunt, and the traditional Canadian-American tug-of-war. Talk-in on .34/.94. For more information, contact Hap Preston W1VSA, PO Box 312, Burlington VT 05402. For campground reservations, call Old Lantern Campground at (802)-425-2120.

LEXINGTON KY
AUG 9

The Bluegrass Amateur Radio

Society will hold its annual Central Kentucky Bluegrass Hamfest on Sunday, August 9, 1981, from 8:00 am until 4:00 pm EDT at a new location, the Tates Creek Junior High School, Centre Parkway, Lexington KY. Tickets are $3.50 in advance and $4.00 at the door. Outdoor flea market space is free with admission. There will be technical forums, indoor exhibits, door prizes, a grand prize of a two-meter all-mode transceiver, a ladies' program, a protected paved flea market area, and free parking. Talk-in on 146.16/.76. For more information, please contact Ernie Cohen K4DHN, 3379 Sutherland Drive, Lexington KY 40502

WILLOW SPRINGS IL
AUG 9

The Hamfesters Radio Club will hold its 47th annual hamfest on Sunday, August 9, 1981, at Sante Fe Park, 91st and Wolf Road, Willow Springs IL.

ST. CLOUD MN
AUG 9

The St. Cloud Amateur Radio Club Hamfest will be held on August 9, 1981, from 8:00 am to 4:00 pm at the Whitney Senior Center in St. Cloud MN. Features will include a swapfest, prizes, and refreshments. Talk-in on 146.34/.94. For further information, contact Mike Lynch KAØHQS, 2115 1st Street South, St. Cloud MN 56301, or phone (612)-251-2297.

MONTGOMERYVILLE PA
AUG 9

The Mid-Atlantic Amateur Radio Club will hold its annual J.B.M. Hamfest on Sunday, August 9, 1981, from 9:00 am to 4:00 pm, rain or shine, at the Budco 309 Drive-In Theater, ¼ mile north of the intersection of Rtes. 63 and 309, Montgomeryville PA (6 miles north of the Fort Washington interchange of the Pennsylvania Turnpike). Admission is $2.50 with $1.00 additional for the first tailgate space and 75¢ for each additional space. Tailgate setup begins at 8:00 am. Featured will be an Alternate Energy Fair which will include exhibitions of various energy resources, as well as door prizes and a flea market for both the hamfest and the Alternate Energy Fair. Refreshments will be available. Talk-in on 147.66/.06 (WB3JOE) or 146.52. For further information, call Don Schuenemann WB3AYT at (215)-822-9076.

AUSTIN TX
AUG 14-16

The Austin Amateur Radio Club and the Austin Repeater Organization will hold the ARRL-approved VHF '81, a combination state convention of the Texas VHF FM Society and the second annual Super Central Texas Swapfest, on August 14-16, 1981, at the Hilton Inn, Austin TX. Registration is $5.00 in advance (August 1st deadline) or $6.00 at the door. Tickets are good for technical sessions, seminars, the swapfest, and more (all indoors and air-conditioned). Other features include the hidden transmitter hunt, the Saturday night boat ride, and the Texas barbecue dinner, prizes, an ARRL forum, and dealers. Talk-in on 146.19/.79. For additional information, contact VHF '81, PO Box 13473, Capitol Station, Austin TX 78711.

OMAHA NE
AUG 14-16

Satellite Television Technology will hold a Satellite Private Terminal Seminar on August 14-16, 1981, in Omaha NE. Included will be more than 50 exhibit booths with low-cost home satellite TV reception terminal equipment and systems. The seminar program will teach how to make this equipment function at peak performance at all times. Three lecture halls will be set up with test equipment and operating portions of systems where attendees can meet with experts and obtain information about their own installations. For more details on the program and registration, contact SPTS '81 Omaha, PO Box G, Arcadia OK 73007, or phone Rick Schneringer at (405)-396-2574.

OAKLAND NJ
AUG 15

The Ramapo Mountain Amateur Radio Club (WA2SNA) will hold its 5th annual flea market on August 15, 1981, at the American Legion Hall, 65 Oak Street, Oakland NJ, only 20 miles from the GW Bridge. Admission is $1.00; YLs and harmonics will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Door prizes will be awarded and refreshments will be available. Talk-in on 147.49/146.49 and 146.52. For more information, contact Walt Zierenberg WD2AAI, 344 Union Avenue, Bloomingdale NJ 07403, or phone (201)-838-7565.

HUNTSVILLE AL
AUG 15-16

The Huntsville Hamfest (formerly the North Alabama Hamfest) will be held on Saturday and Sunday, August 15-16, 1981, at the Von Braun Civic Center in Huntsville AL. There is no admission charge. There will be prizes, exhibits, forums, an air-conditioned indoor flea market, and ladies' activities. Tours of the Alabama Space & Rocket Center are available for the family. A limited number of camping sites with hookups are available at the VBCC on a first-come, first-served basis. Flea market tables are available for $3.00 per day. Talk-in on 3.965 and .34/.94. For more information write, Huntsville Hamfest, PO Box 4563, Huntsville AL 35802.

TACOMA WA
AUG 15-16

The Radio Club of Tacoma will hold its annual Hamfair on August 15-16, 1981, at Pacific Lutheran University in Tacoma, WA. Featured will be many outstanding technical seminars, games and contests for all members of the family, a large flea market and commercial display area, dinner and after-dinner entertainment, and valuable door prizes. Trailer parking and lodging are available. For more details, contact Eva Anderson WB7QNS, 517 Berkeley Avenue West, Tacoma WA 98466, or phone (206)-564-8347.

WARREN OH
AUG 16

The Warren Amateur Radio Association will hold its 24th hamfest on August 16, 1981, at the Kent State University branch, Warren OH. There will be six major prizes. For more information, write PO Box 809, Warren OH 44482.

HAMDEN CT
AUG 16

The 5th annual WELI/Hamden Radio Club Flea Market will be held on Sunday, August 16, 1981, from 9:00 am to 5:00 pm at Radio Towers Park, Benham Street, Hamden CT. General admission is $1.00 and dealer's charge is $5.00 per space with room for one car. For further information or reservations, write Hamden Radio Club, 199 Wayland Street, Hamden CT 06518, or call (203)-288-3765 after 5:00 pm.

LAFAYETTE IN
AUG 16

The Tippecanoe Amateur Radio Association will hold its 12th annual hamfest on Sunday, August 16, 1981, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. The grounds will open at 7:00 am and advance tickets are $3.00. Features will include a large flea market, manufacturers, dealers, fun, and prizes. Talk-in on 146.13/.73 or 146.52. For advance tickets and additional information, send a check (payable to Lafayette Hamfest) to J. B. VanSickle K9KRE, RR 1, Box 63, Westpoint IN 47992.

WILMINGTON DE
AUG 16

The Sixth Annual New Delmarva Hamfest will be held on Sunday, August 16, 1981, at Gloryland Park, Bear DE (5 miles south of Wilmington), from 8:00 am to 4:00 pm. Admission is $2.25 in advance, $2.75 at the gate, and YL and jr. ops will be admitted free. Tailgating or table space under the pavilion is $3.50. There will be a limited supply of free tables, or bring your own. Refreshments will be available. First prize of an Icom IC-2A and many other prizes will be awarded. Talk-in on .52 and .13/.73. For map, info, or advance tickets, send an SASE to Stephen J. Momot K3HBP, 14 Balsam Road, Wilmington DE 19804. Make checks payable to Delmarva Hamfest, Inc.

FARMINGTON ME
AUG 22

The Sandy River Amateur Radio Club/Somerset Amateur Radio Association Hamfest will be held on Saturday, August 22, 1981, at the Farmington Fairgrounds, Farmington ME. Admission is a $1.00 donation. Free camping will be available from 5:00 pm Friday until Sunday morning. Light refreshments also will be available. Talk-in on 146.37/.97, 147.615/.015, or 146.52/.52. For additional information, send an SASE to Charles Stenger W1HTG, Box 111, East Dixfield ME 04227.

MARYSVILLE OH
AUG 22-23

The Union County Amateur Radio Club will hold its fifth annual Hamfest-81 on August 22-23, 1981, at the Union County Fairgrounds, Marysville (near Columbus) OH. Gates open until Sunday at 4:00 pm. Admission is $2.00 in advance and $3.00 at the gate. Children will be admitted free. Featured on Saturday night will be movies, popcorn, round and square dancing to a live band, and overnight camping with hookups, all free. Food will be available all night with a big country breakfast starting at 3:00 am. On Sunday there will be forums, door prizes, and meetings. There will be no extra charge for sellers at the flea market which opens at 4:00 pm on Saturday and 6:00 am on Sunday. Talk-in on 147.99/.39 and .52. For more information, write Union County Amateur Radio Club, 13613 US 36, Marysville OH 43040.

ST. CHARLES IL
AUG 23

The Fox River Radio League will host the 1981 Illinois State ARRL Convention in conjunction with its annual hamfest, all to be held on Sunday, August 23, 1981, from 8:00 am to 4:00 pm at the Kane County Fairgrounds in St. Charles IL. The Convention program features forums on antennas, DX, and ARRL operations. There will also be several contests and demonstrations of amateur radio communications modes. Advance tickets are $1.50 and $2.00 at the gate. Talk-in on 146.940. For advanced tickets, send an SASE to Jerry Frieders W9ZGP, 1501 Molitor Road, Aurora IL 60505. Commercial exhibitors should contact Mike Pittard KA9EVT at (312)-896-7383.

WENTZVILLE MO
AUG 23

The Saint Charles Amateur Radio Club, Inc., will hold Hamfest '81 on August 23, 1981, at the Wentzville Community Center, West Main Street, Wentzville MO. Advance tickets are $1.00 each or 4 for $3.00; at the door tickets are $1.50 each or 4 for $5.00. Parking is $1.00 per car (no camping on hamfest site). Featured will be a reserved flea market for amateurs, a free general flea market area, free bingo, a cake walk, refreshments, and prizes (including a first prize of a Kenwood TS-130S transceiver). Free doughnuts and coffee will be available to the early birds. Talk-in on .07/.67 and .52. For information on motels, tickets, displays, prize lists, camping, etc., write Bill Graham WB0ZEH, 215 Bermuda, O'Fallon MO 63366.

BLUEFIELD WV
AUG 23

The East River Amateur Radio Club, Inc., will hold the Bluefield Hamfest '81 on Sunday, August 23, 1981, at the Brushfork Armory/Civic Center located on US 52, one mile north of Bluefield WV. Admission is $2.00 in advance and $3.00 at the gate, and includes a prize ticket. Tailgaters are $2.00 each and tables are $5.00 each (3 or more are $4.00 each). There will be food, dealers, a flea market, forums, and entertainment. Talk-in on .89/.49 and .52/.52. For more information, write Bluefield Hamfest '81, 2113 Hemlock Hill, Bluefield WV 24701.

DES MOINES IA
AUG 23

The Iowa 75-Meter Net will hold a picnic and swapfest on Sunday, August 23, 1981, at Ewing Park in southeast Des Moines IA. A potluck meal will start at 12:00 noon and a program (including prizes) will follow. Talk-in on .34/.94. For further information, contact Lovelle Pedersen WB0JFF, Net Secretary, 2327 W. Reinbeck Road, Hudson IA 50643.

TIOGA COUNTY PA
AUG 29

The Tioga County Amateur Radio Club will hold its 5th annual hamfest on Saturday, August 29, 1981, from 8:00 am to 4:00 pm, at the Tioga County Fairgrounds just off Rte. 6, between Wellsboro and Mansfield PA. There will be a free outdoor flea market and inside space will be available. Registration is $3.00. Features will include prizes, demonstrations, and food. Pennsylvania's Grand Canyon is nearby. Talk-in on 146.19/.79 and .52. For more information, write PO Box 56, Mansfield PA 16933.

WIN A FREE BOOK!

We are reviving the "Circuits^2" feature in *73*. Just send in your favorite circuit, along with a *brief* description of its operation or intended use. (Make sure that it works!) If we print it, you'll get your choice of a book from our Radio Bookshop. Be sure to include your book choice with your circuit.

SEWELL NJ
AUG 30

The Gloucester County Amateur Radio Club will hold the GCARC Hamfest on August 30, 1981, from 8:00 am to 3:00 pm (7:00 am for tailgaters and dealers) at the Gloucester County College, Tanyard Road, Sewell NJ. Admission is $2.00 in advance and $2.50 at the door. Tailgaters' and dealers' charge is $6.00 (which includes one free admission). Refreshments and free parking will be available. Features will include seminars, prizes, contests, and speakers Dale Smith, from the ARRL, and Miles (Brownie) Brown W2PAU, an RCA antenna expert. FCC exams will be given from Tech through Advanced. Talk-in on 146.52 and 147.78/.18. For more information and reservations, send an SASE to GCARC Hamfest Committee, PO Box 370, Pitman NJ 08071, or phone (609)-456-0500 or (609)-338-4841 days or (609)-629-2064 evenings.

LA PORTE IN
AUG 30

The La Porte and Michigan City Amateur Radio Clubs will hold their annual La Porte County Hamfest on Sunday, August 30, 1981, rain or shine, at the County Fairgrounds on Highway 2, west of La Porte IN (50 miles SE of Chicago). There will be an outdoor paved flea market area, indoor tables at $1.00 each, a satellite TV demonstration, and overnight trailer parking for early birds. Advance tickets are $2.00. For reservations or information, send an SASE to PO Box 30, La Porte IN 46350.

GEORGETOWN IL
SEP 5-6

The Illiana Repeater System will hold the 12th annual Danville Area Hamfest on September 5-6, 1981, at the Georgetown Fairgrounds, Georgetown IL. The gates will open at 6:30 am. Tickets are $1.50 in advance and $2.00 at the gate. There will be a flea market, forums, family entertainment, many prizes (including a Santec synthesized hand-held), and free parking. Talk-in on 146.22/.82 and 146.52. For more information or advance tickets, contact Lowell Wells WD9AFG, Hamfest Chairman, RR 3, Box 215, Danville IL 61832, or phone (217)-759-7560.

BLOOMINGTON IN
SEP 6

The Bloomington Area amateur radio hams will hold their 4th annual Hoosier Backyard Hamfest on Sunday, September 6, 1981, rain or shine, from 7:00 am until 5:00 pm at 2335 Vernal Pike, Bloomington IN. Admission is $2.00. Features will include door prizes, a swap 'n shop, vendors, free setups, balloon rides, a 50/50 drawing, refreshments, ATV demonstrations, and an Aptron ATV converter as the grand prize. Talk-in on 147.78/.18, 146.04/.64, or 223.26/224.86. For further information, contact Bob Myers K9KTH at 2335 Vernal Pike, Bloomington IN, or call (812)-332-2433.

AUGUSTA NJ
SEP 12

The Sussex County Amateur Radio Club will hold its third annual SCARC '81 hamfest on Saturday, September 12, 1981, from 8:00 am to 3:00 pm at the Sussex County Farm and Horse Show grounds, Plains Road off Rte. 206, Augusta NJ. Pre-registration for outdoor flea-market sellers is $4.00; at the gate, $5.00. Pre-registration for indoor flea-market sellers is $5.00; at the gate, $6.00. Other registration is $2.00. There will be door prizes and plenty of free parking. Talk-in on 147.90/.30 and 146.52. For additional information or pre-registration, write Sussex County Amateur Radio Club, PO Box 11, Newton NJ 07860, or Lloyd Buchholtz WA2LHX, 10 Black Oak Drive, Vernon NJ 07462.

GAITHERSBURG MD
SEP 13

The Foundation for Amateur Radio, with the support of more than 50 affiliated clubs in the greater Washington-Baltimore areas, will hold the Gaithersburg Hamfest on Sunday, September 13, at the Montgomery County Fairgrounds, Gaithersburg MD. Gates open at 8:00 am; setup and talk-in begin at 6:00 am. Events featured include commercial exhibits, indoor flea market, tailgating, and ladies' activities. Admission is $3.00 at the gate; children under 12 admitted free. For further information, write Foundation for Amateur Radio, PO Box 523, Bowie MD 20715, or contact Stuart Meyer W2GHK, hamfest chairman, 2417 Newton Street, Vienna VA 22180; (703)-525-6286 (office) or 281-3806 (home).

KEW GARDENS NY
SEP 13

The Hall of Science Amateur Radio Club will hold its annual electronic hamfest on Sunday, September 13, 1981, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th street, Kew Gardens, Queens NY. Featured will be free parking, door prizes, refreshments, a raffle, and an auction. Sellers' spaces are $3.00; buyers' admission is $1.00. Talk-in on .52. For additional info, contact Tom Doyle KA2DTB at (212)-351-6354 (days).

PORT JEFFERSON LI NY
SEP 13

The Suffolk County Radio Club will hold its ARRL-supported 4th annual Electronic Flea Market on Sunday, September 13, 1981, with a rain date of September 20, 1981. The site is the Odd Fellows Hall, Jane Boulevard, Port Jefferson LI NY. Walk-ins will be $1.50 and sellers will be $3.00. There will not be any charge for XYLs and harmonics of attending hams. Gates will open at 7:00 am. Bargains, prizes, food, and hamship will be available. Talk-in on .52, .94, and 223.50. For more information, contact Floyd Davis at (516)-234-9376.

TIVERTON RI
SEP 13

The Bristol County Amateur Radio Association will hold its annual indoor/outdoor flea market on September 13, 1981, from 12:00 noon to 4:00 pm at the VFW hall in Tiverton RI. Admission is $1.00 and flea market spaces are $6.50. Door prizes will be drawn. Talk-in on 147.63/.03 and .52. For maps, send an SASE to Ann M. Carro KA1DNB, 652 Old Colony Terrace, Tiverton RI 02878.

FINDLAY OH
SEP 13

The Findlay Hamfest will be held on Sunday, September 13, 1981, at the Hancock Recreational Center, just east of I-75 exit 161, on the north edge of Findlay, 40 miles south of Toledo. Tickets are $2.00 in advance and $2.50 at the gate. Tables are $2.50 per half. Setups on Saturday are from 5:00 pm to 9:00 pm and on Sunday at 6:00 am. Major prizes include a deluxe low-band rig, two hand-helds, a memory keyer, and more. For tickets, information, or reservations, send an SASE to PO Box 587, Findlay OH 45840

HAMBURG NY
SEP 18

The 10th annual Ham-O-Rama '81 will be held on Friday and Saturday, September 18-19, 1981, from 7:00 am to 5:00 pm at the Erie County Fairgrounds near Buffalo NY. Advance tickets (deadline: September 4th) are $3.00 and tickets at the gate will be $4.00. Children under 12 will be admitted free. The outside flea market is $2.00 per space and the inside flea market is $7.00 per space. Features will include new equipment displays, computers, technical programs, ladies' programs, and valuable awards. Talk-in on 146.31/.91. For advance tickets, send an SASE to David G. Baco WA2TVT, 130 Vegola Avenue, Cheektowaga NY 14225.

GRAND RAPIDS MI
SEP 19

The Grand Rapids Amateur Radio Association will hold its annual Swap and Shop on Saturday, September 19, at the fairgrounds in Hudsonville MI. There will be door prizes, dealers, an indoor swap area, and an outdoor trunk swap area. Gates will open at 8:00 am for both swappers and the public. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

GRAYSLAKE IL
SEP 19-20

The Chicago FM Club will hold Radio Expo '81 on September 19-20, 1981, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL, about 30 minutes north of Chicago and 45 minutes south of Milwaukee. The flea market is open from 6:00 am to to 6:00 pm and the exhibits are open from 9:00 am to 9:00 pm on both days, rain or shine. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. Features include seminars, a ladies' program, prizes, free parking, a new camping site with hookups, commercial ham and computer displays, and full food services. Bring your own tables and chairs to the indoor and outdoor flea market (or even tailgate).

Space is free with a gate ticket. Talk-in on 146.16/.76, 146.52, and 222.5/224.10. For more information, call (312)-BST-EXPO. For advance tickets, send a #10 SASE to Box 1532, Evanston IL 60204.

PEORIA IL
SEP 19-20

The Peoria Area Amateur Radio Club will hold the Peoria Superfest '81 on Saturday and Sunday, September 19-20, 1981, at the Exposition Gardens, W. Northmoor Road, Peoria IL. Gate opens at 6:00 am; commercial building at 9:00 am. Activities include forums, amateur and computer product displays, a flea market, ladies' programs, and children's activities. Full camping facilities are available. Talk-in on 146.16/.76. For more information, contact Charles W. Kuhn WD9EGW, 7005 N. Tobi Lane, Peoria IL 61614.

NEWTOWN CT
SEP 20

The Candlewood Amateur Radio Association's flea market and auction will be held on Sunday, September 20, at the Essex House, Rte. 6 in Newtown CT, Exit 8 off I-84, from 10:00 am to 4:00 pm. Admission is $1.00; tables are $6.00. Activities include door prizes, a raffle, dealers, and a magic show for the kids. Talk-in on 147.72/.12. For more information, contact George WB2THN at (914)-533-2758 or Ken KA1GDS at (203)-744-6953.

ROSS OH
SEP 20

The Greater Cincinnati Amateur Radio Association, Inc., will hold its annual Cincinnati Hamfest on Sunday, September 20, 1981, at Stricker's Grove on Ohio State Rte. 128, one mile west of Ross (Venice) OH. There will be exhibits, 10 major prizes, food, and refreshments available. Activities include a flea market with radio-related products only, a transmitter hunt, entertainment, and an air show. Admission is $4.00. For further information, contact Lillian B. Abbott K8CKI, 1424 Main Street, Cincinnati OH 45210.

MT. CLEMENS MI
SEP 20

The L'Anse Creuse Amateur Radio Club will hold its 9th annual Swap and Shop on Sunday, September 20, 1981, from 9:00 am to 3:00 pm at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 east-bound to the Metropolitan Parkway exit, then the Metropolitan Parkway to Crocker, go left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $2.00 at the door or $1.00 in advance. There will be FCC representatives and a test equipment table. There will be plenty of food and parking, plus hourly prize drawings. Prizes include a first prize of $250, a second prize of $100, and third prize of $50. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Mike Corcoran N8CEN, 650 Chippewa, Mt. Clemens MI 48043.

AUGUSTA GA
SEP 20

The Augusta Amateur Radio Club will hold its annual hamfest on Sunday, September 20, at the Julian Smith Casino in Augusta GA. Tickets are $1.00 each; tailgaters, $3.00. Open at 9:00 am, everything is indoors except the flea market. There will be door prizes, a grand prize drawing at 3:00 pm, bingo, and refreshments. Talk-in on 146.34/.94. For more information, contact Diane Miller WB4YHT at (404)-860-3700.

ELMIRA NY
SEP 26

The Elmira Amateur Radio Association will hold the sixth annual Elmira International Hamfest on Saturday, September 26, 1981, at the Chemung County Fairgrounds. Gates will open at 8:00 am. Tickets are $2.00 in advance and $3.00 at the gate. Features will include a free flea market, tech talks, and dealer displays. Food will be available and door prizes will be awarded. The grand prize will be three items: an Icom IC-255A, an Icom IC-2AT, and an Avanti mobile antenna. A shuttle service from the Chemung County Airport will be provided for fly-ins who bring an HT. Talk-in on 147.96/.36, 146.10/.70, and 146.52/.52. For more information and/or tickets, contact John Breese WA2FJM, 340 West Avenue, Horseheads NY 14845.

LOUISVILLE KY
SEP 26-27

The eleventh annual Greater Louisville Hamfest and the 1981 Great Lakes Division Convention will be held on September 26-27, 1981, at the East Hall of the Kentucky Fair and Exposition Center in Louisville KY. There will be a large indoor exhibitors' area and flea market, completely air-conditioned. For more information, write The Greater Louisville Hamfest, PO Box 34444, Louisville KY 40232, or phone (502)-634-0619.

VIRGINIA BEACH VA
SEP 26-27

The 6th annual Tidewater Hamfest-Computer Show and ARRL Roanoke Division Convention will be held in the Virginia Beach Pavilion on September 26-27, 1981. Featured will be ARRL, traffic, and DX forums and XYL free bingo. FCC license exams will be given to those sending a form 610 request in advance. Free transportation to the oceanfront will be provided for the Neptune Festival. Admission is $3.50. There will be an advance ticket drawing for a handheld FM transceiver. Flea market tables are $5.00 for one day or $7.00 for both days. For tickets and information, write TRC, PO Box 7101, Portsmouth VA 23707, or phone (804)-587-1695.

GAINESVILLE GA
SEP 27

The 8th annual Lanierland ARC Hamfest will be held on September 27, 1981, beginning at 9:00 am in the Holiday Hall at the Holiday Inn, Gainesville GA. Doors will open at 8:00 am for dealer setups, and free tables and an inside display area will be provided. A large parking lot will be available for the flea market, and all activities and facilities will be free to all. A boat anchor auction and prize drawings will be featured. Prize tickets are $1.00 each or 6 for $5.00. Food will be available next door. Talk-in on 146.07/.67. For more information and free dealer space reservations, contact Paul Watkins W4FDK, Rte. 11, Box 536, Gainesville GA 30501, or phone (404)-536-8280.

GRASS VALLEY CA
SEP 27

The Golden Empire Flying Club and Radio Systems Technology are pleased to announce the annual fly-in and avionics swap meet to be held at the Nevada County (CA) Airpark on Sunday, September 27, 1981. The pilot of any antique or home-built aircraft will receive a free "miner's lunch" and a beverage of the pilot's choice. Pastries, bratwurst, and hot dogs will be available also. The swap meet will be free. Table space is limited and it is first-come, first-served. This is the only swap meet in the country to feature the trading of used avionics products. Pilots are reminded that Nevada County Airport is considered a mountain strip, and are advised to check density altitude. For more information, contact Golden Empire Flying Club, PO Box 375, Grass Valley CA 95945.

BEREA OH
SEP 27

The 7th annual Cleveland hamfest will be held on Sunday, September 27, 1981, at the Cuyahoga County Fairgrounds, Berea OH, from 0800 to 1500. Exhibitors' 8-foot spaces are $25.00 (which includes a table). Also, power is available if requested in advance. For more information, write Cleveland Hamfest Association, Box 27211, Cleveland OH 44127.

ADRIAN MI
SEP 27

The Adrian Amateur Radio Club will hold its hamfest on September 27, 1981, at the Lenawee County Fairgrounds, Adrian MI, from 8:00 am to 3:00 pm. There will be prizes, games, and programs. Limited tables available and inside space available for your table. Tickets are $1.50 in advance; $2.00 at the door. Talk-in on 146.31/.91 and .52. For tickets, tables, and information, contact the Adrian Amateur Radio Club, Inc., PO Box 26, Adrian MI 49221. Tables reserved by check no later that September 20.

NEW LONDON NH
SEP 27

The 5th annual Connecticut Valley FM Association hamfest/flea market will be held on Sunday, September 27, 1981, from 9:00 am to 5:00 pm at the King Ridge Ski Area, New London NH. Adult admission will be $1.00 and flea market setup will be $5.00. Children under 16 will be admitted free. The food concession will be by King Ridge.

NEW PRODUCTS

STANDARD KEYBOARD CATALOG AVAILABLE

A 24-page catalog of standard keyboards is now available from George Risk Industries, Inc. Bulletin KB-20 includes data on the company's Model 753, 756, and 771 standard keyboards, plus a variety of new models ranging from 10 to 98 keys. Featured are the new process control keyboard with serial I/O for industrial control system applications, user-programmable ASCII keypads, and a full complement of keyboard enclosures and accessories. Off-the-shelf models include low-cost units for hobby/educational use and keyboards suitable for a variety of prototype, limited production, and specialized applications. Ruggedized versions for heavy-duty industrial and military applications are also offered.

Free copies may be requested from *George Risk Industries, Inc., GRI Plaza, Kimball NE 69145; (800)-445-5218.* Reader Service number 482.

LOW-COST DATA TERMINAL INCLUDES COLOR GRAPHICS

A microprocessor-controlled, interactive data terminal with color graphics, reverse video, programmable and resident character sets, selectable baud rates and data formats and a light-touch, flexible-membrane keyboard with finger positioning overlay and aural feedback has been introduced by RCA Micro-Computer Products.

This professional quality terminal is suitable for a wide variety of applications requiring interactive communication between computer and user. Microprocessor intelligence and LSI video control circuits bring performance, features, and flexibility at low cost.

This versatile terminal can be interconnected with standard RS232 modems for communication across telephone lines. The VP-3301 is compatible with most time-sharing and data-base computer networks.

The character display format, 40 characters by 24 lines or 20 characters by 12 lines, is software selectable. Each character or all characters may be displayed in one of eight colors (or gray scales on a B/W display). The display background may be one of eight colors (or gray scales on a B/W display). There are 125 resident displayable characters or you can define your own characters—Greek letters and other foreign alphabets, graphic symbols, large graphics building blocks, playing card suits, unique character fonts, and "little green men." The reverse video feature creates visual emphasis on single or multiple characters, words, or lines.

The terminal communications interface is industry standard asynchronous RS232C or 20-mA current loop with six switch-selectable baud rates. Switch-selectable configuration control includes line/local, upper case only, full/half duplex, data word formatting, plus two control code options. A built-in tone generator, used for aural keypress feedback, can be programmed for end-of-line bell, error messages, or even music.

The terminal utilizes modern flexible-membrane keyswitches with a light positive activation pressure. Contact life is rated at greater than five million operations. A finger-positioning overlay combined with the positive keypress action gives good operator "feel." The unitized keyboard surface, impervious to liquids or dust particles, combined with high-noise-immunity CMOS circuitry, make this unit particularly suitable for use in hostile environments.

The base-band video output can be directly connected to a 525-line color or black-and-white video monitor or with an rf modulator to a standard color or black-and-white TV set. A wall-receptacle-type power supply is included.

For more information, contact *RCA MicroComputer Products, New Holland Avenue, Lancaster PA 17604; (717)-397-7661.* Reader Service number 485.

GRI's new keyboard catalog.

DOW-KEY'S HIGH-FREQUENCY TRANSFER RELAY

The Dow-Key Division of Kilovac corporation has announced the availability of a new high-frequency transfer relay. The Model 412 has four type N female connectors and carries up to 1000 Watts (CW) at dc and 150 Watts at 4.2 GHz. The Model 412 is available in latching and non-latching versions, each with optional form "C" indicator circuit contacts.

The Model 412 has excellent rf characteristics: Minimum isolation at 1 GHz is –85 dB and at 4.2 GHz is –70 dB. Vswr is less than 1.1 at 1 GHz and 1.25 at 4.2 GHz. Insertion loss is –.15 dB maximum at 1 GHz and –.25 dB at 4.2 GHz. The relay was developed for use in Microwave systems to 4.2 GHz. It is ideally suited for transmit/receive switching between an antenna and a dummy load. The relay may also be used to bypass or insert a circuit element.

For further information, con-

RCA's VP-3301 data terminal.

Dow-Key's Model 412 transfer relay.

tact *Kilovac Corporation, PO Box 4422, Santa Barbara CA 93103; (805)-684-4560.* Reader Service number 487.

EZ CORD CONTROL™

Colton Creators, Inc., has developed a new product called the EZ Cord Control™. The patented new product provides an excellent means of holding and dispensing extension cords, coax, twin-lead, and all the other types of cable that have a way of accumulating in a ham shack. This cable organizer is available in three different sizes.

For more information, contact *Colton Creators, Inc., 216 East Second Street, Mineola NY 11501.* Reader Service Number 484.

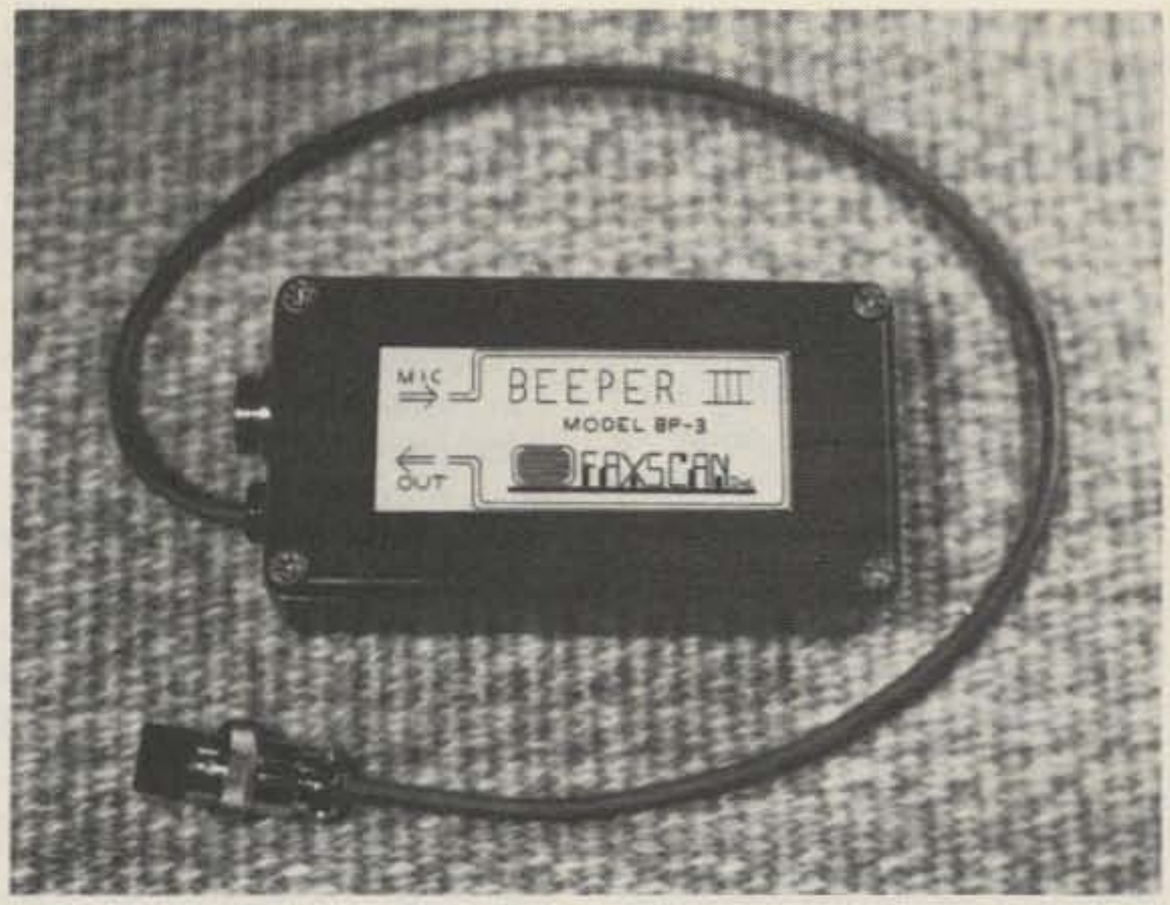
TRI-EX ROTATING TOWER

A new 120-foot guyed rotating tower has been released by the Tri-Ex Tower Corporation. This tower should be of special interest to contesters and other hams who wish to mount yagi arrays in various configurations on the sides of the tower. With this tower, though, these side-mounted antennas can be rotated in any direction just by turning the tower.

Despite its 120-foot height, the tower turns easily by hand, although it is more conveniently rotated by a motorized rotator. The rotator mechanism is mounted inside the tower at its base where it is easily accessible and is completely enclosed for weather protection, reliability, and safety. There are no exposed chain drives or gears which could be a safety hazard to people who enter the tower-site area.

Ball-bearing-type guy attachment rings are at the 30', 70', and 110' tower levels. A mast may be inserted at the top of the tower for additional antennas which can be rotated independently of the tower and its side-mounted antennas.

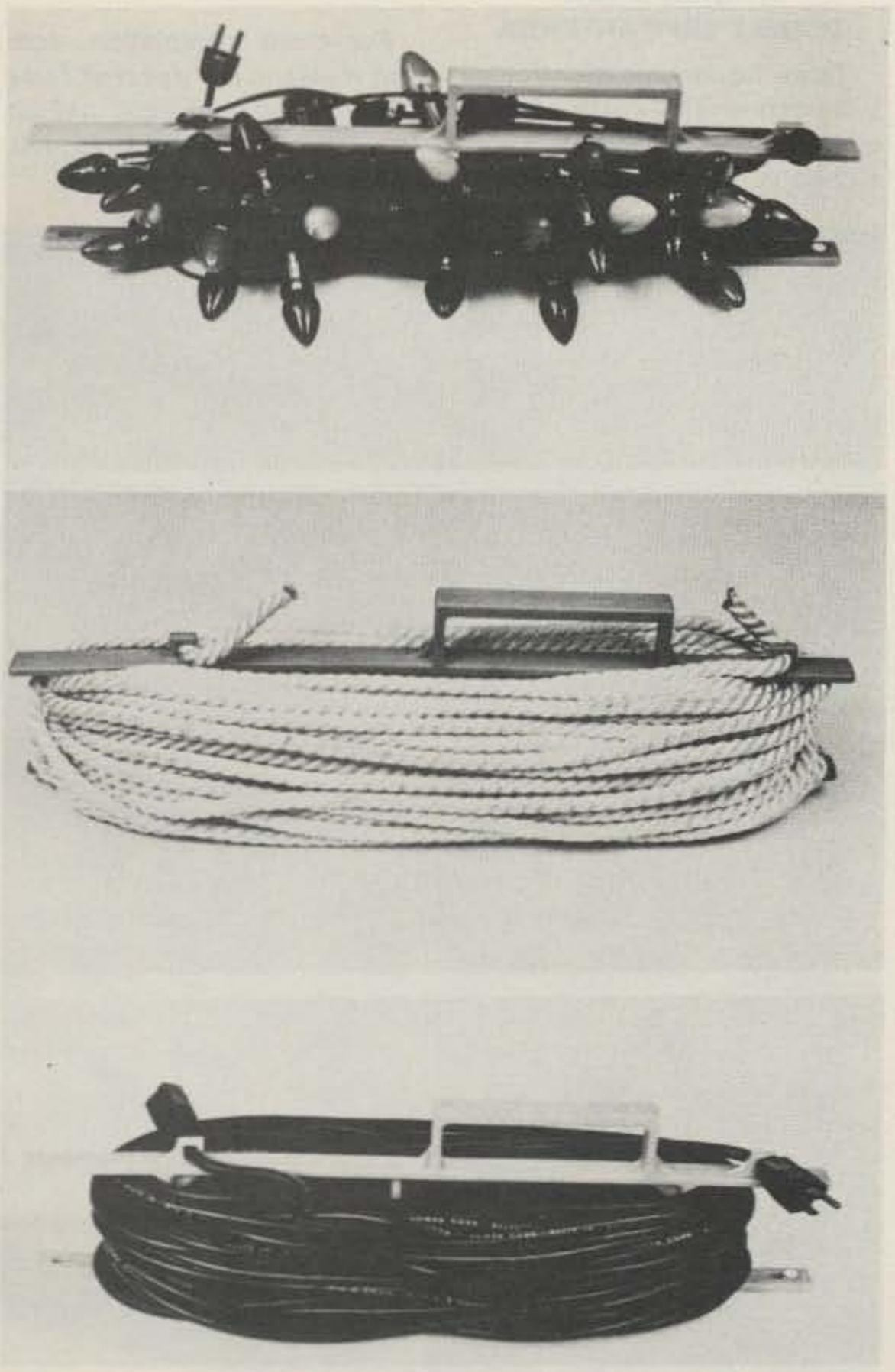
For more information, contact *Tri-Ex Tower Corporation, 7182 Rasmussen Avenue, Visalia CA 93291.* Reader Service number 488.



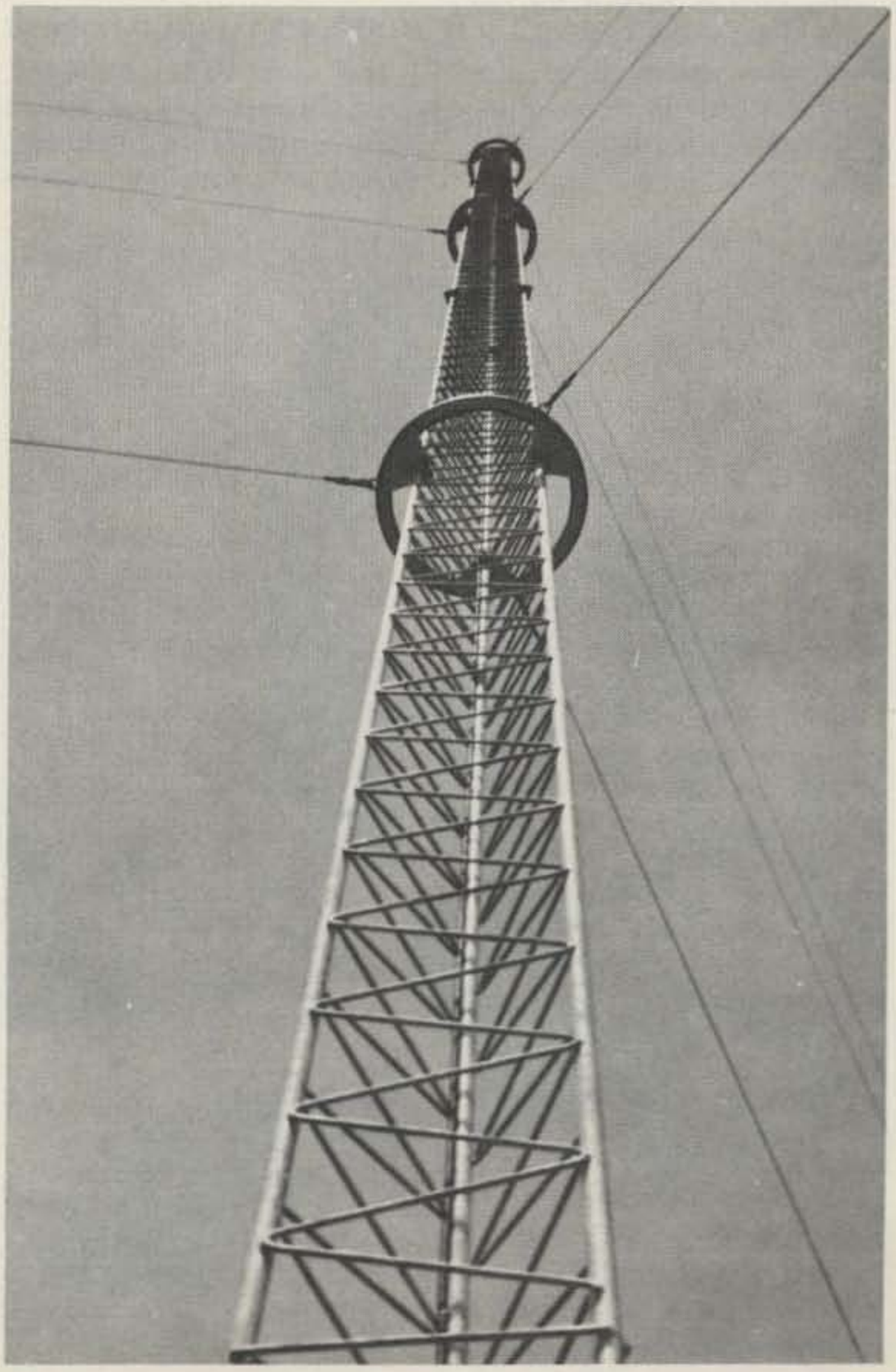
Faxscan's BP-3.

FAXSCAN'S MODEL BP-3 BEEPER

Faxscan, Inc., has announced their Model BP-3, representing the introduction of a new concept for amateur radio operating ease. The BP-3 is based on the idea used for years in commercial, military, and space communications. It provides a gentle beep at the beginning and end of each transmission by sensing the voltage on the PTT



The EZ Cord Control.



Tri-Ex's rotating tower.

line. Further, to differentiate between transmit and receive, the transmit tone has a higher frequency.

The purpose of the unit is to encourage a more natural conversation by eliminating the need to say "over" after each transmission. Under noisy or crowded conditions, the BP-3 virtually eliminates talk-over.

The unit can be directly interfaced to almost all modern gear. The only basic requirement is that the transmitter be keyed by grounding the PTT line and that the voltage at that point not exceed 24 V dc nor the current exceed 100 mA.

The construction is entirely solid state, with CMOS circuitry used to provide a unit that is virtually rf-proof. Current requirements are so low that a single 9-V battery (not supplied) will power the unit for up to one full year.

The BP-3 is perfect for use during nets or emergencies, or under noisy conditions. It is also great for VHF/UHF operation and makes a perfect repeater accessory.

The unit is available as "board-only" or encased. Both are fully assembled and tested. The "board-only" version, a mere 2" × 2", allows for custom installation.

The encased version comes complete with standard 4-pin microphone connectors, shielded cabling, and all interface wiring completed. It is designed for use with rigs using the standard 4-pin connector but instructions are enclosed to modify it for use with most modern gear. The unit is mounted in a "Faxscan gray" cast aluminum enclosure measuring 2-3/8" × 4-3/8" × 1-7/32" (W, D, H). Connection to most rigs involves plugging the mike into the BP-3 and the BP-3 into your rig's mike connector. Operation is totally automatic.

For more information, contact *Faxscan, Inc., 3148 Dorf Drive, Dayton OH 45418.* Reader Service number 483.

MODEL SDI-1150 SLIDE MOUNT

The new Model SDI-1150, quick-connection slide mount being introduced by Scientific Dimensions, Inc., will disconnect ten circuit leads plus coax. Designed for use with mobile two-way radios through the UHF band, this product will handle six more accessory leads than the Model SDI-1050 (which disconnects four circuit leads plus coax). The model SDI-1050 has been reliably used in the mobile two-way market for over five years.

The theft prevention and radio switching capabilities of the Scientific Dimensions line of quick-connection slide mounts have been applied to uses in construction, trucking, oil and gas, small service business, amateur radio, and utilities. The patented product line is sold to Motorola, General Electric, and professional land-mobile radio dealers nationwide.

For more information, contact *Scientific Dimensions, Inc., PO Box 26867, Albuquerque NM 87125.* Reader Service number 481.

HY-GAIN'S NEW DOUBLE ZEPP ANTENNA

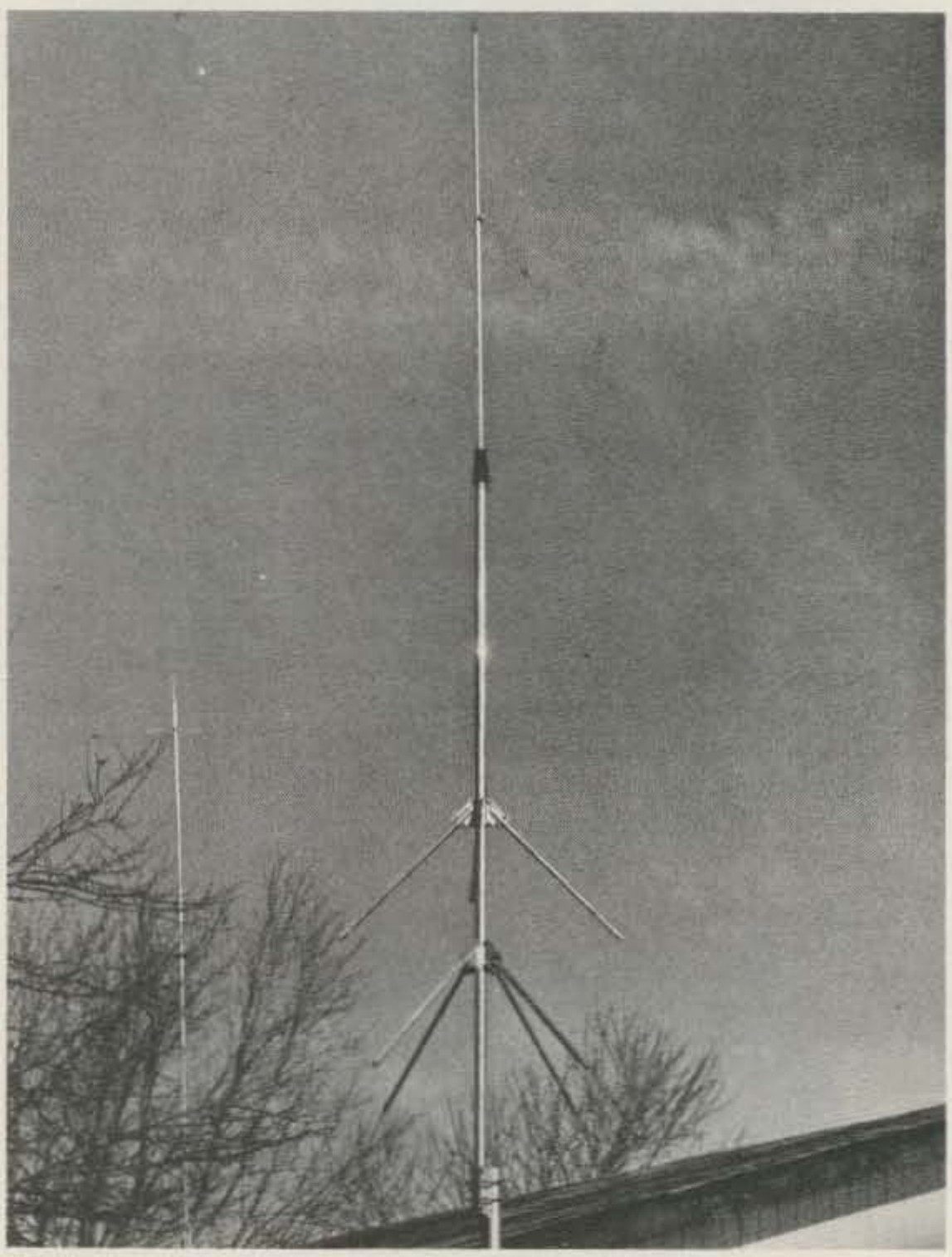
Telex Communications' new V-2 antenna is a 2-meter extended double zepp vertical consisting of two stacked 5/8-wave sections decoupled inside the antenna for complete weatherproofing. The decoupling system allows no rf on the coax feedline. The V-2 is a complete antenna that is easy to assemble and will mount on any mast up to 2" (50.8 mm) in diameter.

Two sets of 1/4-wave radials and a centered feedpoint produce an excellent radiation pattern that is very close to the horizon with a minimum of power loss into the sky. Radiation pattern testing was achieved on a ground-reflection range designed according to IEEE standard 149-1979; the test results of the V-2 and various competitive products are available from Telex/Hy-Gain.

The V-2 is designed to operate from 138 MHz through 174 MHz, obtains a vswr of less than 1.5:1 at resonance, and has a 2:1 vswr bandwidth of at least 7 MHz. The antenna's isolation from the supporting mast is 20 dB minimum.

For more information, contact *Hy-Gain, a division of Telex Communications, 9600 Aldrich Ave. So., Minneapolis MN 55420.* Reader Service number 486.

Scientific Dimensions' Model SDI-1150 slide mount.



Hy-Gain's V-2 double zepp vertical.

HF5V-III *from page 34*

best. To tune the HF5V-III, you simply loosen a wingnut and slide the loading coil up or down. There are separate loading coils for 80 and 40, and adjustment of these coils has a negligible effect on the resonance point on 20, 15, and 10. Use a waterproof marker to mark the position of the bottom of the coil for the phone and CW segments and you'll be able to readjust the antenna without even getting near your swr meter!

The other reason I chose the HF5V-III is the obvious care that went into its design and engineering. Butternut designed this antenna to be as efficient as possible on each band. The following theory of operation is excerpted from the instruction manual.

"The HF5V-III operates as a slightly extended quarter-wave radiator on 15 meters, using a quarter-wave decoupling stub to isolate the upper sections of the antenna from the first quarter-wavelength of that band. On 20 meters, the entire radiator is active and functions as a 3/8-wave resonant vertical having much higher radiation resistance than conventional or trapped antennas with heights of one-quarter wavelength or less. On 10 meters, the HF5V-III operates as a 3/4-wave radiator with considerably greater efficiency than quarter-wave types. On 40 and 80/75 meters, the appropriate resonator circuits provide the inductive reactance required for resonance in conjunction with a slight top loading effect from the 15-meter decoupling stub. The L/C ratios of the 40- and 80/75-meter resonator circuits also determine resonance on 20 and 10 meters. Because of the higher than normal 20-meter radiation resistance, the feedpoint impedance on that band is in the neighborhood of 100 Ohms in a typical installation. Therefore, a quarter-wave matching section of 75-Ohm line is used as a transformer for the 50-Ohm impedance of the main transmission line. This matching section has no appreciable effect on operation on other bands."

Power rating is two kW PEP on 40 through 10 meters, and 1.2 kW PEP on 80 and 75 meters. Bandwidth is quite good, covering the entire 40-, 20-, 15-, and 10-meter bands and approximately 100 kHz on 80 meters. With the optional 160-meter attachment, bandwidth is considerably narrowed on 80 and 40 but still covers the entire 20-, 15-, and 10-meter bands. Wind load is 1.5 square feet; overall height is 26 feet. Shipping weight comes in at 12 pounds, and DXpeditioners may be interested in the special version that allows the antenna to be packed in a relatively small package, with no change in operating characteristics.

Installation

Both roof and ground mounting are straightforward and uncomplicated. It takes less than two hours working at a leisurely pace to assemble a Butternut HF5V-III. The parts fit well and needed no remedial hacking or drilling. Both antennas I built required no adjustment beyond setting the 80- and 40-meter coils for the desired portion of the band. The instruction manual is very well done, with clear assembly instructions and diagrams. There are lots of hints on installation and ample detail on ground systems and their necessity. For the roof-mounted antenna, I used the excellent tuned radial kit that Butternut offers. A system of non-resonant radials resides beneath the ground-mounted antenna, with several wires in excess of 350 feet.

If you are interested in a vertical antenna and can't decide whether to mount it on the ground or on your roof, you should know that indications are that the roof-mounted antenna will be the superior performer. In any case, laying the required radial system for a ground-mounted vertical can be extremely time-consuming. I calculate that the time I spent installing the radials for my ground-mounted vertical would have easily paid the difference between a vertical and a small tribander to mount on my roof!

One has to be very cautious when comparing a vertical to random wire or dipole antennas. Initial comparisons between a 100-foot random wire and the HF5V-III were not particularly encouraging. I used a coax switch to flip back and forth between the antenna tuner for the random wire and the vertical, and the wire seemed to run about one S-unit higher on receive. Surprise! The low angle of radiation of the vertical made itself known when we started tuning in DX stations—DX signals were definitely stronger on the vertical!

Conclusion

The HF5V-III goes together easily and is definitely one of the best of its breed. A vertical antenna is no match for a rhombic, yagi, or quad, but for those of us with limited real estate and funding, it represents an alternative worthy of serious consideration.

For more information, contact: *Butternut Electronics Co., PO Box 1411, San Marcos TX 78666.* ■

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Last month I promised you something to read and something to help you write. No liar I, here we go with some summertime treats.

As I have mentioned before, one of the popular sidelights of having a RTTY machine in the shack is scouting around for non-amateur RTTY signals. The airwaves are full of such beasties, not all of which are decodable, which represent news services, government radio, and other exotic radio stations. A guide to these signals is always welcome, assuming that it is accurate and complete.

A few months ago I reviewed such a guide: Oliver Ferrell's *Guide To RTTY Frequencies*, published by Gilfer Associates, Inc., at $8.95. This month we shall take a look at another entry, a book entitled *World Press Services Frequencies*. Written by Thomas Harrington W8OMV, the book claims (Mr. Ferrell's work notwithstanding) to be the "only one of it's (sic) kind, up to date," and to lead to "exciting news from the far corners of the world." Pretty tall order; let's take a look.

The book's format is in the large, 8½" by 11" size that most electronic magazines have adopted, in contrast to the 9" by 6" size of the Gilfer book. However, the typography is wide open and large, with generous margins and spaces between lines, accompanied by a cute logo of the world on each page. This severely limits the content of each page.

The opening section of the book is a brief, two-page introduction to RTTY, giving the basic "way in" to reception. It appears to be oriented for the non-amateur, or at least for the amateur not involved with RTTY. Next comes a short discussion of time zones, shift, speed, and Baudot (sic) vs. "Ascii" (sic)—as opposed to Murray vs. ASCII code. The codes, however, are not explained—only mentioned. Two pages of photos of several modern receivers are featured, along with mentions of the Info-Tech, IRL FSK-1000 (reviewed here a while back), and HAL ST-6000 converters. A brief mention of printers and whiz-bang readers concludes the first section.

Information on transmitting RTTY stations is presented in several lists. About 225 entries are for world press stations, listed in order of transmitting

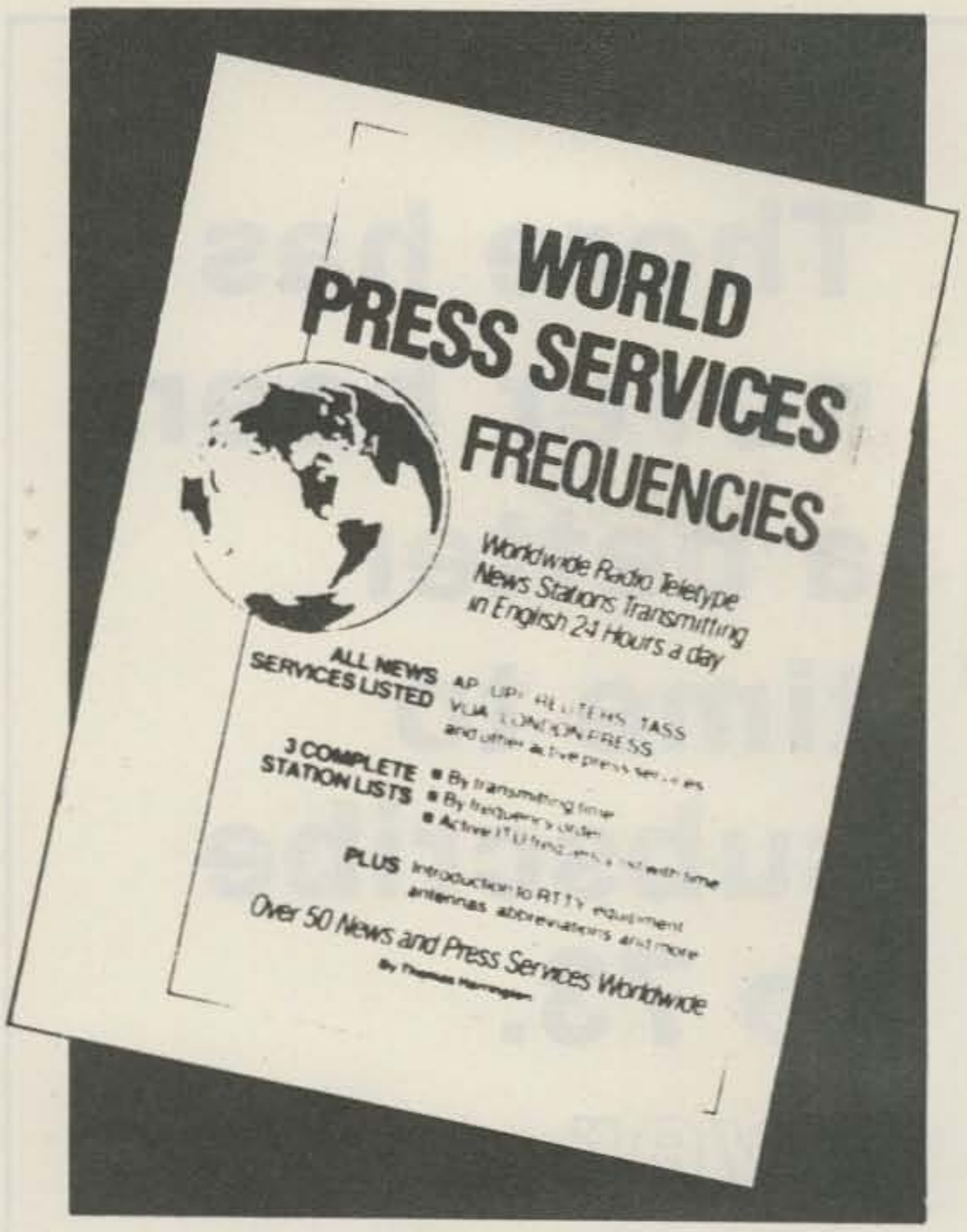


Fig. 1. The Harrington book.

times. A second list contains about 150 entries, describing these same stations in order of frequency. A third list shows International Telecommunications Union press stations in frequency order, showing about 250 stations.

The author indicates his intent to update the information in his book periodically and mail updates to registered individuals. This is an ambitious undertaking and would certainly do much to keep the information current. I should note that this book states, as does the Gilfer one, that all stations listed have been monitored and that this is not just a compilation of stations from a frequency log.

World Press Services Frequencies is available for $5.95 from Universal Electronics, Inc., 1280 Aida Drive, Reynoldsburg OH 43068. It does not have all the listings presented in the Gilfer book, but it may be entirely adequate for the amateur interested in listening in to world press services.

Of course, the other half of my promise, something to write with, is a printer. I have got to tell you about one of the hottest new printers around—one you may have heard about already. Let's take a look at some of its features.

This is a dot-matrix printer that supports the full ASCII character set, numerics, symbols, and upper- and lowercase. The print line is a maximum of eight inches and can be configured with character sizes yielding 40, 66, 80, or 132 characters per line. Furthermore, while standard line spacing of six lines per inch is the default condition, the printer may be switched to eight lines per inch (1/8 inch per line) or a tight 7/72-inch spacing. The resolution may be controlled even further to give one-dot vertical spacing or twenty-four-dot double spacing, all under program control.

Like more? The lower case g, p, q, and y all have descenders that make them look more like the letters we are used to. And a double-strike mode is available to fill in the gaps between dots and approach what is commonly referred to as "letter quality."

Like to see a sample? Fig. 3 is a sample printout, set up for 132 characters per line and eight lines per inch. The justification, by the way, is provided by my 6800-based computer. I think this is quite acceptable, don't you?

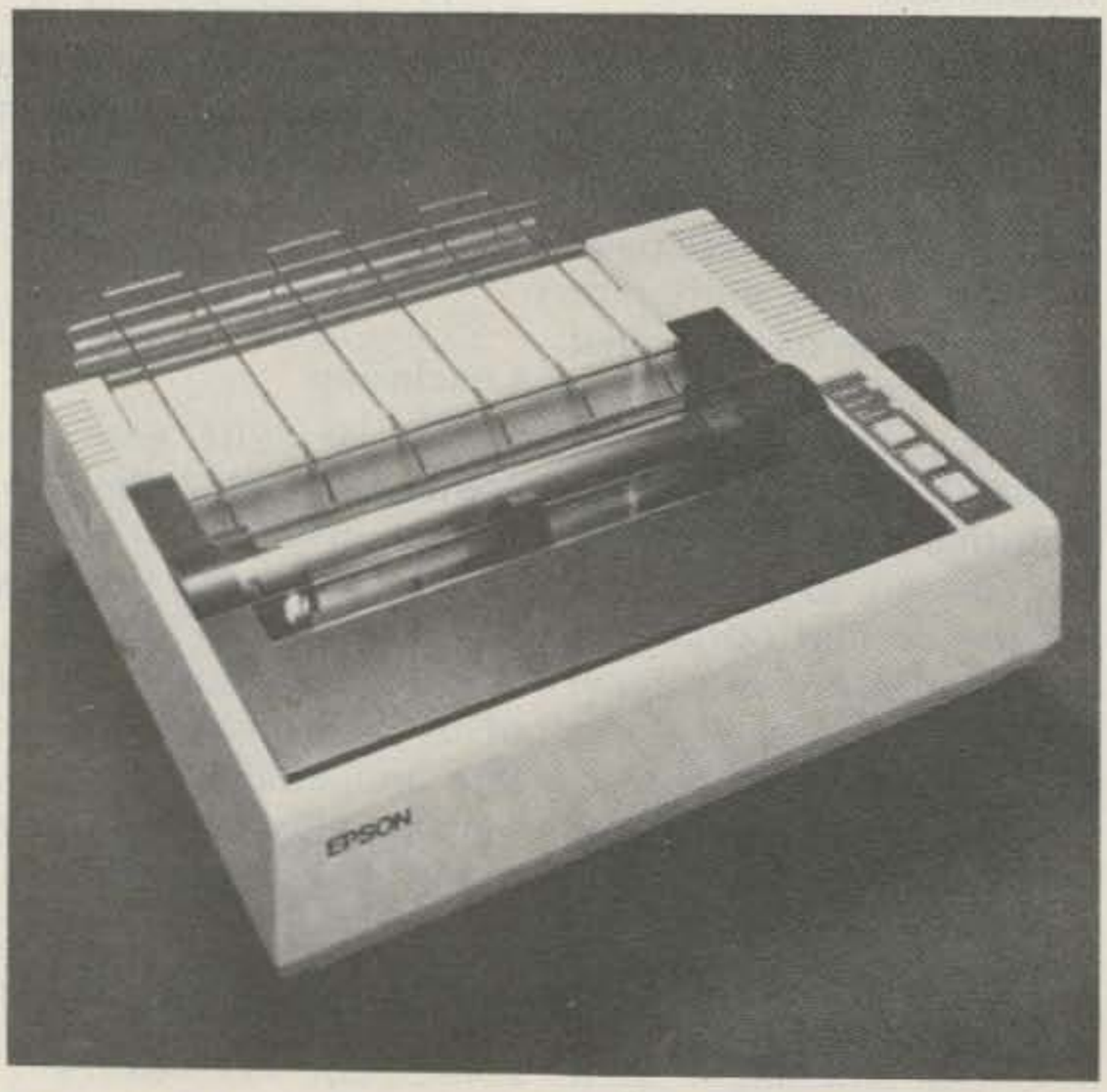


Fig. 2. The Epson MX-80.

How about graphics? Well, the standard TRS-80™ graphics character set is supported and usable by even the non-TRS-80 user. Speaking of character sets, flick a DIP switch inside and you can get any one of several foreign language character sets. French, complete with accents, British (the pound sterling, you know), or German, mit der Umlaut, are all available. Not only that, but an entire Japanese Katakana character set may be substituted for the TRS-80 graphics, again, at the flip of a DIP.

Still not impressed, huh? Would you like a vertical format unit that supports vertical tabs? You got it. How about a built-in beeper/bell to sound off for fun, or to tell you something's wrong? That too. Let's add a standard parallel interface that will plug in to just about any computer, and see what we've got.

At a list price of $645, but being sold at considerable discounts, we have the Epson MX-80 printer. Quite a bundle, I'd say. But before we conclude, let's look at some problems. First off, the MX-80 has a one-line buffer for input. One of the nice things about a printer with at least several hundred bytes of buffer is the ability of the printer to "follow" the computer. The computer can dump its output to the printer quickly and then proceed with processing while printing is going on, neatly overlapping functions. With a one-line buffer, this rarely happens, so the computer sits and waits for the printer to finish.

Furthermore, if the MX-80 is used in the serial mode, the user must be aware that the printer will not accept input while the carriage is returning or other functions—such as graphics—are going on. This necessitates the addition of nulls into the data stream, somewhat slowing the printer throughout.

A minor problem is that the platen cannot be moved manually while the printer is energized. Thus, if a slight adjustment is needed, say to place print on a form, the printer must be turned off and any conditions set up in the printer's memory are lost.

All things considered, however, the MX-80 is a gem of a printer. Several new accessories, including full dot graphics and friction feed, broaden the horizon of this versatile unit. At least one manufacturer of a microcomputer-based RTTY station, Microlog, features the MX-80 as a companion to their unit. If you are looking for a printer, take a long look at the Epson MX-80.

Now, every few months I feel I must repeat this request. If you write me or any other author whose works you enjoy, please enclose a self-addressed, stamped envelope if you expect a reply. Also, remember to mention RTTY Loop and *73 Magazine* to those companies whose products you read about in these pages. They appreciate the feedback.

```
A few months ago I
reviewed such a guide,
Oliver Ferrell's "Guide To
RTTY Frequencies", published
by Gilfer Associates, Inc.,
at $8.95. This month we
shall take a look at another
entry, a book entitled
"World Press Services
Frequencies", costing $5.95,
from Universal Electronics,
Inc. Written by Thomas
Harrington, W8OMV, the book
claims, Mr. Ferrell's work
notwithstanding, to be the
"only one of it's (sic)
kind, up to date," and to
lead to, "exciting news from
the far corners of the
world." Pretty tall order,
let's take a look.
```

Fig. 3. Sample printer output.

Speaking of feedback, we will have some next month. Look for it in RTTY Loop!

LETTERS

THE FIRST COAX?

In his article "Inside Coax" (*73*, May, 1981, p. 78), Dr. Jenkins states that "Prior to World War II, coaxial cable was unheard of."

In 1940, Rex Bassett sold me 50' of coaxial cable at his factory in downtown South Bend, Indiana. He used some kind of rubber as the dielectric. By today's standards, and I think Mr. Bassett will agree, it wasn't too efficient. But it was coaxial cable and I used it to feed my 10-meter antenna for over a year before WWII shut down ham radio.

By coincidence, on page 37 of the same issue, I see Rex Bassett is still in business some 41 years later, having moved his plant from South Bend to Fort Lauderdale.

Robert H. Pearson KH6AKW
Aiea HI

A SNAP

You can chalk up another ham as a direct result of your code-practice tapes. The FCC 5-wpm exam really was a snap after working with the 6+ tape.

So, now I am on to the 13+ and an Advanced license. Thanks for making the code test easy!

William B. Schneider
Technician (no call yet, but passed the test)
Jacksonville FL

LESS IS MORE

Just two weeks ago, I had a rare privilege. Upon arriving at the home QTH, my son informed me that my new *73 Magazine* had arrived in the mail.

That event was like a cool breeze on a warm day. Finally, I could once again be in contact with my hobby through the auspices of your very fine magazine.

Keep up the fine work and to Mr. Wayne Green, even if you are wrong a fair amount of the time, Wayne, you are upholding a fine north-American tradition of saying your piece in a free press. Stay in there and keep on slugging.

I might add that I was slightly sorry to see a magazine which, while it is up in price, is down in thickness and we therefore seem to be receiving somewhat less for our money. Will be looking forward to receiving future copies.

L.E. Babcock, Sr. VE6BAQ
Edmonton, Alberta
Canada

GETTING HIGH

I rarely write to a magazine, however the article in the June *73*, "Repeater at 102,000 Feet!" by VE4FK, certainly was outstanding in all ways. Give us more like this!

Kenneth C. Haas K2YKE
Buffalo NY

MOUNTAINTOP PARTY

On August 1, 1981, there will be an Amateur Radio Mountaintop VHF Party. From the lowest to the highest, pick your favorite peak. Bring yourself, a friend, your two-meter portable FM station, and go for the top. The official time will be Saturday, from 1000 to 1500, local time. The official frequencies will be 146.55, 6.58, 147.51, and 7.57. The WA6GUO/WA6SUW team will be looking for stations on mountain peaks from the top of 14,000 ft. Mt. Shasta, in northern California. For further information, call Dave Bermann WA6GUO at (916)-877-5606. This is not a contest, just a big party.

David A. Bermann WA6GUO
Paradise CA

IN COHERENT CW

This a note from an amateur, HS4AMI, 420 km, seven hours northeast of Bangkok. When I came here in September, 1980, the ARRL said they would ship my amateur club a couple of their Friendship transmitter kits—but nothing arrives. Oh, well, "drinking" executives can't do everything.

I am teaching amateur radio as an extra course to science and engineering students. We are progressing through tuned circuit to antenna theory.

My coherent CW experiments have been a great success: 559 both ways to California with 1 Watt, on 10 meters. We are going for 100 mW over 10,000 km, at 10 baud, with 24 dB gain and *no* filter. We will be happy to hear if our 10-100 mW are heard on the east coast.

Our format is at a 10-baud, crystal-controlled rate. We send

dots for tuning and then ident on 14,049,000 Hertz ± 1 Hz at 1500 and 2300Z every day.

The transmission can be heard on any receiver. The big gain is when you have the digital filter.

George Collins HS4AMI
Khon Kaen University
Khon Kaen, Thailand

SPREAD THE WORD

I just read Wayne's editorial in *73* in the June, 1981, issue and found it very interesting. You say Japan has twice as many hams as the USA. I can believe this. I'm 51 years old, no kid, and have reasonable intelligence, but it took me 11 months to find out how I could become a ham. After all that time, I get to go to my first lesson for my Novice tonight.

I'm really excited because I think it's a great hobby and will probably invest approximately $2000 for equipment. But what a shame it took me so long to find out how to start. The problem is that you guys are like a secret organization.

I checked all over on clubs and how to get started, (Radio Shack, local electronics parts' houses) and all I got was (at Radio Shack) the advice to read a book. I didn't want to read a book, I wanted to talk to someone. I couldn't check antennas on roofs because CB and ham antennas look alike to me.

So maybe if you folks would put out signs at Radio Shack, etc., about clubs and classes it would help build up amateur radio. I don't mean to be a wise guy, but if you folks did more to promote the hobby, more of us would find out about it. There may be 1000s of people out here just trying to find out where to start.

Robert W. Simpson Sr.
Glen Mills PA

SEEING-EYE HAM

I would like to see a "thank you" printed in your magazine. I drive a semi truck and was directed to the heart of New York City, New York, by a person that did an excellent job. I didn't make one wrong turn and was led by the hand via 2 meters for about four hours without a let-up.

I found out later that Butch N2CGQ was blind!

I didn't think much about that because if a person lives in a place many years, he could direct you around town from his QTH. But I just found out yesterday that the fellow only knew New York by what had been described to him. So, Butch put his Seeing-Eye dog aside to help me find my way.

Thank you, Butch, for your assistance and keep up the nice work.

Leo Mercer
Albert Lea MN

ANOTHER POLL?

After having thoroughly enjoyed John Edwards' poll in the June, 1981, issue, I decided to conduct a survey of 20-meter CW. The following results were tabulated:

90% think they have keyers that stick.
2% think I have a receiver that chirps.
87% of those calling CQ are named Noah (why else would they sign with ARK?).
100% think that even though I am hundreds of miles away I am concerned that it is raining there.
67% are quick to point out that they have no problems when I tell them I have TVI.
45% think the band is in bad shape.
13% just got home from school.
12% are just leaving for work.
8% think the QSB is very bad and could I help by slowing down.

I am ever willing to add to the fund of ham radio knowledge.

James F. Reid W8LWS
Laurel MD

GOOD OLD RAY

I am writing to try to clear up a problem I've had ever since I was assigned the call letters W2YI in 1977: I've received many QSL cards from the bureau, dating from 1971 through 1980, for "W2YI, Ray, New Jersey."

To begin: Dear fellow radio amateurs, please accept my apology for any inconveniences you've been caused by this fellow, Ray. He is not assigned the callsign W2YI and, as the FCC has told me, he never was. They have assured me that I am the only person licensed to operate an amateur radio station with that callsign. I am sorry you've been duped by this person.

I would appreciate hearing from any amateur who has any information about good old Ray from New Jersey. He prefers to operate CW on 14 MHz and has worked mostly Europeans. I do have a few QSLs from his expeditions to 40 and 80 meters also.

The FCC has begun a monitoring program, and is fully aware of Ray's activities. It has assured me that I will not be held responsible for Ray's illegalities.

I feel Ray should get off his duff and study for his own Extra class license, since it is not that difficult. It seems he is already a licensed radio amateur, holding a General or Advanced ticket, who is too lazy to take the time to study and upgrade. Another theory holds that he is an ex-military CW operator who likes to DX a bit, but doesn't want to take a test.

And now to Ray: Ray, I am not angry or spiteful about your actions. The FCC understands that I'm not responsible for any problems that may arise as a result of your operations. I do wish to hear from you, though. Please drop me a letter, and enclose a check to cover the costs of maintaining those envelopes at the second call area QSL bureau, courtesy of the kind folks at the North Jersey DX Association.

Jeffry M. Blackmon
The Real W2YI
7714 Lindbergh Avenue
Niagara Falls NY 14304
(716)-283-8346

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

TOTAL OVERHAUL NEEDED

This will not be a normal Looking West column. That's not to say that you should bypass it, though. In fact, I hope that this month we will attract a far greater cross section of the amateur populace than usual. The reason will become evident as we progress.

Simply said, there's something wrong behind the so-called "Codfish Curtain." For those of you who have never heard the term before, I refer to the upper echelon at Newington. First, there was the Central Division Director's race. This is still in dispute as far as the Indiana Radio Club Council is concerned, and I suspect that Wayne will be covering this in depth. On this one, I bow to our fearless leader.

Now, on the heels of this controversy there erupts yet another. One that hits at the very foundation of amateur radio. For the people involved are considered to be the upper crust of amateur radio, the Big-Gun DXers. Why should a group of these people band together for the purpose of undermining the ARRL's DXCC program? In case you were not aware, that's what has happened. As you read on, I think that the rationale for their actions will become quite clear. If not, then tune in the low end of 20 meters and listen to a few pileups. It will become quite self-explanatory at that point.

I should preface all this with a few remarks. First, I neither condemn nor condone the action taken. I can understand the frustration of those involved. Yet I have to say that nothing has ever been accomplished by "burning down a house because you don't like the furniture inside." Second, I am not a DXer. In fact, I don't really fall into any particular category of amateur except possibly that of observer.

As the latter, I come into contact with hundreds of amateurs annually. With some, I share common interests. With others, there is no commonality. Somewhere in between there is another group: Those with whom I

became friends on a social level, while finding commonality of interest in amateur radio.

It is because of this latter involvement that I can relate firsthand the story which is about to unfold. It is based directly on a taped interview with a very well-known DXpeditioner, Dave Gardner K6LPL. Also, there will be some supposition on my part, but the supposition itself will be based upon the fact that I spent about 50 hours editing the audio tapes of Dr. Gardner's ill-fated 1979 DXpedition to Palmyra. A trip that almost cost Dave and those with him their lives.

I think that the best way to begin is to explain the situation as of this date: the 27th of May, 1980, and then present, verbatim, my interview of the 23rd with "Dr. DX." Here we go:

Westlink Newscast #193 for the week of May 25th, 1981, story item number 4: An amateur has been disqualified from DXCC, and another has quit the program as a result of a bogus QSL card scheme now roaring through the DX community. On April 23rd, the League disqualified Robert Findley W6NZX from DXCC because they allege that Findley submitted forged and counterfeit QSL cards for DXCC credit.

Now, hot on the heels of Findley's disqualification comes word that Dr. Dave Gardner K6LPL has tendered his resignation to DXCC, at the same time stating his part in what appears to be a worldwide attempt by some leaders of the DX community to effect what they feel are needed changes to the DXCC program. [At this point we inserted a 33-second sound bit with Dr. Gardner explaining what transpired and why. This will be reprinted later on, so there is no reason to duplicate it here.]

Gardner told us that the idea began at last year's Fresno International DX Convention, and that 14 well-known DXers were involved, ten of them being Honor Roll members. In our interview, Garner stressed what he felt were three key points. First, that this was not an attempt to discredit either the League or its DXCC program. Second, that all the cards involved, possibly as many as 25,000, were all pre-1975 vintage. [Ed. note: As explained later, the date was chosen to not influence those currently trying to climb the DXCC ladder or affect their standings.] Third, that his three QSL managers, W7PHO, W6AHU, and N6AHU had no knowledge or involvement in what Gardner termed to be an organized protest to point out the greed and avarice of many hams.

What action the League will take from here is unknown. A DXCC Advisory Committee member we spoke with declined to comment officially on the matter. He did say that there was no machinery set up to accept the resignation and that any action taken would be precedent setting.

OK. There you have the capsule version. Your basic one-and-a-half-minute news story. But, there is far more to it than what appears on the surface. This I learned while talking to Dave Gardner. Here is our conversation:

Q: What do you know about the bogus QSLs running around in DX circles?

A: At the 1980 Fresno International DX Convention, 14 hams were engaged in a rap session about improving the sorry state of DXing. We decided we had to get the attention of the amateur community to bring the hobby of DXing back to that which would generate some international goodwill and good times instead of this terrible race for QSL cards which has led to greed and avarice and foul language, etc., on the bands. The way we chose to do it was by flooding the world with pre-1975 QSL cards. These cards were given by the 14 members of our group, 10 of whom are Honor Roll members, to amateurs around the world. Our estimate is that about 5,000 of these cards have made it to DXCC headquarters thus far.

I do want to say that his action was not anti-League or anti-DXCC. It was designed to capture the attention of the world so that we might once again bring amateur radio DXing back to what it was before, a hobby instead of an addiction for QSL cards.

Q: What do you think will happen now?

A: I don't really know. Pre-1975 QSL cards are floating into the DXCC office [ARRL headquarters]. I hope it will help the league reassess its position about DXCC and help to take some of the violent competition out of DXing, and also help eliminate some of the bad feelings all over the world in the DX community. It's impossible for a rare DX station to get on and rag chew with a friend. He's completely smothered by people wanting QSL cards. This forces people onto lists, and that's just like reading out of the telephone book. It's certainly not DXing. All it amounts to is getting the QSL card. While I have not been anti-list in the past, I now see this as being another effect of the whole craze for QSL cards.

Q: Do you blame the DXCC program for all these problems?

A: It's not just the DXCC program. It's partly DXCC's fault, but I think the people at DXCC are well intentioned. I don't think them to be evil people trying to do bad. I do think that their policies, among other factors, have led to a general deterioration in the quality of amateur radio, and amateur radio DXing in particular.

Q: Why this route rather than the political one, i.e., lobbying for change with the DX Advisory Committee?

A: The DX Advisory Committee really has no power. They can only make recommendations to the General Manager [Note: currently Dick Baldwin W1RU] who takes it upon himself to decide what *is* a country and what *isn't*. He's a fine gentleman, but he has been unresponsive to the DX community. I just think that the League's emphasis is so far away from improving the DX conditions (operating standards) that I do not think they really care all that much. We didn't think the League would be responsive at all, because they have not been in the past.

Q: What action have you taken as a result of this so-called scandal?

A: I've personally resigned from DXCC. I know of several others whose resignations are also imminent. My resignation was tendered well before this "scandal" broke. We hope that in the future people will have a bit of a question in their minds: "Is that QSL card really necessary and is it worth the price of my own personal pride I will have to pay?"

As to my own future plans? I will continue to work my DXpeditions in the same way I have in the past. All of my own QSLs are handled by QSL managers and they were not in any way a part of this operation. I should also state that the operation is over. No more cards are going out. No more will go out. We feel we have made the point we had to, and now it's time to go on and try to improve conditions in amateur radio DXing.

There you have it! Right from the source. Dave did not name the others involved. In a subsequent conversation, he explained that it was for each of the people involved to come forward of his own accord if that person felt he wanted to. But there is something far more important than who did what involved here. In the view of this writer, it again points out the inability of League headquarters to deal with the problems of "today's" amateur radio scene. When a group of the world's top DXers has to band together outside the ARRL and try to force change, because headquarters has been unresponsive to their ongoing call for change, something definitely is awry. I think that "unresponsiveness" is the key word here and it's not just in dealing with the DXCC program and the problems some feel it creates. Let's look a bit closer to home.

On the two-meter band, there has been an ongoing call for more years than I can remember that the Board of Directors enact a specific band plan in regard to the 146 through 148-MHz repeater subband. Thus far, there is still no true standard. The east runs repeaters every 15 kHz right-side up; the west runs them every 15 kHz inverted and the Pacific northwest opted to totally recoordinate on 20-kHz centers to match the 144.5 through 145.5-MHz subband. Instead of taking a stand one way or the other, the Board continually postpones making a final decision.

OK. Most of us are lucky enough to have synthesized radios these days and most, though not all, will work under all conditions. Am I being picky? I think not. Keep in mind that several parts of the nation are currently becoming involved in what amounts to a "squeeze play." Inverted systems moving toward them from the west, and non-inverted from the east. One of these days, there may be one heck of a looped lockup when the two forces meet. And who

will suffer? The poor ham caught in the middle. Yet, the Board fails to act. Fails to take a stand. I honestly think that they are unaware of the consequences their unresponsiveness may eventually cause. But, they're going to have to take a stand and they're also going to have to learn that you cannot appease everyone, that a nationally-standardized band plan for this spectrum is essential and whatever one they choose will be unpopular in some quarters. It will probably be met with some resistance. But, choose they must.

I think that Gardner has hit upon something important, perhaps the key to what the real problem is in Newington. If this is the case, and I happen to be a League member and supporter who feels it to be so, then maybe it's time that the rank and file, you and I, start taking some positive steps toward revamping "*our*" organization to what is needed to represent us in today's fast-paced society. I've always said that criticism brings with it a responsibility of alternative, so here goes.

First, I think it's time that the rank and file members of the League are given the opportunity to elect more than just their Division Director, Vice Director, SCM, and the like. We should also be the ones who elect the President, the Vice Presidents and other upper-echelon personnel. Maybe utilize a system similar to the Electoral College as used in our own federal government. Here, though, you would vote to "direct your Director" to cast his ballot for the candidate the majority in a given Division voted for, on a popular-vote basis. If it works for the USA, it can work for the ARRL.

Then there are the many Advisory Committees whose advice seldom is heeded it seems. Suppose they were no longer Advisory Committees. Rather, each was empowered to make decisions and implement them. Here, again, you would need a change in the structure. Right now, the members of these committees are appointees of the given current League president. What they should be are elected representatives of a given Division, elected by their peers to represent their views and ideals. For instance, those serving on VRAC should be active members of the mainstream of VHF repeater operation. In other words, be active on all local 2-meter repeaters, since that's where the bulk of today's activity is. They should be accessible to their constituencies both on the air *and* on the phone. If a problem arises, they should be there to take command and arbitrate a solution. I must ask how many of you know who your VRAC representative is or how to get hold of that person on an immediate basis if an emergency were to arise?

This should hold true of all members of all special-interest committees. If you can't reach the man or woman when they are needed, if they are not willing to express your views as your representative, then why bother having such a person in the first place. By the same token, if your representative or an entire committee is ignored time after time, then the committee structure holds no value other than surface political appeasement. I know a number of people who serve on various committees of this sort, and you have no idea how frustrating it is for them to work diligently for months on end, dedicating their time and efforts in the hope of making our amateur community a better place to be, only to have a group of politicos veto, shelve, or ignore their works.

If Wayne Green and I disagree on any one point it's over the ARRL. Wayne has often stated that in regard to the League, you vote with your checkbook. That is to say, if you don't join or "re-up," you have voiced your displeasure in a way anyone can understand: in their pocketbook. I take a different view. First, I believe we need a strong national organization. Right now, the ARRL is the only game in town, and as of this writing nobody has taken the initiative to start a new organizational effort. Maybe someone will. Right now, the League is it, for better or worse. In that vein, I believe that the only way to make the ARRL into the kind of organization we need is to become active in it. Become aggressive. Work toward change. Yes, you will get shot down by the "old guard." In politics, that's the name of the game. If you have the tenacity and the courage of your convictions and if you can garner the support of your fellow hams, you can and will make your voice heard. Nothing is impossible! It merely takes dedication and the willingness to fight it out.

Since I began Looking West, I have been a League watcher. As you know, I have a very simple way of dealing with them. When they do something that's right, proper, and beneficial to amateur radio, I will be among the first to laud them for their achievements. On the other hand, when something is wrong, I will also be among the first to cast criticism. Yes, I am lucky in that I have a national platform from which to be heard, but even if this were not so, my approach would not differ.

I do not remember who coined the expression "Codfish Curtain" in describing Newington. I heard it expressed at more than one convention of late. Unlike a curtain made of iron which can only figuratively rust and decay with age, one made of organic matter can take on a rather odoriferous characteristic if left to the elements. I do not want to see this happen to the League. Not to *my* League. Yet, one must wonder when even the DX crowd has to rebel. To figuratively take to the hills, grow beards, and wage a guerrilla-type of war to get the attention of Newington. Not that I can or will condone such activities or that of any form of terrorism in the world today. Violence only begets violence; hate only begets hate. There's enough of this in the world today without it seeping into the very fiber of amateur radio.

Maybe the 14 DXers were wrong, but it's evident that they were crying out for needed change only to be met with a deaf ear from League headquarters. They made their decision and must live with it. You and I might have taken a completely different route. Nonetheless, I think the point they were trying to make is the very same one I am trying to make right here and now. A simple message to Newington that says wake up, "the times they are a changing."

KAHANER REPORT

Larry Kahaner WB2NEL
PO Box 39103
Washington DC 20016

...IT'S ALL A BIG MICROPHONE

Washington press credentials ought to carry warning labels like the ones on cigarette packs. It should read: "Danger —Covering Congress or federal agencies may result in loss of perspective."

We of the Washington press corps tend to overdo it. Granted, what happens here at the center of the empire eventually affects your life, but we probe every speech from every bureaucrat and analyze every bill even though it stands less than one in a hundred chance of becoming law. What happens as a result of that massive coverage is that we succumb to the forest/tree syndrome. Amid our hunger for details and minutia, we may not see the issues or spot the trends.

Such is the case with reportage of the government's apparent changing attitude toward regulation of the airwaves. Congress, the FCC, and other lawmakers want to change the statutes, little by little, to restrict what we see and what we hear. They wish to deny access to monitor the electromagnetic spectrum, a rather amorphous, albeit quite real, natural resource.

For the past several years, the news media has reported isolated government actions in this area but so far no one has taken a step back and looked at the big picture. *Newsweek* hasn't strung it all together, splashed it on the cover, and pronounced it a trend. Nor has NBC Nightly News run a special report at a quarter past the hour and declared it Truth.

It's not that they're poor journalists, and it's not that they don't care. It's just that we're all too close to the action to see it

clearly and understand that it isn't just a lingering fragment of the '60s paranoia.

Since 1934, when the Communications Act was passed, the law was clear. If it were sent over the air, you could receive it. If you could pick it up, you could listen. Transmissions are regulated for the public good, but receiving is public domain. That's the basis of the Communications Act and, in larger terms, a philosophy that stems from common law.

Constraints exist, however. You can't divulge anything you hear to a third party (that doesn't hold for broadcast or ham communications) but that seems fair; we can live with that.

But we're in a new age and the Communications Act needs rewriting. It's moldy, out-of-date, especially in the area of technology. Last year, Congress tried overhauling it but didn't get very far. They're trying it again this year, but it probably won't go anywhere either. For one thing, the subject is complex and most representatives are afraid to tackle it. However, if you read the proposals, last year's and this year's, you'll notice that they both include prohibitions against receiving so-called pay-TV and other private, commercial transmissions. No one argues that pay-TV operators deserve some sort of protection from video vampires who seek to steal their wares and market them for half price, but that can be handled locally on a case-by-case basis as "theft of service." Growing national policy towards regulating what we may receive seems to be traveling a dangerous path.

In another instance, the FCC has decided to amend the rules to allow licensees in the Power Radio Service to use scramblers. Service members, which includes power companies, prompted the rulemaking to reflect their concern that terrorists and vandals might intercept transmissions and somehow use the information to disrupt a nuclear power plant or blow up a group of hydroelectric generators.

The FCC gave the OK, as it did when police and fire departments requested similar permission. Unless a petitioner convinces the Commission that scrambling is a dumb idea, it becomes law on July 22.

In addition, the FCC said it will allow scramblers in other sectors of the Land Mobile Service on a secondary, noninterference basis. There was even talk of letting taxicabs scramble transmissions.

We can go on. Many states rule that you may listen to police on your scanners at home but not in your car. You may use a microwave receiver at your place of business but not in your car, because then it would be called a radar detector.

The trend is clear. More and more restraints and regulation of the public's access to transmissions that use a public resource.

FCC Commissioner Joseph Fogarty, commenting publicly on the scrambler proposal for the Power Radio Service, recommended formation of a task force "to study the problem of maintaining the privacy and security of the telecommunications network in the face of the threat by the new technologies."

Sorry, Commissioner. The problem can't be solved. There's no way that any telecommunications exchange can be made secure or private, because by its very nature the electromagnetic spectrum is like a city street. If you walk in it, you relinquish your right to privacy, and it seems that everyone really knows that *except* those who try to legislate that security and privacy.

If you want privacy, try a handwritten note. There will always be some high-tech freak who wants to exercise his right to listen and watch while you're using his natural property. Or maybe he'll just do it for the sheer challenge of breaking the code. Nevertheless, no one ever promised that airwaves would be private—in fact, the FCC has historically maintained just the opposite—and to expect it now is socially unreasonable and technologically impossible.

Perhaps the Secret Service—whose field communications consist of simple handie-talkies on easily-found VHF and UHF frequencies—says it best. After the assassination attempt on President Reagan last March, I asked a spokesman if the Service was planning any new procedures to tighten security. He asked in what areas, and I mentioned the handie-talkies. I told him I knew the frequencies and even the code words; Reagan is "Rawhide." "Isn't that a security problem?" I asked.

He replied: "We don't use scramblers because you'll only figure out how to unscramble it. And we use code names because it makes things easier for us. Our philosophy is simple: 'Say nothing over the air that you wouldn't say into a microphone connected to the loudest PA system in Washington. The telephone, the radio; it's all a big microphone, and that's the way it's always going to be.' "

CORRECTIONS

Since my article "The Nicad Conditioner" was published in the April, 1981, issue of *73 Magazine,* I've had many letters from as far away as Honolulu complimenting me on it.

One reader did note a minor error in the diagram shown in Fig. 3 (p. 107). At the top of resistor R2, there should have been a dot to indicate a connection. Without this connection the timer module would not receive its trigger pulse.

Mitchel Katz W2KPE
Flushing NY

Re the article, "Mayday," on page 78 of the June, 1981, *73 Magazine*: After continuous operation for 7 months, we finally had our first Clegg 22'er equipment failure on the ELT detector. The failure was attributed to overheating of an audio loading resistor in the audio output stage. The problem was corrected by circuit changes and relocation of heat-generating components as detailed in Fig. 1.

The DF articles in the June issue were extremely informative and I hope will encourage further innovative advances in the state-of-the-art of DFing.

Ed Sommerfield W2FJT
Poughkeepsie NY

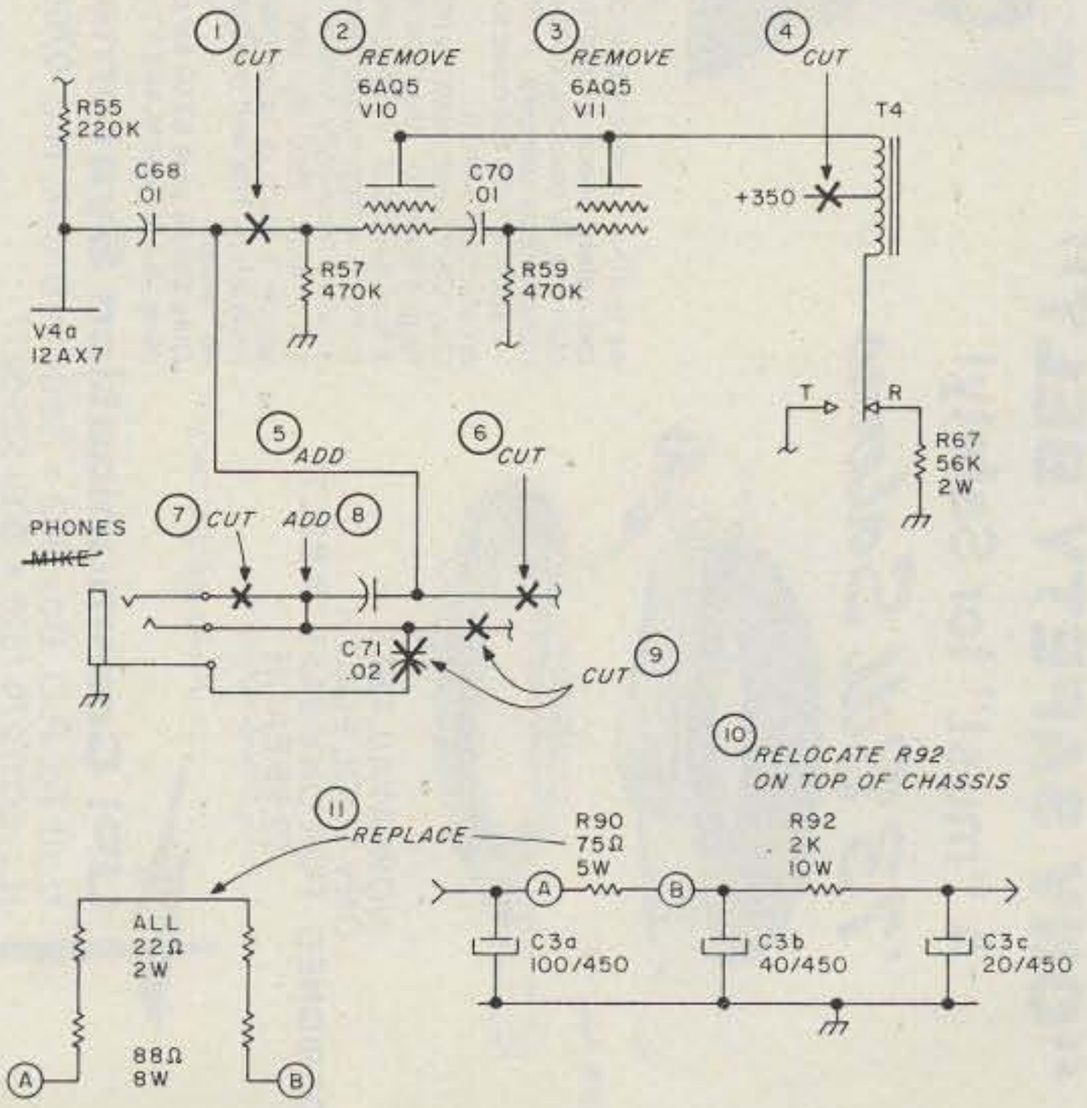


Fig. 1. 11 changes to the Clegg 22'er ELT detector to eliminate heat problems.

Homebrew Headquarters

— COMPONENTS —

- ☐ Amphenol connectors
- ☐ B & W coils, switches, antennas
- ☐ Hammond and LMB enclosures
- ☐ Jackson dials and drives
- ☐ J.W. Miller parts
- ☐ Knobs and shaft couplers
- ☐ Millen components
- ☐ Multronics roller inductors
- ☐ Padders and trimmer capacitors
- ☐ Resistors, capacitors, inductors
- ☐ Semiconductors
- ☐ Toroids, cores, beads, baluns
- ☐ Variable capacitors:
  Cardwell — E.F. Johnson
  Hammarlund — Millen
- ☐ Wire and cable

— KITS —

Microcomputer-based Contest Keyer (*hr* 1/81) partial; CMOS 2-Meter Synthesizer (*hr* 12/79) partial; 40-Meter QRP Transceiver (*hr* 4/80) partial or complete; Split-band Speech Processor (*hr* 9/79); IARU Rx and Tx (*QST* 4/78 & 12/78); W1JR Broadband Balun (*hr* 4/79); R-X Noise Bridge (*hr* 2/77); Memory Accu-Keyer (*hr* 4/79) boards only.

Catalog 25 cents

✓454

RADIOKIT

Box 411H, Greenville, NH 03048
(603) 878-1033

FOTO-SLAVE TRIGGER KIT

Probably the most sensitive slave trigger kit on the market. Not affected by ambient light. Much superior than LASCR types, this kit can operate from bounce or indirect flash. Kit includes all parts, circuit board and sync cord for connection to strobe. Size: 1.5" x 1".

C4450 $6.00

WHEEL OF FORTUNE KIT

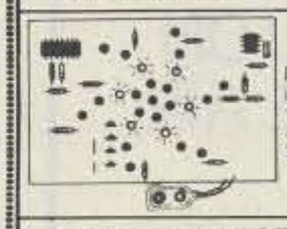
C3806 $9.99

Popular game device uses LEDs, transistors, and IC to give the effect of a bright red ball spinning around numbers. Unit emits sound as ball spins and finally stops on a number. Incl. all parts, faceplate & PC board.

SEQUENTIAL LED FLASHER KIT

IC circuitry sequentially lights up 10 red LEDs continously. With all parts and PC board. Size: 5.25" x 1.5". Requires 9V battery.

C4431 $6.75



FASCINATION STAR KIT

Produces an "exploding star" visual effect. Uses 25 LEDs and IC circuitry. Great attention getter for discos, etc. With all parts and PC board. Size: 5.2" x 3.4". Requires 9V battery.

C4432 $10.95

SOUND EFFECTS KIT

Compact kit uses the popular TI76477 chip to create phasor, locomotive, siren, birds, etc sounds. With all parts, PC board and speaker. Size: 3.25" x 2". Requires 9V battery.

KIT C4422 $12.95
ASSEMBLED C4423 $15.95

GREEN NEONS

Same as NE2 except glows bright green. Operates on 120VAC. C4451 8 for $2.00

PHOTOFLASH CAPS

350MF 330V C2928 .75

720MF 360V C2930 $1.75

SOLAR POWER SALE

$2.95 C4448 Giant 3" whole cell output .4V at 400MA

Special 9V 30MA battery replacement panel for powering transistor radio, calculator. C4396 **$12.00**

120 VAC Xenon Strobe Kit

Complete variable rate strobe light kit. Contains all parts, PC board, line cord and instructions.

C23071 **$7.50**

LARGER SOLAR PANELS

6V 125MA	$ 25.00	C4409
12V 125MA	$ 49.00	C4410
12V 250MA	$ 85.00	C4411
12V 500MA	$150.00	C4449

CHANEY electronics inc. ✓455

P.O. BOX 27038
DENVER, COLORADO 80227

Phone Orders
303-781-5750

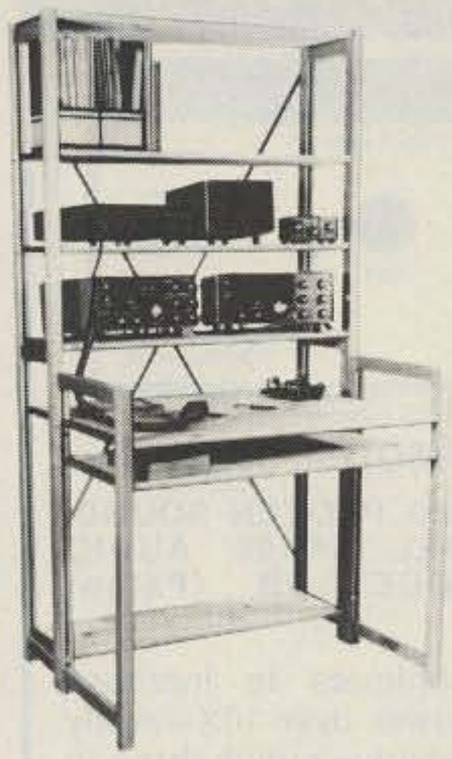
- Minimum AD Order $6.00
- Please include $1.50 for postage
- VISA MC accepted
- Phone orders are welcome

Send for our free catalog of unique items

---

presenting

SHACK DESK



a functional piece of furniture

Radio equipment not included

only $107.50

Pre-Fabricated — Just Assemble.
Open construction. Suitable to enclose.
36'' wide by 30'' deep & 72'' high
Shelves adjustable on 2" centers.
No. 3 pine shelves and select uprights — sanded, ready for finish. ✓463
Write for other available sizes & options.
Master Charge, Visa, Money orders and Checks accepted.
F.O.B. Fort Wayne (Ind. residents add 4% sales tax)
Shipped UPS collect.

RICKER EQUIPMENT, INC.
Fort Wayne, IN 46863
Box 12304 PH. 219/745-0825

Take it anywhere!

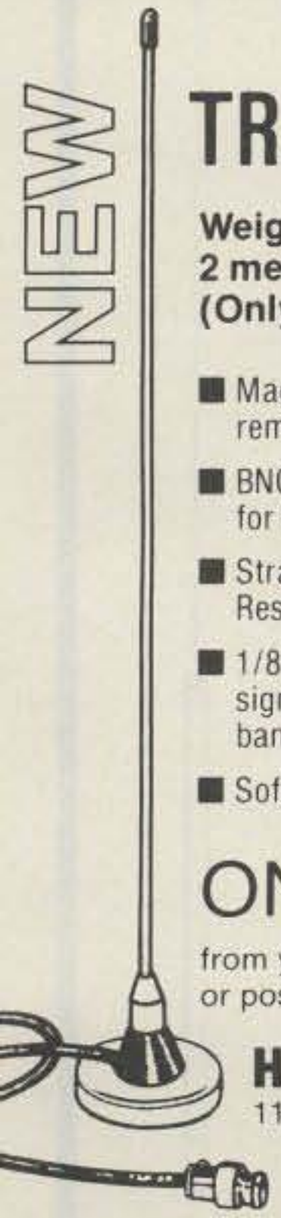
NEW

Your HT's traveling companion

TRAVEL-TENNA

Weighs just 9 ounces.
2 meter, quarter wave.
(Only 20-1/2" overall)

- ■ Magnet mount—holds firmly, removes easily without scratching.
- ■ BNC connector, no adapter needed for HT.
- ■ Stranded coax 12', RG58A/U. Resists breakage in car doors.
- ■ 1/8" dia. rigid whip—resists signal distortion, lower SWR at band edges.
- ■ Soft copper capacitance pad.



ONLY **$15.00**

from your dealer or postpaid

H.C. VanValzah Co.
1140 Hickory Trail
Downers Grove, IL 60515
312/852-0472

✓464

Closeout Special

SAVE $140

FT-101ZD (WARC w/AM)

Older **YAESU FT-101ZD** (Mk II) 9-band, 180w, HF Transceiver with AM. A mid-priced unit loaded with features. Digital + analog readout, variable IF bandwidth, noise blanker, RF speech processor, built-in 117 VAC & 13.5 VDC (with optional DC-DC converter). Uses FT-902DM accessories. 13½"w × 7"h × 13"d, 33 lbs.

Reg. $889 - ***Closeout $749***

Hurry and order now! Send Check or Money Order. To expedite prompt shipment CALL TOLL FREE and use your Mastercharge or VISA; phone COD orders accepted. Allow $8.00 for UPS shipping in the 48 States.

master charge THE INTERBANK CARD

VISA

AMATEUR ELECTRONIC SUPPLY®
4828 W. Fond du Lac Ave; Milwaukee, WI 53216
Phone (414) 442-4200 • Wis. WATS 1-800-242-5195
Nationwide WATS: 1-800-558-0411
AES Branch Stores In:
Orlando, FL • Wickliffe, OH • Las Vegas, NV

POWER LINE PROBLEMS?

Prevent Equipment Damage & Conducted RF Interference To or From Your Ham Radio

SPIKE-SPIKERS™

THE SOLUTION

$79.95	**$44.95**
Deluxe Power Console	**Mini-II Wall Mount**
8-Switched Sockets	**2 Sockets**

Transient Surge Protection plus RF "Hash" Filtering

✓470

Kalglo Electronics
6584 Ruch Rd. E. Allen Twp.
Dept. 73
Bethlehem, PA 18017

DEALERS INVITED

Order Factory Direct
PA Resident Add 6%
215-865-0006
Out of State
800-523-9685

See List of Advertisers on page 114

✓467

Orbit

ORBIT is the Official Journal for the Radio Amateur Satellite Corporation (AMSAT), P.O. Box 27, Washington, DC 20047. Please write for application.

For a **FREE SAMPLE COPY** please send $1 to cover First Class Postage and handling to: Orbit, 221 Long Swamp Road, Wolcott, CT 06716.

SATELLITE TV SYSTEMS

"COMPARE OUR QUALITY, PRICES AND SERVICE!"

WE MANUFACTURE:

PARABOLIC DISHES	MOTORIZATION SYSTEMS
POLAR MOUNTS	LNA HOLDERS
DEMO TRAILERS	ALUMINUM HORNS

WE STOCK

WASHBURN	ALLIANCE
KLM	ATV
AVANTEK	CABLE & CONNECTORS
GARDINER	SWITCHES & HARDWARE

CALL, WRITE OR ✓ FOR OUR LATEST BROCHURE AND PRICES.

AUSTIN C. LEWIS
K4GGC
901-784-2191

LEWIS CONSTRUCTION CO. ✓457
P.O. BOX 100
HUMBOLDT, TN. 38343

"IN BUSINESS AT THIS LOCATION SINCE 1964"

Two-meter H.T. Amplifier Kit

$56.95 PPD. USA

1.5 watts in—20 out
COR BNC in—SO-239 out
small size: 1-3/16" × 3" × 4-1/2"
Class C or AB1

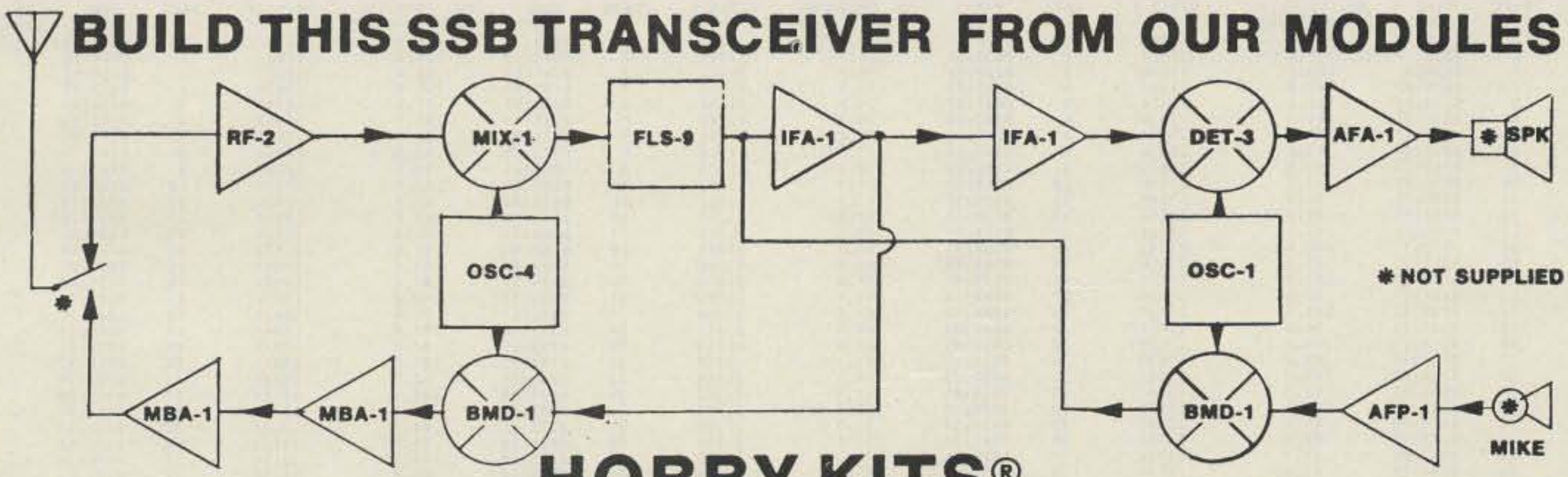
ask about our other UHF & VHF amplifier kits

✓459

QRO ENGINEERING

1398 Edwards Ave.
Lakewood, OH 44107
(216) 221-9500

BUILD THIS SSB TRANSCEIVER FROM OUR MODULES



HOBBY KITS®

EXPERIMENT — LEARN ELECTRONICS; BUILD AND DESIGN YOUR OWN AM, FM, CW, OR SSB RECEIVERS, TRANSMITTERS AND ETC. WITH OUR MINI-LINEAR CIRCUIT KITS

All kits Come Complete With Etched and Drilled Circuit Boards and All Parts Needed To Function As Described

AFA-1 AUDIO AMP. LM-380 1-2 Watts 4-16 OHM Output $4.95
AFP-1 AUDIO PREAMP. Dual Audio Preamp — For Mike Etc. $3.95
BMD-1 BAL. MIX. LM 1496 Mixer — S.B. Modulator Tuned Output $9.95
DET-1 AM DET. Am Envelope Detector With AGC Output $3.95
DET-2 FM DET. LM 3065 FM Detector (455 KHZ or 4-11 MHZ) $7.95
DET-3 SSB DET. LM 1496 SSB Detector (Needs OSC-1 or OSC-4) $9.95
IFA-1 IF AMP. CA 3028 30 DB Gain, Optional AGC (455 KHZ or 9-11 MHZ) .. $6.95
FLS-9 SSB FILTER 9 MHZ/2.1 KHZ BW with USB XAL for OSC-1 ..... $49.95
IFA-2 IF AMP. CA 3028 30 DB Gain 1-100 MHZ Optional AGC $6.95
MBA-1 FREQ. MULT. Tuned Output Buffer-Mult.-Amplifier To 250 MHZ $5.95
OSC-1 CRYSTAL OSC. 100 KHZ — 20 MHZ Not Tuned $3.95
OSC-2 CRYSTAL OSC. Ov. 18-200 MHZ Tuned Output $4.95
OSC-3 VARIABLE FREQ OSC Varactor Tuned 455KHZ $5.95
OSC-4 VARIABLE FRFY OSC Varactor Tuned 4-11 MHZ $5.95
PSV-1 POWER SUPPLY LM 723 With Pass Transistor, 3 amps max $7.95
PLL-2 TONE DETECTOR LM567 PLL Tone Detector $5.95
RF/MIX-1 RF-AMP/MIXER CA 3028 — Tuned RF AMP/Mixer 1-100 MHZ . $7.95
RF/MIX-2 RF-AMP/MIXER 3N204 Tuned RF AM/Mixer 1 — 250 MHZ $7.95

MANY OTHER MODULES AVAILABLE

SEND $2.00 FOR FULL CATALOG WITH CIRCUIT DIAGRAMS AND TYPICAL RECEIVER AND TRANSMITTER HOOK-UPS

TERMS: CASH WITH ORDER
OR 25% DEPOSIT FOR C.O.D.

ELECTRONICS SPECIALTIES SALES CO. ✓419
P. O. BOX 2122 • MIAMI, FLORIDA 33152 • PHONE 305-759-2318

COMPLETE SET OF MODULES TO BUILD A 1-WATT SSB/CW MONO-BAND TRANSCEIVER LESS CASE, CONTROLS, PWR SUPPLY (12 VDC), SPK AND MIKE

$149.95 (Specify Band)

See List of Advertisers on page 114

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR AUGUST

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
30698	1	0137:11	104.7
30710	2	0036:29	89.6
30723	3	0130:43	103.2
30735	4	0030:01	88.0
30748	5	0124:15	101.6
30760	6	0023:33	86.4
30773	7	0117:47	100.0
30785	8	0017:05	84.9
30798	9	0111:19	98.5
30810	10	0010:37	83.3
30823	11	0104:51	96.9
30835	12	0004:09	81.7
30848	13	0058:23	95.3
30861	14	0152:37	108.9
30873	15	0051:55	93.8
30886	16	0146:09	107.3
30898	17	0045:27	92.2
30911	18	0139:41	105.8
30923	19	0038:58	90.6
30936	20	0133:13	104.2
30948	21	0032:30	89.0
30961	22	0126:45	102.6
30973	23	0026:02	87.5
30986	24	0120:16	101.1
30998	25	0019:34	85.9
31011	26	0113:48	99.5
31023	27	0013:06	84.3
31036	28	0107:20	97.9
31048	29	0006:38	82.8
31061	30	0100:52	96.4
31073	31	0000:09	81.2

OSCAR 8 ORBITAL INFORMATION FOR AUGUST

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
17360	1	0029:13	69.3
17374	2	0033:51	70.5
17388	3	0038:30	71.7
17402	4	0043:08	72.8
17416	5	0047:47	74.0
17430	6	0052:25	75.2
17444	7	0057:03	76.4
17458	8	0101:42	77.6
17472	9	0106:20	78.8
17486	10	0110:58	79.9
17500	11	0115:37	81.1
17514	12	0120:15	82.3
17528	13	0124:53	83.5
17542	14	0129:31	84.7
17556	15	0134:09	85.9
17570	16	0138:47	87.0
17583	17	0000:14	62.4
17597	18	0004:52	63.6
17611	19	0009:30	64.8
17625	20	0014:07	66.0
17639	21	0018:45	67.1
17653	22	0023:23	68.3
17667	23	0028:01	69.5
17681	24	0032:38	70.7
17695	25	0037:16	71.9
17709	26	0041:54	73.1
17723	27	0046:31	74.2
17737	28	0051:09	75.4
17751	29	0055:46	76.6
17765	30	0100:24	77.8
17779	31	0105:01	79.0

OSCAR 7 ORBITAL INFORMATION FOR SEPTEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
31086	1	0054:24	94.8
31099	2	0148:38	108.4
31111	3	0047:55	93.2
31124	4	0142:09	106.8
31136	5	0041:27	91.6
31149	6	0135:41	105.2
31161	7	0034:59	90.1
31174	8	0129:13	103.7
31186	9	0028:31	88.5
31199	10	0122:45	102.1
31211	11	0022:02	86.9
31224	12	0116:16	100.5
31236	13	0015:34	85.4
31249	14	0109:48	99.0
31261	15	0009:06	83.8
31274	16	0103:20	97.4
31286	17	0002:38	82.2
31299	18	0056:52	95.8
31312	19	0151:06	109.4
31324	20	0050:23	94.3
31337	21	0144:37	107.8
31349	22	0043:55	92.7
31362	23	0138:09	106.3
31374	24	0037:27	91.1
31387	25	0131:41	104.7
31399	26	0030:58	89.5
31412	27	0125:13	103.1
31424	28	0024:30	88.0
31437	29	0118:44	101.6
31449	30	0018:02	86.4

OSCAR 8 ORBITAL INFORMATION FOR SEPTEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
17793	1	0109:39	80.1
17807	2	0114:16	81.3
17821	3	0118:53	82.5
17835	4	0123:31	83.7
17849	5	0128:08	84.9
17863	6	0132:45	86.0
17877	7	0137:22	87.2
17891	8	0141:59	88.4
17904	9	0003:25	63.8
17918	10	0008:02	64.9
17932	11	0012:39	66.1
17946	12	0017:16	67.3
17960	13	0021:53	68.5
17974	14	0026:30	69.7
17988	15	0031:07	70.8
18002	16	0035:44	72.0
18016	17	0040:20	73.2
18030	18	0044:57	74.4
18044	19	0049:34	75.5
18058	20	0054:11	76.7
18072	21	0058:47	77.9
18086	22	0103:24	79.1
18100	23	0108:00	80.3
18114	24	0112:37	81.4
18128	25	0117:13	82.6
18142	26	0121:50	83.8
18156	27	0126:26	85.0
18170	28	0131:02	86.1
18184	29	0135:39	87.3
18198	30	0140:15	88.5

HAM HELP

I need mint-condition ARRL *Handbook*s for 1947, 1952, 1955, 1961, 1962, 1966, 1967, 1975, 1977, and 1979. Top Dollar Paid.

Norton K. Earle
6421 Burgundy Way
Las Vegas NV 89107

I am looking for parts and cards for a Hickock Cardmatic tube tester. I have a Bell System model number KS-15874-L2 serial number above 900; the military model is AN/USM-118 and the commercial version is 1234 commercial 4. The test cards can be used with any unit. Thank you.

Karl D. Burket
PO Box 790
Payette ID 83661

I need a schematic and/or manual for a Measurements Model M-216 signal generator. I will pay copying and mailing costs.

Oliver Wayne
514 Park Ave.
Hoboken NJ 07030

Would someone who has a copy of a Hallicrafters S-27 receiver schematic let me borrow it or send me a copy of it? I will gladly pay costs.

Jules Vetter KH6YU
3657 Tantalus Drive
Honolulu HI 96822

Any amateurs with Sinclair Z80 or 81 or Micro-Ace microcomputers: Please write to me if you are interested in exchanging programs/ideas for ham use.

Paul L. Newman G4INP
3, Red House Lane, Leiston
Suffolk IP16 4JZ
United Kingdom

I am looking for a portable intercom circuit with the following features: one master station with power supply, up to 10 slave units small enough to wear as belt packs, three-wire connection between units, call light and call switch on each unit, individual volume control, and headset earphone/boom mike.

Fred Musgrave, Major
The Salvation Army
Special Projects Director
Suc 3 Cass 194
1403 Buenos Aires, Argentina

I need a schematic and/or an alignment procedure for a Hallicrafters SX62A general-coverage receiver. I will pay for copying and postage or I will copy and return.

Dick Roux N1AED
25 Greenfield Dr.
Merrimack NH 03054

See List of Advertisers on page 114

Satellite TV

FOR THE HOME

Sick of Network TV?

Our receiver lets you get over 75 channels of television directly from earth-orbiting cable TV satellites!: HBO, Showtime, super stations, sports and movies worldwide.

We don't just sell information! We Manufacture Hardware!

From offshore oil rigs, data links to hotels and backyard installations, we wrote the book. Constantly updated, our **94 Page** technical information book and catalog gives you all the facts. Inexpensive dishes, feeds, telemetry software, kits and more. Recommended reading by NASA, The Office of Consumer Affairs and quality companies like Rockwell/Collins. Send $7.95 today!

CALL ✓309
24-hrs. C.O.D. Hotline
(305) 339-7600

© SPACECOAST
RESEARCH CORPORATION
P.O. Box 442-D, Altamonte Spgs, FL 32701

YAESU FT-207R OWNERS

AUTO SCAN MODULE AND BATTERY SAVER KIT

WRITE FOR CLUB DISCOUNTS

15 minutes to install; scan restarts when carrier drops off; busy switch controls automatic scan on-off; includes module and instructions.

Model AS-1. $25.00

new **FT-207R BATTERY SAVER KIT MODEL BS-1 $14.95**

- *No more dead batteries due to memory back-up
- *30% less power drain when squelched
- *Simple to install; step-by-step instructions and parts included
- *4 mA memory backup reduced to 500 μA.
- *45 mA receiver drain reduced to 30 mA.
- *Improved audio fidelity and loudness

ENGINEERING CONSULTING
P. O. BOX 94355 ✓400
RICHMOND, B. C. V6Y2A8, CANADA

MICROWAVE DOWNCONVERTER RX-2300

- Quality metal enclosure w/hardware
- Low noise preamplifier
- 90-day warranty
- Fully assembled, *NOT* a kit!
- Temperature compensated

The RX-2300 downconverter is a state-of-the-art microwave converter that converts 1900 - 2700 Mhz microwave signals down to VHF. It is especially suited for line-of-sight reception of amateur and TV transmissions and will drive either a VHF receiver or a standard television.

SPECIAL INTRODUCTORY OFFER — $140

✓430 TEM MICROWAVE CORP.

✓ for *additional data.*

22518 - 97th Avenue North
Corcoran, MN 55374
612-498-8014

Satellite T.V.

By: rCom

CONFIDENTIAL DEALER PRICE LIST

Why spend $5K to $10K on a satellite Earth Station when you can buy at dealer prices. You can receive 60 and more television stations, current uncut movies, Pro games each Sunday, sporting events not available on commercial T.V., live Los Vegas entertainment, special children's and religious programming and much, much more.

Buy one, your choice at Dealer prices. Systems for home or commercial use. We will also make recommendations for your Earth Station location as to equipment needed. Complete systems, all major brands.

Send $2.00 with S.A.S.E. today for confidential Dealer Price List Catalog.

For Information call (318) 233-6941

✓452

rCom Distributors
164 Acadian, Lafayette, LA 70503

PILOTS

Build your own aircraft radios.

✓381 *FREE CATALOG.*

OUT OF STATE? CALL TOLL FREE.

800
824-5978
OTHERWISE
916
272-2203

Radio Systems Technology, Inc.
10985-G GRASS VALLEY AVE.
GRASS VALLEY, CA 95945

2300 MHZ Antenna

This antenna is for your 2300 MHZ down convertor. Design gain of up to 20DB. Some assembly required. Variable voltage, 150MA power supply for down convertors, 8V-15V.

	PRICE	SHIP. & HNDL.
2300 MHZ antenna only	45.00	5.00
Power supply kit	35.00	2.00
Power supply PC board only	5.00	PPD
2300 MHz PC Board w/Data	15.00	PPD

Complete system: 230 MHZ convertor, antenna, power supply, 18" coax, 50' coax. Ready to hook up and turn on. $225.00 PLUS $5.00 shipping.

No C.O.D. Cash only in money order or cashier check

H.M. GOODWIN W5EEY
11421 FERNALD AVE.
DALLAS, TX 75218 ✓393

SATELLITE TV RECEIVER KITS

FACTORY DIRECT

We have complete kits, individual boards, and components. Call or write for further information.

STAR TRAK ✓465
SYSTEMS, INC.
404 Arrawanna St.
Colorado Springs, CO 80909
(303) 475-7050

Robby WBØSFR | Jera NOAGT | Dave WDØCDU

COAXIAL CABLE SALE

POLYETHYLENE DIELECTRIC

RG213 noncontaminating 95% shield mil spec	36¢/ft.
RG11AU 75ohms 97% shield mil spec	27¢/ft.
RG62U 93 ohms	09¢/ft.
RG8U 80% shield	18¢/ft.
RG58CU noncontaminating 95% shield mil spec	13¢/ft.
RG174U miniature 50 ohm mil spec	10¢/ft.

LOW LOSS FOAM DIELECTRIC

RG-8X (mini 8) 95% shield. Blue Jacket	22¢/ft.
RG8U 97% shield white jacket	30¢/ft.
RG58U 80% shield	07¢/ft.
RG58U 95% shield	10¢/ft.
RG58AU stranded center 80% shield	11¢/ft.
Rotor cable 2-18ga 6-22ga	19¢/ft.

*Cable—shipping $2.50 1st 100 ft., $2.00 each add'l 100 ft.

CONNECTORS

PL-259 to BNC (UG-255)	$3.50 ea.
PL-259 push-on adapter shell	10/$3.89
PL-259 & SO-239	10/$5.89
Double Male Connector	$1.79
1 ft. patch cord w/RCA type plugs each end	3/$1.00
Reducer UG-175 or 176	10/$1.99
UHF T (M358)	$2.59
Elbow (M359)	$1.79
F59A (TV type)	10/$1.99
UG-255 (PL-259 to BNC adapter)	$3.50

Connectors—shipping 10% add'l, $1.50 minimum

FREE CATALOG—VISA/MASTER CHARGE—
C.O.D. ADD $1.50—FLA. RES. ADD 4%

✓412

NEMAL ELECTRONICS
5685 S.W. 80th ST., DEPT. RLO, MIAMI, FLORIDA 33143
TELEPHONE (305) 661-5534

DIRECTION FINDING?

New Technology (patent pending) converts any VHF FM receiver into a modern Doppler Radio Direction Finder. **No receiver mods required.** See June 1981 issue of **73** for technical description. Kits available from $235. Write for full details and prices.

✓425

DOPPLER SYSTEMS
111 E. Moon Valley Drive
Phoenix, Arizona 85022
(602) 869-9608

PRO-25 MICROWAVE ANTENNAS
2.0-3.0 Ghz

FEATURES:
- Precision 25" parabolic reflector
- Seamless aluminum feed-horn
- Sturdy "spyder" mount
- All metal construction
- Easy assembly
- Superior gain

Only Data Service Co. antennas offer the superior mechanical and electrical performance of antennas manufactured to commercial standards at a residential price! *Call, write or ✔ for our data sheets.*

AMPEX T-120 and L-500 VTR tapes in stock.

✔346

Data Service Company
3110 Evelyn Street
Roseville, MN 55113
612-636-9469

SYNTHESIZED SIGNAL GENERATOR

made in U.S.A.

model SG-100C
$329.95

• Covers 100 to 179.999 MHz in 1 kHz steps with thumb-wheel dial • Accuracy .00001% at all frequencies • Internal frequency modulation from 0 to over 100 kHz at a 1 kHz rate • Spurs and noise at least 60dB below carrier • RF output adjustable from 5 to 500mv across 50 ohms • Operates on 12vdc @ ½ amp • Price $ 329.95 plus shipping.

In stock for immediate shipping. Overnight delivery available at extra cost. Phone: (212) 468-2720.

✔311

VANGUARD LABS
196-23 Jamacia Ave. Hollis, NY 11423

SATELLITE TV Receiver Modules

Tunable audio demod, video demod & AFC **$185.00**

IF Unit with Filter, 54DB gain, 70 MHZ, 30 MHZ band pass. **$80.00**
RF Converter Module **$310.00**
LNA-50 DB gain 120K°. **$755.00**
10' Fiberglass Dish **$900.00**
Polar Mount **$220.00**

Complete units available. For information call:

JOSEPH'S LTD ✔456
Echo Communications Division
613 Washington Avenue
Iowa Falls, Iowa 50126
Ph. 515-648-3518

THE LITTLE GIANT BRAKE

BEND & FORM .060 ALUM. & STEEL!

CLEAN SMOOTH BENDS TO 90°

EASY TO USE! BUILD CUSTOM CABINETS YOU'LL BE PROUD OF! COMMERCIAL QUALITY at 1/10 THE COST!!

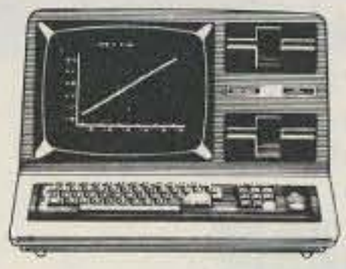
GUARANTEED! clamps not incl.

NO COD OR CREDIT CARDS.
ALL ORDERS IN US FUNDS.
ALL FOREIGN ORDERS ADD $5.50 SHIPPING IN ADDITION TO P&H. ✔336

21.95

Z ASSOCIATES +2.00 P&H
P O BOX 757
3050 NE 55 TH AVE.
SILVER SPRINGS, FLA. 32688

LOWEST POSSIBLE PRICES BEST POSSIBLE WARRANTY



model III 16K
$859

color computer 4K
$310

✔444 call TOLL FREE **1-800-343-8124**

computer plus
245A Great Road
Littleton, MA 01460
617 • 486 • 3193

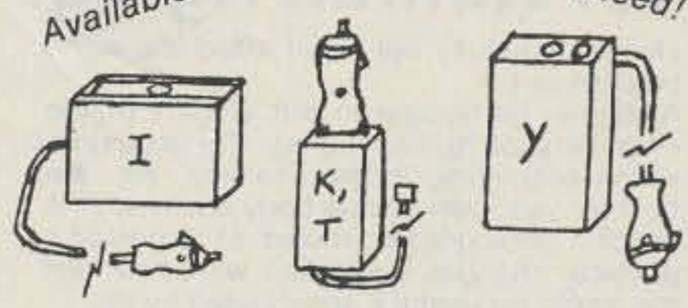
Write for your free catalog.

TRS-80 is a registered trademark of Tandy Corp.

GO MOBILE WITH YOUR H.T.!

ICOM Available

Guaranteed!



A unique battery eliminator
HANDI-TEK Regulator allows constant hand-held operation from auto DC or base supply with no ni-cad drain and WITHOUT RADIO MODIFICATION!
Model I—Icom IC-2A/T; K—TR-2400
Y—FT-207R, T—Simple mod for Temp
$24.95 PPD in USA. CA add $1.50.

HANDI-TEK ✔460
P.O. BOX 2205, LA PUENTE, CA 91746
Icom—slides on bottom of radio
Yaesu—fits into battery compartment
Kenwood—powered thru battery plug

INOTEK ENGINEERING PRESENTS: RTTY!

✔414

GOT THOSE METER TUNING BLUES??

NOW YOU CAN SEE WHETHER THAT SIGNAL HAS DRIFTED, AND WHICH WAY.
BRIGHT, SOLID STATE LED ARRAY.
INSTANTLY IDENTIFIES 170HZ, 425HZ, AND 850 HZ SHIFTS.
REQUIRES ONLY +5 AND ±12 VOLT REGULATED POWER SUPPLY.
JUST ANOTHER "SIMPLE" RTTY PROJECT

"SIMPLE RTTY TUNER"

drilled p.c. board with documentation - $15.95
complete kit $60.00

P.O. Box 110
Spanish Fork
Ut. 84660

ONLY: $69.95
assembled and aligned

CB TO 10 METER

10 METER CONVERSION KITS FOR MOST C.B. MODELS

- Kits for over 300 Models of CB Radios
- Low Cost from $10.00
  Easy to Install with All Instructions
  Tune-Up Procedure Alignment
- KITS FOR MOST POPULAR UNITS
  Over 5,000 Satisfied Customers
- Write or Call Today for Our Free 10 meter catalog

AMERICAN CRYSTAL SUPPLY COMPANY
PO Box 638
W Yarmouth, MA 02673
(617) 771-4634 ✔7

MORSE CODE, BAUDOT and ASCII RTTY FOR THE TRS-80 MODELS I and III

DISASSEMBLED HANDBOOK - VOLUME 4

no RS-232C interface is required

Chapt. 1: 8 to 800 WPM Morse transmit pgm.
Chapt. 2: Adding type ahead capabilities
Chapt. 3: Morse receive decoding program
Chapt. 4: Merging + 12 prepared messages
Chapt. 5: Baudot transmit 60-66-75-100 WPM
Chapt. 6: Baudot receive for above speeds
Chapt. 7: Merging + 22 prepared messages
Chapt. 8: ASCII transmit program 110 Baud
Chapt. 9: ASCII receive decoding program
Chapt. 10: Merging + 22 prepared messages

$18 [US] per copy add $2 shipping
[$4.50 overseas airmail]

—GERMAN & FRENCH LANGUAGE EDITIONS—

Morse, Baudot & ASCII on disks $49
✔458 **[Vol. 4 required for instructions]**

RICHCRAFT ENGINEERING LTD.
#1A Wahmeda Industrial Park
Chautauqua, New York 14722

COD orders [US only] [716] 753-2654

✔See List of Advertisers on page 114

Enjoy Satellite TV Now

Better than Cable TV—Over 200 TV and radio services. Why waste money? Learn the whole story and build a video system the family can enjoy. No commercials, **FREE** movies, sports and Vegas shows—worldwide, crystal clear reception connects to any TV set. Big (8 × 11 in.) book loaded with details, photos, plans, kits—**TELLS EVERYTHING! Satisfaction Guaranteed.**

Send $7.95 TODAY! Add $2.00 for 1st class (air mail) or call our 24 hour C.O.D. rush order line **(305) 862-5068.**

GLOBAL ELECTRONICS,
P.O. Box 219-H, Maitland, Florida 32751

BE HEARD!

WITH THESE LOW-COST 2-METER AMPLIFIERS.

Anyone who can operate a 2-meter rig can assemble these low cost amplifiers. Our detailed, step-by-step instructions allow you to build these 2-meter kits without an SWR bridge, wattmeter or other type of equipment.

Model 225 Designed to allow any 2-meter, hand-held FM transceiver, with an output of 350 milliwatts or more, to produce an output of 25 watts. Input BNC connector allows your hand-held to be connected and disconnected easily.

Model 335 Operate up to 35 watts on FM with an input of only 3 watts. Also operates with less power; 2 watts yields 30 watts, and 1 watt yields 15 watts. Current drain of 4-5 amps @ 13.6 VDC.

Model 875 Full 75 watts on FM or SSB with 10 watts input.

Model KEB 430 MHz 100 Watt Linear Amplifier
This high power kit is designed for ATV, SSB or FM operation in the 420 to 450 MHz band.

Write or call for our latest brochure. ✓435

Communication Concepts Inc.
2648 North Aragon Avenue • Dayton, Ohio 45420 • (513) 296-1411

10 METER RIG? CB BOARD

Hygain 40 channel CB board, with PLL IC, 9W amp w/heat sink, RF & modulator xistors, lots more! A few connections and alterations makes a 10 meter rig (as described in a 73 Mag series). With typical schematics. 12 oz., #D1KS0007. . . **$9.88 each!**

ASC11 ENCODED KEYBOARD

Sanders 720 surplus keyboard, with parallel output. This nice unit has been written up for projects numerous times in 73 and other computer mag's. Sh. Wt. 5 Lbs. . . #1A30126 . . $39.95 ea.

LOTS MORE SURPLUS COMPUTER
PERIPHERAL EQUIPMENT AVAILABLE!
CIRCLE READER SERVICE FOR OUR CATALOG

Terms: Add Postage. MC / VISA / AE Welcome!
Phone orders welcome on credit card orders!

FREE GIANT CATALOG of ELECTRONIC BARGAINS

SPEAKER KITS/COMPUTER MAT'L/KITS/GADGETS
TOOLS/POWER SUPPLIES/SEMI'S/TRANSFORMERS
1,000's of Electronic Parts! Use Reader Service Card!

BNF Enterprises
119 Foster St. Peabody, MA. 01960 (617) 531-5774

✓402

Human Ingenuity vs. Human Aging

Human ingenuity will either affect the aging process or not.

At home, participate in our studies of the chemistry of human aging. For example, which cosmetics, foods, vitamins, etc. are best for your own unique body chemistry? A specific photographic record of a person's physical changes compared with their diet etc. might be useful if coordinated by us.

If thoughtful people voluntarily devote themselves to these and other studies we have planned, as part of a systematic hobby at home, we might discover many things sooner than otherwise.

With dedication, the results of your home investigations, sent to us for evaluation and safekeeping, may prove valuable to all mankind.

For further details, send a self-addressed stamped envelope to:
The Exact Chemical Institute
Home Science Experiments®
11759 San Vicente Blvd.
Los Angeles, California 90049
The United States of America

✓446

TUFTS Electronic Department Store

✓77

NEW ENGLAND'S HAM STORE
Stocking Distributor for Major Equipment and Accessories

CODE & THEORY

CLASSES ARE IN PROGRESS—INSTRUCTION FROM *NOVICE* TO *EXTRA*. CALL TODAY FOR THE NEXT STARTING DATE!

(617) 391-3200
206 MYSTIC AVENUE
MEDFORD, MASS. 02155

OUR NAME SAYS IT ALL!

Amateur Accessories

The new and ACTIVE dealer in Richmond/Tidewater for quality Amateur Radio products you know and trust:

MFJ	NYE VIKING
HYGAIN/TELEX	VAN GORDEN
VOCOM	ASTRON POWER SUPPLIES
AZDEN (new PCS 3000)	ALLIANCE
BENCHER	MINI PRODUCTS
HAM KEY	AKIGAWA METERS
PALOMAR	B&W

Watch us add more lines in the near future!

CALL or WRITE for our price on:

KEYERS & PADDLES	COAX SWITCHES
HEADPHONES	ROTATORS
MICROPHONES	SPEECH PROCESSORS
TUNERS	PHONE PATCHES
2M RIGS & AMPLIFIERS	CW/SSB FILTERS
ANTENNAS—HF, VHF	MORE—NOW & FUTURE

We look forward to quoting your needs.
Ask about delivery to the Richmond/Tidewater areas!

13817 BARNES SPRING ROAD
MIDLOTHIAN, VIRGINIA 23113
(804) 744-3861

✓429

S-LINE OWNERS
ENHANCE YOUR INVESTMENT

with

TUBESTERS™

Plug-in, solid state tube replacements

- **S-line performance—solid state!**
- **Heat dissipation reduced 60%**
- **Goodbye hard-to-find tubes**
- **Unlimited equipment life**

TUBESTERS cost less than two tubes, and are guaranteed for so long as you own your S-line.

✓433

SKYTEC
Box 535
Talmage, CA 95481

Write or phone for specs and prices.
(707) 462-6882

Radio Amateurs

Tempo Handheld

S-1	$251.10	2 Meter
S-1T	278.10	with Tone Pad
S-2	315.00	220 MHz
S-2T	359.00	with Tone Pad
S-4	314.10	440 MHz
S-4-T-12	359.00	12 Button Pad
S-4-T-16	377.00	16 Button Pad
S-5	278.10	2 Meter, 5 Watt
S-5T	314.10	with Tone Pad

Azden PCS-3000 2 Meter	$339.00
Cubic/Swan Astro 102BX	895.00
Ten-Tec Omni C	1082.76

Amateur equipment accessories & antennas.
COD's USA. Export Anywhere.
Amateur & commercial repair service.

2317 Vance Jackson Rd. San Antonio, TX 78213
(800)531-5405 (512)734-7793 in Texas
F.O.B. ORIGIN

RED HOT SPECIALS!!

Icom IC2A Handheld	215.00
with Touchtone Pad	235.00
Icom IC720A XCVR	1199.00
Icom IC730 XCVR	699.00
Icom IC-560 6 Meters	420.00
Icom 551D 80W 6M	599.00
Icom 2KL Linear Amp	1599.00
Icom IC260 2m All Mode	415.00
Azden PCS 3000 2m	315.00
Janel QSA 5 Preamp	36.50
Bearcat 220 Scanner	269.00
Kantronics FDII Code Reader	360.00
Santec HT1200 Handheld	315.00

Price subject to change without notice.
SASE for other RED HOT SPECIALS, new and used.

Ben Franklin Electronics
115½ N Main Hillsboro KS 67063
316-947-2269

✓439

Synthesized Hand-Held Scanner!

Chances are the police, fire and weather emergencies you'll read about in tomorrow's paper are coming through on a scanner right now. All scanners sold by **Communications Electronics** bring the real live excitement of action news into your home or car. With your scanner, you can monitor the exciting two-way radio conversations of police and fire departments, intelligence agencies, mobile telephones, energy/oil exploration crews, drug enforcement agencies and more.

Some scanners can even monitor aircraft transmissions! You can actually hear the news *before* it's news. If you do not own a scanner for yourself, now's the time to buy your new scanner from **Communications Electronics**. Choose the scanner that's right for you, then call our *toll-free* number to place your order with your Visa or Master Charge card.

We give you excellent service because **CE** distributes more scanners worldwide than *anyone* else. Our warehouse facilities are equipped to process thousands of scanner orders every week. We also export scanners to over 300 countries and military installations. Almost all items are **in stock** for **quick shipment**, so if you're a person who prefers fact to fantasy and who needs to know what's *really* happening around you, order your scanner today from **CE**!

NEW! Bearcat®† 350

The Ultimate Synthesized Scanner!

Allow 30-120 days for delivery after receipt of order due to the high demand for this product.

List price $599.95/**CE price $419.00**

7-Band, 50 Channel • Alpha-Numeric • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 30-50, 118-136 AM, 144-174, 421-512 MHz.

The new *Bearcat* 350 introduces an incredible breakthrough in synthesized scanning: Alpha-Numeric Display. Push a button—and the Vacuum Fluorescent Display switches from "numeric" to word descriptions of what's being monitored. 50 channels in 5 banks. Plus, Auto & Manual Search, Search Direction, Limit & Count. Direct Channel Access. Selective Scan Delay. Dual Scan Speeds. Automatic Lockout. Automatic Squelch. Non-Volatile Memory. Reserve your *Bearcat* 350 today!

Bearcat® 300

List price $549.95/**CE price $349.00**

7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.

The *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat* 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.

NEW! Bearcat® 350

Bearcat® 250

List price $429.95/**CE price $279.00**

6-Band, 50 Channel • Crystalless • Searches Stores • Recalls • Digital clock • AC/DC Priority Channel • Delay • Count Feature

Frequency range 32-50, 146-174, 420-512 MHz.

The *Bearcat* 250 performs any scanning function you could possibly want. With push button ease you can program up to 50 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear. A special search feature of the *Bearcat* 250 actually stores 64 frequencies and recalls them, one at a time, at your convenience.

NEW! Bearcat® 20/20

Allow 30-60 days for delivery after receipt of order due to the high demand for this product.

List price $449.95/**CE price $289.00**

7-Band, 40 Channel • Crystalless • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay

Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.

The *Bearcat* 20/20 automatic scanning radio replaces the *Bearcat* 220 and monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

Bearcat® 210XL

List price $349.95/**CE price $229.00**

6-Band, 18 Channel • Crystalless • AC/DC

Frequency range: 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more!

Bearcat® 160

List price $299.95/**CE price $189.00**

5-Band, 16 Channel • AC only • Priority Dual Scan Speeds • Direct Channel Access

Frequency range: 32-50, 144-174, 440-512 MHz.

Would you believe...the *Bearcat* 160 is the least expensive *Bearcat* crystalless scanner.

This scanner presents a new dimension in scanning form and function. Look at the smooth keyboard. No buttons to punch. No knobs to turn. Instead, finger-tip pads provide control of *all* scanning operations, including On/Off, Volume and Squelch. Of course the *Bearcat* 160 incorporates other advanced *Bearcat* features such as Priority, Direct Channel Access, Dual Scan Speeds, Lockout, Scan Delay and more.

NEW! Bearcat® 100

The first no-crystal programmable handheld scanner.

Allow 60-180 days for delivery after receipt of order due to the high demand for this product.

List price $449.95/**CE price $299.00**

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. It has chrome-plated keys for functions that are user controlled, such as lockout, manual and automatic scan. Even search is provided, both manual and automatic. Wow...what a scanner!

The *Bearcat* 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

Included in our low **CE** price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. For earliest delivery from **CE**, reserve your *Bearcat* 100 today.

Bearcat® 5

List price $134.95/**CE price $94.00**

4-Band, 8 Crystal Channels • Lockout • AC only

Frequency range: 33-50, 146-174, 450-508 MHz.

The *Bearcat* 5 is a value-packed crystal scanner built for the scanning professional — at a price the first-time buyer can afford. Individual lockout switches. Order one crystal certificate for each channel.

Bearcat® Four-Six ThinScan™

List price $189.95/**CE price $124.00**

Frequency range: 33-47, 152-164, 450-508 MHz.

The incredible, *Bearcat* Four-Six Thin Scan™ is like having an information center in your pocket. This four band, 6 channel crystal controlled scanner has patented Track Tuning on UHF. Scan Delay and Channel Lockout. Measures 2¾ x 6¼ x 1." Includes rubber ducky antenna. Order crystal certificate for each channel. Made in Japan.

TEST ANY SCANNER

Test any scanner purchased from **Communications Electronics**™ for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in original condition with all parts in 31 days, for a prompt refund (less shipping/handling charges and rebate credits).

Fanon Slimline 6-HLU

List price $169.95/**CE price $109.00**

Low cost 6-channel, 4-band scanner!

The *Fanon* Slimline 6-HLU gives you six channels of crystal controlled excitement. Unique Automatic Peak Tuning Circuit adjusts the receiver front end for maximum sensitivity across the entire UHF band. Individual channel lockout switches. Frequency range 30-50, 146-175 and 450-512 MHz. Size 2¾ x6¼ x 1." Includes rubber ducky antenna. Order crystal certificates for each channel. Made in Japan.

Fanon Slimline 6-HL

List price $149.95/**CE price $99.00**

6-Channel performance at 4-channel cost!

Frequency range: 30-50, 146-175 MHz.

If you *don't* need the UHF band, get this model and save money. Same high performance and features as the model HLU without the UHF band. Order crystal certificates for each channel. Made in Japan.

FANON SCANNER ACCESSORIES

SCMA-6 Mobile Adapter/Battery Charger	$49.00
CHB-6 AC Adapter/Battery Charger	$15.00
CAT-6 Carrying case for Fanon w/Belt Clip	$15.00
AUC-3 Auto lighter adapter/Battery Charger	$15.00
PSK-6 Base Power Supply/Bracket for SCMA-6	$20.00

OTHER SCANNERS & ACCESSORIES

Regency®‡ M400 Scanner	$259.00
Regency® M100 Scanner	$199.00
Regency® R1040 Scanner	$149.00
SP50 AC Adapter	$9.00
SP51 Battery Charger	$9.00
SP58 Carrying Case for *Bearcat* 4-6 ThinScan™	$12.00
FB-E Frequency Directory for Eastern U.S.A.	$12.00
FB-W Frequency Directory for Western U.S.A.	$12.00
FFD Federal Frequency Directory for U.S.A.	$12.00
B-4 1.2 V AAA Ni-Cad's for ThinScan™ and Fanon	$9.00
A-135cc Crystal certificate	$3.00

Add $3.00 shipping for all *accessories* ordered at the same time.

INCREASED PERFORMANCE ANTENNAS

If you want the utmost in performance from your scanner, it is essential that you use an external antenna. We have six base and mobile antennas specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna. Order **#A61** is a gutter clip mobile antenna. Order **#A62** is a trunk-lip mobile antenna. Order **#A63** is a ¾ inch hole mount. Order **#A64** is a ⅜ inch snap-in mount, and **#A70** is an all band base station antenna. All antennas are $35.00 and $3.00 for UPS shipping in the continental United States.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance. Minimum order $35.00.

Mail orders to: **Communications Electronics,**™ Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $7.00 per scanner or phone product for U.P.S. *ground* shipping and handling, or $14.00 for faster U.P.S. *air* shipping to some locations. If you have a Master Charge or Visa card, you may call anytime and place a credit card order. **Order toll free** in the U.S.A. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. **Dealer inquiries invited.** All order lines at **Communications Electronics**™ are staffed 24 hours.

Scanner Distribution Center™ and CE logos are trademarks of Communications Electronics.™

†*Bearcat* is a federally registered trademark of Electra Company, a Division of Masco Corporation of Indiana.

‡*Regency* is a federally registered trademark of Regency Electronics Inc.

CODE OF ETHICS

VISA

master charge THE INTERBANK CARD

✓377

COMMUNICATIONS ELECTRONICS™

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.

Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

We're first with the best.℠

MICROWAVE COMPONENTS

ARRA

2416	Variable Attenuator	$ 50.00
3614-60	Variable Attenuator 0 to 60dB	75.00
KU520A	Variable Attenuator 18 to 26.5 GHz	100.00
4684-20C	Variable Attenuator 0 to 180dB	100.00
6684-20F	Variable Attenuator 0 to 180dB	100.00

General Microwave

Directional Coupler 2 to 4GHz 20dB Type N		75.00

Hewlett Packard

H487B	100 ohms Neg Thermistor Mount (NEW)	150.00
H487B	100 ohms Neg Thermistor Mount (USED)	100.00
477B	200 ohms Neg Thermistor Mount (USED)	100.00
X487A	100 ohms Neg Thermistor Mount (USED)	100.00
X487B	100 ohms Neg. Thermistor Mount (USED)	125.00
J468A	100 ohms Neg Thermistor Mount (USED)	150.00
478A	200 ohms Neg Thermistor Mount (USED)	150.00
J382	5.85 to 8.2 GHz Variable Attenuator 0 to 50dB	250.00
X382A	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	250.00
NK292A	Waveguide Adapter	65.00
8436A	Bandpass Filter 8 to 12.4 GHz	75.00
8471A	RF Detector	50.00
H532A	7.05 to 10 GHz Frequency Meter	300.00
G532A	3.95 to 5.85 GHz Frequency Meter	300.00
J532A	5.85 to 8.2 GHz Frequency Meter	300.00
809A	Carriage with a 444A Slotted Line Untuned Detector Probe and 809B Coaxial Slotted Section 2.6 to 18 GHz	175.00
X347A	**8.2 to 12.4 GHz noise source**	**500.00**
S347A	**2.6 to 3.95 GHz noise source**	**600.00**
G347A	**3.95 to 5.85 GHz noise source**	**500.00**
J347A	**5.85 to 8.2 GHz noise source**	**500.00**
H347A	**7.05 to 10 GHz noise source**	**540.00**
349A	**400 to 4000 MHz noise source**	**310.00**
P532A	**12.4 to 18 GHz Frequency meter**	**400.00**
M532A	**Frequency meter**	**500.00**
P382A	**0 to 50 DB attenuator**	**520.00**
355C	**0.5 Watts 50 OHMs DC to 1000 MC attenuator**	**132.50**
NK292A	**Adapter**	**100.00**
3503	**Microwave switch**	**100.00**
3300IC	**Pin absorption modulator**	**295.00**
11660A	**Tracking generator shunt**	**50.00**
11048C	**Feed-through termination**	**25.00**
10100B	**Termination**	**25.00**
H421A	**7.05 to 10 GHz Crystal Detector**	**75.00**
H421A	**7.05 to 10 GHz matched pair**	**200.00**

Merrimac

AU-26A/	801162 Variable Attenuator	100.00

Microlab/FXR

601-B1B	X to N Adapter 8.2 - 12.4 GHz	35.00
Y610D	Coupler	75.00

Narda

4013C-10/	22540A Directional Coupler 2 to 4 GHz 10db Type SMA	90.00
4014-10/	22538 Directional Coupler 3.85 to 8 GHz 10dB Type SMA	90.00
4014C-6/	22876 Directional Coupler 3.85 to 8 GHz 6dB Type SMA	90.00
4015C-10/	22539 Directional Coupler 7.4 to 12 GHz 10dB Type SMA	95.00
4015C-30/	23105 Directional Coupler 7 to 12.4 GHz 30dB Type SMA	95.00
3044-20	Directional Coupler 4 to 8 GHz 20dB Type N	125.00
3040-20	Direcitonal Coupler 240 to 500 MC 20dB Type N	125.00
3043-20/	22006 Directional Coupler 1.7 to 4 GHz 20dB Type N	125.00
3003-10/	22011 Directional Coupler 2 to 4 GHz 10dB Type N	75.00
3003-30/	22012 Directional Coupler 2 to 4 GHz 30dB Type N	75.00
3043-30/	22007 Directional Coupler 1.7 to 3.5 GHz 30dB Type N	125.00
22574	Directional Coupler 2 to 4 GHz 10dB Type N	125.00
3033	Coaxial Hybrid 2 to 4 GHz 3dB Type N	125.00
3032	Coaxial Hybrid 950 to 2 GHz 3 dB Type N	125.00
784/	22380 Variable Attenuator 1 to 90dB 2 to 2.5 GHz Type SMA	550.00
22377	Waveguide to Type N Adapter	35.00
720-6	Fixed Attenuator 8.2 to 14.4 GHz 6 dB	50.00
3503	Waveguide	25.00

PRD

U101	12.4 to 18 GHz Variable Attenuator 0 to 60dB	300.00
X101	8.2 to 12.4 GHz Variable Attenuator 0 to 60dB	200.00
C101	Variable Attenuator 0 to 60dB	200.00
205A/367	Slotted Line with Type N Adapter	100.00
195B	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	100.00
185BS1	7.05 to 10 GHz Variable Attenuator 0 to 40dB	100.00
196C	8.2 to 12.4 GHz Variable Attenuator 0 to 45dB	100.00
170B	3.95 to 5.85 GHz Variable Attenuator 0 to 45dB	100.00
588A	Frequency Meter 5.3 to 6.7 GHz	100.00
140A,C,D,E	Fixed Attenuators	25.00
109J,1	Fixed Attenuators	25.00
WEINSCHEL ENG.	2692 Variable Attenuator +30 to 60dB	100.00

COMPUTER I.C. SPECIALS

MEMORY

MEMORY	DESCRIPTION	PRICE
2708	1K x 8 EPROM	$ 7.99
2716/2516	2K x 8 EPROM 5Volt Single Supply	20.00
2114/9114	1K x 4 Static RAM 450ns	6.99
2114L2	1K x 4 Static RAM 250ns	8.99
2114L3	1K x 4 Static RAM 350ns	7.99
4027	4K x 1 Dynamic RAM	3.99
4060/2107	4K x 1 Dynamic RAM	3.99
4050/9050	4K x 1 Dynamic RAM	3.99
2111A-2/8111	256 x 4 Static RAM	3.99
2112A-2	256 x 4 Static RAM	3.99
2115AL-2	1K x 1 Static RAM 55ns	4.99
6104-3/4104	4K x 1 Static RAM 320ns	14.99
7141-2	4K x 1 Static RAM 200ns	14.99
MCM6641L20	4K x 2 Static RAM 200ns	14.99
9131	1K x 1 Static RAM 300ns	10.99

C.P.U.'s ECT.

MC6800L	Microprocessor	13.80
MCM6810AP	128 x 8 Static RAM 450ns	3.99
MCM68A10P	128 x 8 Static RAM 360ns	4.99
MCM68B10P	128 x 8 Static RAM 250ns	5.99
MC6820P	PIA	8.99
MC6820L	PIA	9.99
MC6821P	PIA	8.99
MC68B21P	PIA	9.99
MCM6830L7	Mikbug	14.99
MC6840P	PTM	8.99
MC6845P	CRT Controller	29.50
MC6845L	CRT Controller	33.00
MC6850L	ACIA	10.99
MC6852P	SSDA	5.99
MC6852L	SSDA	11.99
MC6854P	ADLC	22.00
MC6860CJCS	0-600 BPS Modem	29.00
MC6862L	2400 BPS Modem	14.99
MK3850N-3	F8 Microprocessor	9.99
MK3852P	F8 Memory Interface	16.99
MK3852N	F8 Memory Interface	9.99
MK3854N	F8 Direct Memory Access	9.99
8008-1	Microprocessor	4.99
8080A	Microprocessor	8.99
Z80CPU	Microprocessor	14.99
6520	PIA	7.99
6530	Support For 6500 series	15.99
2650	Microprocessor	10.99
TMS1000NL	Four Bit Microprocessor	9.99
TMS4024NC	9 x 64 Digital Storage Buffer (FIFO)	9.99
TMS6011NC	UART	9.99
MC14411	Bit Rate Generator	11.99
AY5-4007D	Four Digit Counter/Display Drivers	8.99
AY5-9200	Repertory Dialler	9.99
AY5-9100	Push Button Telephone Diallers	7.99
AY5-2376	Keyboard Encoder	19.99
AY3-8500	TV Game Chip	5.99
TR1402A	UART	9.99
PR1472B	UART	9.99
PT1482B	UART	9.99
8257	DMA Controller	9.99
8251	Communication Interface	9.99
8228	System Controller & Bus Driver	5.00
8212	8 Bit Input/Output Port	5.00
MC14410CP	2 of 8 Tone Encoder	9.99
MC14412	Low Speed Modem	14.99
MC14408	Binary to Phone Pulse Converter	12.99
MC14409	Binary to Phone Pulse Converter	12.99
MC1488L	RS232 Driver	1.00
MC1489L	RS232 Receiver	1.00
MC1405L	A/D Converter Subsystem	9.00
MC1406L	6 Bit D/A Converter	7.50
MC1408/6/7/8	8 Bit D/A Converter	4.50
MC1330P	Low Level Video Detector	1.50
MC1349/50	Video IF Amplifier	1.17
MC1733L	LM733 OP Amplifier	2.40
LM565	Phase Lock Loop	2.50

See List of Advertisers on page 114

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

1900 MHz to 2500 MHz DOWN CONVERTER
This receiver is tunable a range of 1900 to 2500 mc and is intended for amateur radio use. The local oscillator is voltage controlled (i.e.) making the i-f range approximately 54 to 88 mc (Channels 2 to 7)

PC BOARD WITH DATA	$19.99
PC BOARD WITH CHIP CAPACITORS 13	$44.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY	$69.95
PC BOARD WITH ALL PARTS FOR ASSEMBLY PLUS 2N6603	$89.00
PC BOARD ASSEMBLED AND TESTED	$79.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY, POWER SUPPLY AND ANTENNA	$159.99
POWER SUPPLY ASSEMBLED AND TESTED	$49.99
YAGI ANTENNA 4' LONG APPROX. 20 TO 23 dB GAIN	$39.99
YAGI ANTENNA 4' WITH TYPE (N, BNC, SMA Connector)	$64.99
2300 MHz DOWN CONVERTER includes converter mounted in antenna, power supply, plus 90 DAY WARRANTY	$259.99
2300 MHz DOWN CONVERTER HMRII, with dish antenna, plus SIX MONTH WARRANTY	$200.00
OPTION #1 MRF902 in front end (7 dB noise figure)	$299.99
OPTION #2 2N6603 in front end (5 dB noise figure)	$359.99
2300 MHz DOWN CONVERTER ONLY	
10 dB Noise Figure 23 dB gain in box with N conn Input F conn Output	$149.99
7 dB Noise Figure 23 dB gain in box with N conn Input F conn Output	$169.99
5 dB Noise Figure 23 dB gain in box with SMA conn Input F conn Output	$189.99
DATA IS INCLUDED WITH KITS OR MAY BE PURCHASED SEPARATELY	15.00

Shipping and Handling Cost:
Receiver Kits and $1.50. Power Supply add $2.00. Antenna add $5.00. Option 1/2 add $3.00. For complete system add $7.50

HOWARD/COLEMAN TVRO CIRCUIT BOARDS

DUAL CONVERSION BOARD $25.00
This board provides conversion from the 3.7-4.2 band first to 900 MHz where gain and bandpass filtering are provided and, second, to 70 MHz. The board contains both local oscillators, one fixed and the other variable, and the second mixer. Construction is greatly simplified by the use of Hybrid IC amplifiers for the gain stages. Bare boards cost $25.

47 pF CHIP CAPACITORS $6.00
For use with dual conversion board. Consists of 6-47 pF

70 MHz IF BOARD $25.00
This circuit provides about 43 dB gain with 50 ohm input and output impedance. It is designed to drive the HOWARD/COLEMAN TVRO Demodulator. The on-board band pass filter can be tuned for bandwidths between 20 and 35 MHz with a passband ripple of less than ½ dB. Hybrid ICs are used for the gain stages. Bare boards cost $25.

.01 pF CHIP CAPACITORS $7.00
For use with 70 MHz IF Board. Consists of 7-.01 pF

DEMODULATOR BOARD $40.00
This circuit takes the 70 MHz center frequency satellite TV signals in the 10 to 200 millivolt range, detects them using a phase locked loop, deemphasizes and filters the result and amplifies the result to produce standard NTSC video. Other outputs include the audio subcarrier, a DC voltage proportional to the strength of the 70 MHz signal, and AFC voltage centered at about 2 volts DC. The bare board cost $40.

SINGLE AUDIO $15.00
This circuit recovers the audio signals from the 6.8 MHz frequency. The Miller 9051 coils are tuned to pass the 6.8 MHz subcarrier and the Miller 9052 coil tunes for recovery of the audio.

DUAL AUDIO $25.00
Duplicate of the single audio but also covers the 6.2 range

DC CONTROL $15.00
This circuit controls the VTO's, AFC and the S Meter

TERMS:
WE REGRET WE NO LONGER ACCEPT BANK CARDS.

PLEASE SEND POSTAL MONEY ORDER, CERTIFIED CHECK, CASHIER'S CHECK OR MONEY ORDER
PRICES SUBJECT TO CHANGE WITHOUT NOTICE. **ALL RETURN ORDERS ARE SUBJECT TO PRIOR APPROVAL BY MANAGEMENT**

ALL CHECKS AND MONEY ORDERS IN US FUNDS ONLY

ALL ORDERS SENT FIRST CLASS OR UPS.

ALL PARTS PRIME AND GUARANTEED

WE WILL ACCEPT COD ORDERS FOR $25.00 OR OVER. ADD $2.50 FOR COD CHARGE

PLEASE INCLUDE $2.50 MINIMUM FOR SHIPPING OR CALL FOR CHARGES

WE ALSO ARE LOOKING FOR NEW AND USED TUBES, TEST EQUIPMENT, COMPONENETS ETC

WE ALSO SWAP OR TRADE

FOR CATALOG SEE JANUARY, 1980, *73* Magazine, 10 Pages

(602) 242-8916
2111 W. Camelback
Phoenix, Arizona 85015

See List of Advertisers on page 114

Quest ELECTRONICS

P.O. Box 4430M
Santa Clara, CA 95054
Will calls: 2322 Walsh Ave.
(408) 988-1640 TWX 910-338-2139

60

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

INTEGRATED CIRCUITS

7400TTL		LM320K-5	1.35	CD4026	2.50
7400N	.19	LM320K-12	1.35	CD4027	.66
7402N	.20	LM320K-15	1.35	CD4028	.85
7404N	.25	LM320T-5	.95	CD4029	1.35
7408N	.27	LM320T-8	.95	CD4030	.45
7410N	.35	LM320T-12	.95	CD4035	1.00
7414N	.70	LM320T-15	.95	CD4040	1.35
7425N	.25	LM323K-5	5.95	CD4042	.85
7432N	.39	LM324N	1.00	CD4043	.85
7430N	.25	LM339N	1.00	CD4044	.85
7442N	.98	LM340K-5	1.35	CD4046	1.67
7445N	.82	LM340K-8	1.35	CD4049	.45
7447N	.63	LM340K-12	1.35	CD4050	.50
7448N	.77	LM340K-15	1.35	CD4051	1.13
7450N	.25	LM340K-24	1.35	CD4060	1.42
7474N	.35	LM340T-5	.85	CD4066	.71
7475N	.49	LM340T-8	.85	CD4068	.40
7485N	.88	LM340T-12	.85	CD4069	.40
7486N	1.70	LM340T-15	.85	CD4070	.50
7490N	.43	LM340T-18	.85	CD4071	.45
7492N	.43	LM340T-24	.85	CD4072	.45
7493N	.43	LM350	5.50	CD4073	.45
7495N	.69	LM377	2.95	CD4075	.45
74100N	1.35	LM379	5.00	CD4076	1.45
74107N	.35	LM380N	1.00	CD4078	.40
74121N	.34	LM381	1.60	CD4081	.35
74123N	.59	LM382	1.60	CD4082	.35
74125N	.45	LM709H	.59	CD4116	.47
74145N	.77	LM723H/N	.50	CD4490	5.50
74150N	1.20	LM733N	.85	CD4507	1.00
74151N	.69	LM741CH	.35	CD4508	2.85
74154N	1.25	LM741N	.38	CD4510	1.00
74157N	.69	LM747H/N	.75	CD4511	.94
74161N	.67	LM748N	.50	CD4515	2.52
74162N	.85	LM1303N	1.75	CD4516	1.10
74163N	.67	LM1304	1.10	CD4518	1.56
74174N	.96	LM1305	1.27	CD4520	1.82
74175N	.85	LM1307	2.00	CD4527	1.51
74190N	1.15	LM1310	1.95	CD4528	1.69
74192N	.87	LM1458	.55	CD4553	3.50
74193N	.85	LM1812	7.50	CD4566	2.45
74221N	1.25	LM1889	3.00	CD4583	2.35
74298N	1.65	LM2111	1.75	CD4585	1.10
74365N	.75	LM2902	2.25	CD40192	3.00
74366N	.75	LM3900N	.60	74C00	.35
74367N	.75	LM3905	1.75	74C04	.40
		LM3909N	.95	74C10	.35
74LS00 TTL		MC1458V	.55	74C14	.89
74LS00N	.29	NE550N	1.35	74C20	.35
74LS02N	.29	NE555V	.39	74C30	.35
74LS04N	.35	NE556A	.85	74C48	1.95
74LS05N	.25	NE565A	1.00	74C74	.85
74LS08N	.35	NE566V	1.50	74C76	1.25
74LS10N	.35	NE567V	1.00	74C90	1.25
74LS13N	.55	NE5708	4.75	74C93	1.25
74LS14N	1.00	78L05	.60	74C154	3.50
74LS20N	.35	78L08	.60	74C160	2.75
74LS22N	.35	78M05	.85	74C173	1.35
74LS28N	.35	7510B	1.75	74C192	1.65
74LS30N	.35	75491CN	.50	74C221	1.90
74LS33N	.60	75492CN	.55	74C905	6.00
74LS38N	.59	75494CN	.89	74C906	.75
74LS74N	.45			74C914	1.95
74LS75N	.65			74C922	5.00
74LS90N	.60	**A to D CONVERTER**		74C923	5.50
74LS93N	.75	80388	4.50	74C925	7.50
74LS95N	1.00	8700CJ	13.95	74C926	6.95
74LS107N	.45	8701CN	22.00	74C927	6.95
74LS112N	.45	8750CJ	13.95		
74LS113N	.45	LD130	9.95	**INTERFACE**	
74LS132N	.89	9400CJV/F	7.40	8095	.65
74LS136N	.50	ICL7103	9.50	8096	.65
74LS151N	.75	ICL7107	14.25	8097	.65
74LS155N	.79			8098	.65
74LS157N	1.10	**CMOS**		6709	1.25
74LS162N	1.10	CD4000	.25	8T10	4.50
74LS163N	1.10	CD4001	.35	8T13	3.00
74LS174N	1.15	CD4002	.35	8T26	5.50
74LS180N	1.25	CD4006	1.10	8T23	3.10
74LS221N	1.25	CD4007	.35	8T24	3.50
74LS258N	1.00	CD4008	1.20	8T25	3.20
74LS367N	.89	CD4009	.45	8T26	1.69
		CD4010	.45	8T28	2.75
LINEAR		CD4011	.35	6T97	1.69
CA3045	.90	CD4012	.28	6T98	1.69
CA3046	1.10	CD4013	.47		
CA3081	1.80	CD4014	1.25		
CA3082	1.90	CD4015	1.00	**MOS/MEMORY RAM**	
CA3088	3.40	CD4016	.55	2101-1	2.95
LM301AN/AH	.35	CD4017	1.00	2102-1	.95
LM305H	.87	CD4018	.94	2102AL-4	1.45
LM307N	.35	CD4019	.45	2102AN-2L	1.65
LM308N	1.00	CD4020	1.02	2104A-4	4.95
LM309K	1.25	CD4021	1.35	2107B-4	3.75
LM311H/N	.90	CD4022	1.10	2111-1	3.75
LM3171	1.65	CD4023	.28	2112-2	3.95
LM317K	3.75	CD4024	.75	2114	3.75
LM318	1.50	CD4025	.28	2114L 300ns	4.25

2114L 450ns	4.00
4116 200ns	3.95
8/4116 200ns	18.40
MM5262	.40
MM5280	3.05
MM5320	9.95
MM5330	5.94
PD4110-3	4.00
PD4110-4	5.00
P5101L	8.95
4200A	9.95
82S25	2.90
91L02A	1.50
HD0165-5	6.95
MM57109	4.50
GIAY38500-1	9.95
MCM66751A	9.95
9368	3.50
4100	10.00
416	16.00

CLOCKS

MM5311	5.50
MM5312	3.90
MM5314	3.90
MM5369	2.10
MM5841	14.45
MM5865	7.95
CT7010	8.95
CT7015	8.95
MM5375AA/N	3.90
MM5375AG/N	4.90
7205	16.50
7207	7.50
7208	15.95
7209	4.95
DS0026CN	3.75
DS0056CN	3.75
MM53104	2.50

MICROPROCESSOR

6502	10.95
6504	9.95
6522	9.95
6800	6.95
6802	11.95
6820	4.95
6850	5.95
6880A	3.95
8085	12.95
8086	75.00
Z80	9.95
Z80A	11.95
8212	2.90
8214	3.95
8216	2.90
8224	3.45
8228	4.95
8251	6.95
8253	15.00
8255	5.75
8257	10.95
8259	14.95
1802CP plas	13.95
1802DP plas	17.95
1861P	9.50
CDP1802CD	28.95
CDP1802D	35.00
CDP1816P	7.95

UART/FIFO

AY5-1013	5.50
AY5-1014	7.50
3341	6.95

PROM

1702A	5.85
2708	6.10
2716/1	12.00
2716 5 Volt	10.50
8/2716 5 Volt	64.00
2732	19.95
2758	14.00
8741A	55.00
8748	55.00
8748-8	55.00
8755A	55.00
N82S23	2.95
N82S123	4.95
N82S126	4.75
N82S129	4.95
N82S131	4.95
N82S136	8.75
N82S137	8.75
DM8577	2.90
6223	3.50

CONNECTORS

30 pin edge	2.50
44 pin edge	2.75
86 pin edge	4.00
100 pin edge	4.50
100 pin edge WW	5.25

IC SOCKETS

Solder Tin Low Profile			
PIN	1 UP	PIN	1UP
8	.15	22	.30
14	.14	24	.35
16	.16	28	.42
18	.27	36	.58
20	.29	40	.57

2 level 14 pin ww .70

WIRE WRAP LEVEL 3

PIN		PIN	
14	.55	24	.93
16	.57	28	1.00
18	.67	40	1.59

CRYSTALS

1 MHz	4.50
2 MHz	4.50
4 MHz	4.25
5 MHz	4.25
10 MHz	4.25
18 MHz	3.80
20 MHz	3.90
32 MHz	3.90
32768 Hz	4.50
1.8432 MHz	4.50
3.5795 MHz	1.20
2.0100 MHz	1.95
2.097152 MHz	4.50
2.4576 MHz	4.50
3.2768 MHz	4.50
5.0688 MHz	4.50
5.185 MHz	4.50
5.7143 MHz	4.50
6.5536 MHz	4.50
14.31818 MHz	4.25
18.432 MHz	4.50
22.1184 MHz	4.50

KEYBOARD ENCODERS

AY5-2376	$12.50
AY5-3600	17.95
AY5-9100	10.50
AY5-9200	16.50
74C922	5.50
74C923	5.50
HD0165-5	6.95
AY5-9400	10.50

D Connectors RS232

DB25P	3.62
DB25S	5.20
Cover	1.67
DE9S	1.95
DA15P	2.10
DA15S	3.10
Complete Set	9.50

Hickok 3½ Digit LED multimeter 89.95
Stopwatch Kit 26.95
Auto Clock Kit 17.95
Digital Clock Kit 14.95

8K/16K Eprom Kit
(less PROMS) $89.00
Motherboard $39.00
Extender Board $15.00

RESISTORS ¼ watt 5%
10 per type .03
25 per type .025
100 per type .013
1000 per type .012
350 piece pack
5 per type 8.75
½ watt 5% per type .05

Televideo Terminal
Model 912 $785.00
Model 920 $885.00

KEYBOARDS

56 key ASCII keyboard kit	$67.50
Fully assembled	77.50
53 key ASCII keyboard kit	60.00
Fully assembled	70.00
Enclosure Plastic	14.95
Metal Enclosure	29.95

LEDS

Red T01¾	.15
Green, Yellow T01¾	.20
Jumbo Red	.20
Green, Orange, Yellow Jumbo	.25

Clip/lite LED Mounting Clips 9/$1.25
(specify red, amber, green, yellow, clear)

CONTINENTAL SPECIALTIES in stock
Complete line of breadboard test equip.
MAX-100 8 digit Freq. Ctr. $149.95

OK WIRE WRAP TOOLS in stock
Portable Multimeter $18.00
Complete line of AP Products in stock.

SPECIAL PRODUCTS

MM5865 Stopwatch Timer with 10 pg. spec	9.00
PC board	7.50
Switches Mom. Pushbutton	.27
3 pos. slide	.25
Encoder HD0165-5	6.95

Paratronics

Model 10 Trigger Expander Kit	$229.00
Model 150 Bus Grabber Kit	$369.00
Clock Calendar Kit	**$23.95**
2.5 MHz Frequency Counter Kit	**$37.50**
30 MHz Frequency Counter Kit	**$47.75**

TRANSFORMERS

6V 300 ma	3.25
12 Volt 300 ma transformer	1.25
12.6V CT 600 ma	3.75
12V 250 ma wall plug	2.95
12V CT 250 ma wall plug	3.75
24V CT 100 ma	3.95
10V 1.2 amp wall plug	4.85
12V 6 amp	12.95
12V 500 ma wall plug	4.75
12V 1 amp wall plug	6.50
10/15 VAC 8/16 VA wall plug	9.75

DISPLAY LEDS

MAN1	CA	.270	2.90
MAN3	CC	.125	.39
MAN72/74	CA/CA	.300	1.00
DL704	CC	.300	1.25
DL707/DL707R	CA	.300	1.00
DL727/728	CA/CC	.500	1.95
DL747/750	CA/CC	.600	1.95
FND359	CC	.357	.70
FND560/567	CC/CA	.500	1.35
FND503/510	CC/CA	.500	.90
FND800/807	CC/CA	.800	2.20
3 digit Bubble			.60
10 digit display			1.25
7520 Clairex photocells			.39
TIL311 Hex			9.50
MAN3640	CC	.30	1.10
MAN4610	CA	.40	1.20
MAN4640	CC	.40	1.20
MAN4710	CA	.40	.95
MAN4740	CC	.40	1.20
MAN6640	CC	.56	2.95
MAN6710	CA	.60	1.35
MAN6740	CC	.60	1.35

MA1002A, C, E	8.95
MA1012A	8.95
102PS transformer	2.25
MA1012A Transformer	2.25

DIP Switches
4-position $ .95 7-position 1.00
5-position 1.00 8-position 1.05
6-position 1.00

4116 200ns Dynamic RAM
8/$18.40

RCA Cosmac 1802 Super Elf Computer $106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

Before you buy another small computer, see if it includes the following features: ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Real cost of in warranty repairs; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5 S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Free 14 page brochure.

Moews Video Graphics **$3.50.** Games and Music **$3.00,** Chip 8 Interpreter **$5.50.**

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes. **A 1K Super ROM Monitor $19.95** is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at $15.25 for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply).

PROM Eraser

assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$69.50** (with timer **$94.50**).

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00. Tiny Basic $30.00**

S-100 Computer Boards

8K Static Godbout Econo IIA Kit	149.00
16K Static Godbout Econo XIV Kit	269.00
24K Static Godbout Econo XX-24 Kit	414.00
32K Static Godbout Econo XX-32 Kit	537.00
16K Dynamic RAM Kit	289.00
32K Dynamic RAM Kit	328.00
64K Dynamic RAM Kit	399.00
Video Interface Kit	**$161.00**
Color Video Kit	129.95

81 IC Update Master Manual $79.95

Comp. IC data selector, 2 vol. master reference guide. Over 51,000 cross references. Free update service through 1981. Domestic postage $4.75.

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in May *Radio Electronics*.

LRC 7000+Printer $389.00

64/40/32/20 column dot matrix impact, std. paper. Interface all personal computers.

LRC 7000 printer interface cable for Super Elf with software $35.00

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$9.95**

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display, ROM monitor, fully expandable. **$405.00.** 4K version **$450.00.** 4K Assembler **$85.00**, 8K Basic Interpreter **$100.00.**

Special small power supply for AIM65 assem. in frame **$54.00.** Complete AIM65 in thin briefcase with power supply **$499.00.** Molded plastic enclosure to fit both AIM65 and power supply **$47.50.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$625.00.**

AIM65/KIM/VIM/Super Elf 44 pin expansion board; 3 female and 1 male bus. Board plus 3 connectors **$22.95.**

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm.17E^{38}$), 32 bit integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O included.

Super Basic on Cassette $55.00.

Ohio Scientific Computers

CIP Series 2 **$447.00.** Like an Apple at less than half the price! CIPMF Series 2 **$1199.00.** Minifloppy version with additional RAM/ROM. Complete software and peripherals available. Send for free brochure.

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Gremlin Color Video Kit $69.95

32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. No high res. graphics. On board RF Modulator Kit **$4.95**

Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

Dealers: Send for excellent pricing/margin program.

1802 16K Dynamic RAM Kit $149.00

Expandable to 32K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00**

Tiny Basic Extended on Cassette (added commands include Stringy, Array, Cassette I/O etc.)	**$15.00**
S-100 4-Slot Expansion	**$ 9.95**
Super Monitor VI.I Source Listing	**$15.00**
Editor Assembler (Requires minimum of 4K for E/A plus user source)	**$25.00**
1802 Tiny Basic Source listing	**$19.00**
Super Monitor V2.0/2.1 Source Listing	**$20.00**

TERMS: $5.00 min. order U.S. Funds. Calif residents add 6% tax.
$10.00 min. BankAmericard and Master Charge accepted. $1.00 insurance optional.
Postage: Add 5%. C.O.D. $10.00 min. order.

FREE: Send for your copy of our NEW 1981 QUEST CATALOG. Include 48¢ stamp.

SEMICONDUCTORS SURPLUS

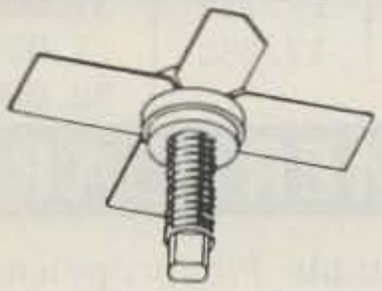
ARCO CAPS

304	100-550pF	1.50	469	170-780pF	1.40
400	.9-7pF	1.00	4615	390-1400pF	2.02
402	1.5-20pF	1.00	404	8-60pF	1.00
420	1-12pF	1.00	405	10-80pF	1.00
423	7-100pF	1.00	422	4-40pF	1.00
426	37-250pF	1.01	424	16-150pF	1.00
464	25-280pF	1.00	427	55-300pF	1.00
465	50-380pF	1.39	462	5-80pF	1.50
467	110-580pF	1.03			

TUBES

6KD6	5.00	6939	7.99
6LQ6/6JE6	6.00	6146	5.00
6MJ6/6LQ6/6JE6C	6.00	6146A	5.69
6LF6/6MH6	5.00	6146B/8298	7.95
12BY7A	4.00	6146W	12.00
2E26	4.69	6550A	8.00
4X150A	29.99	8908	9.00
4CX250B	45.00	8950	9.00
4CX250R	69.00	4-400A	145.00
4CX300A	109.99	4-400C	145.00
4CX350A/8321	100.00	572B/T160L	44.00
4CX350F/J/8904	100.00	7289	9.95
4CX1500B/8660	300.00	3-1000Z	229.00
811A	20.00	3-500Z	141.00
6360	4.69		

RF Transistors



MRF203	P.O.R.	MRF449	12.65	BFR91	1.25
MRF216	19.47	MRF449A	12.65	BFR96	1.50
MRF221	8.73	MRF450	11.00	BFW92A	1.00
MRF226	10.20	MRF450A	11.77	BFW92	.79
MRF227	2.13	MRF452	15.00	MMCM918	14.30
MRF238	10.00	MRF453	13.72	MMCM2222	15.65
MRF240	14.62	MRF454A	21.83	MMCM2369	15.00
MRF245	28.87	MRF455	14.08	MMCM2484	15.25
MRF247	28.87	MRF455A	14.08	MMCM3960A	24.30
MRF262	6.25	MRF474	3.00	MWA120	7.80
MRF314	12.20	MRF475	2.90	MWA130	8.08
MRF406	11.33	MRF476	2.25	MWA210	7.46
MRF412	20.65	MRF477	10.00	MWA220	8.08
MRF421	27.45	MRF485	3.00	MWA230	8.62
MRF422A	38.25	MRF492	20.40	MWA310	8.08
MRF422	38.25	MRF502	.93		
MRF428	38.25	MRF604	2.00	NEW MRF472	
MRF428A	38.25	MRF629	3.00	12.5 VDC, 27 MHz	
MRF426	8.87	MRF648	26.87	4 Watts output	
MRF426A	8.87	MRF901	3.99	10 dB gain	
		MRF902	9.41	1.69 ea.	
		MRF904	3.00	10/9.50	
		MRF911	4.29	100/69.00	
		MRF5176	11.73	1000/480.00	
		MRF8004	1.39		
		BFR90	1.00		

TO-3 TRANSISTOR SOCKETS
Phenolic type.....6/$1.00

NEW SIMPSON 260-7 $99.99

RG174/U - $15.00 per 100 ft.
Factory new

PL259 TERMINATION
52 Ohm 5 Watts $1.50 each

TORIN TA700 FANS NEW $29.99 each
Model A30340
230 VAC @ .78 Amps
Will also work on 115 VAC

CRYSTAL FILTERS

EFCL455K13E	3.99
EFCL455K40B2	2.99
FX-07800L, 7.8 MHz	12.99
FHA103-4, 10.7 MHz	12.99

CB type crystals

$4.95 each

51-T

T1	T15	T28
T2	T16	T29
T3	T17	T30
T4	T18	T31
T5	T19	T32
T6	T20	T33
T7	T21	T34
T8	T22	T35
T9	T23	T36
T10	T24	T37
T11	T25	T38
T12	T26	T39
T13	T27	T40
T14		

51-R

R1	R15	R28
R2	R16	R29
R3	R17	R30
R4	R18	R31
R5	R19	R32
R6	R20	R33
R7	R21	R34
R8	R22	R35
R9	R23	R36
R10	R24	R37
R11	R25	R38
R12	R26	R39
R13	R27	R40
R14		

NEW CHERRY BCD SWITCH
New end plates
Type T-20..... 1.29 each

Johnson AIR Variables

$1.00 each

T-3-5	1 to 5 pF
T-6-5	1.7 to 11 pF
T-9-5	2 to 15 pF
189-6-1	.1 to 10 pF
189-502-Y	1.3 to 6.7pF
189-503-105	1.4 to 9.2pF
189-504-5	1.5 to 11.6pF
189-505-5	1.7 to 14.1pF
189-505-107	1.7 to 14.1pF
189-506-103	1.8 to 16.7pF
189-507-105	2 to 19.3pF
189-508-5	2.1 to 22.9pF
189-509-5	2.4 to 24.5pF
545-043	1.8 to 11.4pF

64

See List of Advertisers on page 114

Johnson AIR Variables

1/4 x 2 1/2" shaft

$2.50 each

193-10-6	2.2 to	34 pF
193-	1.5 to	27.5pF
193-	.6 to	6.4pF

$1.00 each

160-107-16	.5 to	12 pF
193-10-9	2.2 to	34 pF
193-10-104	2.2 to	34 pF
193-4-5	3 to	30 pF

RF Power Device

MRF454 Same as MRF458
12.5 VDC, 3-30 MHz
80Watts output, 12dB gain
$17.95 ea.

E.F. JOHNSON TUBE SOCKETS

#124-0311-100 ..... 6.99 each
For 8072 etc.

#124-0107-001 ..... 13.99 each
For 4CX250B/R, 4X150A etc.

#124-0111-001 ..... 4.99 each
Chimney for 4CX250B/R and 4X150

#124-0113-001 and 124-0113-021
$12.99 each
Capacitor for #124-0107-001

#123-209-33 Sockets....6.99 each
For 811A, 572B, 866, etc.

UNELCO CAPS

6.8pF	47pF	
8.2pF	62pF	
10pF	100pF	
12pF	160pF	
13pF	180pF	
14pF	200pF	
20pF	240pF	
24pF	380pF	
33pF	470pF	
36pF	1000pF	
43pF	350V	$1.00 each

86 Pin Motorola Bus Edge Connectors

Gold plated contacts
Dual 43/86 pin .156 spacing
Soldertail for PCB.....$3.00 each

110VAC MUFFIN FANS

New $11.95
Used $5.95

Transistors

2N2857JAN	2.50
2N2949	3.60
2N2947	15.00
2N2950	4.60
2N3375	8.00
2N3553	1.57
2N3818	5.00
2N3866	1.00
2N3866JAN	2.50
2N3866JANTX	4.00
2N3925	10.00
2N3948	2.00
2N3950	25.00
2N3959	3.00
2N3960JANTX	10.00
2N4072	1.60
2N4427	1.10
2N4429	7.00
2N4877	1.00
2N4959	2.00
2N4976	15.00
2N5070	8.00
2N5071	15.00
2N5108	4.00
2N5109	1.50
2N5179	1.00
2N5583	4.00
2N5589	6.00
2N5590	8.00
2N5591	11.00
2N5635	5.44
2N5636	11.60
2N5637	20.00
2N5641	5.00
2N5643	14.00
2N5645	10.00
2N5842	8.00
2N5849	20.00
2N5942	40.00
2N5946	14.00
2N5862	50.00
2N6080	7.00
2N6081	10.00
2N6082	11.00
2N6083	13.00
2N6084	14.00
2N6095	11.00
2N6096	20.00
2N6097	28.00
2N6166	38.00
2N6368	22.99
A210/MRF517	2.00
BLY38	5.00
40280/2N4427	1.10
40281/2N3920	7.00
40282/2N3927	10.48

CRYSTALS

$4.95 each

5.120	7.4825	9.565	10.150	11.155	11.905	17.315
7.3435	7.4865	9.575	10.160	11.275	11.955	17.355
7.4585	7.4925	9.585	10.170	11.700	12.000	17.365
7.4615	7.4985	10.000	10.180	11.705	12.050	37.600
7.4625	7.5015	10.010	10.240	11.730	12.100	37.650
7.4665	7.5025	10.020	10.245	11.750	16.965	37.700
7.4685	7.5065	10.030	10.595	11.755	17.015	37.750
7.4715	7.7985	10.040	10.605	11.800	17.065	37.800
7.4725	7.8025	10.0525	10.615	11.850	17.165	37.850
7.4765	9.545	10.130	10.625	11.855	17.215	37.900
7.4785	9.555	10.140	10.635	11.900	17.265	37.950
7.4815						38.000

High Voltage Caps

30 MFD @ 500 VDC	1.69
22 MFD @ 500 VDC	1.69
100 MFD @ 450 VDC	2.29
150 MFD @ 450 VDC	3.29
225 MFD @ 450 VDC	4.29
.001/1000pF @ 10 KV	.89
.001 @ 3 KV	4/1.00
.0015 @ 3 KV	3/1.00
.01 @ 4 KV	.79
.01 @ 1.6KV	4/1.00
.02 @ 8 KV	2.00
.01 @ 1 KV	6/1.00

NEW 2" ROUND SPEAKERS
100 Ohm coil $.99 each

PLASTIC TO-3 SOCKETS
4/$1.00

CRYSTAL FILTERS
Tyco 001-19880 Same as 2194F
10.7 MHz narrow band
3 dB bandwidth 15 KHz min.
20 dB bandwidth 60 KHz min.
40 dB bandwidth 150 KHz min.
Ultimate 50 dB insertion loss 1 dB max.
Ripple 1 dB max. Ct. 0+/-5 pF 3600 Ohms
$3.99 each

78MO5
Same as 7805 but only 1/2 Amp
5 VDC .49 each or 10/$3.00

TRIMMER CAPS

Sprague. Stable Polypropylene.
.50 each or 10/4.00
not sold mixed

1.2 to	13pF
2 to	30pF
3.9 to	18pF
3.9 to	40pF
3.9 to	55pF

Carbide Circuit Board Drill Bits
for PCB Boards
5 mix for $5.00

J-Fet

J310 N-CHANNEL J-FET 450 MHz
Good for VHF/UHF Amplifier,
Oscillator and Mixers 3/$1.00

MURATA CERAMIC FILTERS

SFD 455D	455 KHz	2.00
SFB 455D	455 KHz	1.60
CFM455E	455 KHz	5.50
CFU455H	455 KHz	3.00
SFE 10.7MA	10.7 MHz	2.99

TEXAS INSTRUMENT TIL-305P
5 x 7 array alphanumeric display
$3.85 each

SEMICONDUCTORS SURPLUS

ATLAS FILTERS

ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR

Your Choice

$15.95 ea.

5.645 - 2.7/8
5.595 - 2.7 USB
5.595 - 2.7/8/L
5.595 - 2.7 LSB
5.595 - .500/4
9.0 - USB/CW

Soldering Kit

New Weller Soldering Iron Kit
#SP-23F..... 9.99 each
Kit includes:
- 1 - 25 Watt soldering iron, develops 750° of tip temperature
- 3 - tips (screwdriver, chisel, cone)
- 1 - soldering aid tool
- 1 - coil 60/40 rosin core solder

CERAMIC PLATE CAPS

$1.09 each
#1 type for 3/8 plate cap
#2 type for 5/8 plate cap

Used NiCads

Used C Nickel Cadmium Batteries
1.8 amp hour
Pack of ten $8.99 per pack

CERAMIC COIL FORMS

$1.99 each

#1	3/16" x 4/8"
#2	3/16" x 1/4"
#3	1/4 " x 3/4"
#4	3/8 " x 7/8"
#5	3/8 " x 5/8"

All of the above have powdered iron cores.

#6	1/2"x 2 3/4"

NEW BOGNER DOWNCONVERTER
Industrial version.
1 year guarantee..... $225.00
NOT FOR SALE IN ARIZONA

UHF/VHF RF POWER TRANSISTORS
CD2867/2N6439
60 Watts output
Reg. Price $45.77
SALE PRICE $19.99

CHOKES

.1-3 uH	2.99	4.7 mH	2.99
VIV .15 .15 uH	2.99	5 mH	2.99
VIV 150 150 uH	2.99	5.11 mH	2.99
5-20 uH	1.69	6 mH	2.99
Variable coil 10-80 uH	2.99	7.2 mH	2.99
Transformer dual 8.8 uH	1.00	8.25 mH	2.99
.47 uH	1.00 ea. or 10/7.50	8.28 mH	2.99
.68 uH	1.00 ea. or 10/7.50	8.6 mH	2.99
1 uH	1.00 ea. or 10/7.50	10 mH	2.99
1.2 uH	1.00 ea. or 10/7.50	12 mH	2.99
1.5 uH	1.00 ea. or 10/7.50	15 mH	2.99
2.2 uH	1.00 ea. or 10/7.50	17 mH	2.99
2.7 uH	1.00 ea. or 10/7.50	19.6 mH	2.99
3.3 uH	1.00 ea. or 10/7.50	20 mH	2.99
6.5 uH	1.00 ea. or 10/7.50	20.5 mH	2.99
7.5 uH	1.00 ea. or 10/7.50	22.6 mH	2.99
10 uH	1.00 ea. or 10/7.50	24 mH	2.99
15 uH	1.00 ea. or 10/7.50	27.4 mH	2.99
20 uH	1.00 ea. or 10/7.50	28.7 mH	2.99
22 uH	1.00 ea. or 10/7.50	29.9 mH	2.99
33 uH	1.00 ea. or 10/7.50	30 mH	2.99
39 uH	1.00 ea. or 10/7.50	36 mH	2.99
47 uH	1.00 ea. or 10/7.50	36.5 mH	2.99
50 uH	2.99	40 mH	2.99
56 uH	1.69	40.2 mH	2.99
62 uH	1.00 ea. or 10/7.50	43 mH	2.99
68 uH	1.00 ea. or 10/7.50	47 mH	2.99
100 uH	2.99	50 mH	2.99
120 uH	1.69	59 mH	2.99
185 uH	1.00 ea. or 10/7.50	60 mH	2.99
538 uH	1.00 ea. or 10/7.50	71.5 mH	2.99
680 uH	1.00 ea. or 10/7.50	78.7 mH	2.99
1000 uH	1.00 ea. or 10/7.50	86 mH	2.99
1630 uH	1.50	100 mH	2.99
.1 mH	2.99	120 mH	2.99
.2 mH	2.99	150 mH	2.99
.22 mH	2.99	175 mH	2.99
.27 mH	2.99	200 mH	2.99
.33 mH	2.99	205 mH	2.99
.39 mH	2.99	237 mH	2.99
.240 mH	2.99	240 mH	2.99
1.2 mH	2.99	300 mH	2.99
1.5 mH	2.99	360 mH	2.99
1.65 mH	2.99	390 mH	2.99
1.75 mH	2.99	430 mH	2.99
1.9 mH	2.99	500 mH	1.50
1 mH	1.69	600 mH	2.99
1.88 mH	3.99	1000 mH	2.99
2 mH	2.99	1.5 Hy	2.99
2.4 mH	2.99	2.0 Hy	2.99
2.5 mH	1.00 ea. or 10/7.50	2.5 Hy	2.99
2.7 mH	2.99	3.0 Hy	2.99
3.0 mH	2.99	5.0 Hy	2.99
3.6 mH	2.99	10 Hy	2.99
4.3 mH	2.99		

HIGH VOLTAGE CAPS

420 MFD @ 400 VDC	3.99 each
600 MFD @ 400 VDC	3.99 each

New Fairchild Prescaler Chip

95H90DCQM..... 6.50 each
350 MHz prescaler divide by 10/11

See List of Advertisers on page 114

1.9-2.5G CONVERTERS

1900 MHz to 2500 MHz DOWNCONVERTERS
Intended for amateur radio use.
Tunable from channel 2 thru 6. NOT FOR SALE IN ARIZONA
34 dB gain 2.5 to 3 dB noise.
Warranty for 6 months Model HMR 11
Complete Receiver and Power Supply
(does not include coax)..... $225.00

4 foot Yagi antenna only..... $39.99
Downconverter Kit - PCB and parts.. $69.95
Power Supply Kit -
Box, PCB and parts..... $49.99
Downconverter assembled..... $79.99
Power Supply assembled..... $59.99
Complete Kit form $109.99
(includes Yagi antenna and instructions)

REPLACEMENT PARTS
MRF901..... $ 3.99
MBD101..... 1.29
.001 Chip Caps 1.00
Power Supply PCB 4.99
Downconverter PCB..... 19.99
Instructions for any separate item 10.00

NEW TRANSFORMERS

		Price each
F-18X	6.3 VCT @ 6Amps	6.99
F-46X	24V @ 1Amp	5.99
F41X	25.2VCT @ 2Amps	6.99
P-8380	10VCT @ 3Amps	7.99
P-8604	20VCT @ 1Amp	4.99
K-32B	28VCT @ 100 MA	4.99
E30554	Dual 17V @ 1Amp	6.99

DIODES

HEP 170
3.5 A, 1000 PIV
.20 ea., 100 for $15.00

D61005
1.5 A, 1000 PIV
.15 ea., 100 for $12.00

HVK 1153
25 mA, 20,000 PIV
$1.00 ea., 10 for $8.00

Fairchild LEDs
FLV 5007 & 5009 red.
Case type TO-92.
6/$1.00

SCMS 10K
15 mA, 10,000 PIV
$1.69 ea., 10 for $12.50

High-voltage diode EK500
5000 Volts, 50 mA
.99 each

Motorola SCR
TO-92 Case, 0.8 Amp, 30 V.
Igt 0.2 Vgt 0.8.
Same as #N5060.
4/$1.00 or 100/$15.00

Dialco Type 555-2003
LED 5 VDC with built-in resistor.
.69 each

Motorola MA 752 Rectifier
6 Amps, 200 PIV
4/$1.29

NEW BCD SWITCH
8 switch with end plates
Model TSM200-1011 (CDI) $16.87

CONTINUOUS TONE BUZZERS
12VDC..... $2.00 each

EIMAC FINGER STOCK #Y-302
36 in. long x 1/2 in. $4.99 each

MAGNET WIRE
$22.50 per spool

#24	A.W.G.	9 lb.
#26	A.W.G.	9 lb.
#25	A.W.G.	9 lb.
#30	A.W.G.	8 3/4 lb.
#31	A.W.G.	6 lb.

CORES
4/1.00

T20-12	T30-6	T37-6
T25-6	T30-12	T37-10
T30-2	T37-2	T44-6

CABLE TIES
#/T-18R 100 per bag
mil. spec. #MS-3368S, 4"
Made by Tyton Corp.
$2.50 per bag
100 bags - $20.00

Miniature Ceramic Trimmers
.50 each or 10/$4.00

CV31D350	2 to 8 pF
HM00-4075-03	3.5 to 11 pF
300425	3.5 to 13 pF
E5-25A	5 to 25 pF
	5.1 to 40 pF
	3.5 to 15 pF
	5.2 to 40 pF
	2.5 to 6 pF

CERAMIC STAND OFFS

#CNP-5	3/8 x 5/8"	.29 each
	7/16 x 1 1/4"	.39 each
#N54W0112	3/8 x 1 1/2"	.49 each
#NL523W03-010	3/4 x 1 1/4"	.79 each

CORES AND BEADS

#43	Shield Bead	4/1.00
#61	Toroid	3/1.00
#43	Balun	10/1.00
#61	Balun	8/1.00
#61	Balun	6/1.00
#61	Balun	4/1.00
#61	Beads	10/1.00
Ferrite Rod 1/4 x 7 1/2		2.99
Ferrite Beads 1/8" long		12/1.00
Ferrite Beads 3/8" long		6/1.00
Ferrite Beads 1/16" long		12/1.00

DOOR KNOB CAPS

470 pF @ 15 KV	$3.99 each
Dual 500 pF @ 15 KV	5.99 each
680 pF @ 6 KV	3.99 each
800 pF @ 15 KV	3.99 each
2700 pF @ 40 KV	5.99 each

TRANSFORMERS
$9.99 each
#2899652-01
26.8 VCT @ 660 MA
21.9 VCT @ 1.1 Amps
$1.99 each
#18000711P
24 V @ 100 MA
$12.99 each
#2099459-00
28 V @ 1.5 Amps
9.6 V @ 9 Amps
16.8 V @ 300 MA

JUMBO LED'S

Red	8/$1.00
Clear	6/$1.00
Yellow	6/$1.00
Green	6/$1.00
Amber	6/$1.00

MEDIUM LED'S

Red	6/$1.00
Green	6/$1.00

NE555V TIMERS
.39 each or 10/$5.00

NEW DUAL COLON LED
.69 each or 10/$5.00

PLATE CHOKES

75 uH	3.00
.94 mH	3.99

TRANSISTORS/IC S

Motorola MHW 252 VHF power amplifier.
Frequency range: 144-148 MHz.
Output power: 25W.
Minimum gain: 19.2 dB.
$29.67 each

Motorola MC 1316P.
House no. same as HEP C6073 & EC9814.
2-W audio amplifier.
$1.29 ea., 10 for $9.50

Fairchild 007-03 IC.
ECG no. 707 Chroma demodulator.
$1.29 ea., 10 for $8.50

Motorola rf transistors.
Selection Guide & Cross-Reference Catalog.
43 pgs.
$1.99 each

RCA Triacs.
Type T2310A.
TO-5 Case with heat sinks.
1.6 Amp, 100 VDC, Igt 3mA.
Sensitive gate.
$1.00 each

RCA power transistors.
NPN RCS 258.
Vceo 60 NFE 5mA.
IC 20 Amps Vce 4V.
250 Watts, Ft 2 MHz.
$3.00 each

RCA Triacs.
Type T4121B/40799.
200 VDC 10 Amps.
Stud type.
$3.69 each

RCA Triacs.
Type 40805/T6421D.
30 Amps, 400 VDC.
$5.00 each

Motorola rf amplifier.
544-4001-002, similar to type MHW 401-2.
1.5 Watts output. 440-512 MHz.
15 dB gain min. $19.99 each

ORDERING INSTRUCTIONS

Check, money order, or credit cards welcome. (Master Charge and VISA only.) No personal checks or certified personal checks for foreign countries accepted. Money order or cashiers check in U.S. funds only. Letters of credit are not acceptable.

Minimum shipping by UPS is $2.35 with insurance. Please allow extra shipping charges for heavy or long items.

All parts returned due to customer error or decision will be subject to a 15% restock charge. If we are out of an item ordered, we will try to replace it with an equal or better part unless you specify not to, or we will back order the item, or refund your money.

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Prices supersede all previously published. Some items offered are limited to small quantities and are subject to prior sale.

We now have a toll free number, but we ask that it be used for *charge orders only*. If you have any questions please use our other number. We are open from 8:00 a.m. - 5:00 p.m. Monday thru Saturday.

Our toll free number for *charge orders only* is 800-528-3611.

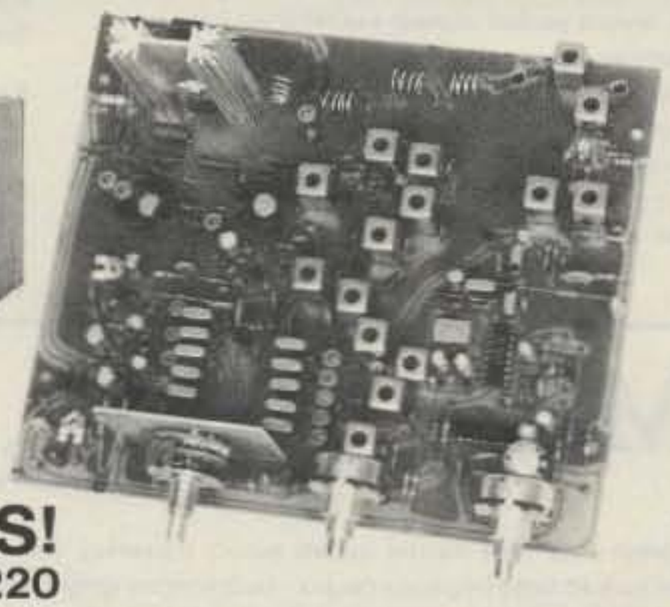
SEMICONDUCTORS SURPLUS

2822 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423

• FM • SSB • CW • ATV • OSCAR
• LINKS • REPEATERS • TRANSMITTERS
• RECEIVERS • PREAMPS • CONVERTERS
• TRANSCEIVERS • POWER SUPPLIES • PA'S

QUALITY VHF/UHF KITS AT AFFORDABLE PRICES

-NEW-



SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

10 watts, 5 Channels, for 6M, 2M, or 220

Hamtronics® Does it Again!

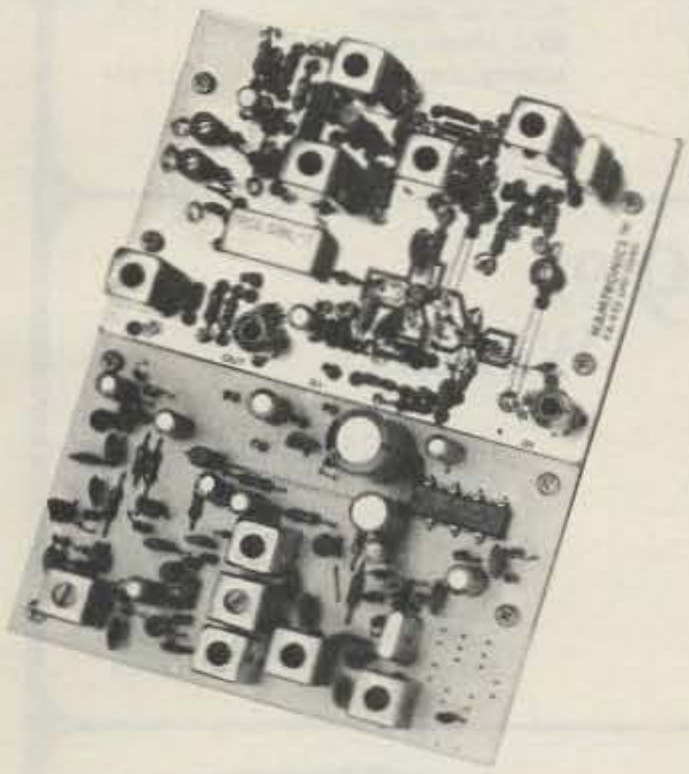
Where else can you get a value-packed radio at such reasonable cost?

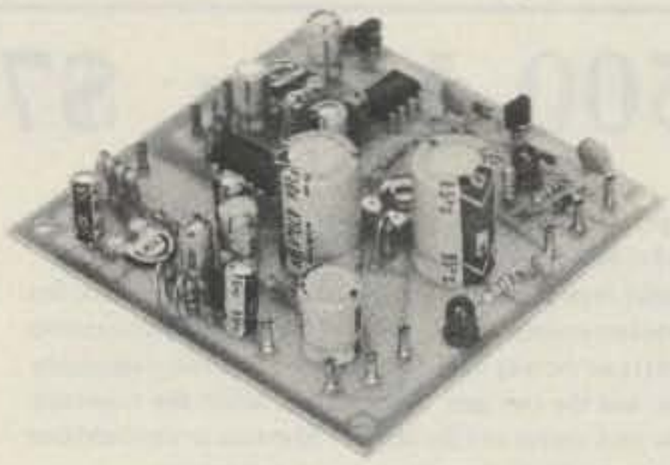
FM-5 PC Board Kit – ONLY $159.95
complete with controls, heatsink, etc.

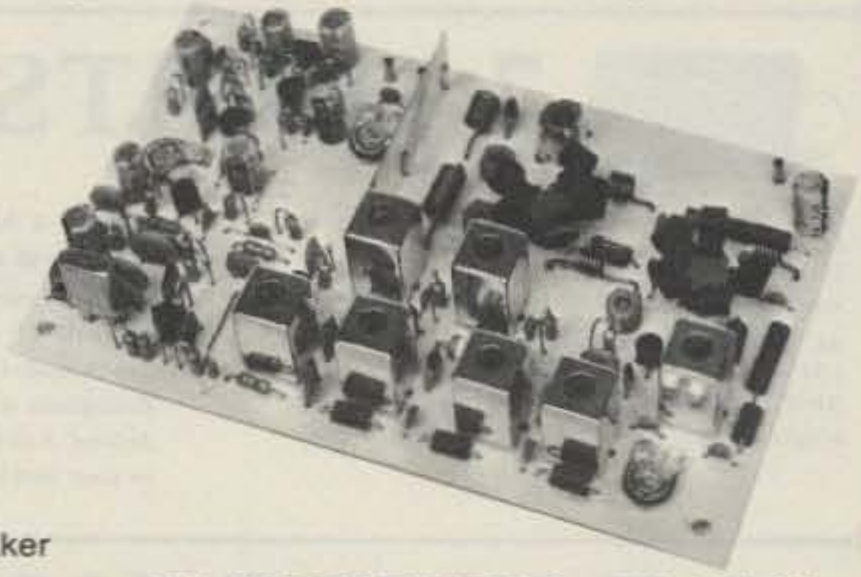
Cabinet kit, microphone, crystals, etc. available separately

Request catalog for full details.

HIGH QUALITY FM MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.







- **R75 VHF FM RECEIVER** for 10M, 6M, 2M, 220, or commercial bands. 4 fantastic selectivity options. Kits from $84.95 to $119.95
- **R450 UHF FM RECEIVER** for 380-520 MHz bands. Kits in selectivity options from $94.95
- **R110 VHF AM RECEIVER** Kit for vhf aircraft band or ham bands. Only $84.95.

- **COR KITS** With audio mixer and speaker amplifier. Only $29.95.
- **CWID KITS** 158 bits, field programmable, clean audio. Only $59.95.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Only $18.00.
- **SCANNER CONVERTERS** Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $79.95.

- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous. Kits only $54.95.
- **T451 UHF FM EXCITER** for 450 ham band or adjacent. Kits only $64.95.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Kits from $69.95.

VHF & UHF TRANSMITTING CONVERTERS

For SSB, CW, ATV, FM, etc. Available for 6M, 2M, 220, 440 with many IF input ranges. Converter board kit only at $79.95 (VHF) or $99.95 (UHF) or kits complete with PA and cabinet as shown.

VHF & UHF RECEIVING CONVERTERS

20 Models cover every practical rf and if range to listen to SSB, FM, ATV, etc. on 6M, 2M, 220, 440, and 110 aircraft band. Even convert weather down to 2M! Kits from $39.95 and wired units.

VHF & UHF RECEIVER PREAMPS. Low noise.

VHF Kits from 27 to 300 MHz. UHF Kits from 300 to 650 MHz. Broadband Kits: 20-650 MHz. Prices start at $14.95 (VHF) and $18.95 (UHF). All preamps and converters have noise figure 2dB or less.

• Call or Write for FREE CATALOG
(Send $2.00 or 5 IRC's for overseas MAILING)
• Order by phone or mail • Add $2 S & H per order
(Electronic answering service evenings & weekends)
Use VISA, MASTERCARD, Check, or UPS COD.

hamtronics, inc.

65-P MOUL RD. • HILTON NY 14468
Phone: 716-392-9430

Hamtronics® is a registered trademark ✓33

ramsey the first name in Counters !

9 DIGITS 600 MHz $129.95 WIRED

PRICES	
CT-90 wired, 1 year warranty	$129.95
CT-90 Kit, 90 day parts warranty	109.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC Adapter/Charger	12.95
OV-1, Micro-power Oven time base	49.95
External time base input	14.95

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include; three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally; an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard-10.000 mHz, 1.0 ppm 20-40°C. Optional Micro-power oven-0.1 ppm 20-40°C
Power:	8-15 VAC @ 250 ma

7 DIGITS 525 MHz $99.95 WIRED

SPECIFICATIONS:

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

PRICES:

CT-70 wired, 1 year warranty	$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

7 DIGITS 500 MHz $79.95 WIRED

PRICES:

MINI-100 wired, 1 year warranty	$79.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

SPECIFICATIONS:

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

8 DIGITS 600 MHz $159.95 WIRED

NEW READ RECEIVER FREQUENCY

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	8 digits 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double-duty!

PRICES:

CT-50 wired, 1 year warranty	$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95

DIGITAL MULTIMETER $99.95 WIRED

PRICES:

DM-700 wired, 1 year warranty	$99.95
DM-700 Kit, 90 day parts warranty	79.95
AC-1, AC adaptor	3.95
BP-3, Nicad pack +AC adapter/charger	19.95
MP-1, Probe kit	2.95

The DM-700 offers professional quality performance at a hobbyist price. Features include; 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

SPECIFICATIONS:

DC/AC volts:	100uV to 1 KV, 5 ranges
DC/AC current:	0.1uA to 2.0 Amps, 5 ranges
Resistance:	0.1 ohms to 20 Megohms, 6 ranges
Input impedance:	10 Megohms, DC/AC volts
Accuracy:	0.1% basic DC volts
Power:	4 'C' cells

AUDIO SCALER

For high resolution audio measurements, multiplies UP in frequency.

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

$29.95 Kit $39.95 Wired

ACCESSORIES

Telescopic whip antenna - BNC plug	$ 7.95
High impedance probe, light loading	15.95
Low pass probe, for audio measurements	15.95
Direct probe, general purpose usage	12.95
Tilt bail, for CT 70, 90, MINI-100	3.95
Color burst calibration unit, calibrates counter against color TV signal	14.95

COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer-included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

$34.95 Kit $44.95 Wired

ramsey electronic's, inc. VISA MasterCharge
2575 Baird Rd. Penfield, NY 14526 ~62

PHONE ORDERS
CALL 716-586-3950

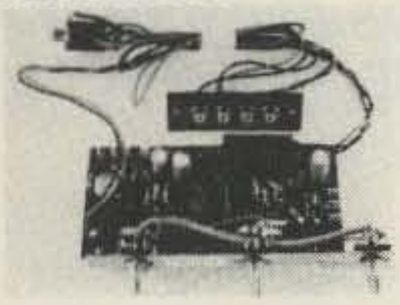
TERMS Satisfaction guaranteed - examine for 10 days, if not pleased return in original form for refund. Add 5% for shipping - insurance to a maximum of $10. Overseas add 15%. COD add $2. Orders under $10 add $1.50. NY residents add 7% tax.

DIGITAL RESEARCH: PARTS

"TOP QUALITY PARTS FOR LESS"

9 Watt Stereo Amplifier

Brand New!



6.50

Fantastic!

One of the neatest items we have come up with. Operates on 8 to 20V. A.C. or D.C. (on board diodes).

- Separate tone control pots
- Balance control
- Volume control

Separate inputs for phono, radio, recorder, etc. Separate jack for head phones.

Replace your car stereo amp. Easy hook up — approximately 10 min. with our "how to" instructions.

Transformer for above — $3.50

Universal Timer Kit NEW!

- ★ Adjustable from 1 sec. to 1 hr.
- ★ Control up to 1 amp *"Turn Things On or Off"*

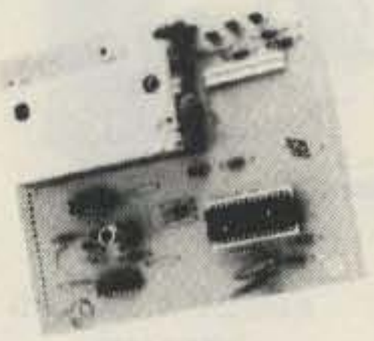
Kit includes all parts necessary to build this exciting kit.

Uses: Children's T.V. programs - Darkroom exposures - Amateur 10 min. I.D.er - Egg Timer - Intermittent Windshield Wiper. Absolutely endless uses.

Complete kit including power supply, p.c. board - DPDT relay, and all parts to make timer operational.

8.95

Video Game Board



4.45

3 for 12.00

Hockey • Tennis • Handball

- General Instruments AY3-8500
- Features Exciting Sounds
- On Screen Scoring
- Speed & Paddle Controls
- 1 or 2 Players
- Works on 8-15 Volts D.C.

Each board comes with RF Modulator (Ch. 3 or 4) and schematic. The only parts needed to complete game are speaker, 2-1 Meg Pots & Switches.

IC Specials!

LM1889-2.25

MC1310 - 1.80

LM3820 - A.M. Radio on a chip w/specs. 2/1.00

16 Pin Header

4/1.00

Power Transistor TO220 Case

3/1.10

1 Amp 30 Watts 100 Volt

TIP 30C (PNP)

TIP 29C (NPN)

Gold Wire Wrap Sockets

Not Cheap Gold Inlay as Sold By Others.

Super 3 Level Gold Wire Wrap.

14 Pin - **10/3.95, 25/8.75**

16 Pin - **10/4.95, 25/11.25**

Video Paddle Controls

2 for 1.00

1 Meg

Can be used with game board above.

Voltage Regulator

LM309K

1.00

5 Volt - 1 Amp Regulator TO3 Case. Super Special!

Sprague RFI Filter

3.65 or 3/9.00

Perfect for Computers, or anything that needs to be "glitch" free. By the #1 name in filtering, Sprague. JN17-5109B. Has I.E.C. Power Line Connector. 2x3 Amp. 115/220 VAC 60 Hz. 2⅛" x 2½" x 3" deep.

Switch Banks

- Non Canceling
- DPDT-PC or Solder

2.50

- Switches Easily Removed
- Push On/Push Off

THAT'S INCREDIBLE!

Transformer

32VCT @ lamp

6V @ lamp **3.25**

Measures:

2" x 2¼" x 2¼"

2⅜" Mounting Centers

Rectifier Diode

IN4007

11/1.00

1000 Volts, 1 Amp

DO-41 Case • Prime • Long Lead • Marked.

RCA Triac

79¢

5 for 3.50

T2800M-TO220 Case

6 Amp 600 Volt

JFET OP AMP

Super High Input Impedance (10^{12} OHMS) — High Frequency Response. TO 4 MHZ. Large DC Voltage Gain 106 DB — New generation OP-AMP with Vastly Superior Features!

LF356BH - **75¢ or 3/2.00**

Micro Mini Toggle Switch

99¢

6 for 5.00

SPDT • Made in USA with Hardware

IF YOU DON'T HAVE CATALOG #81-05, YOU BETTER WRITE TODAY!

TERMS:

Add 50¢ postage, we pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa, MasterCard and American Express cards. Tex. Res. add 5% Tax. Foreign orders (Canada 10%) add 20% P & H.

• VISA • MASTERCARD • AMERICAN EXPRESS •

Digital Research: Parts

P.O. Box 401247 • Garland, Texas 75040

(214) 271-2461

SPECTRONICS, INC.

1009 Garfield St., Oak Park, Illinois · 60304

(312) 848-6777

NEW RELEASES & POPULAR ITEMS

IMPROVE YOUR RECEPTION!

OUR MOST POPULAR PREAMPLIFIER

MODEL PLF-2

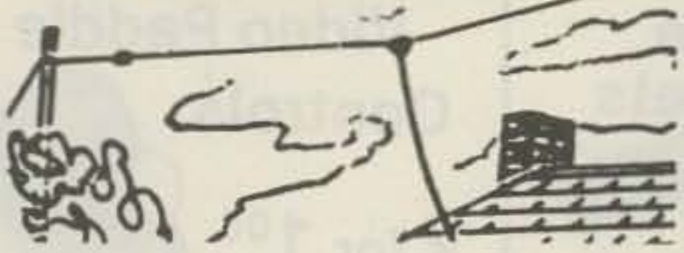
$52.95

AMECO ALL-BAND PREAMP!

- 6-160 Meters
- 20+ dB Gain
- Low Price

MODEL PLF-2 Improves weak signals as well as image and spurious rejection of most receivers. Direct switching to rec. or preamp. Includes pwr. supp. 117 VAC wired & tested **$52.95**
MODEL PLF-2E 240 VAC 50-60 Hz operation **$57.95**
MODEL PT-2 For transceiver use. Continuously tunable from 6 to 160 meters. Features dual-gate FET transistor amplifier for improved receiver sensitivity and low noise figure. Requires no transceiver modifications and can handle up to 250W transceiver output. 117 VAC 60 Hz **$79.95**
MODEL PT-2E 240 VAC 50-60 Hz operation **$84.95**

PARTS TO BUILD YOUR OWN ANTENNA



CABLE

8U FOAM, hi dens braid 50 ft.	$14.95
8U FOAM, hi dens braid 100 ft.	28.00
RG58A/U stranded center 50 ft.	6.95
RG58A/U stranded center 100 ft.	10.95
RG58 3 ft w/PL259 each end	3.35
RG58 5 ft w/PL259 each end	4.39
RG58 50 ft w/PL259 each end	9.95

COPPER WIRE

#14 stranded, 100 ft spool	6.95
#14 solid copper enameled 100'	6.95

INSULATORS

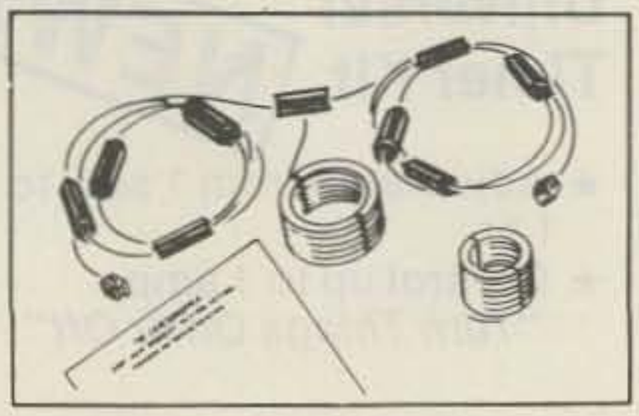
Egg Ins. porcelain per pair	.99
DOG BONE, porcelain set of 3	1.50
HY GAIN #155 center insulator	5.95
HY GAIN Cycolac end ins per pair	3.95

◆◆◆◆◆◆

SHIPPING CHARGES
(Continental USA only)

All Ameco preamplifiers: **$3.00**
All "Build your own" antenna parts: **$2.00** 1st item; **50c** each additional item.
Eavesdropper Antenna: **$3.00**
Mosley SWV-7: **$5.00**
B&W Portable Whip: **$3.00**
Mini-Reader: **$2.50**

NOTE: INTERNATIONAL ORDERS write for Proforma Invoice.



- **AUTOMATIC BANDSWITCHING!**

All the world's shortwave broadcast bands are yours with the Eavesdropper All-Band antenna. Individually tuned traps make the Eavesdropper work like seven separate antennas, each tuned to a different international broadcast band. Also covers 11, and 60M bands as well. Its 100 foot, 72 ohm balanced feedline provides an exact match to the antenna on every band. Comes completely assembled, and ready to install with 50 ft. of 450 lb. test nylon rope. Overall length: 42'10". Wire: #14 copper clad steel. Bandswitching: Automatic. Impedance to rcvr: 50-75 ohms balanced.

Only$59.95

Eavesdropper

SHORT WAVE BROADCAST RECEIVING ANTENNA

$59.95

- COMPLETELY WEATHERPROOF!
- COMPLETE, NO ASSEMBLY NEEDED!
- 60, 49, 41, 31, 25, 19, 16, 13 & 11M BANDS!

B&W PORTABLE WHIP ANTENNA

Quick Mounting

$34.50

Simple, dependable whip is designed especially for apartment dwellers and renters who cannot install a permanent antenna. Tunes the 2, 6, 10, 15, 20 and 40-meter Amateur bands. Offers VSWR of 1.1:1 when properly adjusted to operating frequency. Ideal for use as a portable emergency antenna, too. Amounts to almost any horizontal support with a simple clamp bracket.

Weighs less than 2 pounds including five base-loading coils (not used for 6/2 meters), coax line and counterpoise. Whip is 22½" long disassembled, extends to 57". Mount is 14" long. Power rating: 360 watts SSB or CW.

Model 370-10 **$34.50**

NEW!

Introducing the versatile Kantronics **Mini-Reader**™

ONLY

$299.95

List $319.95

Day 2, including code-speed display, automatic Morse speed tracking, demodulator output, a tuning eye, code-editing programs and a 24-hour clock.

But the **Mini-Reader** measures only 5.74" by 3.5" by 1" and runs on 12 volts! Its calculator size still leaves room for a 10-character, vacuum-tube floures-cent display.

At last, you can have the code-reading functions for Morse, RTTY and ASCII combined in a miniature package. The **Mini-Reader** has all the functions of its larger counterpart, the **Field**

2 METER ANTENNAS at BARGAIN PRICES!!

hy-gain

3 db GAIN MAGNETIC MOUNT

ONLY

$19.95

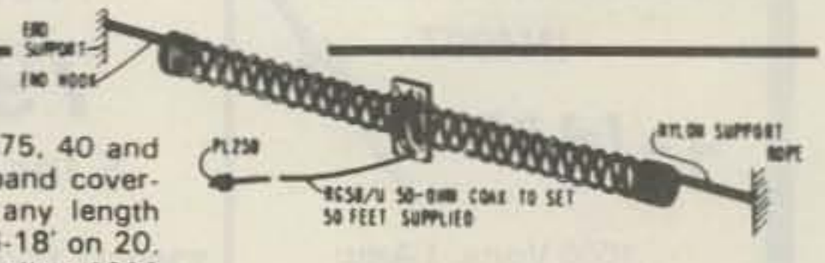
Model 287
Wt. 2.5 lbs.

An economical alternative to drilling a hole. A magnetic antenna by a name you can trust at a low, low price.

Add $2.00 Shipping

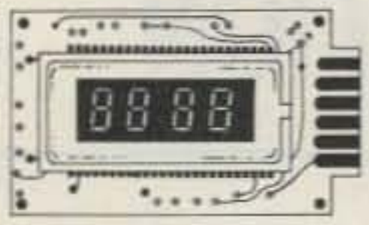
Model 286 Same but trunk lid. . . . . **$15.95 b**

"SLINKY" Dipole Antenna



A lot of performance in a little space, on 80/75, 40 and 20 meters. Only one setting needed for full band coverage—low VSWR throughout. Can be set at any length from 24-40' on 80/75 meters, 12-35' on 40, 6-18' on 20. Band change takes less than a minute. Handles 1000 watts CW, 2000 PEP on SSB. With 50' RG-58/U coax **$49.95**

National Semiconductor Clock Modules



12VDC AUTOMOTIVE/ INSTRUMENT CLOCK

APPLICATIONS:
- In-dash autoclocks
- After-market auto/ RV clocks
- Aircraft-marine clks.
- 12VDC oper. instru.
- Portable/battery powered instrumnts.

Features: Bright 0.3" green display. Internal crystal time-base. ± 0.5 sec./day accur. Auto. display brightness control logic. Display color filterable to blue, blue-green, green & yellow. Complete—just add switches and lens.

MA1003 Module $16.95

CLOCK MODULES

MA1023	.7" Low Cost Digital LED Clock Module	8.95
MA1026	.7" Dig. LED Alarm Clock/Thermometer	18.95
MA5036	.3" Low Cost Digital LED Clock/Timer	6.95
MA1002	.5" LED Display Dig. Clock & Xformer	9.95

TRANSFORMERS

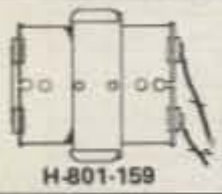
102-P20	Xformer for MA1023 Clock Modules	3.49
102-P22	Xformer for MA1026 Clock Modules	3.49
102-P20	Xformer for MA5036 Clock Modules	3.49

A0201

8 OHM SPEAKER

2¼" — 8 Ohm — .25 watt

$1.25 ea. 2/$1.95 ea. 10/$7.95 ea.

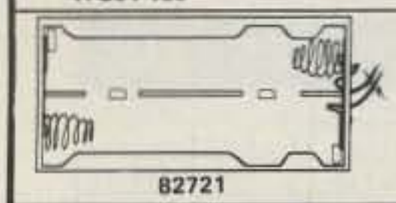


H-801-159

BATTERY HOLDER

- Holds 2 ea. C cells
- Aluminum Case
- 5" leads

$ .45 each 10/$3.95



82721

BATTERY HOLDER

- Holds 4 ea. C cells
- Plastic case
- 9" leads

$ .49 ea. 10/$4.25

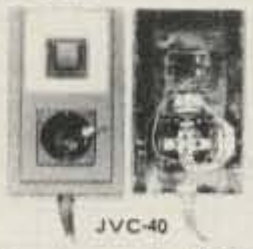
EPROM Erasing Lamp

- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

UVS-11E $79.95

JOYSTICKS

JS-5K



JVC-40

JS-5K	5K Linear Taper Pots	$5.25
JS-100K	100K Linear Taper Pots	$4.95
JVC-40	40K (2) Video Controller in case	$5.95

6-Digit Clock Kit

- Bright .300 ht. comm. cathode display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold modes
- Hrs. easily viewable to 20 ft.
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hr. operation
- Incl. all components, case & wall transformer
- Size: 6¾" x 3-1/8" x 1¾"

JE701 . . . . . $19.95

NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2" w x 5-1/16" L x 2" H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95

(Picture not shown but similar in construction to above)

JE200 Reg. Power Supply Kit (5VDC, 1 amp) . .	$14.95
JE205 Adapter Brd. (to JE200) ±5, ±9 & ±12V.	$12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp.	$19.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS8080A	CPU	6.50
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.95
DP8238	System Controller	5.95
INS8243	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.95
DP8251	Prog. Comm. I/O (USART)	7.95
DP8253	Prog. Interval Timer	14.95
DP8255	Prog. Peripheral I/O (PPI)	9.95
DP8257	Prog. DMA Control	19.95
DP8259	Prog. Interrupt Control	14.95
DP8275	Prog. CRT Controller	49.95
DP8279	Prog. Keyboard/Display Interface	19.95
DP8300	Octal Bus Receiver	6.95
DP8303	System Timing Element	6.95
DP8304	8-Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	3.95
DP8308	8-Bit Bi-Directional Receiver	3.95

6800/6800 SUPPORT DEVICES

MC6800	MPU	14.95
MC6802CP	MPU with Clock and RAM	19.95
MC6810API	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	10.95
MC6830L8	1024x8-Bit ROM (MC6830-8)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	0-600bps Digital MODEM	10.95
MC6862	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus. Trans. (MC8T26)	2.25

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (2MHz)	13.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	15.95
COP1802	CPU	19.95
2650	MPU	16.95
IDM2901ADC	CPU—4-Bit Slice (Com. Temp. Grade)	19.95
MC50902	MPU w/Clock (65K Bytes Memory)	11.95
INS8035N-4	MPU—8-Bit (6MHz)	16.95
INS8039N-4	CPU—Sgl. Chip 8-Bit (128bytes RAM)	19.95
INS8040N-4	CPU (256 Bytes RAM)	24.95
INS8070N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
P8080	CPU	19.95
INS8900	CPU—16-Bit	29.95
TMS9900JL	MPU—16-Bit	49.95

SHIFT REGISTERS

MM500H	Dual 25-Bit Dynamic	.50
MM503H	Dual 50-Bit Dynamic	.50
MM506H	Dual 100-Bit Static	.50
MM510H	Dual 64-Bit Accumulator	.50
MM1402	256-Bit Dynamic	3.95
MM5013	1024-Bit Dynamic/Accumulator	1.95
MM5016H	500/512-Bit Dynamic	.89
MM5034N	Octal 80-Bit	9.95
MM5035N	Octal 80-Bit	9.95
2504V (1404A)	1024-Bit Dynamic	3.95
2518N	Hex 32-Bit Static	4.95
2522V	Dual 132-Bit Static	2.95
2524V	512-Bit Dynamic	.99
2525V	1024-Bit Dynamic	2.95
2527V	Dual 256-Bit Static	2.95
2528V	Dual 250-Bit Static	4.00
2529V	Dual 240-Bit Static	4.00
2532N	Quad 80-Bit Static	2.95
3341PC	Fifo (Dual 80)	6.95

DATA ACQUISITION

AF100-1CN	Universal Active Filter 2.5%	5.95
AF101-1CJ	Touch Tone Low Pass Filter	19.95
AF102-1CJ	Touch Tone Low Pass Filter	19.95
LM308AH	Super Gain Op Amp	1.00
LM334Z	Constant Current Source	1.30
LM335Z	Temperature Transducer	1.40
LF356N	JFET Input Op Amp	1.10
LF398N	Sample & Hold Amplifiers	3.95
LM399H	Temp. Comp. Prec. Ref. (.5ppm/C°)	4.95
ADC0804LCN	8-Bit A/D Converter (1 LSB)	4.95
DAC0808LCN	8-Bit D/A Converter (0.78% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0817CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1008LCN	10-Bit D/A Conv. Micro. Comp. (0.05%)	13.95
DAC1088LCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	8.95
DAC1020LCN	10-Bit D/A Converter (0.05% Lin.)	8.49
DAC1022LCN	10-Bit D/A Converter (0.20% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.20% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.29
AY-5-1013	300 BAUD UART	5.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	.99
2101 (8101)	256x4 Static	3.95
2102	1024x1 Static	1.75
2102L02	1024x1 Static	1.95
2111 (8111)	256x4 Static	2.95
2112	256x4 Static MOS	4.95
2114	1024x4 Static 450ns	5.95
2114L	1024x4 Static 450ns Low Power	6.95
2114-3	1024x4 Static 300ns	7.49
2114L-3	1024x4 Static 300ns Low Power	7.95
2117	16,384x1 Dynamic 550ns (house marked)	4.95
4116N-4 (UPD416)	16K Dynamic 250ns (MM5290N-4)	3.95
4164	64K Dynamic 250ns	49.95
MM2147J	4096x1 Fast 70ns	19.95
5101	256x4 Static	7.95
MM5261	1024x1 Dynamic Fully Decoded	.99
MM5262	2Kx1 Dynamic	.25
MM5280/2107	4096x1 Dynamic	4.95
MM5290N-2 (4116)	16K Dynamic 150ns (UPD416C-3)	5.25
MM5298J-3A	8K Dyn. 200ns (lower ½ of MM5290J)	4.95
MM5799NAA/N	Controller Oriented Processor	9.95
UPD414/MK4027	4K Dynamic 16-pin	4.95
TMS4044-45NL	4K Static	14.95
TMS4045	1024x4 Static	14.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	5.95
TMS2716	16K EPROM (-5V, +5V, +12V)	19.95
2716 Intel (2516) T1	16K EPROM (Single +5V)	10.95
2732 Intel (2532) T1	32K EPROM	19.95
2758	8K EPROM (450ns) (Single +5V)	7.95
5203	2048 PROM	14.95
82S23 (74S288)	32x8 PROM (Open Collector)	4.95
82S115	4096 Bipolar PROM	19.95
82S123 (74S288)	32x8 Tri-State Bipolar PROM	4.95
82S185	8K PROM	29.95

ROM'S

2513 (2140)	Character Generator (Upper Case)	5.95
2513 (3021)	Character Generator (Lower Case)	5.95
2516N	Character Generator	10.95
MM5230N	2048-Bit Read Only Memory	1.95

NMOS READ ONLY MEMORIES

MCM66710P	128x9x7 ASCII Shifted w/Greek	13.50
MCM66740P	128x9x7 Math Symbol & Pictures	13.50
MCM66750P	128x9x7 Alpha, Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

M-Z80	User Manual	7.50
M-COP1802	User Manual	7.50
M-2650	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (5MZ)	3.50
DS0026CN	Dual MOS Clock Driver (5MZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM58167N	Microprocessor Real Time Clock	8.95
MM58174N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg. VAC Fluor. Driver (29-pin pkg.)	1.25

TELEPHONE/KEYBOARD CHIPS

AY-5-8100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9500	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (36 keys)	7.95
74C922	Keyboard Encoder (36 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53200N	Push Button Pulse Dialer	7.95
MM57495N	96/144-Key Serial Keyboard Encoder	8.95

ELECTRONIC TOY MOTORS

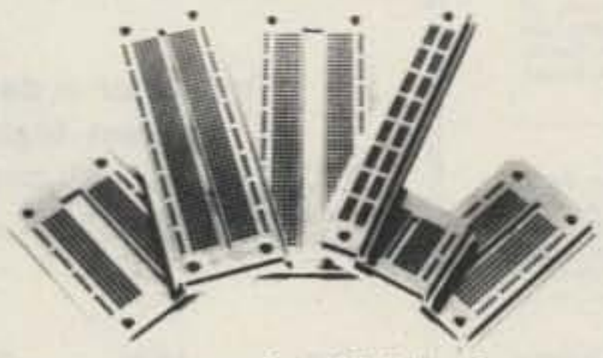
.937 O.D. X 1.201 Length

Typical Power Source	Operating Voltage Range	TYPICAL CHARACTERISTICS: NO LOAD Voltage	NO LOAD Speed RPM	NO LOAD Current AMP	AT MAXIMUM EFFICIENCY Speed RPM	AT MAXIMUM EFFICIENCY Current AMP	AT MAXIMUM EFFICIENCY Torque OZ. IN.	AT MAXIMUM EFFICIENCY Output W	AT MAXIMUM EFFICIENCY Eff. %	SMALL TORQUE OZ. IN.
DRY CELL	1.5-6.0	3.0	9,200	0.20	6,750	0.90	0.260	1.30	57.0	0.97

MABUCHI RE280 $ .99 each . . . 10/$7.50 . . . 100/$50.00

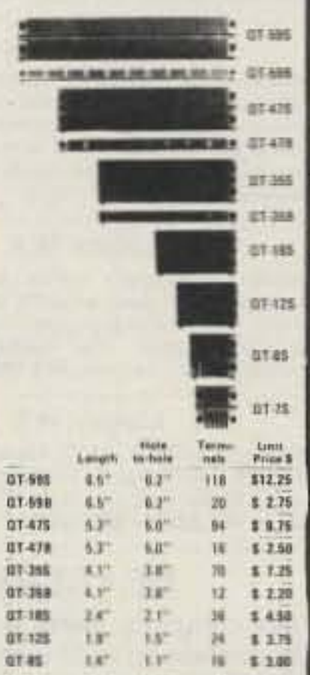
GLOBAL SPECIALTIES

EXPERIMENTOR SOCKETS



Model	Length	Width	Center Channel	5 Tie Point Terminals	Bus Strips	Price
EXP48	6.0"	1.0"	n/a	n/a	4(160)	$ 4.75
EXP300	6.0"	2.1"	.3"	94(470)	2(80)	$12.00
EXP325	1.8"	2.1"	.3"	22(110)	2(20)	$ 3.50
EXP350	3.6"	2.1"	.3"	46(230)	2(40)	$ 6.75
EXP600	6.0"	2.4"	.6"	94(470)	2(80)	$14.75
EXP650	3.6"	2.4"	.6"	46(230)	2(40)	$ 8.75

Quick Test Sockets & Bus Strips



	Length	Hole to-hole	Terminals	Unit Price $
QT-595	6.5"	6.2"	118	$12.25
QT-595	6.5"	6.2"	20	$ 2.75
QT-475	5.3"	5.0"	94	$ 9.75
QT-478	5.3"	5.0"	16	$ 2.50
QT-355	4.1"	3.8"	70	$ 7.25
QT-358	4.1"	3.8"	12	$ 2.20
QT-185	2.4"	2.1"	36	$ 4.50
QT-125	1.8"	1.5"	24	$ 3.75
QT-85	1.4"	1.1"	16	$ 3.00
QT-75	1.3"	1.0"	14	$ 2.75

$10.00 Min. Order — U.S. Funds Only
Calif. Residents Add 6% Sales Tax
Postage—Add 5% plus $1 Insurance

Spec Sheets — 25¢
Send 52¢ Postage for your FREE 1981 JAMECO CATALOG

NEW 1981 CATALOG

Jameco ELECTRONICS

PHONE ORDERS WELCOME (415) 592-8097

MAIL ORDER ELECTRONICS — WORLDWIDE

1355 SHOREWAY ROAD, BELMONT, CA 94002 ✓38

PRICES SUBJECT TO CHANGE

8/81

POWER CORD SALE

d42-812

1-9	10-99	100
.35	.30	.25

362-812

1-9	10-99	100
.39	.35	.30

473-862

1-9	10-99	100
.45	.39	.35

468-828

1-9	10-99	100
.49	.45	.39

435-802

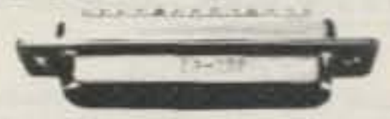
1-9	10-99	100
.59	.55	.49

AC and DC Wall Transformers

Ideal for use with clocks, games, power supplies or any other type of AC or DC application.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12 VAC 250mA	$3.95
AC 500	117V/60Hz	12 VAC 500mA	$4.95
AC1000	117V/60Hz	12 VAC 1 amp	$5.95
AC1700	117V/60Hz	9 VAC 1.7 amp	$6.95
DV 9200	117V/60Hz	9 VDC 200mA	$3.25
DC 900	120V/60Hz	9 VDC 500mA	$3.95

CONNECTORS



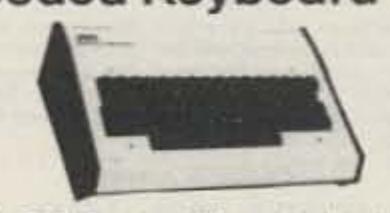
DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
- ★ 8 ea. MM5290 (UPD416/4116) 16K Dyn. Rams (*NS)
- ★ Documentation for Conversion

TRS-16K2 *150NS $39.95
TRS-16K4 *250NS $29.95

JE610 ASCII Encoded Keyboard Kit



The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and —12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3⅝"H x 14½"W x 8¾"D

JE610/DTE-AK (After assembled as pictured above) . . . **$124.95**

JE610 Kit	62-Key Keyboard, PC Board, & Components (no case)	$ 79.95
K62	62-Key Keyboard (Keyboard only)	$ 34.95
DTE-AK	(case only — 3¾"Hx11"Wx8¾"D)	$ 49.95

NEW! JE212 — Negative 12VDC Adapter Board Kit for JE610 ASCII KEYBOARD KIT Kit/ Provides -12V DC from incoming 5V DC . . $9.95

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¾"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit	19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case)	$59.95
K19	19-Key Keyboard (Keyboard only)	$14.95
DTE-HK	(case only — 3½"Hx8¾"Wx8¾"D)	$44.95

✓See List of Advertisers on page 114

DEALER DIRECTORY

Phoenix AZ

The Southwest's most progressive communications company stocking Kenwood, ICOM, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! **Power Communications Corp., 1640 West Camelback Rd., Phoenix AZ 85015, 241-Watt.**

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego. Call us for a low quote.

Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

San Jose CA
SAN FRANCISCO BAY AREA

Homebrewers' haven; tons of new and used Ham/Computer gear and components. Serving Hams since 1958. We specialize in ICOM, KLM, Mirage, Comptronix. We ship worldwide. **Tele-Com Electronics, 15460 Union Avenue, San Jose CA 95124, 377-4479.**

San Jose CA

Bay area's newest Amateur Radio store. New & used Amateur Radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc., 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.**

Aurora CO

Electronic parts, surplus, used ham gear and test equipment, catering to radio amateurs, electronic hobbyists and small manufacturers. Low prices, growing selection. Come see us! **Electronic Bits 'n Pieces, Inc., 9717 E. Colfax, Aurora CO 80010, 361-6530.**

Denver CO

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Corp., 2839 W. 44th Ave., Denver CO 80211, 458-5444.**

Columbus GA

KENWOOD—YAESU—DRAKE

The world's most fantastic amateur showroom! You gotta see it to believe it! **Radio Wholesale, 2012 Auburn Avenue, Columbus GA 31906, 561-7000.**

Smyrna GA

For your Kenwood, Yaesu, ICOM, Drake and other amateur needs, come to see us. **Britt's Two-Way Radio, 2506 N. Atlanta Rd., Smyrna GA 30080, 432-8006.**

Preston ID

Ross WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

Terre Haute IN

Your ham headquarters located in the heart of the midwest. **Hoosier Electronics, Inc., #9 Meadows Center, P.O. Box 3300, Terre Haute IN 478003, 238-1456.**

Littleton MA

The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters, Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, CAM. **TEL-COM Inc. Communications & Electronics, 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.**

Medford MA

New England's Distributor and Authorized Service Center for all Major Amateur Lines. Located Just North of Boston at Exit 5 on I-93. **Tufts Radio Electronics, Inc., 206 Mystic Ave., Medford MA 02155, 391-3200.**

Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN and W8RP behind the counter. **Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor, Michigan 48104. 668-8696.**

St. Louis MO

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Corp., 8123-25 Page Blvd., St. Louis MO 63130, 427-6116.**

Phila. PA/Camden NJ

Waveguide & coaxial microwave components & equipment. Laboratory grade test instruments, power supplies. Buy, sell & trade all popular makes, HP, GR, FXR, ESI, Sorensen, Singer, etc. **Lectronic Research Labs., 1423 Ferry Ave., Camden NJ 08104, 541-4200.**

Somerset NJ

New Jersey's only factory-authorized ICOM and YAESU distributor. Large inventory of new and used specials. Most major brands in stock. Complete service and facilities. **Radios Unlimited, 1760 Easton Avenue, P.O. Box 347, Somerset NJ 08873, 469-4599.**

Amsterdam NY
UPSTATE NEW YORK

Kenwood, ICOM, Drake, plus many other lines. Amateur Dealer for over 35 years. **Adirondack Radio Supply, Inc., 185 West Main Street, Amsterdam NY 12010, 842-8350.**

Syracuse–Rome–Utica NY

Featuring: Kenwood, Yaesu, ICOM, Drake, Ten-Tec, Swan, DenTron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Gain, Mosley, Larsen, Cushcraft, Hustler, Mini Products. You won't be disappointed with equipment/service. **Radio World, Oneida County Airport-Terminal Building, Oriskany NY 13424, 337-0203.**

Columbus OH

All major brands featured in the biggest and best ham store for miles around. Come in and twist the knobs before you buy. **Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

Scranton PA

ICOM, Bird, CushCraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W2AU/W2VS, CDE, AEA, Vibroplex, Ham-Key, CES, Amphenol, Sony, Fanon/Courier, B&W, Ameco, Shure. **LaRue Electronics, 1112 Grandview St., Scranton PA 18509, 343-2124.**

Houston TX

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Inc., 8932 Clarkcrest, Houston TX 77063, 978-6575.**

San Antonio TX

Complete 2 way service shop. Call Dee, W5FSP. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-gain, Standard, Vibroplex, Midland, Henry, CushCraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Cubic, Tempo, Ten-Tec and others. **Appliance & Equipment Co., Inc., 2317 Vance Jackson Road, San Antonio TX 78213, 734-7793.**

Tacoma WA

Tacoma area dealer for Kenwood, Cubic, Cushcraft Antennas, Hustler Antennas, all amateur marine and commercial two-way radio supply. See our used radio dept. **Northwest Radio Supply, 5240 South Puget Sound, Tacoma WA 98409, 475-2619.**

Yakima WA

Central Washington's newest Amateur Radio Store. New and used amateur radio sales and service. Ham Radio Equipment—All Brands—Buy—Sell—Trade. **The Radio Store, 1505 Fruitvale Blvd., Yakima, WA 98902. 248-4777.**

Casper WY

Nye Keys, Callbook, FM Transceivers, Antenna wire, 12 Volt Supplies. Evening and Saturday hours, **Radio Activity, 531 W. Collins Dr., Casper WY 82601. 237-5248.**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the October issue must be in our hands by August 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	7	7	7	14	14	21A	21A	21A	21
AUSTRALIA	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
CANAL ZONE	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7A	14	14	21	21	14A	14
HAWAII	21A	14	7A	7	7B	7B	7	14	14	14	21	21
INDIA	14	7A	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14A	14	14	7B	7B	7B	7B	7B	7	14	14	14A
MEXICO	14A	14	7A	7	7	7	7	14	14	14	21	14A
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	7A	14	14	14	14
PUERTO RICO	14	7A	7	7	7	7	7A	14	14A	14A	14A	14
SOUTH AFRICA	14	7B	7B	7	7	14	14	21	21A	21A	14	14
U. S. S. R.	7	7	7	7	7	7A	14	14A	14A	14	14	14
WEST COAST	14A	14	7	7	7	7	7	14	14A	21	21	21

CENTRAL UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	7	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
CANAL ZONE	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	7	14	14A	14A	14	14
HAWAII	21A	14A	14	7A	7	7	7	14	14	21	21	21
INDIA	14	14	7	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14	14	7B	7B	7B	7B	7B	7	14	14	14A
MEXICO	14	14	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14A	7B	7B	7B	7B	7B	7A	14	14	14	14
PUERTO RICO	14A	14	14	7	7	7	7A	14	14A	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	14B	14	21	21A	21A	14	14
U. S. S. R.	7	7	7	7	7	7B	7B	14	14A	14	14	7A

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	7	14	21	21A	21A	21A
AUSTRALIA	21	14A	14	7	7	7	7A	14	21	21A	21A	21A
CANAL ZONE	21	14A	14	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	7B	14	14A	14	14	14
HAWAII	21A	21	14A	7A	7	7	7	14	14	21	21	21A
INDIA	14	14	14	7A	7B	7B	7B	7B	14	14	14	14
JAPAN	21	14	14	14	7A	7	7B	7B	7	14	14	14A
MEXICO	14A	14	7	7	7	7	7	14	14	14A	14A	14A
PHILIPPINES	21	14A	14	7	7	7B	7B	7A	14	14	14	14A
PUERTO RICO	21	14	14	7	7	7	7	14	14	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	14	14	14A	21A	14A	14
U. S. S. R.	7	7	7	7	7	7B	7B	14	14A	14	14	7A
EAST COAST	14A	14	7	7	7	7	7	14	14A	21	21	21

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair
G = Good P = Poor * = Chance of solar flares

AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
						1 P/P*
2 F/F	3 G/F	4 G/F*	5 G/F	6 G/G	7 G/G	8 G/F
9 G/F	10 G/F	11 G/F	12 G/G	13 G/G	14 G/G	15 G/G
16 G/G	17 G/G	18 G/F	19 G/F	20 G/G	21 G/G	22 G/F*
23 P/P* 30 G/G	24 P/P* 31 G/G	25 F/P	26 G/F	27 G/G	28 G/G	29 G/F

THE EVOLUTION OF A Cchampion!

FT-101ZD Mk III

The FT-101ZD Mk III is the latest chapter in the success story of the FT-101 line. Armed with new audio filtering for even better selectivity, the FT-101ZD now includes provision for an optional FM or AM unit. Compare features and you'll see why active operators everywhere are upgrading to Yaesu!

Variable IF Bandwidth

Using two 8-pole filters in the IF, Yaesu's pioneering variable bandwidth system provides continuous control over the width of the IF passband — from 2.4 kHz down to 300 Hz — without the shortcomings of single-filter IF shift schemes. No need to buy separate filters for 1.8 kHz, 1.5 kHz, etc.

Improved Receiver Selectivity

New on the FT-101ZD Mk III is a high-performance audio peak/notch filter. Use the peak filter for single-signal CW reception, or choose the notch filter for nulling out annoying carriers or interfering CW signals. In the CW mode, you can choose between the 2.4 kHz SSB filter and an optional CW filter (600 or 350 Hz) from the mode switch.

Diode Ring Front End

The FT-101ZD now sports a high-level diode ring mixer in the front end. This type of mixer, well known for its strong signal performance, is your assurance of maximum protection from intermod problems on today's crowded bands.

WARC Bands Factory Installed

The FT-101ZD Mk III comes equipped with factory installation of the new 10, 18, and 24 MHz bands recently assigned to the Amateur Service at WARC. In the meantime, use the 10 MHz band for monitoring of WWV!

RF Speech Processor

Not an additional-cost option, the FT-101ZD RF speech processor provides a significant increase in average SSB power output, for added punch in those heavy DX pile-ups. The optimum processor level is easily set via a front panel control.

Worldwide Power Capability

Every FT-101ZD comes equipped with a multi-tap power transformer, which can be easily modified from the stock 117 VAC to 100/110/200/220/234 VAC in minutes. A DC-DC converter is available as an option for mobile or battery operation.

Convenience Features

Designed fundamentally as a high-performance SSB and CW transceiver, the FT-101ZD includes built-in VOX, CW sidetone, semi-break-in T/R control on CW, slow-fast-off AGC selection, level controls for the noise blanker and speech processor, and offset tuning for both transmit and receive. The Mk III optional FM unit may be used for 10 meter FM operation, or choose the optional AM unit for WWV reception or VHF AM work through a transverter (AM and FM units may not both be installed in a single transceiver).

Full Line of Accessories

See your Yaesu dealer for a demonstration of the top performance accessories for the FT-101ZD, such as the FV-101Z External VFO, SP-901P Speaker/Patch, YR-901 CW/RTTY Reader, FC-902 Antenna Tuner, and the FTV-901R VHF/UHF Transverter. Watch for the upcoming FV-101DM Digital Memory VFO, with keyboard frequency entry and scanning in 10 Hz steps!

Nationwide Service Network

During the warranty period, the Authorized Yaesu Dealer from whom you purchased your equipment provides prompt attention to your warranty needs. For long-term servicing after the warranty period, Yaesu is proud to maintain two fully-equipped service centers, one in Cincinnati for our Eastern customers and one in the Los Angeles area for those on the West Coast.

Note: A limited quantity of the earlier FT-101ZD (with AM as standard feature) is still available. See your Yaesu dealer. FT-101ZD Mk III designates transceivers bearing serial #240001 and up, with APF/Notch filter built in and AM/FM units optional.

681

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU ✓83

The radio.

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007
YAESU Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 ● (513) 874-3100

Hand-shack.

Synthesized, big LCD, 10 memories, scanning, DTMF

TR-2400

Put a ham shack in your hand. The TR-2400 is the ideal hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

TR-2400 FEATURES:

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.

CONVENIENT TOP CONTROLS

- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 2.0 mA). "M0" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF encoder**
  All 16 buttons of keyboard provide telephone dual-tones while transmitting.
- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Repeater or simplex operation**
  Convenient mode switch shifts transmit frequency +600 kHz or -600 kHz or to the frequency stored in "M0" memory.
- **Subtone switch**
  Activates subaudible tone encoder (not Kenwood-supplied).
- **Extended operating time**
  With LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output), for longer operating time between charges.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.

Microphone PTT and audio terminals

Charger terminal

Earphone Jack

- **Reverse operation**
  Push-button switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR" "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

Standard accessories included:

- Flexible rubberized antenna with BNC connector
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- External-microphone plug
- AC charger • Hand strap
- Earphone

More information on the TR-2400 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

Optional accessories:

- ST-1 base stand (shown) which charges to 90% (to protect battery) in 1.5 hours, with 4-pin connector for dynamic microphone and SO-239 antenna connector
- BC-5 DC quick (90%) charger
- SMC-24 speaker/microphone
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook

KENWOOD
...pacesetter in amateur radio

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