International Edition

June 1983 $2.49½
Issue #273

73®

Amateur Radio's Technical Journal

A Wayne Green Publication

Meter Mania:
8 Probing Articles

Battle Plan for Interference
Page 92

Suitcase Dipole
Page 30

Home-Brew Contest Winners
Pages 26, 84

Filter Fun for 830 Fans
Page 36

Computer QSLing
Page 48

All Aboard for Trindade
Page 74

Trindade PY0—74

0 74470 65946 06

ICOM IC-740+

IC-740 PS + Cooling Fan + Mic + Rebate = Your Best Buy!

FREE AC POWER SUPPLY
EX238

FREE COOLING FAN
(Part of EX238 Kit)

HM7 MICROPHONE
Included With IC-740

Now the world's only completely self contained solid state 200W PEP, 12VDC/117VAC 9 band HF ham transceiver with a **Competition Grade Receiver** can be yours . . . at a special price.

Until July 31, 1983, the IC-740 and the optional IC-740PS ($159 value) internally mounted power supply are available at your authorized ICOM dealer for the price of the IC-740 alone. PLUS you get a $50 cash rebate directly from ICOM.

$50 Cash Rebate
For the purchase of an IC-740.
Expires July 31, 1983

The ICOM 740 provides competition grade receiver performance with superb dynamic range in excess of **100dB** and a intercept point of **+18dBm** plus **pass band tuning, variable AGC**, and a **noise blanker** that works, all **standard.**

The IC-740PS AC power supply installs in under 30 minutes, making the IC-740 the ideal self contained rig for both summer vacation portable operation, as well as your main home rig . . . The benefits of 12 VDC and AC operation in one compact package.

For the ham who appreciates quality, get a competition grade receiver, rock solid solidstate transmitter, internal AC/DC power supply with cooling fan, and a microphone all for the price of the transceiver. Get extra savings while getting an ICOM IC-740 . . . simply the best ham transceiver in the world today . .

. . . Offer subject to equipment availability . . . at your authorized ICOM dealer . . .

ICOM

The World System

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

5-STORE BUYING POWER in action!

Some retailers guarantee you'll be satisfied but don't really have the means to back their promises. When Ham Radio Outlet guarantees you satisfaction, it means exactly that! You can count on it!!

KENWOOD SPECIALS!!

SAVE $230 on **TS-930S** W/ANTENNA TUNER

PRICE **$1799**

Plus three FREE Bonus Items

1)- SP-930 spkr. 2)- MC-60A mic. 3)- YK-88C-1 filter.

Plus free shipment UPS (Brown)

Substantial savings TS-430S

CHECK OUR LOW PRICES

AND REMEMBER...
FREE SHIPMENT UPS BROWN

ICOM

IC-R70 **SAVE!!** **IC-730**

LOW, LOW PRICES *(Plus Free UPS Brown)*

SPECIAL SALE PRICES ALL ETO ALPHA

Example:
76PA
$1699.95

MIRAGE SALE

2 METER AMPLIFIERS

B-3016 30W IN, 160W OUT. REG. $239.95 **$199.95**

B-1016 10W IN, 160W OUT. REG. $279.95 **$249.95**

B-108 10W IN, 80W OUT. REG. $179.95 **$159.95**

B-23 2W IN, 30W OUT. REG. $89.95 **$79.95**

KLM/Tri-EX

KT-34A SALE **$299**

KT-34XA SALE **$459**

TRI-EX

W36 SALE **$499**

W51 SALE **$799**

LM 470D SALE **$2499**

PRICES ARE FOB CALIF. EXCEPT FOR CERTAIN COMBINATIONS. PLEASE INQUIRE.)

YAESU

SAVE!

CALL FOR LOW PRICES ON HAND-HELDS and all YAESU items

FT-208R **FT-708R**

FREE SHIPMENT *(U.P.S. Brown)* CONTINENTAL U.S.A.

ON MOST ITEMS THAT CAN BE SHIPPED UPS BROWN.
THERE ARE SOME EXCEPTIONS IN ALPHA, TRI-EX AND KLM

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

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

FREE PHONE 800 854-6046

9:30AM to 5:30PM PACIFIC TIME.

OVER-THE-COUNTER, 10AM to 5:30PM.
MONDAY THROUGH SATURDAY

CALIFORNIA CUSTOMERS PLEASE PHONE OR VISIT LISTED STORES.

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 (619) 560-4900
Hwy 163 & Clairemont Mesa Blvd.

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

AEA • ALLIANCE • ALPHA • AMECO • AMPHENOL • ARRL • ASTRON
AVANTI • BELDEN • BENCHER • BERK-TEC • BIRD • B & W
BUTTERNUT • CALLBOOK • CDE • COLLINS • CURTIS • CUSHCRAFT
DAIWA • DRAKE • DX EDGE • 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 • TELEX
TEMPO • TEN-TEC • TRISTAO • VOCOM • YAESU and many more!

Prices, specifications, descriptions 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: 603-924-9471

Advertising Offices:

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

Circulation Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-9471

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 and Mexico—$27.97/1 year only, U.S. funds. Foreign surface mail—$44.97/1 year only, U.S. funds drawn on U.S. bank. Foreign air mail—please inquire.

To subscribe, renew or change an address:

Write to *73*, 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.

Subscription problem or question:

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

73: Amateur Radio's Technical Journal (ISSN 0745-080X) is published monthly by Wayne Green, 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. Postmaster: Send address changes to *73*, Subscription Services, PO Box 931, Farmingdale NY 11737.

WE WANT YOU!

TO CALL TOLL FREE

1-800-325-3636

FOR A TRADE-IN QUOTE

We Trade

on New or Used Equipment

(Check for prices on available used equipment)

HAM RADIO CENTER

8340-42 Olive Blvd. • P.O. Box 28271 • St. Louis, MO 63132

In Missouri Call 1-314-993-6060

VISA

MasterCard

W2NSD/1
NEVER SAY DIE

editorial by Wayne Green

A KERCHUNK SUBSTITUTE?

One of the more frustrating aspects of repeaters is listening to 'em. This is such a drudge that I've noticed that few repeaters seem to ever have anyone actually monitoring. Notice that? I'll bet I've checked into several hundred repeaters in various cities, only to be met by nothing.

Perhaps it is time for us to hike up our mental skirts and make some progress toward a system which would solve a whole bunch of repeater problems all at once. Yes, *mes amis*, I have a way out of both the boredom of listening to a repeater and not being able to raise anyone on it. The problems go together, of course. If no one is listening, you really have to have a flat final if you think someone is going to answer your call, right?

Suppose we were able to come up with a relatively simple accessory to our rigs which would allow us to monitor the repeater without having to listen to all that garbage (my apologies to the garbage men). Well, of course there are already some simple systems which will work...for instance, a tone-encoded system, using touchtones™ to call a specific station and a decoder attached to the receiver. That's easy and should have been put in years ago.

But we're into digital circuits and microprocessors these days, so why settle for something so basic, even if it would be a godsend. Let's get what few brain cells you have left working on something a bit more sophisticated. For instance, suppose we set up a system where the repeater has a computer attached which keeps track of who is monitoring and who isn't. Until someone invents an automatic transmitter identifier system, we can still use the old touchtone pad to identify ourselves. Three tones would take care of about a thousand different stations...which should be enough.

Now there you go...I've just started to explain what I have in mind and you are already coming up with arguments. There's just no pleasing you. Well, this time I'm ahead of you. Yes, I know as well as you that half of the chaps who check in are going to eventually turn off their rigs, forgetting to check out, or perhaps drive out of range of the repeater so it won't be able to get the signal to cross them off the list of the living. No, a good system will have to check with you every so often to make sure that your rig is still on line. Feel better?

One way to do this is to have the repeater transmitter send out a coded pulse every so often which would be addressed to your particular rig and would trigger a short answer-back, thus assuring the repeater that you are still alive and well and within range. If we start using some high-speed digital addressing and identification, the whole process can take a fraction of a second.

In this way the repeater would know who is monitoring at any moment so that a caller could conceivably check to see if someone specific was on channel or even get a fast list of those monitoring so he or she could call the operator of his or her choice. Like it?

Okay, so I lied about it being simple. That just shows you can't trust everyone all the time. But it *can* be done and with current technology. It will take some experimenting. It will be worth it...just think of how this could change two meters for us! Lordy, I might even start checking into a couple of local repeaters if I knew that I wouldn't have to listen to every mobile coming on channel explain at length about where he is driving, where he's been, and where he's going.

Tell you what...I've got a $500 prize here for the first article we get on a working system to do about what I suggested. That ought to get some of you soldering-iron jockeys flinging solder and zapping ICs. Further, if you can come up with something relatively simple that does the job, I'm reasonably sure that we could set up a licensing system to get it into just about every two-meter rig being made in short order.

We're going to need such a polling system eventually to handle digital traffic, so we might as well get cracking on developing and using it now for our voice communications. And you can bet that we're going to make a big fuss over the repeater group that gets this system working first. Will it be yours?

CALLING CAPTAIN QUEEG

Old-timers will remember the captain, nervously rolling the big ball bearings in one hand, striving to relive his one great moment of success with the strawberries, no matter how inept the present situation. I'm reminded of this when I read the solemn pronouncements of old-time hams, echoed at times by true-blue youngsters who have heard the refrain but haven't yet thought about it, and it all has to do with the bottom line inescapability of the need for Morse code. We keep hearing that, dammit, when everything else stops working, hams are going to be able to throw together small transmitters and use Morse code for communications.

What a bunch of fecalberry pie! Oh, we could go along with that scenario twenty years ago, but how in the heck is even a diligent ham going to whip up a CW rig out of a carton of AM/FM stereo solid-state radios? Not that our enthusiastic ham is going to be able to find a 12-volt soldering iron to do the work anyway. Come on now, let's try to face the facts. Radios are mostly large-scale integrated circuits these days, not tubes, and these gadgets are not easily remade into anything except trash.

No, the ham who digs his way out of a cellar after a nuclear attack and dusts himself off is not going to look for 30-year-old broadcast sets to rebuild into transmitters; he's going to take the HT off his belt and see who else is around. He's going to dig into his car and start tuning his Drake to see what's going on on 75m.

Commercial radio communications these days is mostly via high-speed digital circuits. Even the high-speed Morse code we are hearing on our ham bands is generated and read by digital circuits, not the operators. Morse code, with its throughput of around ten words per minute and its requirement of two experienced operators who are devoting 100% concentration to the job of sending and receiving, is probably the worst possible system we can think of for using radio. Voice is somewhat better since it does not require a lot of training on the part of the operator. Setting up our communications so only we hams are able to use it smacks a good deal of featherbedding, doesn't it?

Since amateur radio has been kept so firmly about fifty years behind the rest of the communications world, about all we can really offer right now in the way of emergency communications message-handling is voice. That's about three or four times as fast as the code, but still medieval when compared to digital communications which start at around 100 words per minute these days and easily go into the thousands of words per minute.

One rig passing traffic at 1,000 words per minute (about 1,200 baud) can do the work of two hundred trained hams using two hundred rigs and CW on one hundred channels. Now tell me about the ham who is going to build a little Morse code rig and get on the air. With some experimentation we can get our rigs to work at 9,600 baud, which gives us about 8,500 words per minute. Think of 850 sweating hams...no, make that 1,700, because we need one on each end...all trying to keep up with one little box with a couple ICs in it.

How much power will we save by not having to run 1,700 rigs to handle that traffic? Think of the hamburgers and Cokes! The support of this army of dedicated hams would be monumental. Think of the laundry bills! No, it is getting time to think in terms of automation, as abhorrent as that may be to the dedicated key-banger.

When the first radioteletype experimenting began to appear on the ham bands back in 1948, a shiver of panic went through the

Continued on page 126

TR-2500

BIG performance, small size, smaller price!

The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

- Weighs 540 g, (1.2 lbs). 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.

CONVENIENT TOP CONTROLS

- Optional MS-1 mobile or ST-2 AC charger/supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

- ST-2 Base station power supply/charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/power supply.
- VB-2530 2-M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

TR-3500

70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- Hi-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt. TU-35B
- Other outstanding features similar to TR-2500.

- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7950/7930

Big LCD, Big 45 W, Big 21 memories, Compact.

Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (back-lighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency, repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output. HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or ±600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert. May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resume-scan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.
- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch encoder, with monitor (Audible tones).
- Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- Compact lightweight design.

Optional accessories:

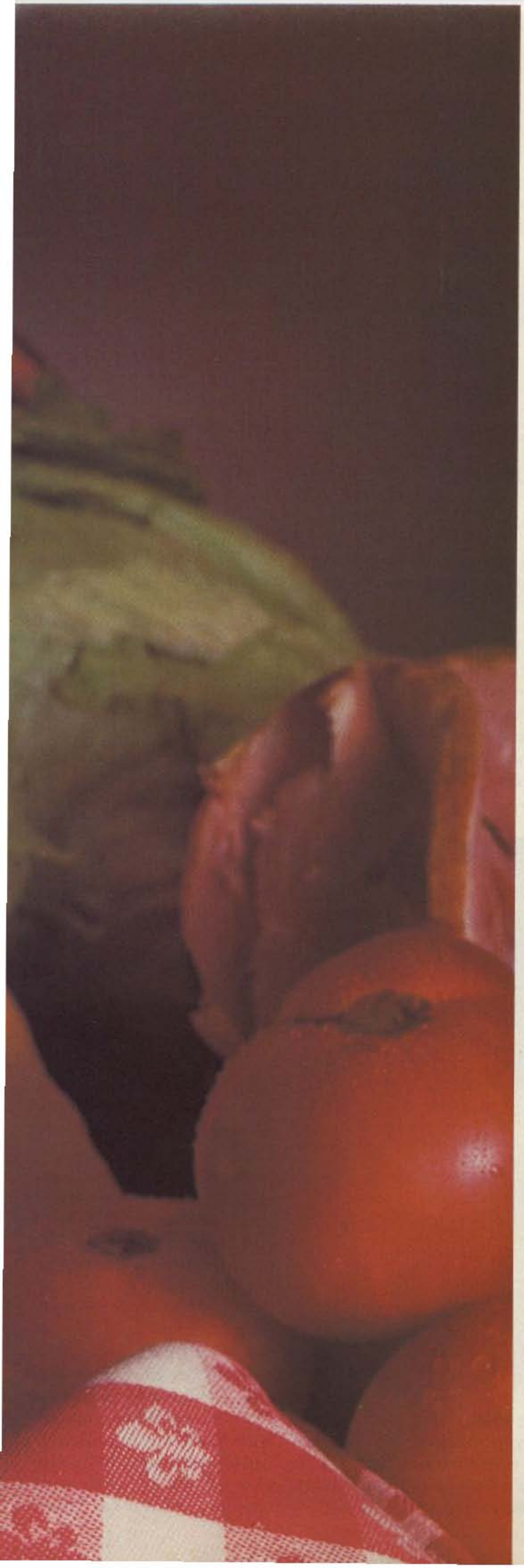
- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

Communications Specialists TE-64



Food for thought.

Our new Universal Tone Encoder lends it's versatility to all tastes. The menu includes all CTCSS, as well as Burst Tones, Touch Tones, and Test Tones. No counter or test equipment required to set frequency-just dial it in. While traveling, use it on your Amateur transceiver to access tone operated systems, or in your service van to check out your customers repeaters; also, as a piece of test equipment to modulate your Service Monitor or signal generator. It can even operate off an internal nine volt battery, and is available for one day delivery, backed by our one year warranty.

- All tones in Group A and Group B are included.
- Output level flat to within 1.5db over entire range selected.
- Separate level adjust pots and output connections for each tone Group.
- Immune to RF
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
- Instant start-up.
- Off position for no tone output.
- Reverse polarity protection built-in.

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: $79.95

master charge VISA

COMMUNICATIONS SPECIALISTS

15

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

George A. Wilson W1OLP
318 Fisher Street
Walpole MA 02081

D'Arsonval Dossier

How these meters work and how to make them work for you is no mystery. Discover the inner machinations of the D'Arsonval movement for yourself.

This article covers the basic aspects of the panel meters most frequently used by amateurs. These meters indicate voltage and current. The article will not address itself to alternating-current meters and meters combined with electronic circuits that measure values such as FM frequency deviation, resistance, signal strength, and the like. However, a little knowledge of how the simple voltage- and current-measuring devices work may turn your junk box or your next flea-market visit into something very profitable.

Panel meters are made in a large variety of ranges, and when the desired range is not available, it is possible to adapt what is on hand to provide the necessary service. Voltmeters can be bought with ranges from millivolts to kilovolts and ammeters from microamperes to a hundred Amperes. However, by judicious buying at auctions and flea markets, low-current meters (typically, 0-1 milliampere) can be purchased that can be adapted to a wide range of currents and voltages. Read on!

Flea-market meters come in all shapes, sizes, and ranges. Some really large units are frequently seen. Six- and 10-inch sizes make great bench meters; how about an oversize S-meter for your next QRP rig? It may take a bit of patience, but even matching meters can be found if you keep your eye out for them. There are thousands of low-price, high-quality meters like the Weston 301 type available in junk boxes and flea markets.

How They Work

Meters measure current even when they are actually indicating voltage. Their needle deflection is nominally proportional to the flow of current through them. In the case of meters using D'Arsonval moving coil movements, the meter deflection is strictly proportional to the current through them. This is the most popular type of meter and will be the type primarily discussed in this article.

The only other type of meter that is normally seen by amateurs is the iron-vane type. This type is used frequently for ac measurements. It does not deflect strictly proportionally with current through its coil. Its major claim to fame (for amateur use) is its low cost. Unlike the D'Arsonval type, the current in an iron-vane meter flows through a fixed rather than a moving coil. The common, low-cost type is generally plagued with calibration problems caused by magnetic material (e.g., iron or steel) in its vicinity. D'Arsonval move-

ments are relatively but not entirely free of this sort of problem.

Meters deflect when current passes through them because the current creates a magnetic field that opposes a permanent magnetic field built into the meter. The vane in an iron-vane meter is a permanent magnet and is attached to the indicator needle. The metered current flows in a fixed coil that is wound around (but not on) the vane. The field created by the current in the coil opposes that of the vane, and the vane moves until force from its field balances the force from the field of the coil.

D'Arsonval meters have moving coils that rotate within a permanent magnetic field. In this configuration, the fields can be properly arranged to cause the needle (attached to the rotating coil) to move in a manner that is strictly proportional to the current flowing in the coil. The proportionality of the D'Arsonval meter allows its scale to be divided into equal divisions for equal changes in current throughout its scale. The typical iron-vane meter provides more motion for a given current change at the low end of its scale than at the top end. The scale at the top end of a typical iron-vane meter is crowded and difficult to read.

Flea marketeer with his meter display. Excellent sources of meters of all descriptions, flea markets and auctions offer the lowest prices. In most cases, meters work properly or do not work at all. Flea-market and auction prices are generally low enough to risk as-it-is purchasing. However, most sellers will honor your request for your money back.

Meter Resistance

The flow of current through a meter obeys Ohm's Law. The meter itself has resistance and, therefore, the current through it will be proportional to the voltage across it—see Fig. 1(a). If resistance is added in series with a meter—see Fig. 1(b), more voltage will be required to cause the original amount of meter current to flow. It will be shown later that this is the way to turn a sensitive current meter into a voltmeter. If a resistance is added in parallel with the meter—see Fig. 1(c), the input voltage still occurs across the meter, but a portion of the input current is bypassed (or shunted) through the parallel resistance. The parallel resistance is known as a shunt. This is the method for turning a sensitive current meter into a less sensitive (or higher) current meter.

If meters are to be modified with series or parallel resistance, it is obvious that the resistance of the meter must be known. Examination of meter characteristics, as given in manufacturers' catalogs, gives us the ranges shown in Table 1.

Full Scale Current	Resistance (Typical)
100 microamps	1000-2000 Ohms
200 microamps	400-1000 Ohms
500 microamps	100-200 Ohms
1 milliamp	40-60 Ohms
3 milliamps	20-40 Ohms
5 milliamps	10-20 Ohms

Table 1. Typical sensitive current meter resistances (D'Arsonval type).

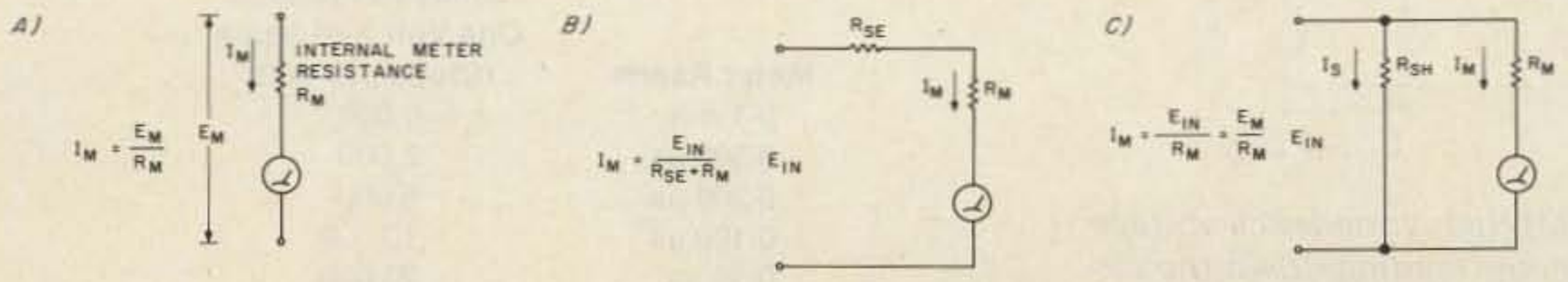


Fig. 1. Basic meter circuits. (a) Electrical characteristics of meter alone. (b) The meter with resistors in series. (c) The meter with resistance (R_{SH}) shunting current around it.

In no case should an ohmmeter be connected across a sensitive meter to determine its resistance. The current from the ohmmeter will overrange the meter and may destroy it. A convenient and safe method of determining the resistance of a meter is shown in Fig. 2. It consists of causing full-scale current to flow in the meter and then adding a variable resistance (shunt) across the meter and adjusting it until the meter reads half-scale. If the series resistance (R_{SE}) is much higher than the meter resis-

Fig. 2. Determining meter resistance. Set E_{IN} and/or R_{SE} for full scale with R_V disconnected. (R_{SE} should be at least 100 × R_M.) Connect R_V and adjust it until the meter reads one-half scale. Disconnect R_V and measure its resistance with an ohmmeter. R_V will equal R_M.

A typical D'Arsonval meter movement is shown above. Note the even (linear) scale. All of the divisions are the same size. This type of meter is the most used by amateurs. The ordinary variety balances the force resulting from a fixed magnet and a moving current coil against a pair of hair springs. Recently, a new type using taut-band springs has been introduced. Both types operate similarly and have linear needle motion with respect to current.

tance (use Table 1 as a guide), the total current will not vary significantly when the variable resistance is added. It can be shown that when the variable resistance is adjusted for half-scale current, the meter resistance is equal to the external shunting resistance. The external resistance can then be disconnected and (safely) measured with an ohmmeter.

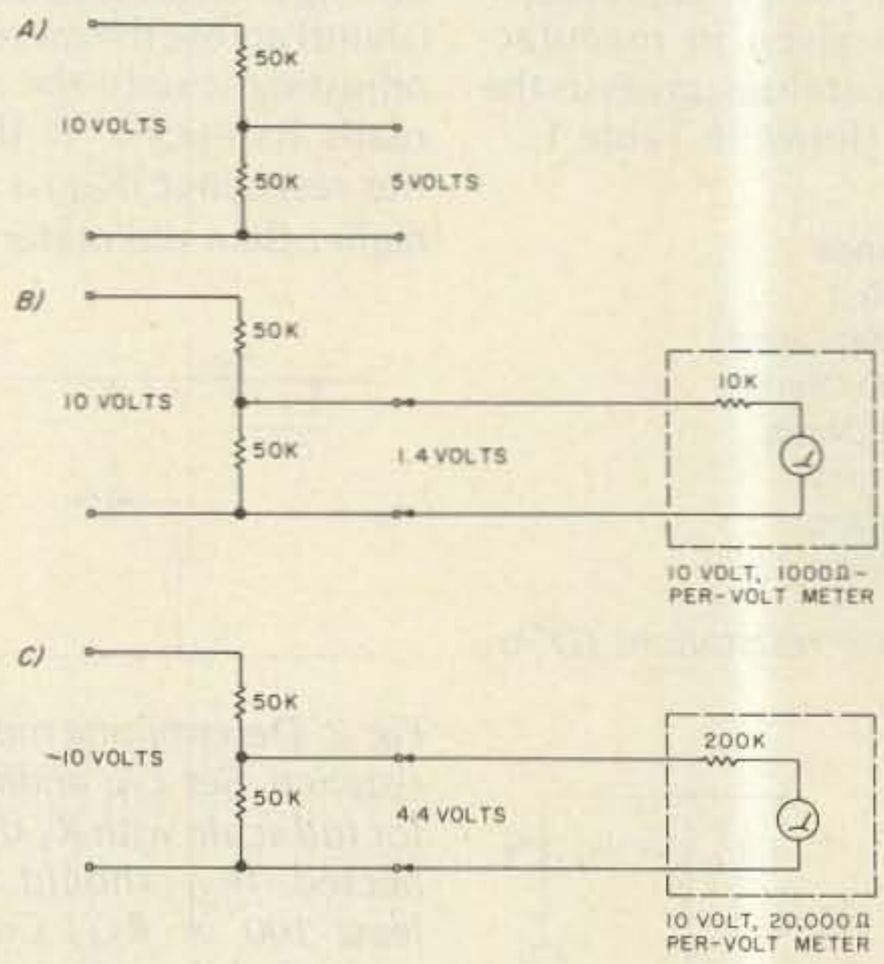


Fig. 3. Voltmeter circuit loading. (a) High-impedance voltage divider. (b) The result of a voltmeter loading down the circuit in 3(a). (c) Using a meter with higher internal resistance gives more accurate results.

Meter Resistance Problems

In the case of voltmeters, the resistance of the meter and its series resistors must be high with respect to the resistance of the circuit being measured. If it is not, the voltmeter will load down the circuit and the voltage measurement will be low. This is illustrated in Fig. 3. Note in Fig. 3(a) that the real divider voltage is five volts and that a 1,000-Ohms-per-volt meter, see Fig. 3(b), loads the circuit down to 1.4 volts (72% low). Even a 20,000-Ohms-per-volt meter as shown in Fig. 3(c) loads the circuit down to 4.4 volts (12% low). If an 11-megohm vacuum-tube voltmeter were used, the indicated voltage would be essentially correct, at about 4.99 volts (0.2% low). The moral here is very clear: Use the highest resistance voltmeter that you can if you want to avoid loading down the circuit being measured.

Voltmeters are rated for their resistance in Ohms-per-volt. Simply, this means that a 10-volt, 20,000-Ohms-per-volt meter will have a resistance of $10 \times 20{,}000 = 200{,}000$ Ohms. In a multirange voltmeter, the resistance of the meter accordingly increases with the voltage range in use. Electronic voltmeters are frequently an exception to the foregoing statement. They have a fixed input resistance (frequently 11 megohms) regardless of the range they are set to.

However, do not write off the lowly 1,000-Ohms-per-volt meter (made from a 0-1 mA meter). In this day of solid state, circuit resistances (with certain exceptions such as FET circuits) tend to be quite low and quite tolerant of low-resistance voltmeters. Additionally, one should examine one's needs carefully. The 1,000-Ohms-per-volt meter is rugged, inexpensive, and is just the thing for an occasional check of power supply and battery voltages. If general servicing of tube and solid-state circuits is to be done, nothing short of a voltmeter with megohms of input resistance should be considered.

For the most part, insertion of a meter for current measurements does not cause significant circuit change. Milliammeters have resistances of less than 100 Ohms, which is small with respect to resistances (impedances) they are connected in series with. Consideration should be exercised with meters in the microampere ranges. A sensitive microammeter may have over 1,000 Ohms resistance and could add significant resistance to the circuit being measured.

Making Voltmeters from Milliammeters/ Microammeters

Voltmeters with convenient scales can be made by adding series resistance to a milliammeter or microammeter, most often to a 0-1 milliammeter or more sensitive meter. It is most convenient to choose a meter range whose scale can be multiplied by a factor of 10, 100, and so on, to give the desired voltmeter scale. For example, say you want a 1,000-volt, full-scale meter. If a 0-1-milliamp meter is

Meter Range	Ohms to Produce One Volt Full Scale (Ohms-per-Volt)
0-1 mA	1,000
0-500 μa	2,000
0-200 μa	5,000
0-100 μa	10,000
0-50 μa	20,000

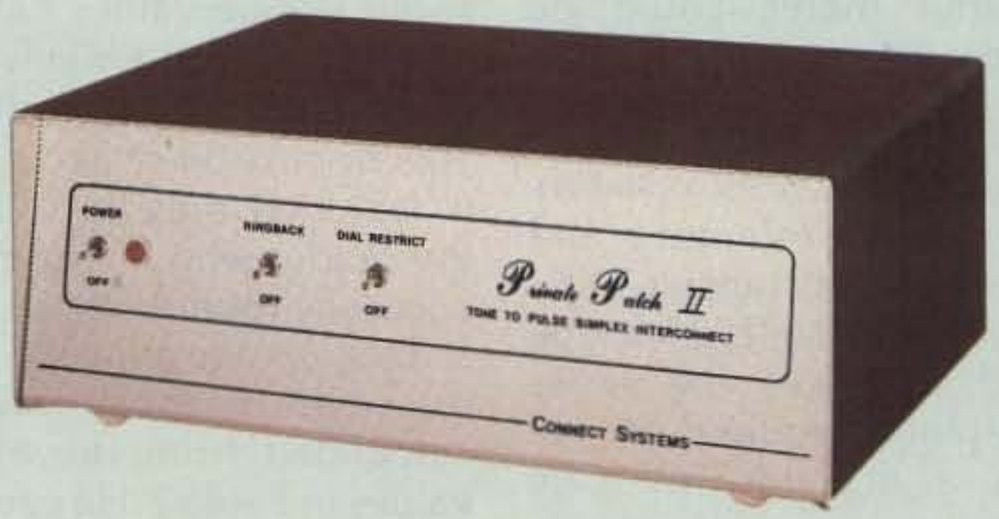
Table 2. Voltmeter series resistance ratings.

ANNOUNCING

PRIVATE PATCH II

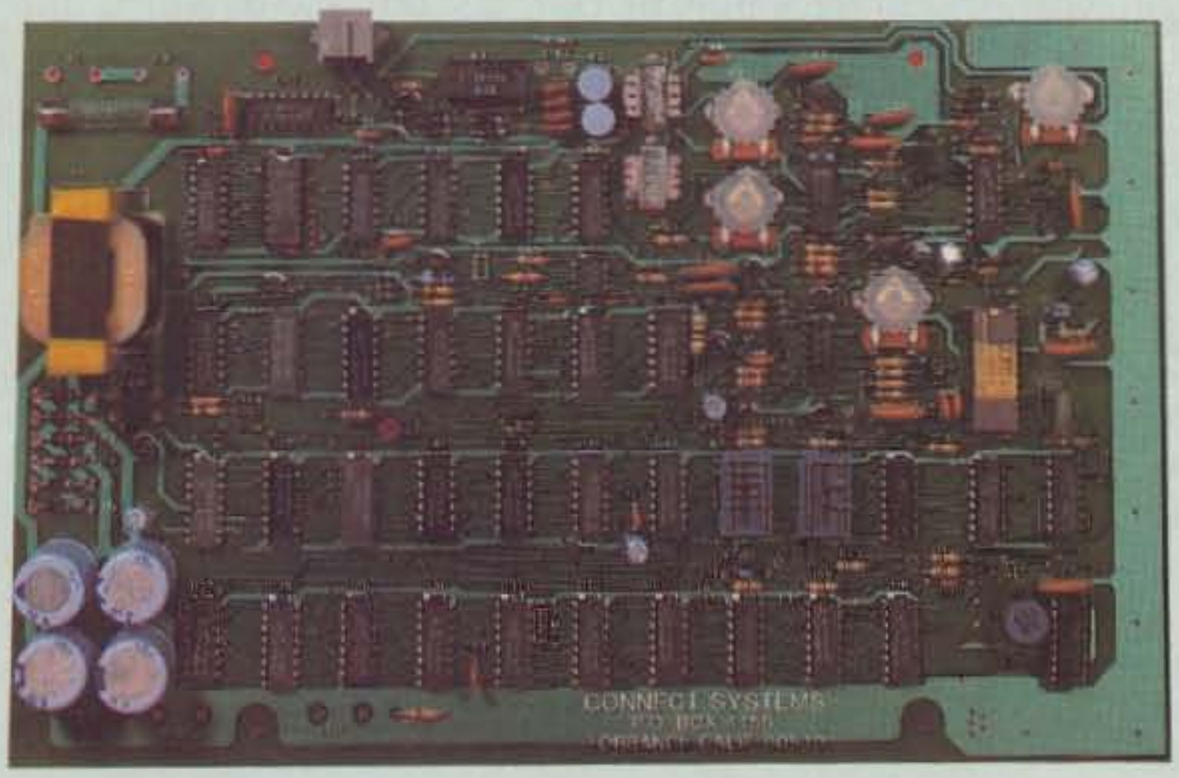
TONE TO PULSE SIMPLEX INTERCONNECT

AT LAST...Professional quality interconnect at an *affordable* price! Imagine the convenience of having your own private, commercial quality mobile telephone in your car. And without the hassles of shared systems. Put your base FM transceiver to work while on the road. Our *ultra state of the art* digitally processed audio scheme (Patent pending) *totally* eliminates the continuous train of squelch tails which has kept you away from sampling interconnects. Our nonsampling approach has additional benefits: 1. Interface to your transceiver is the MOST SIMPLE EVER. Connects only to microphone and speaker jacks! NO INTERNAL CONNECTIONS OR MODIFICATIONS REQUIRED! 15 minutes typical installation time. 2. Works with ANY FM transceiver. (T/R speed is not critical.) 3. Operates through any repeater or simplex without use of tone equipment. Imagine having TOTAL access to your own home phone from 100 miles away! Our *busy channel ringback inhibit logic* prevents "accidental" interference to a QSO in progress when a phone call is received. This feature will keep you out of hot water with co-channel users! Discover for yourself what high quality simplex interconnect sounds like. Call us, and listen to actual "on the air" tapes of this incomparable interconnect product.



STANDARD FEATURES

- Compatible with either rotary or tone exchanges
- 16 Digit buffer memory — dial as fast as you want
- 3201 tone decoder chip
- High quality glass circuit board
- CW identification
- Five digit user programmable sequential access code — 60,000 code combinations
- Sophisticated toll restrict — restricts any quantity of leading digits
- Both accessing and dialing are compatible with speed dialing equipment
- Operates superb through repeaters — no special tone equipment required
- Three/six minute "time out" timer is resettable from mobile four CW ID warnings during last minute
- Ringback (reverse patch) pages you once with CW ID — answer when convenient with your access code
- Busy channel ringback inhibit logic — prevents accidental interference to QSO in progress
- Most easily interfaced autopatch on the market
- Positive control logic
- Fully digital timing — there are *no* timing adjustments! assures quick easy set-up
- Touch tone™ digits and strobe pulse available on DIP socket
- Modular phone jack and cord
- Self contained 115 VAC supply (230 VAC 50/60 cycle export model available)



QUALITY AND ENGINEERING...
THAT YOU CAN DEPEND ON!!

PRIVATE PATCH II $475

NOW REDUCED

PRIVATE PATCH I $399

HAS MOST OPERATIONAL FEATURES OF PRIVATE PATCH II — BUT IS FOR USE ONLY ON DTMF EXCHANGES

AND OF COURSE:

ONE YEAR WARRANTY
14 DAY RETURN PRIVILEGE
UNMATCHED CUSTOMER SERVICE

VISA

SEND OR CALL FOR BROCHURES
INQUIRE ABOUT COMMERCIAL MODELS

DEALERSHIPS INVITED

Connect Systems

P.O. BOX 4155
TORRANCE, CA 90510
PHONE (213) 540-1053

used, the scale is multiplied by 1,000 and a label can be added to the meter face saying: "1,000 volts." Half-scale (0.5 mA) will be 500 volts. Similarly, a 100-microamp meter could be used with a × 10 multiplier.

For most amateur purposes, the series resistors can be 5% tolerance and the meter resistance can be neglected. Table 2 can be used to select the series resistance required to obtain a one-volt full-scale meter from various basic meter movements. If the series resistance is increased by a factor, the full-scale reading will be increased by the same factor. Typically, if 1,000 Ohms is required for one-volt full scale, 2,000 Ohms will result in two-volts full scale and 10,000 Ohms will give 10 volts. The series resistance rating for a basic meter may be calculated by dividing one by the basic full-scale meter reading. Typically, a 0-3 milliammeter would require 1 ÷ 0.003 = 333 Ohms-per-volt.

The accuracy of a meter with added series resistance depends on the meter accuracy, the series resistor accuracy, and the meter's internal resistance. The latter effect is generally small for the accuracies needed by the amateur. For a 1-volt, 1,000-Ohms-per-volt meter that uses a basic 0-1 milliammeter with 50-Ohms internal resistance, the total series resistance is 1050 Ohms (assuming a 1000-Ohm external series resistor). Ohm's Law tells us that 1.05 volts will be required for a full-scale reading. This is a 5% error and could be corrected by using a 950-Ohm series resistor. For high voltage ranges, the error becomes proportionately less.

If you have a means of accurate calibration at hand, the series resistance can be trimmed to eliminate essentially all of the error at *one* scale reading. The remaining error will be the meter's inherent inaccuracy. For the best possible accuracy, the error at various scale values has to be plotted using a highly accurate calibration standard. This discussion of accuracy is included only to satisfy the reader who has special accuracy requirements.

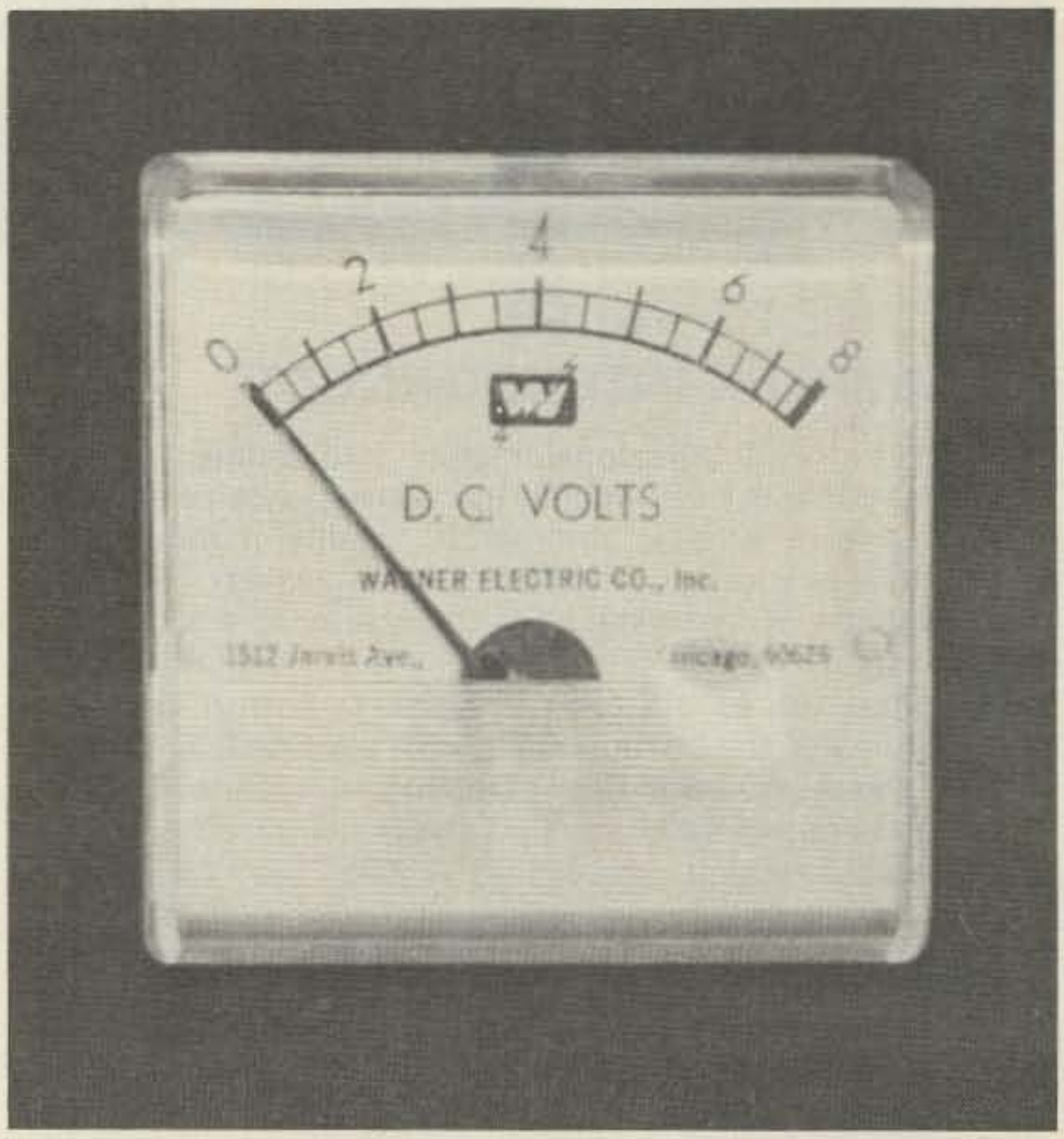
The average amateur can use series resistance values calculated from the basic values in Table 2. He can assume that his accuracy will be roughly that of the series resistance tolerance plus the meter's tolerance, i.e., on the order of ±10%, if ±5% series resistors are used.

Shunting to Obtain Higher Current Ranges

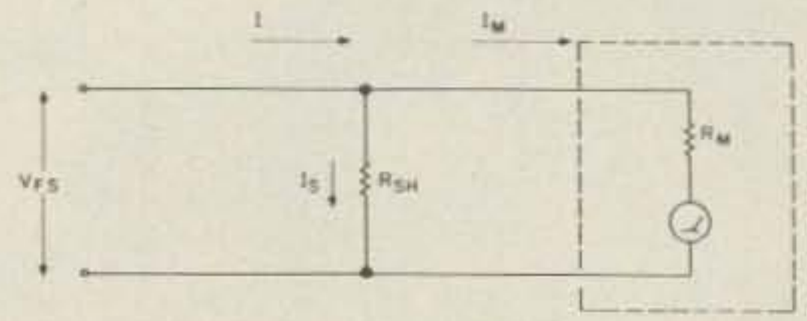
Shunting is just a bit more difficult than adding series resistances to obtain different voltage ranges. First, the resistance of the shunt must be calculated. Then, the shunt resistor must be obtained. Most often, the shunt resistor will have to be wound or otherwise fashioned. This is because the resistance values turn out to be quite low and most often of non-standard value.

The shunt resistance in parallel with the meter resistance must result in a voltage across the meter that will produce full-scale deflection for the desired full-scale current. This voltage is calculated using Ohm's Law as follows: $V_{FS} = I_{M(FS)} \times R_M$. (Here, V_{FS} is the voltage across the meter at full scale, $I_{M(FS)}$ is the basic meter's full-scale current, and R_M is the meter resistance (see Fig. 4). The method of determining R_M was previously discussed. It should be noted that meter resistances can sometimes be found by referring to catalog descriptions. By using the parallel resistance expression and Ohm's Law, it can be shown that the shunt resistance is: $R_S = R_M(V_{FS}/I_{FS})/(R_M - V_{FS}/I_{FS})$, where I_{FS} is the desired full-scale current and R_S is the corresponding value of resistance needed to shunt the meter.

For example, the shunt required to make a 10-milliamp meter from a 50-Ohm, 1-milliamp meter is calculated as follows: $V_{FS} = .001 \times 50 = 0.05$ volts, and $R_S = (.05/.01) \times 50/50 - .05/.01) = 5.56$ Ohms.



This photo shows the face of an iron-vane-type meter. Note that it has an irregular (non-linear) scale. For the same amount of current change, less motion occurs near full scale than at the low end of the scale. In some applications this may have advantages. Most meters of this sort are made for low-cost applications or for use in ac applications. They are frequently found in automotive equipment, both in car instrument panels and in devices such as battery chargers.



a. $V_{FS} = I_{M(FS)} \times R_M$, FULL SCALE VOLTAGE

b. $R_{PAR} = \frac{R_{SH} \times R_M}{R_{SH} + R_M}$, SHUNTED METER RESISTANCE

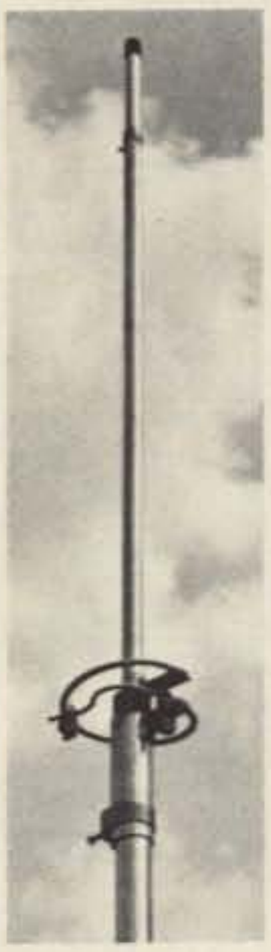
c. $R_{PAR} = \frac{V_{FS}}{I_{FS}}$, SHUNTED METER RESISTANCE

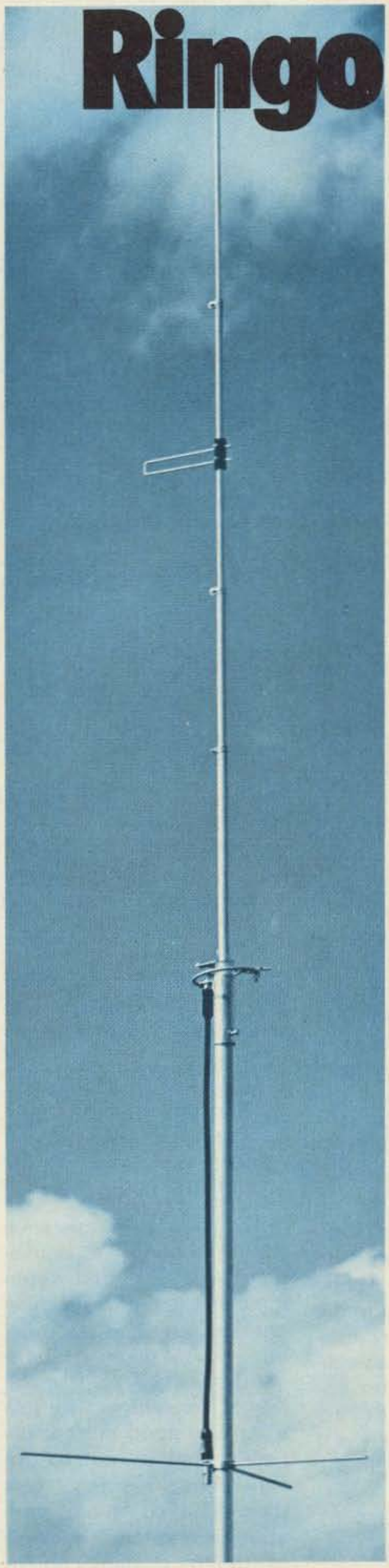
REQUIRED FOR A DESIRED VALUE OF CURRENT AT FULLSCALE (I_{FS})

d. $R_{SH} = \frac{R_{PAR} \times R_M}{R_M - R_{PAR}}$, SHUNT RESISTANCE

OR $R_{SH} = \frac{\frac{V_{FS}}{I_{FS}} \times R_M}{R_M - \frac{V_{FS}}{I_{FS}}}$

Fig. 4. Shunt value calculation.





Ringo Ranger II

Simply the best

The best combination of gain, bandwidth and low angle radiation for simplex or repeater operation.

Quick easy assembly and installation

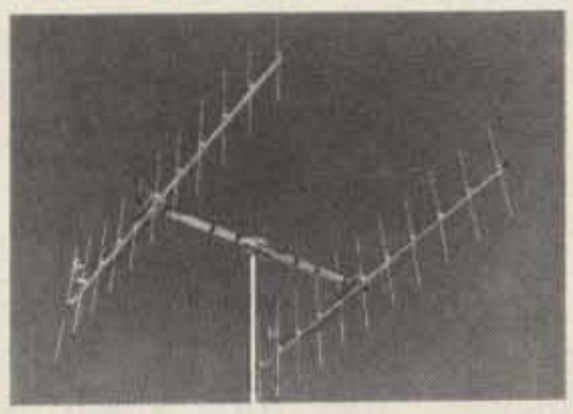
Mount anywhere with compact dimensions and neat appearance

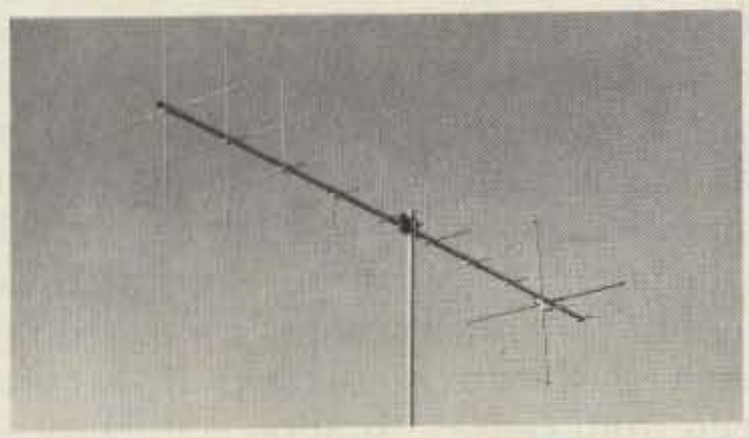
Proven performance and durability in all environments

Complete FM band coverage

One year warranty

Cushcraft antennas created the FM antenna revolution by making the best performance and value available to every ham. We continue to set the pace with a broad line of antennas for every FM application. Tune across the band and you will find the overwhelming majority of hams using one, two, or more Cushcraft antennas. The reason is very simply that they are the best. Now is the time for you to enjoy the value of a Cushcraft antenna. See your nearby dealer today.





RINGO RANGER II

ARX-2B	134-164 MHz
ARX-220B	220-225 MHz
ARX-450B	435-450 MHz

RINGO RANGER

ARX-2	134-164 MHz

RINGO

AR-6	50-54 MHz
AR-2	135-175 MHz
AR-10	28-29.7 MHz
AR-220	220-225 MHz
AR-450	440-460 MHz

MOBILE ANTENNAS

-147	144-148 MHz	Magnetic Mount
-147	144-148 MHz	Trunk Lip Mount
-220	220-225 MHz	Magnetic Mount
-220	220-225 MHz	Trunk Lip Mount

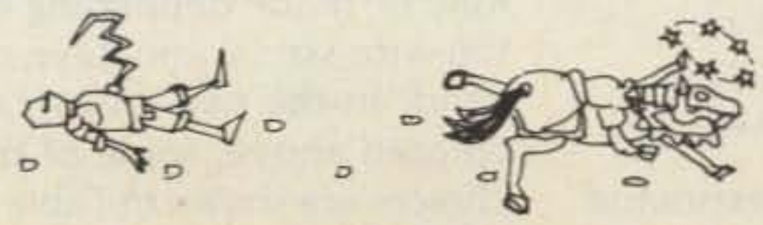
YAGIS

A147-4	145.5-148 MHz	4 Element
A147-11	145.5-148 MHz	11 Element
A147-22	145.5-148 MHz	22 Element
214-FB	145.5-148 MHz	14 Element
A220-7	220-225 MHz	7 Element
A449-6	440-450 MHz	6 Element
A449-11	440-450 MHz	11 Element

CROSS YAGI

FOR CW/SSB and FM

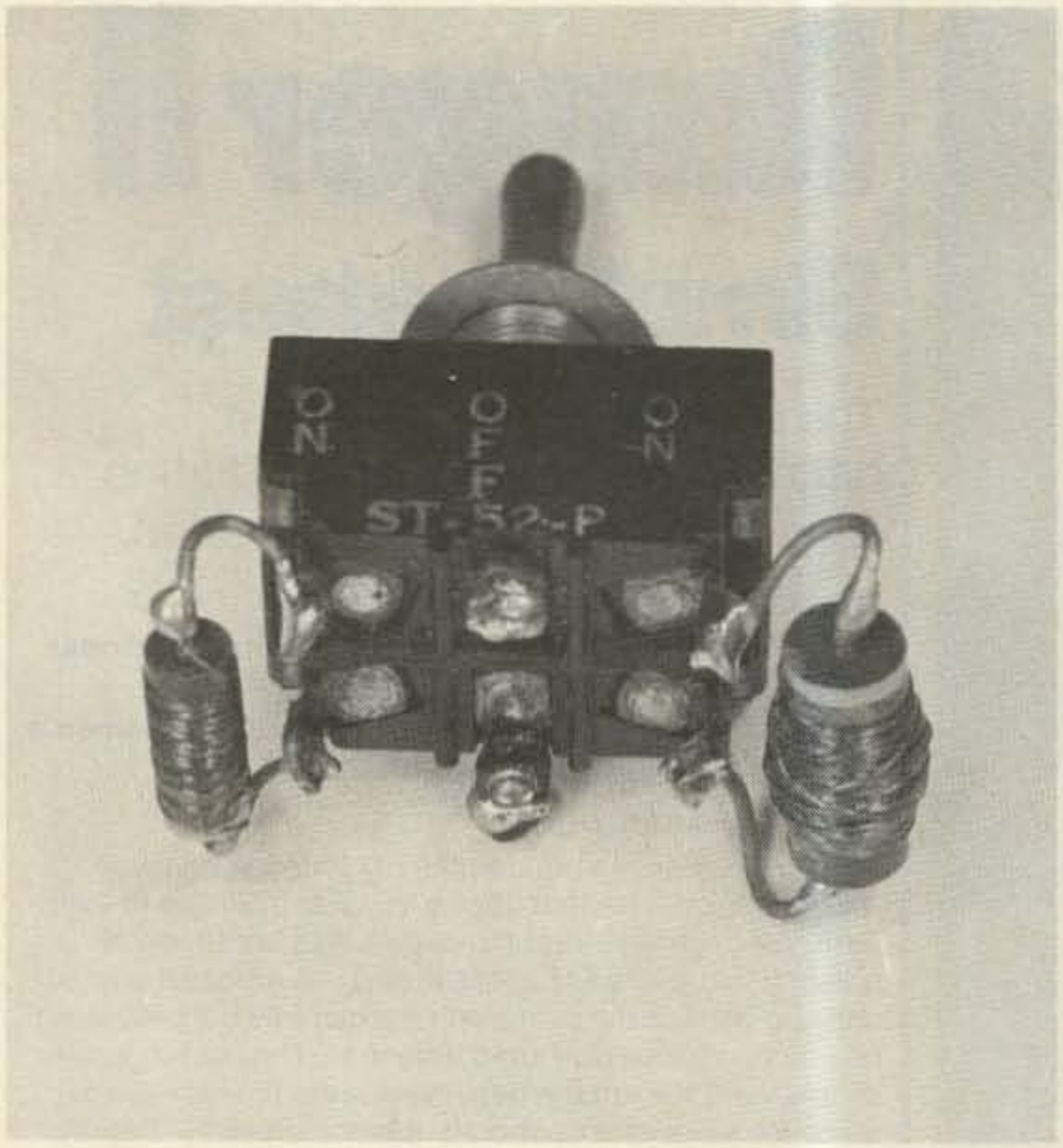
A147-20T 144-146 MHz Horizontal
145.5-148 MHz Vertical



cushcraft CORPORATION

THE ANTENNA COMPANY
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108 ✓106

✓See List of Advertisers on page 114



Shunts may be wound using resistors as forms. The shunts above are those used in the 0-3, 0-30, and 0-300 milliamp meter described in the text. The resistors should be at least 100 times the resistance value of the shunt. Use a two-Watt resistor if you have room. This gives better cooling and makes construction easier.

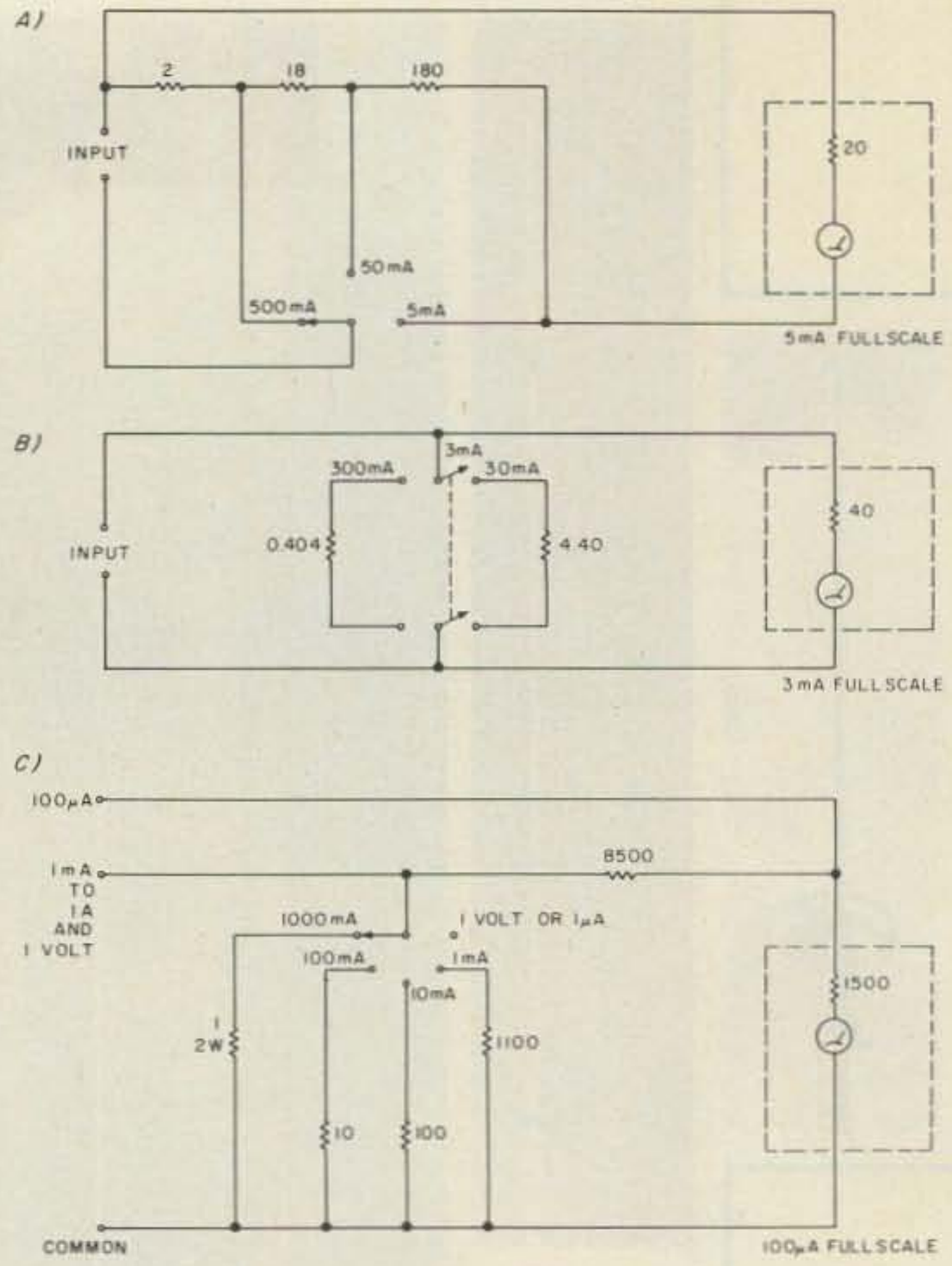


Fig. 5. (a) A multi-scaled milliammeter using an unusual series and parallel shunting scheme. (b) A multi-scaled milliammeter using standard shunting and a DPDT center-off switch. (c) A multi-scaled milliammeter/microammeter that produces less than one volt drop at full-scale current. Resistances are in Ohms.

If a 100-milliamp range were desired, the foregoing calculation would indicate that 0.505 Ohms was required. Note that in both cases the shunt resistor is in proportion to the amount of current that must bypass the meter. In the latter case, the shunt is about 1/100 of the basic meter resistance. As can be seen from these calculations, the resistances are low and (generally) non-standard.

However, shunt resistances can be constructed easily from copper wire. They also may be constructed from other less available wires such as nichrome if you have the materials available. By using the Standard Wire Tables found in the handbooks, the wire gauge and the length of this gauge wire necessary to construct a proper shunt can be determined easily. As in the case of series resistors for voltmeter applications, the shunts can be trimmed and adjusted if accurate calibration standards are available.

As in the case of voltmeters, the meter can be made truly accurate at one scale reading and must be error-noted at other readings because of the basic inaccuracies of the meter. For amateur use, this sort of accuracy is most often not necessary. Typically, in the 100-milliamp case cited above, a 0.5-Ohm, ±5% resistor will give overall accuracy on the order of ±10%. This would suffice in almost all amateur applications. A 5-Ohm, ±5% resistor would do for the 10-milliamp case.

To make low resistance shunts, choose a convenient wire size and determine what its resistance-per-unit length is. In most tables this is given in Ohms-per-thousand feet. Use the largest convenient wire size to ensure good current capacity, and try not to use very thin sizes (e.g., less then #30) to avoid variations in resistance because of stretching. Many choices may be made depending on the wire size(s) you have on hand. In the two cases calculated above, some of the choices are shown in Table 3.

	Wire Size	Ohms-per-1000 Feet	Ohms-per-Foot	Required Length
5.56 Ohms	30	105.2	0.105	52.4 ft.
5.56 Ohms	33	211.0	0.211	26.4 ft.
0.505 Ohms	28	66.17	.0662	7.63 ft.
0.505 Ohms	24	26.17	.0262	19.3 ft.

Table 3. Typical wire length for two values of resistance.

The determination of the required wire length is made quite easily by dividing the required resistance value by the resistance of the wire in Ohms-per-foot. The latter is determined by dividing the Ohms-per-thousand-feet rating by 1000 (see Table 3 for illustrations). Some trial-and-error calculation is generally required to choose a size that results in a relatively small coil (or spool) of wire of a size you have on hand. Shunts should be wound on forms such as a relatively high-value resistor (100 times the shunt value) and should be coated with varnish or other strong coating that will prevent the turns from moving as a result of on/off current change.

Shunts should be located as close to the meter ter-

minals as convenient. However, low-current shunts can be located "in-circuit" with their meters in remote positions. In these cases, the circuit resistance to and from the meter must be low with respect to the meter.

If you are clever with Ohm's Law, many special cases can be developed for shunts. Fig. 5 shows a neat way of building a multi-scaled milliammeter using a 5-milliamp, 20-Ohm meter. A more conventional multi-scale approach is shown in Fig. 5(b).

Fig. 5(c) makes a lot of use of a 100-microampere, 1,500-Ohm meter. (Incidentally, these appear to be readily available from surplus houses these days.) Ranges are provided from 100 microamperes to one Ampere, and a bonus scale of one volt is provided. A drawback to this circuit in at least the one-Ampere range is the fact that the drop across the meter circuit will be one volt for full scale on all current scales except the basic 100-microamp range.

Examination of the circuit will quickly show that it is a one-volt, 10,000-Ohms-per-volt voltmeter that measures the voltage across shunts that develop one volt for full scale. Note that the one-milliampere shunt is 1100 Ohms. This, in parallel with the meter resistance, gives an input resistance of roughly 1000 Ohms. Consequently, the accuracy on this range is improved. On the other ranges, the shunt resistances are low enough to make the parallel effect of the meter circuit insignificant.

Home-built multi-scaled meters can be housed in metal or wooden cabinets. The example above is a multi-scaled milliammeter built into a Masonite™ and wood enclosure. Care should be taken to protect terminals and circuitry that may carry dangerous voltages. Further, circuitry of this sort should always be protected to avoid accidental shorts that may burn out the circuit under test or the meter itself.

Conclusion

This article has only scratched the surface of the subject of meters and their applications. However, it can serve as a basic reference for the many newcomers to our hobby.

The kind assistance of Robert Foley and Julius Hoffer W1DL is acknowledged. They reviewed the draft of this article and made valuable suggestions.■

↙See List of Advertisers on page 114

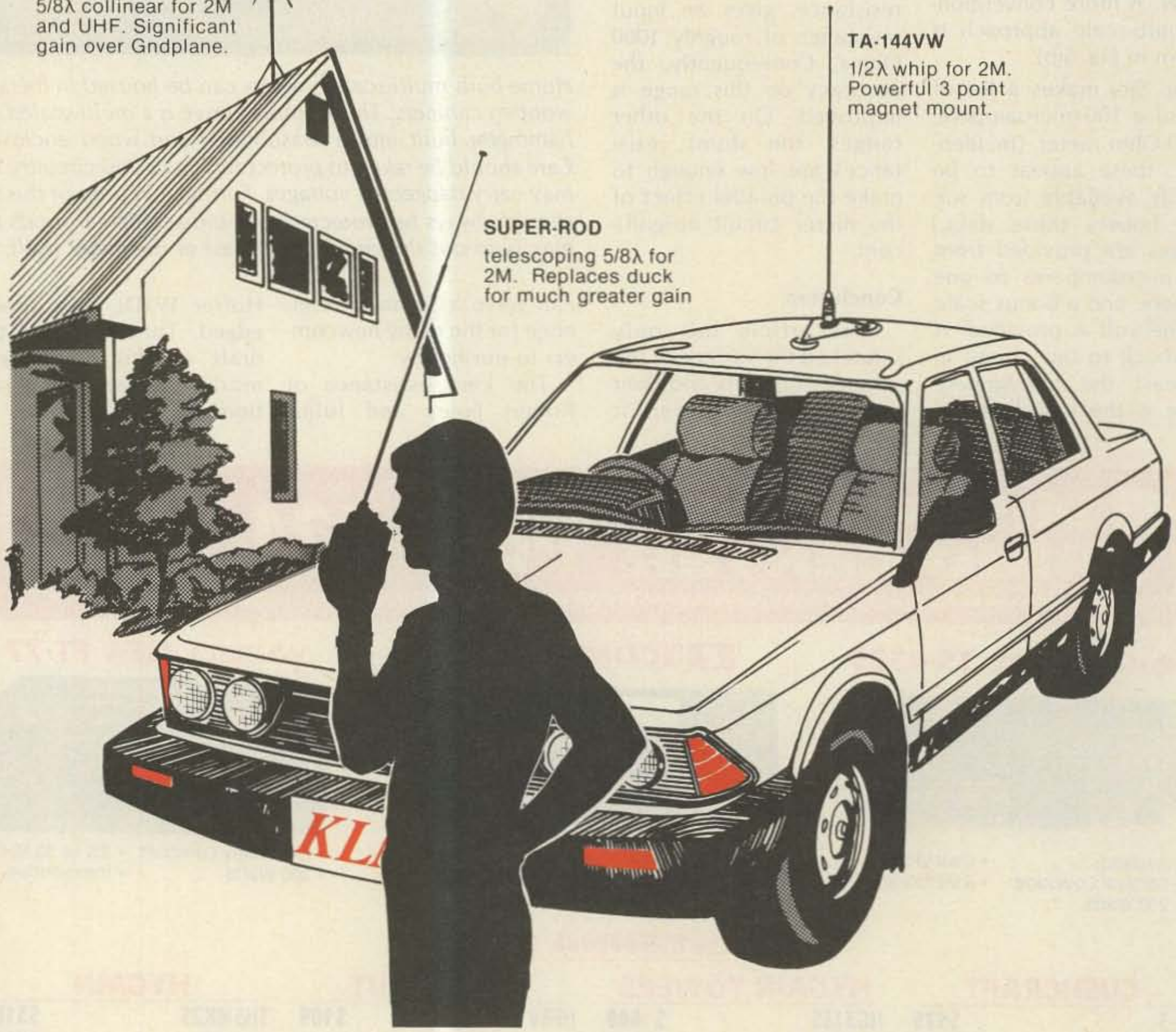
KLM Mobile MAXIMIZERS

THE ***MAXIMIZERS:*** KLM's brand new series of mobile communications antennas can help make the most of your mobile signal. Enjoy greater range, cleaner reception for the best of local and DX operations. Models for base station, auto, marine and handie applications.

AP-144DIII
5/8λ collinear for 2M and UHF. Significant gain over Gndplane.

TA-144VW
1/2λ whip for 2M. Powerful 3 point magnet mount.

SUPER-ROD
telescoping 5/8λ for 2M. Replaces duck for much greater gain



Make yourself heard with a *MAXIMIZER*

- for HF, VHF, and UHF bands
- multiband models, too
- easy assembly and installation
- magnet and bumper/trunk lip mobile mounts
- accessories

WRITE FOR A COMPLETE CATALOG

KLM Electronics, Inc. P.O. Box 816, Morgan Hill, CA 95037 (408) 779-7363

Save Money on Used Meters

Does it work or doesn't it?
This simple tester spots real hamfest bargains.

Keats A. Pullen, Jr. W3QOM
2807 Jerusalem Road
Kingsville MD 21087

The prices seen on meters at hamfests these days as compared to list prices can easily make one's mouth water if one is interested in observing the operating characteristics of either transmitters or test gear. Nonetheless, one may shy away from purchases because an inoperative meter may not be worth anything at all.

Fortunately, there are several useful solutions to this problem, each of which has its particular advantages. Probably the more important meters to test, and among the more expensive, are microammeters and millivoltmeters. They are also among the more delicate. The techniques for testing these meters can be applied to many of the other types if changes noted later are taken.

The simplest test, although not necessarily the best, is to compare the pointer damping (sluggishness) with and without a short across the meter terminals. Since use of every bit of space available for the moving coil is essential with meters having full-scale ranges of 100 microamperes or less, the customary aluminum damping frame used for the moving coil in less sensitive meters is often not used. As a result, the movement turns easily when the body of the meter is rotated gently.

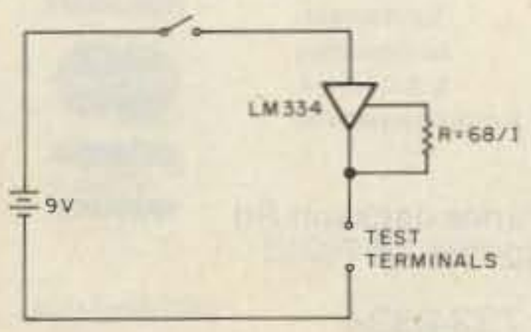


Fig. 1. Meter-testing circuit.

When the terminals are shorted on one of these meters, however, the movement of the coil typically becomes sluggish. One can then use a clip lead or a small screwdriver for making a continuity test. A substantial change in the damping characteristics will be noted with or without the short in place. And the test can in no way damage the meter under test.

In making this test, one holds the meter in one hand and rotates the case quickly along the coil axis. Inertia will cause the movement to lag behind the case, and the mass and spring will act like a resonant circuit. The amount of damping in the motion of the pointer will be a function of the effect of the coil frame and the external short.

The best technique I have found for testing current meters is by the use of a constant-current source like the LM-334. This source is used with a control resistance of magnitude (68/I) where the current, I, is in milliamperes, between the calibration terminals. A nine-volt transistor battery, a push-button, a small box, and test leads are required to complete the unit. The normal current range is from one microampere to ten milliamperes, for resistances from 68,000 Ohms to 6.8 Ohms.

The number of current steps you select will depend on your application. The unit I use has test currents of 1, 10, 100, 1000, and 10,000 microamperes. Better testing can be obtained through either ratios of 1:3:10 or 1:2:5:10. These test points will provide a more sensitive test for friction due to filings, etc.

In using this device, start at minimum current and observe the pointer as you change ranges. A rough check of calibration is available (±10 percent) and, more importantly, you will be able to detect mechanical problems as noted above. With a device like this, you can very quickly decide if a meter is suitable for your application.

This unit can also be used to test voltmeters up to its nine-volt maximum. Most voltmeters will deflect at least a little with nine volts, so you simply connect the current source and step the current up until the pointer moves. The nominal voltage will be between eight and nine volts.

If you are looking for either higher-current or higher-voltage test units, then a different approach is indicated. For higher current, the use of a D-cell, a push-button, and a few resistors (or perhaps a rheostat) should suffice. A current-limiting resistance set for approximately the maximum current is desirable, with the rheostat providing varying current values. The approximate maximum is first set, the unit connected to the meter, and the test initiated. The required minimum resistance is approximately 1.5/I, where I is the maximum current in Amperes and the 1.5 is the voltage from the D-cell used for the test.

For higher-voltage voltmeters, either a high-voltage battery or several nine-volt batteries may be used. Since, however, these meters are often designed for external multipliers, first tests should be made with the constant-current source. Up to a meter range of eight volts, the deflection will be current controlled; above, the voltage limitation takes over.

As is explained in my book, *Design of Transistor Circuits, with Experiments,* published by Sams, there are many ways of devising special test circuits that can help you both to understand how some of your circuits and devices are operating and to test them conveniently. ■

CRYSTALS

2 meter for these Radios

Drake TR-22	Lafayette HA-146	Regency HR-2MS
Drake TR-33 rec. only	Midland 13-505	Heathkit HW-202
Drake TR-72	Midland 13-506	Sears 3573
Genave	Regency HR T2	Standard 146/826
Heathkit HW-2021 rec. only	Regency HR-2, A	Tempo FMH
Hygain 3806	Regency HR-212	Trio/Kenwood TR2200
Icom/VHF Eng	Regency HR-2B	Trio/Kenwood TR7200
Wilson 1402, 5, MK2, 4	Regency HR 312	Yaesu FT 202R

IF YOUR RADIO IS A NEW MODEL
PLEASE INQUIRE FOR PRICING AND DELIVERY

CRYSTALS **$3.65** IF RADIO AND FREQUENCY IS LISTED IN AD

FREQUENCIES WE STOCK

146.01T	6.22T	6.52R	7.75T
6.61R	6.82R	6.55T	7.15R
6.04T	6.25T	6.55R	7.78T
6.64R	6.85R	6.58T	7.18R
6.07T	6.28T	6.58R	7.81T
6.67R	6.88R	6.94T	7.21R
6.10T	6.31T	7.60T	7.84T
6.70R	6.91R	7.00R	7.24R
6.13T	6.34T	7.63T	7.87T
6.73R	6.94R	7.03R	7.27R
6.16T	6.37T	7.66T	7.90T
6.76R	6.97R	7.06R	7.30R
6.19T	6.40T	7.69T	7.93T
6.79R	6.46T	7.09R	7.33R
	6.46R	7.72T	7.96T
	6.52T	7.12R	7.36R
			7.99T
			7.39R

ANY TWO METER FREQUENCY OR RADIO NOT LISTED CAN BE SPECIAL ORDERED **$5.00**
WE SUPPLY MICRO-PROCESSOR CRYSTALS

TERMS: CRYSTALS – SHIPPED C.O.D. FIRST CLASS MAIL. ORDERS PAID BY CHECK, M.O., MASTERCARD OR VISA ARE SHIPPED F.C.M. POSTAGE PAID. CRYSTALS ARE GUARANTEED FOR LIFE.

COMPARE our PRICES

74LS SERIES

LS00	.23	LS74	.40	LS158	.57	LS248	.86
LS01	.23	LS75	.40	LS160	.80	LS251	.78
LS02	.27	LS76	.51	LS161	.80	LS253	.78
LS03	.27	LS83	.78	LS162	.92	LS257	.78
LS04	.29	LS85	.92	LS163	.74	LS258	.78
LS05	.29	LS86	.46	LS164	.97	LS259	1.61
LS08	.29	LS90	.46	LS165	1.20	LS266	.69
LS09	.27	LS92	.57	LS166	.92	LS273	1.32
LS10	.27	LS93	.57	LS169	2.01	LS279	.57
LS11	.29	LS96	.80	LS170	1.72	LS280	2.07
LS12	.29	LS107	.41	LS173	.80	LS283	.97
LS13	.51	LS109	.41	LS174	.51	LS290	.82
LS14	.46	LS112	.43	LS175	.46	LS298	1.15
LS15	.40	LS113	.51	LS181	2.24	LS320	2.30
LS20	.29	LS114	.63	LS190	.92	LS323	4.02
LS21	.29	LS123	.69	LS191	.92	LS365	.92
LS22	.29	LS125	.51	LS192	.74	LS366	.92
LS26	.40	LS126	.51	LS193	.74	LS367	.69
LS27	.29	LS132	.63	LS194	.86	LS368	.69
LS28	.51	LS136	.51	LS195	1.03	LS373	1.43
LS30	.25	LS137	1.09	LS196	.97	LS374	1.43
LS32	.31	LS138	.57	LS197	.97	LS377	1.43
LS37	.34	LS139	.57	LS221	.86	LS386	.74
LS38	.34	LS147	2.24	LS240	1.09	LS390	1.49
LS40	.46	LS151	.46	LS241	1.09	LS393	1.49
LS42	.51	LS153	.46	LS242	1.38	LS398	2.87
LS47	.74	LS154	2.18	LS243	1.38	LS670	1.84
LS51	.25	LS155	.69	LS244	1.15	LS682	3.45
LS54	.29	LS156	.92	LS245	1.38	81LS97	.92
LS73	.40	LS157	.51	LS247	.86	81LS98	.92

SCR'S

	1.5A	6A	35A	PRV	1A	10A	25A
100	.40	.46	1.61	100	.41	.69	1.61
200	.46	.57	2.27	200	.57	.92	2.18
400	.69	.80	2.76	400	.80	1.15	2.99
600		1.15	4.14	600	1.15	1.38	4.14

TRIACS

SILICON POWER RECTIFIERS

EPOXY 1 AMP			EPOXY 3 AMP			FULL WAVE		
PRV	1-99	100	PRV	1-99	100	BRIDGES		
1N4002	.07	.07	100	.16	.16	PRV	2A	6A 25A
1N4004	.10	.10	400	.28	.25	200	.92	1.55 2.53
1N4007	.23	.19	1000	.51	.43	600	1.49	2.18 5.06

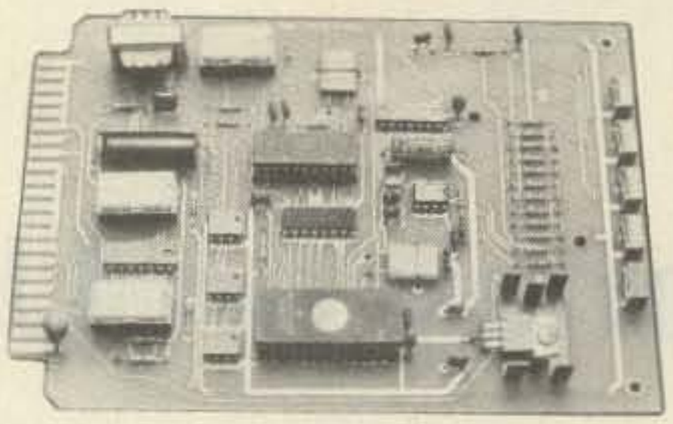
PHONE ORDERS ACCEPTED MON. FRI. 5:30 PM to 9:00 PM
(617) 294-1553

TERMS: COMPONENT PARTS – F.O.B. PEMBROKE, MA. SEND CHECK or M.O. MINIMUM MAIL ORDER $5.00. C.O.D. or CHARGE ORDERS & TELEPHONE MINIMUM $25.00.
POSTAGE RATES ADD 10% FOR ORDERS UNDER $25.00
ADD 5% FOR ORDERS BETWEEN $25.00 & $50.00
ADD 3% FOR ORDERS ABOVE $50.00

A TO Z CRYSTAL CO.
P.O. BOX 454 E
PEMBROKE, MA. 02359 ✓262

VISA MasterCard

Micro Processor Repeater Control



MCD 01 *"The Affordable Controller"*
Call or Write for immediate delivery.

Price $549.00 (Complete)

Features: **NEW!!**

- ★ COR
- ★ Automatic I.D.
- ★ 16 digit selectable command codes
- ★ Field Programmable
- ★ Auto Patch Tone & Rotary Dial
- ★ Reverse Autopatch
- ★ Autodialer
- ★ Repeater Timers
- ★ 12 Volt Operation
- ★ 150 MA Current Drain
- ★ Many more features included

Micro Concepts & Designs Co.
P.O. Box 19786
Orlando, FLA. 32814
Phone (305) 298-3026 ✓227

3% CASH DISCOUNT--CASHIERS CHECK OR M/O

AZDEN

PCS-300 2 METER HANDHELD.....285.00
PCS-4000 25 WATT MICRO-COMPUTER.....285.00

BUTTERNUT ANTENNAS

2MCV-5 2 METER 5/2 WAVE COLLINEAR.....31.00
2 MCV 2 METER COLLINEAR.....30.75
HF6V 10-80 PLUS 30 METER VERTICA...110.00
HF6VX SAME AS ABOVE/SMALLER PACKAGE.127.00
TBR-160 HD 160 METER ADD ON KIT.....45.00

CUSHCRAFT

A3 10-15 & 20 MHZ 3 ELEMENT BEAM.....176.95
A4 10-15 & 20 MHZ 4 ELEMENT BEAM.....228.50
A3SK/A4SK S/S HARDWARE FOR A3&A4'S.....41.50
A32-19 144-146 MHZ 19 ELEMENTS.....83.00
AV-4 10-15-20-40 M 1/4 WAVE VERTICAL....83.00
AV-5 10-15-20-40-80 M 1/4 WAVE VERTICAL.90.78
10-3CD 28 MHZ 3 ELEMENT SKY WALKER BEAN.76.50
10-4CD 28 MHZ 4 ELEMENT SKY WALKER BEAM.90.00
15-3CD 21 MHZ 3 ELEMENT SKY WALKER BEAM.97.00
15-4CD 21 MHZ 4 ELEMENT SKY WALKER BEAM104.50
20-3CD 14 MHZ 3 ELEMENT SKY WALKER BEAM174.50
20-4CD 14 MHZ 4 ELEMENT SKY WALKER BEAM242.50
AMS-147 146-148 MHZ MOBILE MAG MOUNT....27.95
ATS-147 146-148 MHZ MOBILE TRUNK MOUNT..27.95
A147-11 146-148 MHZ 11 ELEMENT BEAM.....38.00
A147-20T 144&147 MHZ 20 ELEMENT BEAM....63.00
ARX-2B 134-164 MHZ RONGO RANGER.....34.95
A144-11 144 MHZ 11 ELEMENT BEAM.....38.00
A144-10T 145 MHZ 10 ELEMENT TWIST.....44.98
A144-20T 145 MHZ 20 ELEMENT TWIST.....69.50
214B 144-146 MHZ 14 ELEMENT BOOMER.....69.50
214FB 14 ELEMENT BOOMER.....69.50
617-6B 6 METER 6 ELEMENT BOOMER.....180.00
MANY OTHER ANTENNAS IN STOCK AT SAVIGS

DIAWA/MILLER

CS-201 2 POSITION COAX SWITCH.....21.00
CS-401 4 POSITION COAX SWITCH.....62.95
CN-520 1.8-60 MHZ SWR/POWER METER.....69.75
CN-540 50-148 MHZ SWR/POWER METER.....77.25
CN-620-B 1.8-150 MHZ SWR/POWRE METER...108.00
CN-603 140-450 MHZ SWR/POWER METER.....129.80
CN-720-B 1.8-150 MHZ SWR/POWER METER...155.00
CN1001A AUTOMATIC ANTENNA TUNER.....311.00

ROTORS & CABLES

HD-73 ALLIANCE W/METER USES 6C CABLE....99.00
RG213(RG8 MIL-SPEC)CABLE PER 100 FT.....28.00
U100 ALLIANCE W/AUTOMATIC DIAL SET.....45.25
HDR-300 HYGAIN DELUXE DIGITAL.....430.59
AR22XL TELEX AUTOMATIC BELL ROTOR.....60.00
CD45II TELEX METERED ROTOR.....103.00
HAM IV TELEX MERERED W/WEDGE BRAKE.....199.75
T2X SUPER DUTY METERED & WEDGE BRAKE...248.69
8 CONDUCTOR ROTOR CABLE PER 100 FT.....17.00
8 CONDUCTOR ROTOR CABLE ALL 8 GAGE.PER FT..33
100 FT RG8 SUPERFLEX W/PL259 INSTALLED..29.80
MINIATURE RG8(RG8X) PER 100 FT.....16.00
RG11 75 OHM CABLE PER FOOT.....25

HY-GAIN

TH7DXS 7 ELEMENT TRIBAND BEAM.....369.00
TH3MK3 3 ELEMENT TRIBAND BEAM.....218.85
TH3JRS 3 ELEMENT TRIBAND BEAM.....154.50
HG-2 10-15-20M HY-QUAD BEAM.....259.00
TH7 KIT FOR TH6DXX UPDATE.....137.00
V2-S 2M VERYICAL COLINEAR BASEW/SS H/W..38.50

KDK 2 METER RADIOS

FM2030 2 METER SYNTHESIZED RADIO.....293.50

MINI-PRODUCTS

HQ-1 MINIATURE 4 BAND QUAD.....132.00

MACO POWER SUPPLIES

2006 S/L 8 AMP I/L 6 AMP C/L 4 AMP.....48.00
2010 S/L 12 AMP I/L 10 AMP C/L 6 AMP....61.50
2020 S/L 24 AMP I/L 20 AMP C/L 12 AMP...73.80
2030 S/L 36 AMP I/L 30 AMP C/L 18 AMP..115.65

MFJ PRODUCTS

MFJ-102 12/24 HOUR CLOCK.....30.69
MFJ-202 RF NOISE BRIDGE.....52.00
MFJ-262 1 KW DRY DUMMY LOAD.....57.25
MFJ-308 8 BAND SW CONVERTER.....87.40
MFJ-311 154-158MHZ CONV. FOR 2 M SYN....43.80
MFJ-481 MEMORY KEYER 50 CHARACTER MESS..79.00
MFJ-494 SUPER KEYBOARD 50 CHARACTERS...245.50
MFJ-496 SUPER KEYBOARD 256 CHARACTERS..297.00
MFJ-722 SUPER CW/SSB FILTER"OPTIMIZER"..61.00
MFJ-825/830 SWR/PEK WATTMETER W/830 ...104.00
MFJ-941C ANT TUNER/SWR MERETER 1:4 BAL..79.00
MFJ-989 3KW TUNER LOADED.....289.00
MFJ-16010 RANDOM WIRE TUNER.....34.90

MIRAGE AMPLIFIERS

B-23 144-148 2 IN 30 OUT.....78.50
B-108 144-148 10 IN 80 OUT.....157.00
B-1016 144-148 10 IN 160 OUT.....244.00
B-3016 144-148 30 IN 160 OUT.....203.25
D-1010N 430-450 10 IN 100 OUT.....286.95
D-1010U 430-450 10 IN 100 OUT.....286.95
MP-1 WATTMERER H/F..... 100.00

TEMPO RADIOS & AMPS

S-1 2 MTR. SYN. 143-147 MHZ.....255.00
S1-T 2 MTR. SYN. W/TT PAD..... 271.00
S-15 2 MTR. 5 WATT H/H 140-150 MHZ.265.00
S-15BEXP 2 MTR. 5 WATT H/H 150-160 MHZ.307.00
S-15T SAME AS S-15 WITH TT PAD.....293.50
S-15TBEXP SAME AS S-15B WITH TT PAD.....322.50
ACH-15 AC QUICK CHARGER FOR S-15'S....54.00
CC-15 LEATHER CASE FOR S15'S.....25.00
BP-15 SPARE BATTERY PACK FOR S-15'S..30.50
HM-15 SPEAKER/MICROPHONE.....36.50
S-30 30 WATT POWER AMP.FOR WALKIES..84.00
S-80 80 WATT POWER AMP.FOR WALKIES.148.79

TEN-TEC

560 CORSAIR 1.8-30 MHZ NEW TEN-TEC....1035.00
MA114 ATT SSB/CW 10-80M ANALOG.....458.00
545 200 WATT SSB/CW 10-80M ANALOG.....738.00
580 DELTA 200 WATT SSB/CW 10-160M DIG..765.00
444 HERCULES 1 KW AMP W/POWER SUPPLY..1659.00

VOCOM PRODUCTS

2C025-2W 2 IN 25 OUT 2 METER AMPLIFIERT.69.98
2C050-2W 2 IN 50 OUT 2 METER AMPLIFIER.101.30
2C100-2/25 W IN 80 TO 100 WATTS OUT....170.00

WILSON BY MACO

SY-33 3 ELEMENT 10,15,20 METERS.....207.87
SY-36 6 ELEMENT 10,15,20 METERS.....285.36
33-6MK ADD ON 40 METERS TO TRIBANDS.....88.50
GR-1 GROUND KIT FOR WV-1A.....27.00
WV-1A 4 BAND TRAP VERTICAL 10-40 METERS.88.50

CALL FOR QUOTES ON OTHER RELATED PRODUCTS FOB ORIGIN

Amateur Equipment, Accessories & Antennas. Export Anywhere.

AMERICAN EXPRESS MasterCard VISA

Appliance & Equipment Company inc.

2317 Vance Jackson Rd.
San Antonio TX 78213

(512) 733-0334

COD Available

Hours: 8:30 a.m. to 5:00 p.m. Monday thru Friday
9:00 a.m. to 2:00 p.m. Saturday - CST
Prices Subject to Change without notice.

The Interface

Software Available for Six Computers

The versatility of the personal computer gives you a whole new world with the Kantronics Interface™ and Hamsoft™ or Hamtext™. The Interface™ connects to any of six popular computers with Hamsoft™ or Hamtext™ giving you the ability to send and receive CW/RTTY/ASCII. An active filter and ten segment LED bargraph make tuning fast and easy. All programs, except Apple, are on program boards that plug directly into the computer.

Hamtext™, our new program, is available for the VIC-20 and Commodore 64, with all the features of Hamsoft™ plus the ability to save received information to disc or tape, variable buffer sizes, VIC printer compatibility, and much more. Our combination of hardware and software gives you the system you want, with computer versatility, at a reasonable price.

Hamsoft™ Features

Split Screen Display
1026 Character Type Ahead Buffer
10 Message Ports-255 Characters each
Status Display
CW-ID from Keyboard
Centronics Type Printer Compatibility
CW send/receive 5-99 WPM
RTTY send/receive 60, 67, 75, 100 WPM
ASCII send/receive 110, 300 Baud

Hamsoft™ Prices

Apple Diskette	$29.00
Atari Board	$49.95
VIC-20 Board	$49.95
TRS-80C Board	$59.95
TI-99 Board	$99.95

Hamtext™ Prices

VIC-20 Board	$99.95
Commodore 64 Board	$99.95

Suggested Retail $169.95

For more information contact your local Kantronics Dealer or:
Kantronics 1202 E. 23rd Street Lawrence, KS 66044

Marvin C. Born WB4EMI
9330 Sunshine Avenue
Corpus Christi TX 78409

Live, From Across America— It's Field Day!

The Corpus Christi Amateur Radio Club had helicopter TV coverage of its activities. Club member WB4EMI unveils the secret behind their success.

During Field Day, most amateur groups and clubs are scurrying around looking for media coverage for their local Field-Day outing. For the Corpus Christi Amateur Radio Club in Corpus Christi, Texas, things are a little different. The news media literally brings the coverage to them. The amateur community is highly respected by many government and media organizations due to its past performances, and any request by the amateur group is seriously considered. This consideration is especially true of KRIS-TV, channel 6.

The founder of KRIS-TV, T. F. Smith, Sr. W5VA, was a pioneer in radio broadcasting and amateur radio in Texas. KRIS-TV still has the .34-.94 repeater on its tower that was installed many years ago. The present owner, T. F. Smith, Jr., though not an amateur, has kept the tradition of amateur radio alive at channel 6. The most outstanding example of this cooperation was use of the station's Jet Ranger helicopter for live coverage during this year's Field Day.

The station has a five-o'clock local newscast in addition to its more formal 6:00 pm newscast. At five on the Friday before Field Day, Bob Douglas W5GEL was interviewed for two minutes on the subject of radio and the upcoming Field Day. At the end of the interview, the newscaster announced that the Field-Day event was open to the public and that the station would do two live remotes from the site including one from Sky 6, the station's helicopter. Since the use of news helicopters is relatively new in this market, great interest is generated by the appearance of the copter.

Sky 6 arrived at about 5:00 pm and landed near the Field-Day site, with about a hundred people there to greet it. The station's minicam van had arrived earlier along with a reporter who spent an hour getting all the details correct. The newscast opened with a "bump shot" from the helicopter, promoting the story, followed by national and local lead stories. Then at 6:06 pm, the anchorman at the station introduced the story with special-effects shots of the site live from the helicopter. The next shot was of the same area from ground cameras, which then panned to the reporter and covered a 2½-minute interview with K5OG, the club president. Coverage was repeated at 10:00 pm without the helicopter.

So, for this Field Day, KRIS-TV provided more than 8 minutes of coverage, some of it from a very expensive helicopter.

KIII, channel 3, had sent a videotape crew and reporter during the setup, and they carried a 2½-minute package at 6:00 pm and a 90-second package at 10:00 pm.

Photos by KA5GIA

The KRIS-TV helicopter while shooting live Field-Day coverage.

The main Field-Day tent getting Sky 6 coverage.

Inside the tent. Note photoflood light for live TV coverage.

One needs to stop and think about what 12 minutes of air time really means in terms of publicity for a club. The combined ratings of both stations are in excess of 60% of the homes with television. In other words, more than 60,000 people saw some coverage of Field Day in Corpus Christi.

Some of the equipment on the helicopter may be of interest to amateurs. Sky 6 is a Bell Jet Ranger with an air speed of 120 mph and a range of 300 miles; it carries a payload of 900 pounds of people and equipment. The aircraft costs about $350,000 and the television equipment adds about $75,000 more. The operating cost to the station is approximately $450 per hour.

In addition to the usual navigation and communication equipment, the helicopter is equipped with a 12-Watt, 2-GHz microwave that is selectable to one of 15 channels in the 2-GHz band. The microwave transmits full-color video and two separate audio channels. One channel is for the program audio and the second is for the cameraman to tell the station director what he is planning to shoot, etc. This one is one way and feeds into the director's headset.

The antenna is a circular polarized beam with either 9-dB gain or 17-dB gain. It can be hand-held or mounted on the aircraft frame. It is usually hand-held in the 17-dB-gain position. An omnidirectional antenna is difficult to use in a coastal area due to multi-path problems over water. The directional antenna eliminated most of these problems.

The antenna is aimed visually from the aircraft to the receiving antenna for local operation and "talked on target" by the control room for longer shots out to 125 miles. The beamwidth of the antenna is such that once on target it is relatively easy to keep it there. Control room people watch the agc of the receiver and talk to the antenna operator, keeping him "peaked up." While this system may sound crude by some standards, it is very effective and removes multi-path problems. The receiving antenna consists of four 90-degree horn antennas which select which quadrant the copter is operating in and require no further attention.

In addition to the microwave equipment, there is a 10-Watt business-band FM radio for antenna positioning, time cues, etc. The three TV crew members listen to this in one half of a dual-headset system with program audio in the other ear. For safety reasons, the pilot can hear only aircraft radio traffic. During news operations with other helicopters in the area, all pilots use a second aircraft frequency to coordinate who will be over the news area. Stations take turns shooting the story then fly to a safe area while the competition takes its turn.

Another feature of Sky 6 is the inclusion of ham-radio equipment on board. Since 75% of the members of the engineering department of KRIS-TV are licensed amateurs and two of the four crew members are always engineers, there is always at least one ham on board. The helicopter has fixed antennas for 2 meters and 460 business-band radios, and there is a 444-MHz antenna available that can be mounted in a few seconds. The equipment is a Kenwood 2500 or an Icom IC-2AT and IC-4AT. One Watt is more than enough power from an aircraft. The rubber-ducky antennas work from the aircraft; however, we elected to use external antennas to avoid possible interference problems.

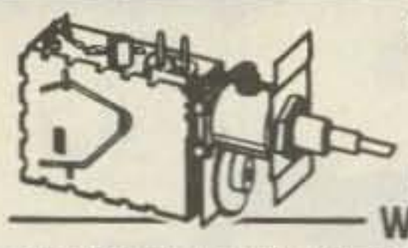
The full potential of this equipment has not been tested yet. It has, however, been used to assist amateurs on the ground during a parade. The amateur equipment is aboard every flight of Sky 6, and if it is ever needed, the hams of Corpus Christi will have a relay station in the sky.

I once heard a local NOAA weather meteorologist comment, "I just wouldn't want to have a hurricane without the hams here." There is a two-meter radio available at the weather service, and the local civil defense has operators ready almost at a moment's notice to assign to the weather center. One thing that impressed the weather service was the preparation of the hams assigned there during the last hurricane. This crew arrived with radio equipment, spare radio equipment, antennas, food, sleeping bags, emergency power, and fuel. They came to do a job and were prepared to hold out until that job was finished.

This is the kind of image that amateur radio needs in every community, and the way to get this image is to do a job and make sure the media know who you are and what you did. Tell them what you are going to do while you are preparing, as in a Field Day. Then tell them while you are doing it and make sure they get it right.

The Corpus Christi Amateur Radio Club enjoys a special relationship with members of the news media. This relationship is the result of hard work in times of stress and of knowing how the news media operate. Knowing the interworking of any news operation is the key to getting your story on the air. Some people call this press manipulation, others call it press relations—what term you use depends upon which side of the fence you are sitting on, but the result is the same.■

MORE GAIN
Than a Varactor UHF Tuner



$15.00 SATISFACTION GUARANTEED

Frequency Range 470-899 MHz Channels 14-83. Output Channel 3. Ch 2 or 4 Avail.

PART #B20 ..... $15.00

WHAT'S IN IT?

To make a regular UHF tuner into a **GILCO HIGH GAIN TUNER**, each and every one of the following steps is painstakingly taken by a certified technician:

1. The first thing GILCO does is change the standard diode to a **hot carrier diode**.
2. The tuner's output is then measured on our JERROLD field strength meter and compared to a computer derived chart from which we determine the correct value coil to add across the IF output for ***maximum pre-peaked gain***.
3. The tuner is then fed a standard 10db 300 ohm antenna input and while monitoring the output on our HEWLETT PACKARD spectrum analyzer, the tuner is tuned to the desired channel and its oscillator is offset for the desired output frequency as follows:

Channel 2: 58 Mhz, Channel 3: 63 Mhz, Channel 4: 68 Hhz

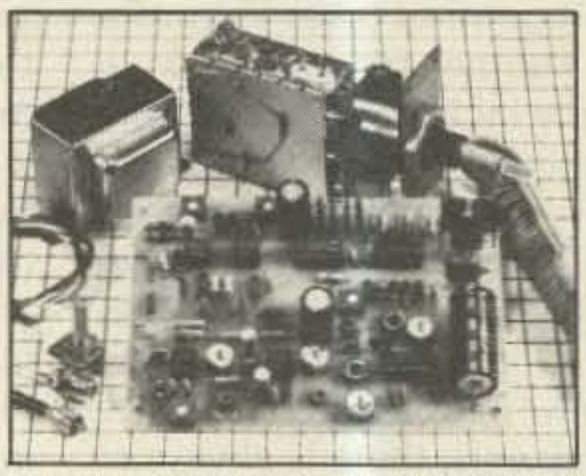
We call this step peaking because the tuner's output looks like a peak on our spectrum analyzer and the highest point of that peak is actually adjusted for the desired output.

4. The last step is one more measurement on the field strength meter which is again compared to our performance chart to calculate the correct value of the second coil which is added to the tuners internal connections.

This procedure was developed by GILCO and it is our computer derived performance charts that make our tuner better, that's because ***almost every tuner gets a different value coil*** before it's peaked and again a different value coil after it's peaked. The combinations are endless and ***the way we determine the values is our secret...***

GILCO PARTS KIT & PRINTED CIRCUIT BOARD

- **Use with GILCO High Gain Tuner**
- **Requires NO Modification to Your Television**
- ***Individually Packaged and Labeled Parts Save Guesswork***



Pre-drilled, pre-screened, plated through the holes P/C board. All hardware, connectors, 22 page illustrated instruction manual, & Gilco Hy-Gain tuner. Kit assembles in just 4 hours.

• The only tools required for assembly are: screwdriver, soldering iron, voltmeter. No drilling is required to the P/C board.

• This kit was designed to take advantage of the GILCO high gain tuner which means its circuitry is ***simpler and more efficient*** than those circuits that require inferior varactor tuners.

FREE 22 Page Instruction Book included with each P/C Board or Parts Kit. This instruction book will guide the builder through every step of the assembly. ***Nearly every page is illustrated***. With this Instruction Book, estimated assembly time is 4 hours.

HERE'S WHAT YOU GET FROM GILCO

Part No. B21 Printed Circuit Board $17.00

1. This Printed Circuit Board uses ***only one jumper, others use nine.***
2. ***The component layout is screen printed*** on the component side of the P/C board.
3. The solder side of the P/C board is covered with high temperature solder resist. This prevents solder bridges.
4. ***Newest Addition:*** **the P/C board is plated through the holes**. This allows for easier and more positive soldered contact between the parts and the P/C board.

Part No. B22 Complete Electronic Parts Kit $80.00

All resistors (30), Potentiometers (1-5K, 3-10K), Panel Mount Potentiometer (10K), Electrolytic Capacitors (6), Ceramic and Mylar Disc Capacitors (35), Variable Capacitors (4), All Integrated Circuits (7), Voltage Regulator, Heat Sink, Diodes (4), IC Sockets (4-8 pin, 3-14 pin), Power Transformer (24V, 1A), Coil Kit with No. 26 wire (4), Speaker (4'', 3oz.), Standoffs, Coaxial Cable, All Miscellaneous Harware, Etc. All parts are individually packaged and labeled.

All components including the Wire, Hardware, Coaxial Cable and Heat Sinks are included in the parts kit. This means your assembly time from start to finish is just 4 hours.

GILCO ACCESSORIES & AMPLIFIER KITS

#A02 New 2 stage, low noise, 28db gain RF amplifier kit ..... Kit $18.00
#A03 New 1 stage, low noise, 14db gain RF amplifier ..... Kit $10.50

GILCO ORDER FORM

#B20	GILCO Hy-Gain Modified Tuner	$15.00
#B21	GILCO Predrilled, Screen Printed, Circuit Board	$17.00
#B22	GILCO Parts Kit (Less P/C Board)	$80.00
#B20, B21, B22	Complete P/C Board and Parts Kit (all three) ..	$110.00
#A02	Two stage, 28 db gain, Amplifier Kit	$18.50
#A03	One stage, 14db gain, Amplifier Kit	$10.50

Name _____ Total _____

Address _____ Tax _____

City _____ State _____ Zip _____ Ship _____

Total _____

Mail Order Only. Send check or money order to:

GILCO INTERNATIONAL, INC.

P.O. Box 8817, Coral Gables, Florida 33124

CALL (305) 823-5891 for COD orders ***PLEASE WRITE FOR OUR FREE CATALOG***

SHIPPING: Orders under $50 add 10%, Orders over $50 add 5%, FL residents +5% Tax

ALL NEW H.F. 10/160 METER SOLID STATE P.L.L. TRANSCEIVER

Model 10/160 M

USB-LSB	CW-W CW-N
4 Memories	200 W. PEP (160M-12M)
3 Way Auto-Scan	100 W. PEP (10M)
Includes New Bands	Built-in Power Supply
3-Step Tuning Speed	AC-120 VAC
IF Tune ±1 KHZ	DC-13.8 V -Ground
Built-in Dual VFO	External ALC & Relay
Narrow CW filter optional	RTTY, FAX, ASCII

NCG

Mfg. Sug. Amateur price

$1,059.00

NOW ONLY $949.50

JUST SLIGHTLY AHEAD

1275 N. GROVE ST.
ANAHEIM, CA 92806
Cable: NATCOLGLZ

TO ORDER OR DLR INFO. CALL
(714) 630-4541

↙254

NOTE: Price, Specifications subject to change without notice and obligation

coaxial R. F. antenna switches

Heavy Duty switch for true 1 Kw POWER - 2 Kw P.E.P.

Single Pole, 3 Position.
Desk or wall mount
All unused positions grounded
#593 - UHF connectors / **$27.25***
#596 - BNC connectors / **$36.50***

2 Pole, 2 Position, bypasses, linears, reflectometers, antenna tuners, etc.
#594 - UHF connectors / **$34.25***

Single Pole, 5 Position, all unused positions grounded.
#595 - UHF connectors / **$32.00***
#597 - BNC connectors / **$46.50***

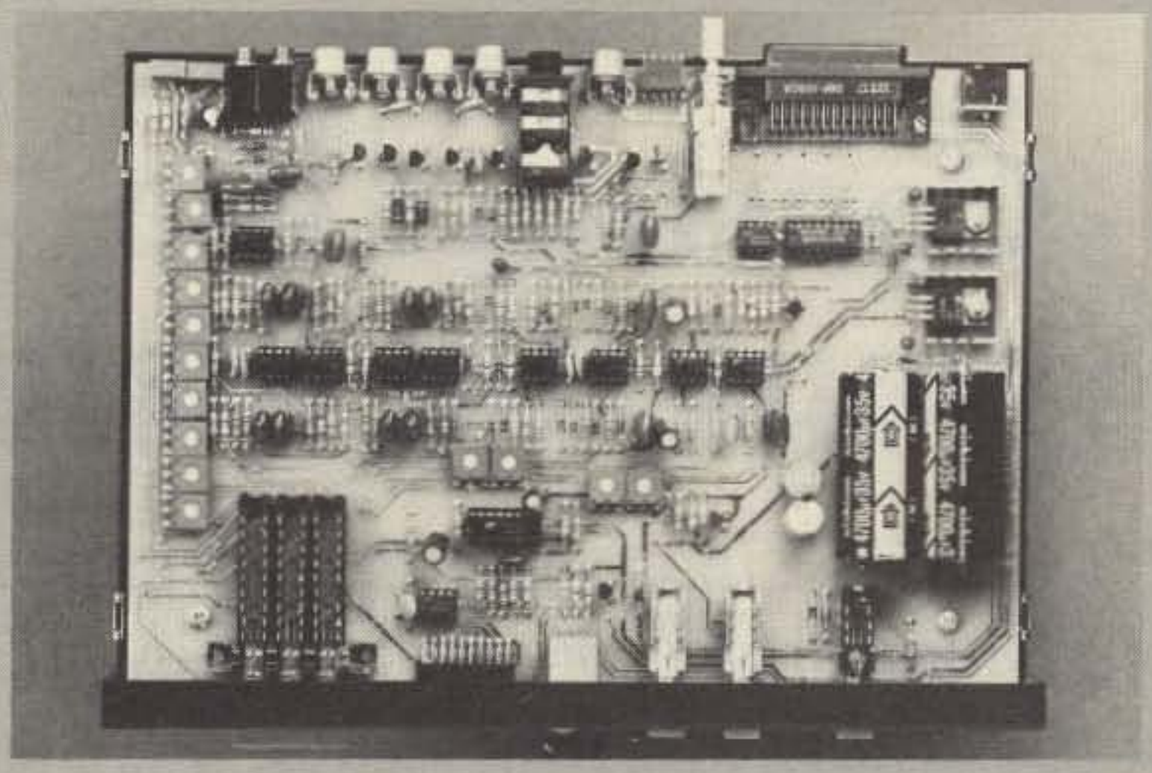
* Shipping and handling for any item add $2 each.

ALL OUR PRODUCTS MADE IN USA

B&W **BARKER & WILLIAMSON**

Quality Communication Products Since 1932
At your Distributors write or call
10 Canal Street, Bristol PA 19007
(215) 788-5581 ↙11

CHAMPAGNE RTTY/CW on a Beer Budget



CP-1 Computer Patch™ Interface

The AEA Model CP-1 Computer Patch™ interface will let you discover the fastest growing segment of Amateur Radio: computerized RTTY and CW operation.

When used with the appropriate software package (see your dealer), the CP-1 will patch most of the popular personal computers to your transceiver for a complete full-feature RTTY/CW station. No computer programming skills are necessary. The CP-1 was designed with the RTTY neophyte in mind, but its sophisticated circuitry and features will appeal to the most experienced RTTY operator.

The CP-1 offers variable shift capability in addition to fixed 170 Hz dual channel filtering. Auto threshold plus pre and post limiter filters allow for good copy under fading and weak signal conditions.

Transmitter AFSK tones are generated by a clean, stable function generator. Plus (+) and minus (-) output jacks are also provided for CW keying of your transmitter. An optional low cost RS-232 port is also available. The CP-1 is powered with 16 VAC which is supplied by a 117 VAC wall adaptor included with the CP-1.

MIDWEST AMATEUR RADIO SUPPLY
3454 Fremont Avenue, North
Minneapolis, MN 55412
Store Hours: Mon.–Fri. 9–6
Saturday 9–3
(612) 521-4662

↩264

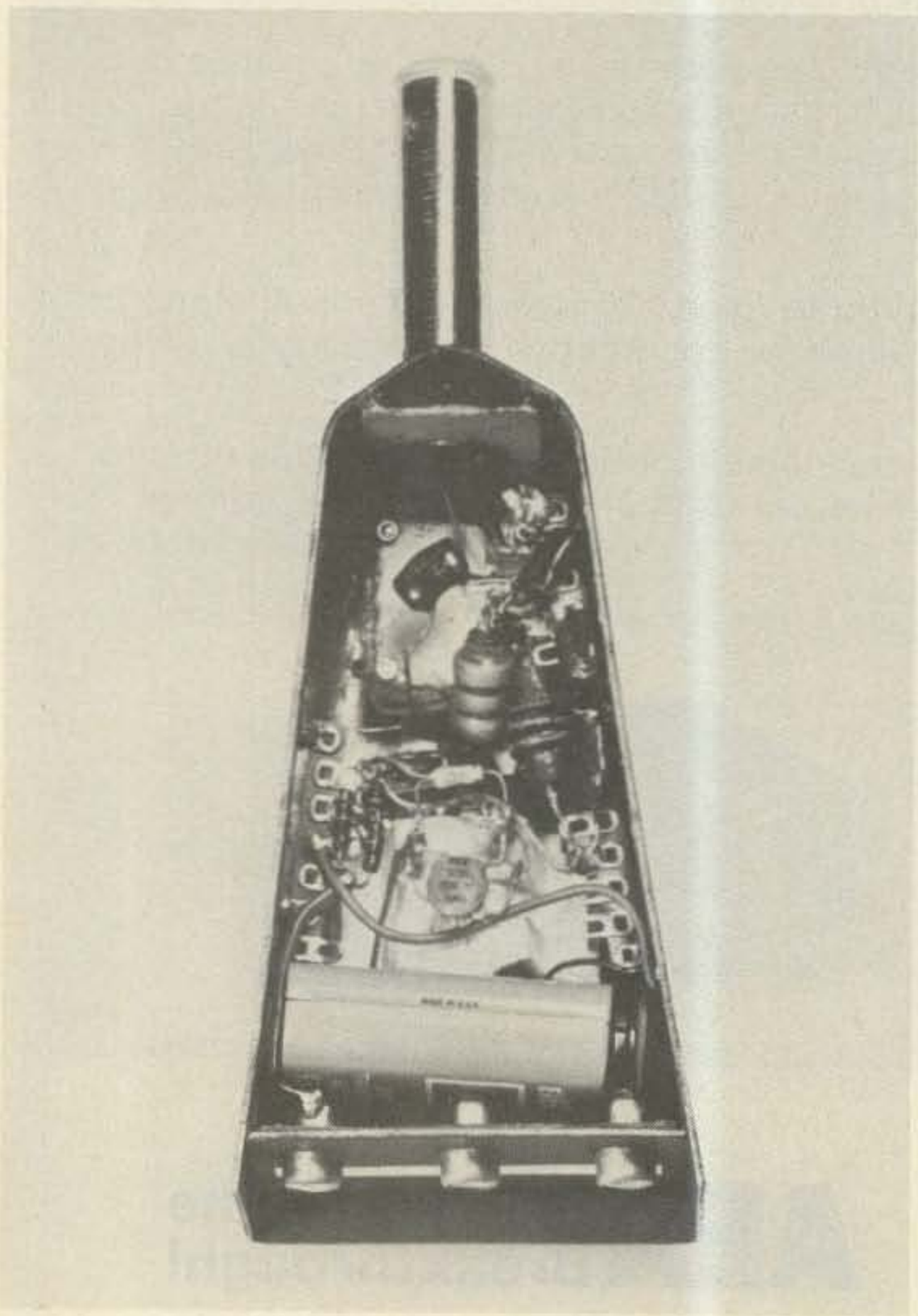
AEA Brings you the Breakthrough!

↩See List of Advertisers on page 114

Construct the Cyclops Dip Meter

W4ATE's unique single-coil design captured an Honorable Mention in 73's Home-Brew II Contest. Now you can build this award-winning circuit for yourself.

Gene Brizendine W4ATE
600 Hummingbird Drive SE
Huntsville AL 35803



Component layout.

The dip meter is clearly one of the most versatile tools for anyone involved with antenna systems or rf-related equipment. Its myriad uses range from troubleshooting tuned rf circuits to locating power lines concealed inside a building wall.

The most evident shortcoming of present-day dippers is the inconvenience of constantly changing and storing a half-dozen plug-in coils. Especially frustrating is the experience of attempting to pinpoint the frequency of a resonant circuit which falls at either end of the dial range. When another coil is plugged in, the meter current requires readjustment, and one often wonders whether the new dip obtained is the same one as read with the previous coil.

Dip-Meter History

These problems have been endured for years and have been attacked from many directions. One commercial design utilized a coil of flexible wire which was reeled from one nonconducting coil form onto a metal shorting form as the dip meter was tuned through its continuous range. The product was cosmetically attractive, but not entirely practical, and appeared only briefly on the market.

I at one time built a prototype dip meter with all coils

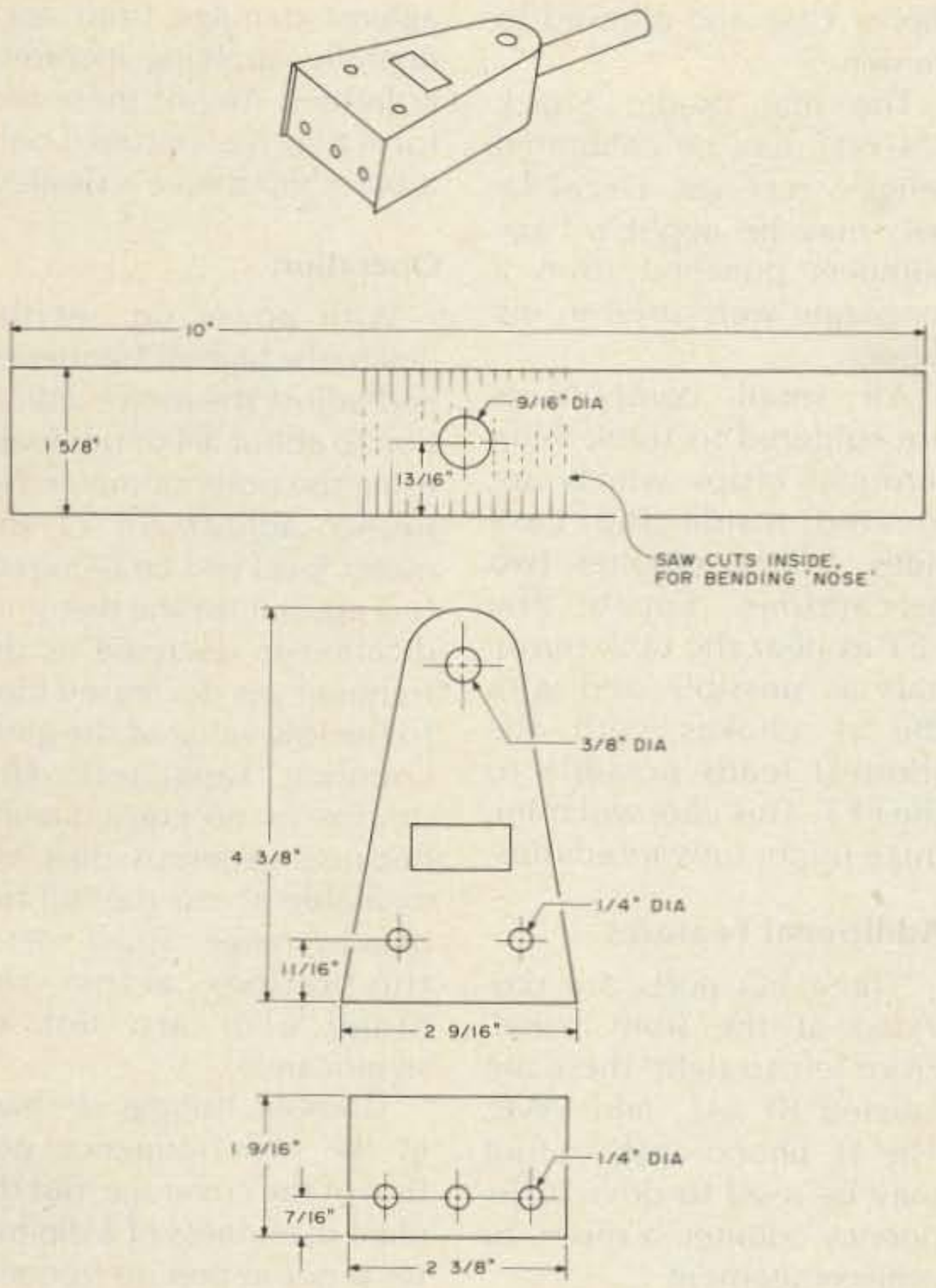


Fig. 1. Meter-case construction for the one-coil dip meter. Material is glass epoxy double-clad PC board.

Completed meter.

mounted on a turret and enclosed within a non-shielding case. The unit performed well, but was too bulky to reach tuned circuits located within high-density packages. Other wide tuning range tanks are possible, but may involve mechanical complexes which simultaneously tune a variable capacitor and move a ferrous coil slug. In the dip-meter application, the proximity of the slug would disturb the tuning of the measured tank; also, the arrangement becomes too large.

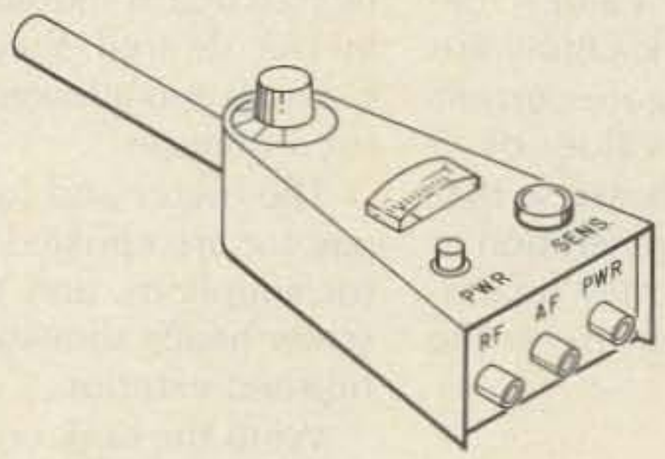
The Single-Coil Concept

Most "new" devices are the happy result of divorcing and remarrying existing arts into combinations not previously joined. So, a wide-range tank used in a previous design[1] was recalled and set up in prototype for study. The type of variable capacitor which utilizes plastic sheets between the plates provides maximum capacity per cubic centimeter. However, in this application, rf heating of the dielectric occurs, resulting in unacceptable frequency drift. Suitable compact air-dielectric units are listed in the parts data.

To provide the widest tuning range, a capacitor with the highest maximum-to-minimum tuning capacity ratio is required. For this reason, select one with the widest gap when adjusted to the wide-open plate setting. All parallel padders must be removed completely. To further ensure the widest tuning range, the lightest loading of the tank by the active device is necessary, which also points to the use of an FET. Reduction of loading by tapping down on the coil usually introduces false dips; therefore, a low-value gate coupling capacitor is used instead. The inductance of the coil between the source tap and ground resonates well above the design coverage and therefore causes no erroneous indications. The coil is shaped with a high length-to-diameter ratio to allow probing components located in close quarters.

The Circuit

The wide-range tank was joined to the vigorous Hartley oscillator in a simple one-



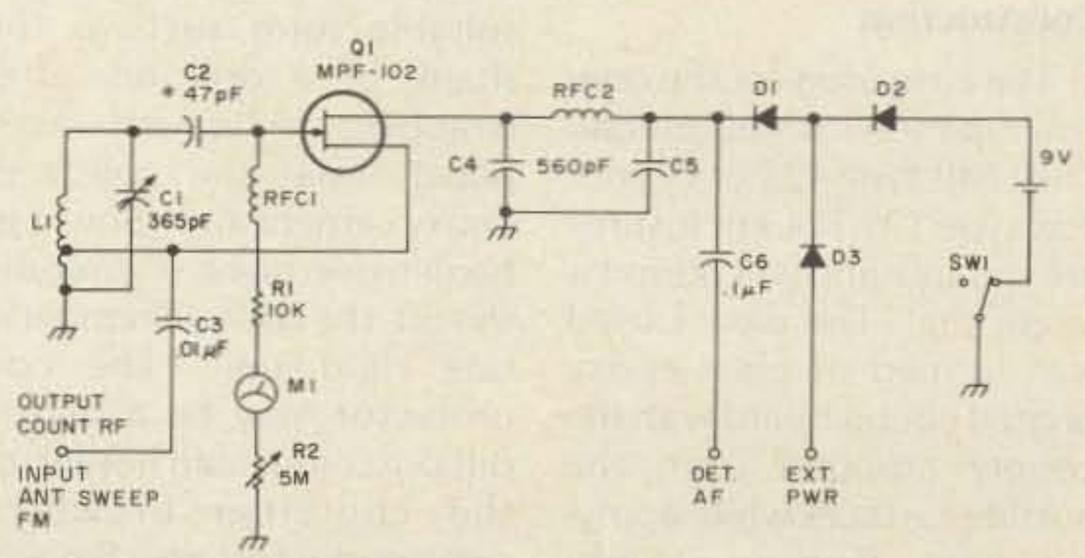
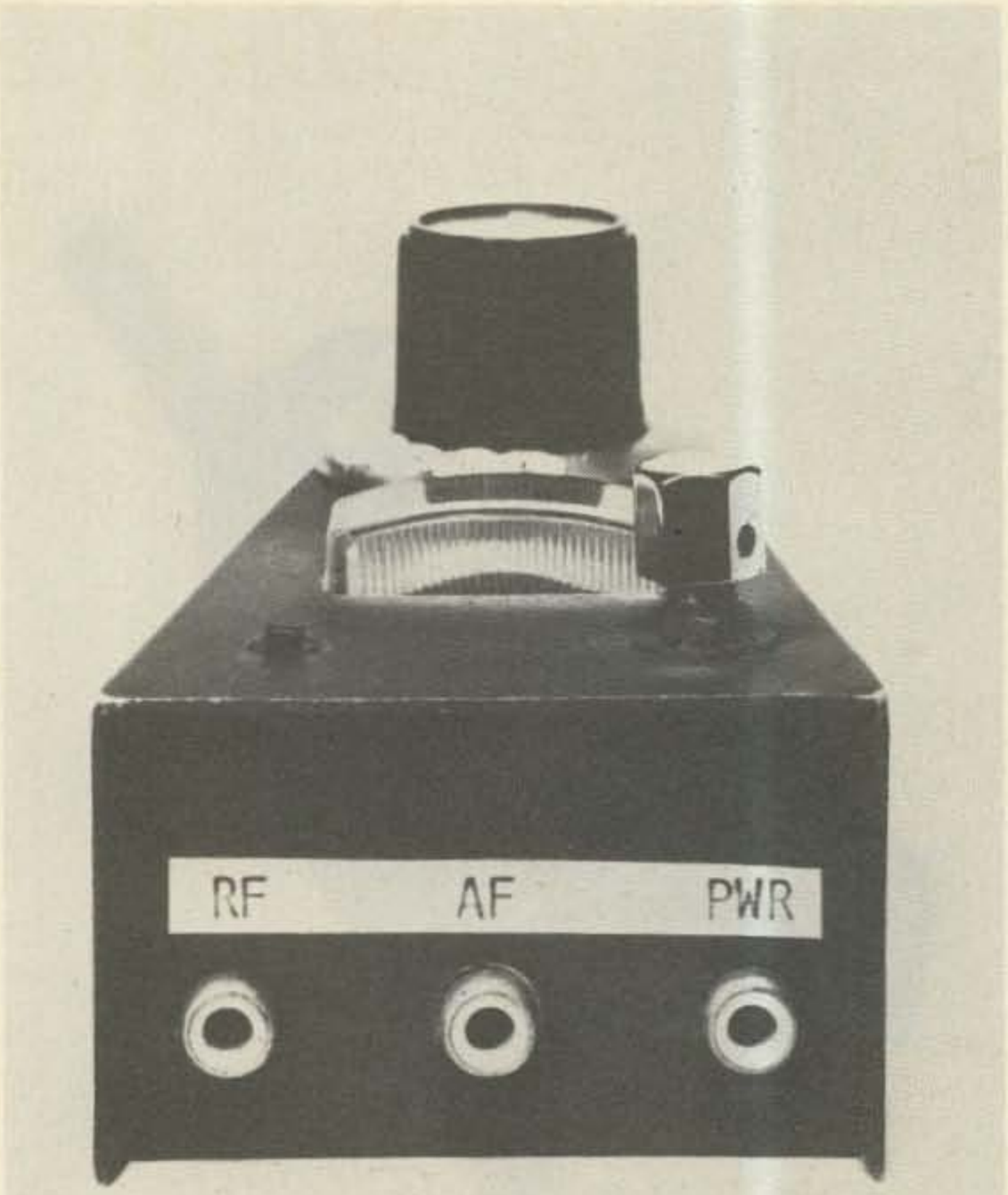


*Fig. 2. Circuit schematic and details of control mounting. *Polystyrene or silver mica. See Parts List.*



End view.

ring ceremony. The most critical items for minimizing minor spurious dips are the two rf chokes. The small 3-pi winding type has been found to be a good choice. Chokes with metallic cores are not recommended. To a minor degree, the gate resistor may cause ripples. Values between 3 and 10k Ohms are suitable. The gate-current potentiometer value of 5 megohms was chosen so that conditions of regeneration or near-oscillation may be easily controlled for use in the detector mode.

Construction

The case used for the one-coil dip meter is not critical. The LMB type 425 or Econobox type CU-124 enclosures are suitable and will permit a larger dial. The case I used was formed of glass epoxy printed circuit board with the copper stripped from the outside surfaces while applying heat. Copper is also removed from inside the "nose" area, which is also sawed halfway through for forming the curved portion. The forming should be done outdoors to avoid breathing fumes generated by heating the material. Apply heat from a propane torch and bend the curved portion around a suitable piece of pipe. The heated board should be held in the desired shape by a C-clamp and allowed to cool for 5 minutes.

The meter and tuning capacitor are epoxied in place for simplicity and to avoid screw heads showing on the finished exterior.

Wind the tank coil onto a suitable form such as the shank of a drill bit, after wrapping the bit with waxed paper. Coat the coil with epoxy cement and allow it to harden overnight. If carefully slid off, the coil will remain in one rigid unit. The coil protector may be a plastic pill box, dime coin holder, or the container in which semiconductors are shipped. This item is epoxied in a hole cut in the nose section of the dipper case and allowed to harden.

The dial (Radio Shack 274-391) may be calibrated using a receiver. Decal labels may be applied. Page numbers punched from a magazine were used in my dipper.

All small components are soldered to three 5-lug terminal strips which are located inside the case sides. Wiring requires two precautions: Locate the FET as near the tank terminals as possible and wire the rf chokes with the shortest leads possible to the FET. This care will minimize minor unwanted dips.

Additional Features

Three I/O ports are provided at the front panel. From left to right, these are labeled RF, AF, and PWR. The rf phono jack output may be used to drive a frequency counter, a mixer, or other equipment.

Conversely, an antenna may be fed in at this point or a sawtooth waveform may be applied to provide a wide-range, swept test signal from the dipper.

The af port may be used to monitor AM signals or to detect ripple on carriers.

The power jack permits the use of an external power source. Isolation diodes prevent conflict between battery and the ac power source and also protect against damage from accidentally applying incorrect polarities. Any of these features may be omitted if only a basic dip meter is desired.

Operation

With power on, set the dial to the highest frequency and adjust the meter indication to about 3/4 of full scale using the potentiometer. No further adjustment of the meter level will be required. It is normal for the meter indication to decrease as the frequency is decreased (due to the low value of the gate-coupling capacitor). This drop is of no consequence because generous dips are available across the full frequency range. Small meter fluctuations across the range also are not of significance.

Granted, tuning is sharp in the high-frequency portion of the coverage. But the chief usefulness of a dip meter is not in precise frequency measurement but in the rapid scanning of a wide range of frequencies.

Now it is a pleasure to quickly scan the 3.9-to-21-MHz range in one uninterrupted swing without all those loose coils, meter adjustments, and re-coupling! ■

Reference

1. G. Brizendine W4ATE, "Wide-Range Field-Strength Meter," *Radio & TV News*, November, 1958.

Parts List

C1	Tuning capacitor, 365 pF, Poly Paks No. 7060	$1.00
C2	47-pF dipped mica, Jameco No. DM15-470J	.35
C3	.01-uF disc ceramic, Jameco No. DC.01/50	.08
C4,5	560-pF dipped mica, Jameco No. DM15-561J	1.24
C6	.1-uF disc ceramic, Jameco No. DC.1/12	.12
D1,2,3	1N103 or 1N56	.30
M1	200-uA meter, Poly Paks No. 7021	1.00
L1	41 turns #16 enameled on 7/16-inch form	1.00
Q1	MPF-102 FET, Digi-Key	.54
R1	10k, 1/2-Watt resistor, Jameco	.05
R2	5-megohm pot, Allen-Bradley Type "W" Mini, Napco No. POT-34	.69
RFC1	500 uH, Miller No. 4649	2.10
RFC2	56 uH, Miller No. 4629	1.32
SW1	SPDT subminiature switch, Jameco No. MSL34	.25
Miscellaneous:		
Case	Bud "Econobox" Type CU-124	3.50
Dial	Radio Shack Stock No. 274-391	.69
	Total Cost	$14.23

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment! ✓305

For The Best Buys In Town
Call: 212-925-7000

"Taking A Ride . . .
With An HT On My Side."

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 PM
Monday-Friday 9 to 6:30 PM
Come to Barry's for the best buys in town. For Orders Only Please Call: 1-800-221-2683.

ICOM
IC-R70, IC-720A, IC-730, IC-740, IC-25A/H, IC-35A
IC-45A , C-251A, IC-2KL, IC-451A, IC-290H

YAESU

FT-ONE, FT-980, FT-102, FT-77, FT-707, FT-230R
FT-726 FT-480R, FT-720RU, FT-290R, FRG-7700, FT-625RD

YAESU
FT-208R
FT-708R

ICOM
IC2AT
IC3AT
IC4AT

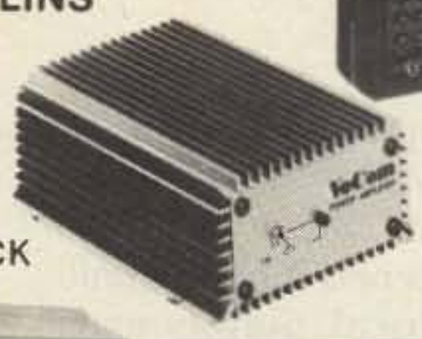
Land-Mobile H/T
Wilson Mini-Com II
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine)
IC-H12

DRAKE TR-5, TR-7A, R-7A, L-7, L-15, Earth Satellite Receiver ESR-24, THETA 9000E & 500.
Digital Multimeter Model #8550-$95.00

ROCKWELL/COLLINS
KWM-380

SMART PATCH
CES Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone Great For Telephone Calls From Mobile To Base Simple To Use $319.95

VoCom/Mirage
Tokyo Hy-Power
Amplifiers &
5/8λHT Gain
Antennas IN STOCK



SPECTRUM
COMMUNICATIONS
REPEATERS
SCR-1000, 4000 & 77
Commercial &
Amateur In Stock

SANTEC
ST-220/UP
ST-144/UP
ST-440/UP

NEW IMPROVED
MURCH Model
UT2000B

MFJ
Model 941C, Model 982

DENTRON AMPLIFIERS
GLA-1000C

AEA CP-1 Computer Patch

KANTRONICS
Field Day 2, Mini-Reader, Interface, Software & Code Tapes

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
4-400A

BIRD
Wattmeters &
Elements
In Stock

Complete Butternut Antenna Inventory In Stock!

Communications Specialists Encoders in Stock!

Smallest Wireless
Telephone Available
600 ft. range w/encoder $135.00

BENCHER PADDLES & Vibroplex Keys In Stock!!

DIGITAL
FREQUENCY
COUNTER
Trionyx-
Model TR-1000
0-600 MHz
Digimax Model
D-510 50 Hz-1GHz

New TEN-TEC
Corsair In Stock

Tri-Ex Towers
Hy-Gain Towers
& Antennas,
and Rotors
will be shipped direct
to you FREE of shipping cost.

AEA 144 MHz
AEA 440 MHz
ANTENNAS

MAIL ALL ORDERS TO **BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012.**

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670
TOP TRADES GIVEN ON YOUR USED EQUIPMENT
STORE HOURS: Monday-Friday 9 to 6:30 PM
($1.50 parking across the street)
Saturday & Sunday 10 to 4 PM (Free Parking)
AUTHORIZED DISTS. MCKAY DYMEK FOR SHORTWAVE ANTENNAS & RECEIVERS.

Subways: IRT/LEX-"Spring St. Station"
BMT-"Prince St. Station"
IND-"F" Train-Bwy. Station"

Bus: Broadway #6 to Spring St.

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron, B & K, B & W, Bash, Bencher, Bird, Butternut, CDE, CES, Collins, Communications Spec. Connectors, Covercraft, Cubic (Swan), Cushcraft, Daiwa, Dentron, Digimax, Drake, ETO (Alpha), Eimac, Encomm, Henry, Hustler (Newtronics), Hy-Gain, Icom, KLM, Kantronics, Larsen, MCM (Daiwa), MFJ, J.W. Miller, Mini-Products, Mirage, Newtronics, Nye Viking, Palomar, RF Products, Radio Amateur Callbook, Robot, Rockwell Collins, Saxton, Shure, Swan, Telex, Tempo, Ten-Tec, Tokyo Hi Power, Trionyx TUBES, W2AU, Waber, Wilson, Yaesu Ham and Commercial Radios,Vocom, Vibroplex, Curtis, Tri-Ex, Wacom Duplexers, Repeaters, Phelps Dodge, Fanon Intercoms, Scanners, Crystals.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
DEALER INQUIRIES INVITED. PHONE IN YOUR ORDER & BE REIMBURSED.

COMMERCIAL RADIOS stocked & serviced on premises.

Amateur Radio & Computer Courses Given On Our Premises, Call

Export Orders Shipped Immediately. TELEX 12-7670

Be the First on Your Block with a 2-Meter Dipole

A few safety pins, some wire, and a little rod stock will make a portable antenna perfect for the traveling ham.

Paul L. Schmidt W9HD
PO Box 105
Bloomfield IN 47424

A dipole on two meters! You've got to be kidding. That is often the response I get when I explain that I use a dipole antenna on two meters.

Then I ask what kind of element excites a yagi beam. It is called the driven element, but it is a dipole, nevertheless. The number of dipoles on two meters is considerable.

Dipole antennas work fine on two. I have had one for at least five years, mounted in the vertical plane some two-thirds of the way up my fifty-foot TV mast. My dipole is made from two pieces of rod stock fastened into a chunk of cylindrical polystyrene. The center is firmly clamped to a five-foot angle-iron support attached at right angles to the mast. It is fed with RG-8/U coax. The pattern is quite circular. I regularly contact repeaters, full-quieting, fifty miles distant with 20 Watts. These repeaters are situated on the unfavorable side of the antenna, where the TV mast is between the antenna and the desired station.

For several years I had a traveling job and spent many nights in motels here and there in the midwest. My GTX-200, its power supply, and a portable dipole antenna all fit neatly into an attaché case. Thus, I spent many an evening in QSO with friends.

Due credit must be given the ground-plane antenna. It is every bit as good as a dipole. But I would not take a ground-plane-type along for portable work; in a motel room, those ground-plane rods can be dangerous. About the only place you can put a ground-plane antenna is on top of the TV set. Then two of the rods are pointing at the wall while the other one or two are pointing into the room to poke you in the nose, ribs, or whatever as you walk about the room.

My portable dipole might have been made from two pieces of rod stock fed at the center, but I had been experimenting at that time with inductive loaded elements. I decided to try an inductive-loaded dipole.

The two radiating elements of this dipole are formed from lengths of insulated #12 house-wiring wire, each approximately 23 inches long at the start. 3 inches from the center feedpoint, each wire is made into 5 turns of a coil wound on a 3/4" mandrel. Each coil is then stretched to approximately 4 inches long, evenly spaced, and epoxied to a cardboard tube or whatever light-

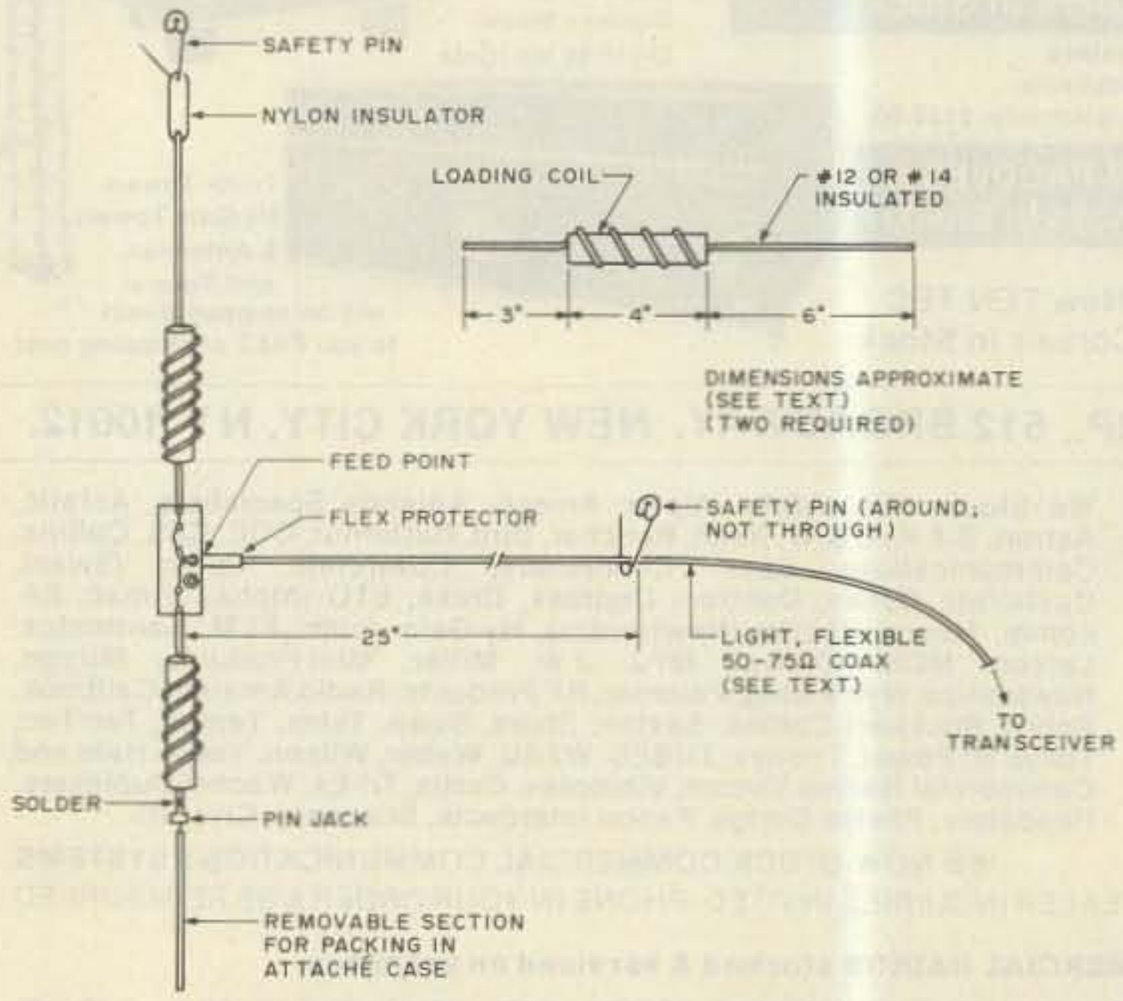


Fig. 1. The traveler's friend.

weight nonmetallic object can be found. See Fig. 1. Incidentally, modern house-wiring insulation exhibits good dielectric properties at 146 MHz, so leave the insulation on. Also, bear in mind that one must use a heavy 100-Watt, or better, soldering iron on wire this heavy.

A substantial insulating material block is used at the feedpoint to hold everything together. Each of the two radiating elements is securely bolted to the block. The coax center conductor is soldered to one of the elements, the shield to the other. Light, flexible 50- to 75-Ohm coax is recommended for feedline, unless you prefer to stuff 20 to 25 feet of RG-8/U into your attaché case day after day. Use a cable clamp to secure the coax to the block at the feedpoint. Maybe you can slide a few inches of protective tubing over the coax there under the cable clamp because frequent handling of your gear involves a lot of cable flexing. You don't want wear and tear to kill it before its time!

Find the dipole element connected to the center conductor of the coax. This is to be the top member of the dipole. Take about 1/2" of insulation off the very end. Form the bare end into a hook. Next, use scissors to make a strap 2" or 3" long by 1/2" wide cut from the top of a margarine container. Burn a small hole in each end of the strap using a pencil soldering iron (don't mind the smell). Then epoxy one end of the strap to the bare hook. Epoxy doesn't bond well to smooth nylon, so roughen up the surfaces a bit.

Remember, this dipole antenna is vertically polarized. This means that instead of hanging horizontally, it hangs vertically from one end.

Now put a diaper-type safety pin through the top hole of the insulator strap. This is to hold the antenna vertical while attached to the motel drapery. Some 25" away from the feedpoint, attach a safety pin to the coax, putting the pin around the coax, not through it. This is used to attach the coax to the drapery so that the antenna is fed 90° from its axis. Between this last pin and the transceiver, the routing of the coax is not critical.

As described so far, the antenna will not fit lengthwise into standard luggage. So, cut off the bottom element just below the loading coil and solder a pin jack at the recently cut coil end. Next, remove 1/2" of insulation from the piece cut off and insert it into the pin jack. Trim for symmetry.

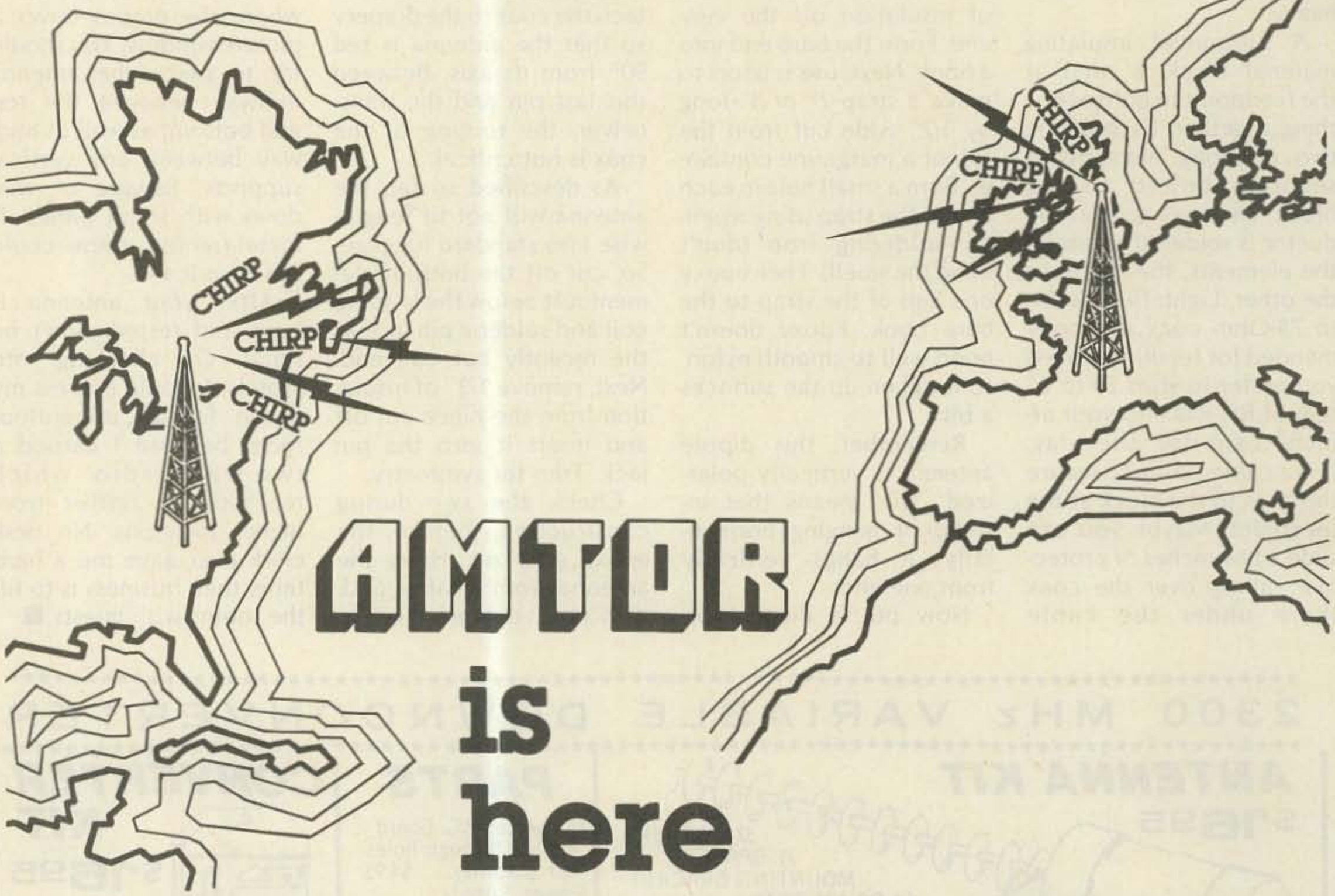
Check the swr during construction, before the epoxy goes on. Hang the antenna from a rafter and, with tape, compress or expand the coils, searching for the lowest swr. If that doesn't work, house wire is plentiful; make another one. If you can improve this design, be my guest. Using it as described, I have had excellent results, so I did not try to improve it.

The best installation is where the drapes cover a picture window. You should try to place the antenna midway between the top and bottom, as well as midway between any vertical supports. Beware of windows with small panes. If metal-framed, these could upset your swr.

After your antenna is built and tested, don't be timid. On checking into motels, I would express my desire for an upper-floor room because I carried a two-way radio which reached out further from higher locations. No desk clerk ever gave me a hard time; their business is to fill the rooms with guests.■

See List of Advertisers on page 114

Now you can chirp back!



AMTOR is here

Been wondering what those "chirp-chirp" signals were around 14075? They're AMTOR, AMateur Teleprinting Over Radio. European hams have been enjoying the benefits of error free RTTY for sometime. (It's a must for commercial Maritime traffic.) Now, U.S. Amateurs are on the threshold of a new era of RTTY.

Old problems of QRM, QRN, & QSB are gone! If a propagation path exists, AMTOR will get the message thru — with no "hits" — "newspaper" perfect copy!

Two modes are available; AMTOR mode A transmits a three character block specially coded so that the receiving station can recognize an error. The three character block is repeated until the receiving station confirms reception by replying with the proper control code signal. Flawless print is possible with this "hand-shake" style operation.

Mode B, "FEC" or Forward Error Correction, is actually a time diversity mode where text is repeated and intermixed in the transmission. The receiving station unscrambles it and prints the clear text. This "broadcast" mode allows more than two stations to communicate. It's more effective than conventional Baudot or ASCII, but not as reliable as AMTOR mode A.

The actual DATA transfer in either AMTOR mode is nominally equivalent to conventional RTTY at 50 baud, or 66 WPM.

A receive only "Listen" mode is also available for reception of mode A data by a station not directly involved in the "hand-shake" communication.

Start with a new AMTOR ACT-1, ATR-6800, or update your present system.

Microlog is ready with AMTOR! Give us a "chirp" at Microlog Corporation, 18713 Mooney Drive, Gaithersburg, MD 20879. TEL (301) 258–8400. TELEX 908153

51

MICROLOG

INNOVATORS IN DIGITAL COMMUNICATION

When it comes to

QSL's...

it's the

ONLY BOOK!

US or Foreign Listings

1983 callbooks

Here they are! The latest editions of the world-famous Radio Amateur Callbook are available now. The U.S. edition features over 400,000 listings, with over 75,000 changes from last year. The Foreign edition has over 370,000 listings, over 50,000 changes. Each book lists calls and the address information you need to send QSL's. Special features include call changes, census of amateur licenses, world-wide QSL bureaus, prefixes of the world, international postal rates, and much more. Place you order for the new 1983 Radio Amateur Callbooks, available now.

	Each	Shipping	Total
☐ US Callbook	$19.95	$3.05	$23.00
☐ Foreign Callbook	$18.95	$3.05	$22.00

Order both books at the same time for $41.95 including shipping.

Order from your dealer or directly from the publisher. All direct orders add shipping charge. Foreign residents add $4.55 for shipping. Illinois residents add 5% sales tax.

SPECIAL OFFER!
Amateur Radio
Emblem Patch
only $2.50 postpaid

Pegasus on blue field, red lettering. 3" wide x 3" high. Great on Jackets and caps.

ORDER TODAY!

↙61

RADIO AMATEUR callbook INC.
Dept. B
925 Sherwood Drive
Lake Bluff, IL 60044, USA

Don't Be Left Out in the Cold with the Russian Woodpecker

GET A MOSCOW MUFFLER™

Another first from AEA. The Woodpecker Blanker, WB-1 really works. This unit effectively blanks the pulsing interference of the Russian Woodpecker. Two versions are available, the WB-1 for use with communication receivers and WB-1C for use with all popular transceivers.

This extremely useful accessory is designed for direct insertion between your receiver (or transceiver) and the antenna. It is both MORE EFFECTIVE than I.F. type blankers and requires NO MODIFICATIONS to your receiver! The unit operates from a 13 VDC ± 2 VDC power source at less than 575 mA. (AEA AC wall unit AC-1 will operate the blanker.)

The blanker works well on both CW and SSB modes that are being interfered with by a woodpecker. Controls on the front panel include; four push button switches, a synchronize control and a width control The WB-1 also features a low-noise untuned broadbanded 6 db gain pre-amp which can be selected with or without the blanker enabled. The WB-1C uses the same circuitry but includes a carrier operated relay (COR). This provides protection to the receiver section during transmissions from the attached transceiver.

Prices and Specifications subject to change without notice or obligation.

BRITT'S TWO-WAY RADIO
2508 N. Atlanta Rd.
Smyrna, GA 30080
(404) 432-8006
1-800-241-2027 ↙223

AEA Brings you the Breakthrough!

HI-Q BALUN

- For dipoles, yagis, inverted vees & doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz
- Small, lightweight and weatherproof
- 1:1 impedance ratio
- For full legal power and more
- Helps eliminate TVI
- With SO 239 connector

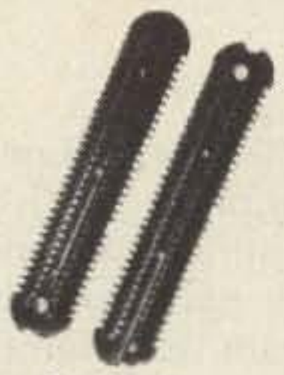
only $12.95

HI-Q ANTENNA CENTER INSULATOR

Small, rugged, lightweight, weatherproof
Replaces center insulator
Handles full legal power and more
With SO 239 connector

$6.95

HI-Q ANTENNA END INSULATORS



Rugged, lightweight, injection molded of top quality material, with high dielectric qualities and excellent weatherability. End insulators are constructed in a spiral unending fashion to permit winding of loading coils or partial winding for tuned traps.

May be used for
- Guy wire strain insulators
- End or center insulators for antennas
- Construction of antenna loading coils or multiband traps

Patent No 4 091 350

$4.95

DIPOLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
Dipoles				
D-80	80,75	130	$31.95	$27.95
D-40	40,15	66	28.95	24.95
D-20	20	33	27.95	23.95
D-15	15	22	26.95	22.95
D-10	10	16	25.95	21.95
Shortened dipoles				
SD-80	80,75	90	35.95	31.95
SD-40	40	45	32.95	28.95
Parallel dipoles				
PD-8010	80,40,20,10,15	130	43.95	39.95
PD-4010	40,20,10,15	66	37.95	33.95
PD-8040	80,40,15	130	39.95	35.95
PD-4020	40,20,15	66	33.95	29.95
Dipole shorteners - only, same as included in SD models				
S-80	80,75		$11.95 pr	
S-40	40		$10.95 pr	

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center insulator, No. 14 antenna wire, ceramic insulators, 100 nylon antenna support rope (SD models only 50) rated for full legal power. Antennas may be used as an inverted V and may also be used by MARS or SWLs.

Antenna accessories—available with antenna orders

Nylon guy rope 450# test 100 feet	$4.49
Ceramic (Dogbone Type) antenna insulators	$1.50 pr
SO-239 coax connectors	.55

All prices are postpaid USA 48
Available at your favorite dealer or order direct from

Dealer Inquiries Invited

Van Gorden Engineering

BOX 21305 B, SOUTH EUCLID, OHIO 44121

↙See List of Advertisers on page 114

Jeff Duntemann KB2JN
301 Susquehanna Road
Rochester NY 14618

Two Meters for the Price of One

The oft-ignored shunt principle will turn an everyday junk-box meter into a surprising supermeter. The key is a piece of solder.

The philosopher William James was a champion of empiricism. Paraphrasing his definition of that awesome word: If I want to know if my pipe is lit, I will not perform endless rational operations examining cause and effect; instead, I will stick my finger in the bowl.

I became an empiricist recently (although not at such cost to my fingers) when confronted with the problem of using a 200-milliamp current meter to measure 2 Amperes of current. I knew there was a way, from years ago in tech school; it's called a shunt.

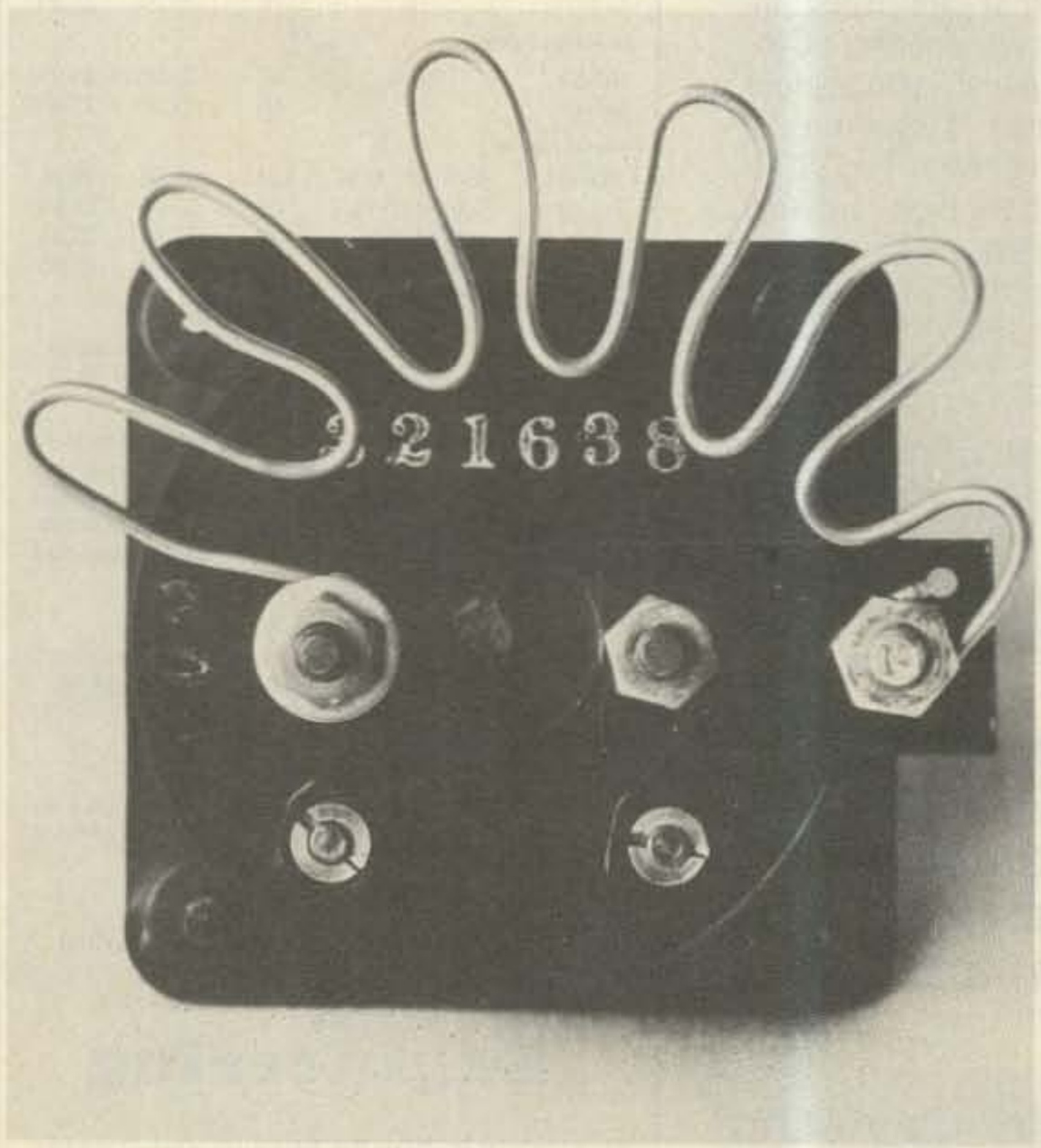
The shunt principle is nothing more than an expression of Ohm's Law. Current meters have a very low internal resistance, which we usually call negligible. It is some small fraction of an Ohm. Although current flowing through a resistance always generates heat, meter resistances are so small that the heat generated is carried away by the body of the meter.

If you place another resistance in parallel with the meter, current to the meter splits; part goes through the meter and part goes through the shunt. This split follows Ohm's Law faithfully. If the resistance of the shunt is precisely the same resistance as the meter, the current splits down the middle, and the meter indicates exactly one-half the true current flowing through it.

This sounds like a great way to make a meter tell lies. True, a 50-50 current shunt accomplishes little. The process gets interesting when the split becomes 90-10 with 90% of the current passing through the shunt and only 10% passing through the meter. In this arrangement, you multiply the apparent current reading on the meter by ten to get the true current. The numbers on the meter face still read true—all you have done is shifted the meter's decimal point! (I should point out that the various current ranges on VOMs force you to do exactly the same thing.)

Simple enough in concept—and very attractive since I had a good 200-mil meter in hand and a 2-Amp specimen would cost me six or eight bucks. Furthermore, by switching the shunt into and out of the circuit, I could have both current ranges with one meter. Since I was building a battery charger, I could indicate both fast charge current and the much smaller float charge current.

Fine—now, to build the shunt. My moth-eaten tech books had the theory, but the theory required that I know the resistance of the meter and be able to measure the resistance of the shunt. Since both values hovered down in the bottom quarter of an inch of the lowest resistance scale on my VOM, I realized that that method would not serve real-life needs. Rather than measuring or calculating at all, I decided to become an empiricist.



The empirical shunt, finished and in place.

The idea is disarmingly simple: Set up a shunt which is easily variable. Then pass the same current through the shunted meter and a VOM and vary the shunt until the reading is the same on both meters. At that point, the resistance of the shunt is correct because the results are correct, and calculation be damned! That's empiricism.

The setup I used is outlined in Fig. 1. An old-timer once told me of winding loops of solder around wooden spools for meter shunts. Solder is good shunt material because it has a relatively high resistance compared to copper. A copper shunt would be possible, but it would be much longer than a solder shunt.

I didn't even cut a length of solder off the roll. (You folks know what solder goes for! I wasn't going to waste a single inch.) I screwed the end of the solder roll under one meter terminal, pulled about a foot off the roll, and then pinched the solder under the other screw terminal leaving a loop of about ten inches in parallel with the meter movement.

Using clip-leads, I passed a current of two Amps through the two meters. The shunted meter went off the scale. This told me that not enough current was going through the solder. I reduced the resistance of the solder loop by shortening it by half. The next reading on the small meter was 110 mils. I had gone too far; now the solder loop was taking too much of the current. By pinching the solder loop off at different points under the terminal screw, I finally found a point at which the reading on both meters was exactly 2. The solder loop was about eight inches long. I cut the loop at that point and wasted no solder at all.

If you follow this process, the rules are simple. Shoot for full scale on the shunted meter. If your meter pins, shorten the shunt. If you fail to reach full scale, lengthen the shunt. This assumes, of course, that you have a current source adjustable to full scale on your meter. Full scale will give you the most accuracy, but if you can't rig just the right current, match readings and make the best of it.

Eight inches of solder seemed too little to wrap around a spool, so I compacted the loop by bending it back and forth into a number of smaller loops. I drilled two holes in a small piece of bakelite and clamped one end under the meter terminal. The other end of the loop I clamped through the other end of the bakelite with a small screw. I needn't mention the futility of trying to solder to a piece of solder. This arrangement allows me to switch the shunt out of the meter circuit to measure small currents.

The idea of having all those loops of bare conductor flapping around inside my charger bothered me, so I dipped the solder into the plastic insulation material normally used for dipping the handles of electrical pliers. You might also sandwich the solder loops between two pieces of thin plastic, which would also provide some mechanical support.

The solder I used was rosin core Kester 44, .062 inches in diameter. Smaller diameter solder could be used, but it is much flimsier and would have to be wound around something more substantial than thin air. Also, small solder melts more easily, so don't use it unless your total current through the shunt-meter combo is less than one Amp. Remember (and this is the only fly in the ointment) that if your shunt melts, full current will again flow through the meter, and unless you catch it quickly, you can kiss that meter good-bye.

Using this method, you can make a low-current meter read practically any larger current, within reason, all without calculation and the hair-tearing associated with all that sticky math stuff. You don't even have to stick your fingers in anything! ■

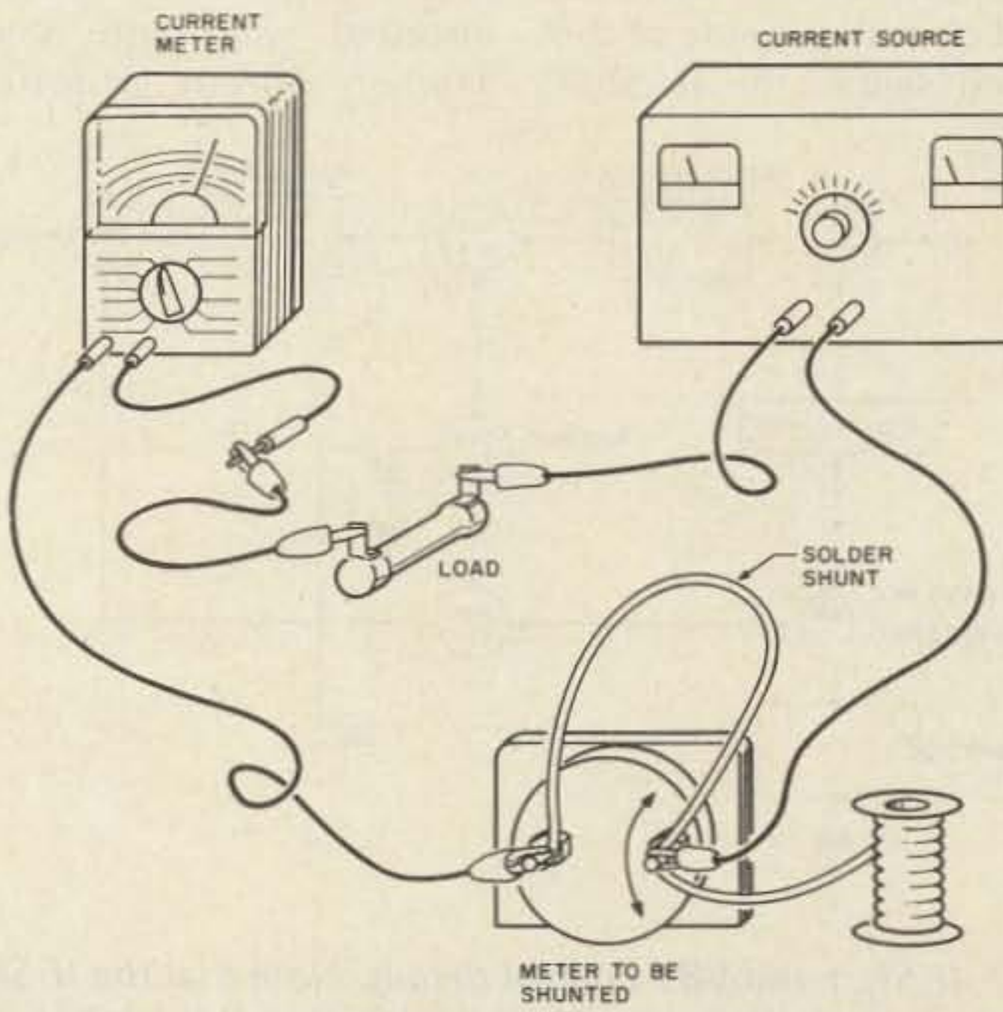


Fig. 1. Shunt calibration setup. If a variable current source is not available, a husky rheostat may be used to vary the load resistance.

Harrison K. Clark KA2R
1 Orchard Park Drive
Clifton Park NY 12065

Strangle QRM with Your TS-830S

Simple filter modifications will help your Kenwood choke out interference. KA2R gives you the lowdown on how to do it.

The Kenwood TS-830S transceiver contains a fine receiver. It has numerous features and most of them work quite well. The two features that I find most useful in the TS-830S are the "VBT" and "IF Shift" controls. These two controls vary the i-f passband width and position respectively. When there is QRM on both sides of a desired signal, the VBT control can be used to move the skirts on both sides of the i-f passband inward, and when there is QRM on just one side of the desired signal, the IF Shift can be used to move the i-f passband away from the offending signal.

I found that these controls would perform their respective functions reasonably well but not as spectacularly as I had expected when I ordered the rig. I found that troublesome adjacent SSB signals could be moderately attenuated but not eliminated. I was especially disappointed to find that CW performance without optional CW filters installed was quite poor. The minimum practical passband setting was 500 Hz, and signals within 2 kHz of the desired signal were attenuated but not eliminated. This article describes a relatively straightforward modification to the TS-830S that significantly improves selectivity and increases the effectiveness of the VBT and IF Shift controls.

After owning the rig for several months, I went inside it to determine if I could improve the controls by optimizing the alignment. There was only one adjustment that would have any effect on VBT or IF Shift performance, and it wasn't far from its optimum setting (more on it later). I then studied the circuit diagram in detail to better understand the operation and the reason the controls were not performing as well as I had hoped they would.

VBT and IF Shift Circuit Details

The VBT operates by

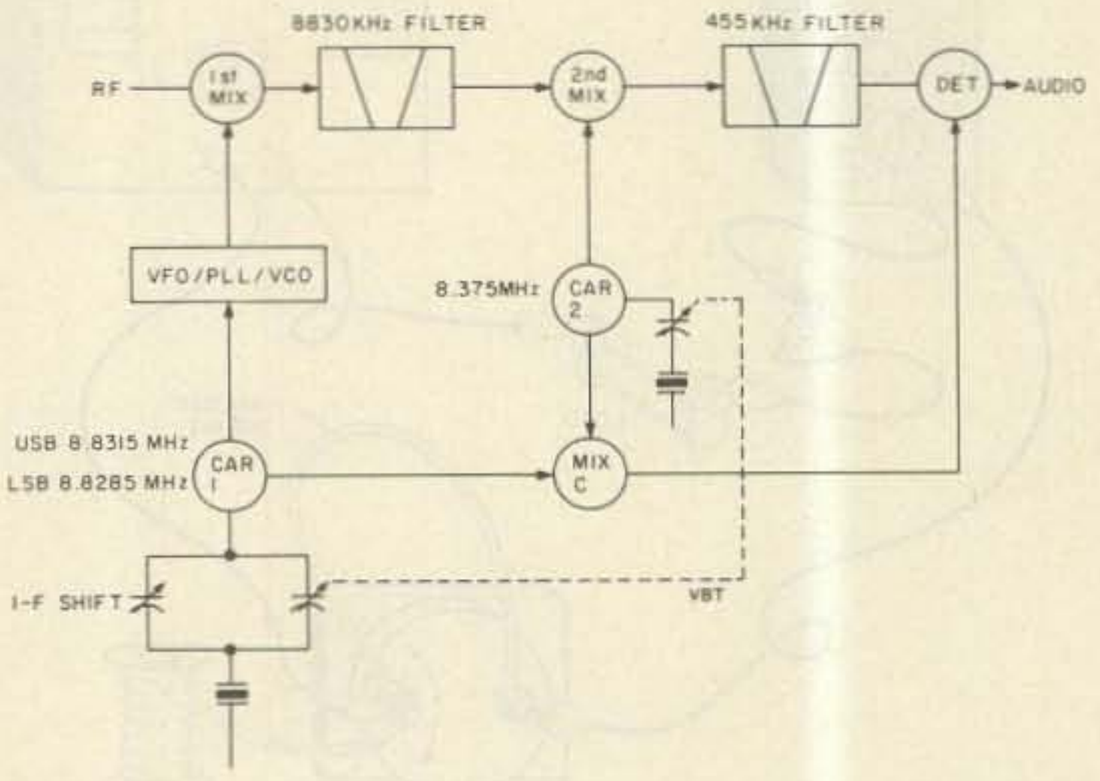


Fig. 1. IF Shift and VBT control details. Note that the IF Shift affects only the first mixer and the detector, thus shifting the i-f signal in both filters. The VBT increases the i-f signal frequency in one filter and reduces it in the other, effectively narrowing the i-f passband.

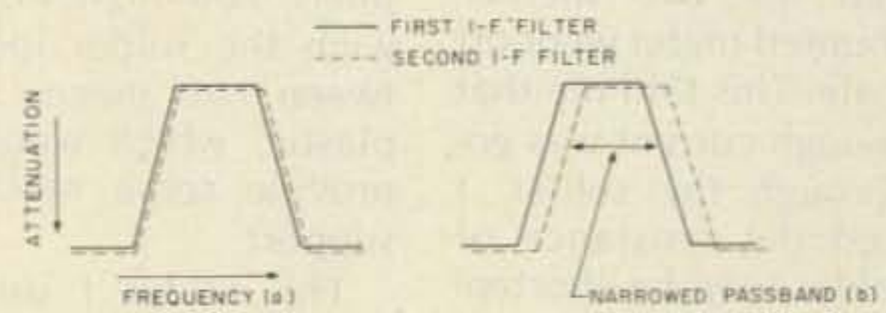


Fig. 2. The VBT control effect on overall i-f passband. The two filters are aligned as in (a) when the VBT is not in use. The VBT control effectively misaligns the two i-f filters, thus reducing the passband width as in (b).

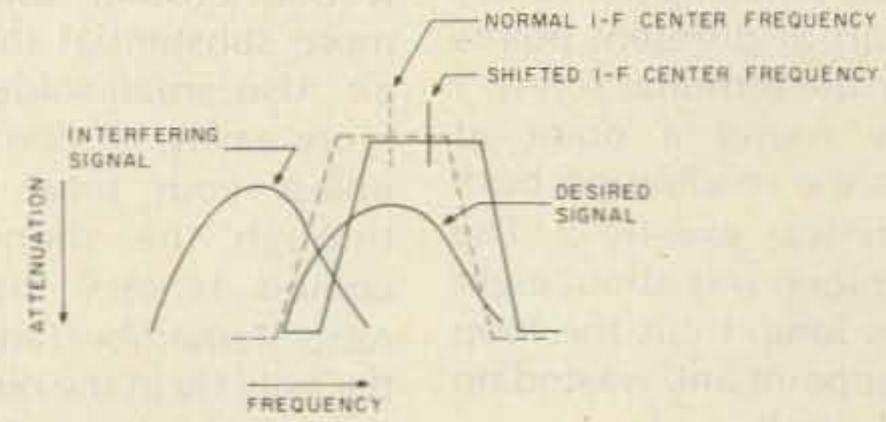


Fig. 3. Demonstration of IF Shift action in reducing QRM. Note that some of the desired signal is moved out of the passband along with the interfering signal.

shifting the frequency of the signal in the first i-f in one direction and the signal in the second i-f in the other direction. This is done by shifting the frequency of two of the oscillators that control the frequency of the signals in the i-f chain (see Fig. 1). The VBT control changes the frequency of an 8.83-MHz carrier oscillator and an 8.375-MHz i-f conversion oscillator (this oscillator converts an 8.83-MHz i-f signal to a 455-kHz i-f signal). Effectively, the two filters, normally in close alignment—Fig. 2(a)—are moved in opposite directions—Fig. 2(b). One filter provides the cutoff on one side of the passband while the other filter provides the cutoff on the other side. (For the purposes of Fig. 2, two identical, typical, filter characteristics are used. We will examine the actual filter characteristics provided in the TS-830S in a later figure.)

The IF Shift control changes only the carrier-oscillator frequency. This moves the signal the same direction in both i-f filters, cutting off the signal on one side or the other, as shown in Fig. 3. The VBT and IF Shift controls can be used simultaneously to select just one part of the incoming signal (the part that is not covered by QRM).

From the circuit details it would appear that, given ideal filters, the controls should work wonders at reducing QRM. Since their performance was less than spectacular, I examined the characteristics of the filters used in the TS-830S. I found the following:

● The 8.83-MHz i-f filter is a monolithic 8-pole crystal filter. Kenwood's specifications for it indicate a −6 dB passband width of greater than 2.7 kHz and a −60 dB passband width of less than 5.0 kHz. These specifications indicate a shape factor (−6 dB to −60 dB) of somewhat less than 1.85. The stopband attenuation of the filter is listed as 80 dB or more.

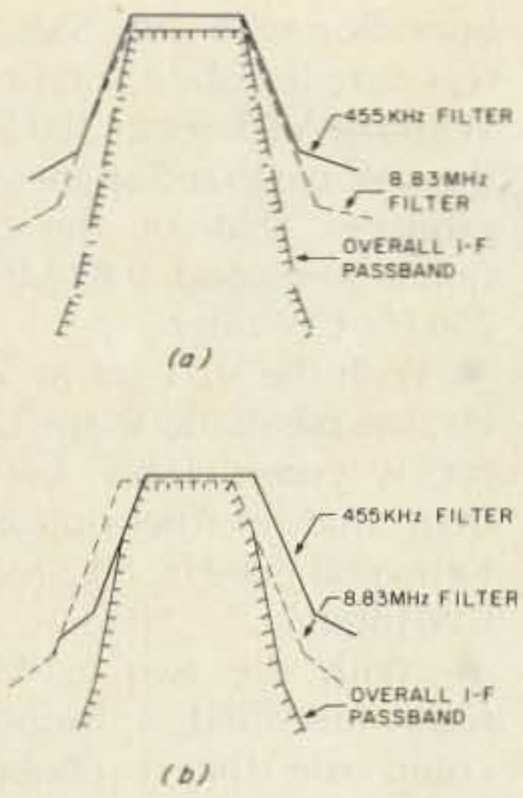


Fig. 4. At (a), the combination of the two filters provides a respectable overall i-f passband characteristic. At (b), the VBT is used to reduce −6-dB passband width; it only slightly reduces the −60-dB passband width. Use of the VBT and SSB filters for CW operation results in shoulders on the passband skirts as shown in (c).

● The 455-kHz i-f filter is an 8-pole ceramic unit. It is specified to be 2.7 kHz or more at −6 dB and 4.5 kHz or less at −60 dB, for a shape factor somewhat less than 1.67. The "guaranteed" stopband attenuation is indicated to be 60 dB or more.

Some tests on the TS-830S showed that the filters meet their specifications but that the 8.83-MHz i-f filter stopband attenuation is not achieved due to leakage past the filter on the i-f board. This, combined with the modest stopband attenuation of the 455-kHz ceramic filter, clearly explains why CW signals within 2 kHz of the desired signal are not fully attenuated when the VBT control is used to bring the passband width down to something suitable for CW operation.

The reason for the modest performance in both SSB and CW modes is demonstrated in Fig. 4. Fig. 4(a) shows the characteristics of the stock Kenwood filters in the TS-830S, along with the overall passband characteristic provided by the two filters when VBT is not in use. Fig. 4(b) shows how the passband skirt steepness is reduced when the VBT is used to bring the passband width down to about 2.0 kHz (my usual setting for operation on 20 meters). Note that the passband skirts are not nearly as steep as they are when the VBT is not in use. The shape of the passband in the region from −6 dB to −60 dB approaches that of a single filter as the VBT is cut in. Additionally, when the passband is narrowed by more than about 800 Hz, "shoulders" are formed on the passband skirts due to the limited stopband attenuation. This is shown in Fig. 4(c). The close-in stopband attenuation is limited to about 75 dB on one side (the 8.83-MHz filter side) and just over 60 dB on the other side (the 455-kHz filter side). Strong nearby CW signals are clearly audible if they fall within the region of limited stopband attenuation. And, of course, signals within the skirt area are going to be even louder than those in the shoulder area.

Improvement

From this analysis, it was clear that all I needed to make the TS-830S really perform well in the selectivity department were two ideal filters (i.e., filters with a 1.0 shape factor).

At this point, I recalled the successful "16-pole" modification I made to my TS-820S in 1979 (see the May, 1980, issue of the *Users International Radio Clubs Kenwood Newsletter*, published by N8RT). Even with VBT, the TS-830S was not providing the selectivity that my TS-820S provided after I added a second filter to it; since the TS-830S has two filters, it should be able to do at least as well as my old TS-820S. I decided that since the most significant difference between the modified TS-820S and the stock TS-830S was in the filters, upgrading of the TS-830S filters would surely be the key to improving its performance.

In previous similar projects, I have used filters purchased from the Fox Tango Corporation (Box 15944, W. Palm Beach FL 33406). This firm offers 8-pole, 2.1-kHz discrete-crystal filters in both 8.83-MHz and 455-kHz center frequencies. I have found their filters to have steeper passband skirts and higher stopband attenuation than the original equipment filters they are designed to replace. Since the TS-830S i-f skirt steepness and stopband attenuation are maximized when the two i-f filters are aligned (VBT not in use), I felt that the narrower passband width available in this line of filters would be particularly advantageous. Since I was operating the TS-830S with the VBT set for about 2.0 kHz most of the time anyway, I felt I might as well have filters that would provide that passband without the skirt steepness degradation that results from use of the VBT.

The original 2.7-kHz SSB filters in the TS-830S provide a −6-dB passband width of just over 2.4 kHz (VBT out) and are largely responsible for the reputation Kenwood has for excellent audio qual-

ity. I knew that two 2.1-kHz filters would reduce the −6-dB passband width to about 2 kHz and recognized that the audio quality would be affected. However, Heath, Collins, and others have long used 2.1-kHz SSB filters without owner complaint. Further, I applied cascaded 2.1-kHz filters in a Heath SB-102 transceiver some years ago and never regretted it for a minute.

Results

I installed the two Fox Tango filters in the TS-830S and found the results very gratifying. The following summary of my conclusions is taken from an earlier report published in the April, 1982, issue of the *UIRC Kenwood Newsletter.*

- The effect of the modification on audio quality is noticeable in a side-by-side comparison but is not bothersome in day-to-day use.
- The audio quality is far better than that provided by the optional 1.8-kHz filter offered by Kenwood and several other transceiver manufacturers.
- The VBT is now used less often and to a lesser degree when it is needed because the basic passband is closer to the ideal for today's crowded bands. The shape factor (−6/−60 dB) of the modified rig is 1.19 compared with 1.45 for the stock rig set for a comparable passband width.
- The VBT control, when used to combat QRM during SSB operation, is now generally used to bring the passband down only 200 or 300 Hz, leaving the shape factor quite high (i.e., the skirts remain relatively steep and shoulders are not formed on the skirts).
- The IF Shift is significantly more effective because of the steep, deep skirts provided by the two 2.1-kHz filters.
- The VBT can be used to bring the passband down to about 300 Hz, making CW operation with only SSB filters installed quite practical. With the VBT set at 300 Hz, the CW passband shape approaches that of the optional Kenwood 8.83-MHz, 250-Hz CW filter.
- With the VBT set at 500 Hz, the passband shape factor is considerably better than that of the optional Kenwood 500-Hz, 8.83-MHz CW filter.
- With the two 2.1-kHz filters installed, I found I could run the rf clipping higher without complaints of audio quality degradation.
- In most on-the-air tests I have been told that the combination of the new filters and a Shure 444 mike provides impressive punch. No one has yet observed any unusual quality in my transmit audio when I am using a Kenwood MC-50 mike.

Replacing the 8.83-MHz i-f filter with an improved unit does not eliminate the 8.83-MHz i-f board leakage but significantly reduces its effect on SSB operation since less VBT must be used to fight QRM. In CW operation, the limited stopband attenuation in the 8.83 i-f is still sometimes noticeable. However, the stopband attenuation of the new 455-kHz filter appears to be greater than −100 dB and provides nearly this level of attenuation when installed in the Kenwood 455-kHz i-f circuit, reducing the effect of the more troublesome of the two shoulders.

Installation

Both replacement filters are larger than the original filters (the 455-kHz filter is about 10 times larger than the small ceramic filter it replaces), but there is plenty of room for mounting them above the i-f board in the TS-830S. The discrete-crystal filters have built-in isolating transformers and thus, unlike the monolithic crystal and ceramic filters used by Kenwood, require isolating capacitors. These can be mounted right on the new filters. Short pieces of RG-174 coax can be used to bridge between the i-f board and the new filters.

I will not go into detail on the physical installation of these filters here; the manufacturer now offers the two required filters in a kit complete with coax, capacitors, and instructions. The kit instructions detail several installation options. Those who have no CW filters installed can have automatic or manual switch selection between the original filters and the new 2.1-kHz filters and can select the desired filters independently for receive and transmit operating modes. Incidentally, the 455-kHz crystal filter is a rather expensive item at $125. However, I understand that the kit will continue to be offered for some time at its current introductory price of $150.00 plus $3.00 shipping.

The minimal alignment required during the modification is readily facilitated by the built-in calibrator oscillator and the S-meter. For those who have a frequency counter handy or can borrow one, the 8.375-MHz oscillator can be trimmed to put the two 2.1-kHz-filter center frequencies in perfect alignment. This step maximizes the −6-dB passband, bringing it up to about 2050 kHz. It also maximizes the steepness of the passband skirts.

Conclusions

I have been living with the modified TS-830S for over 6 months now and still get a kick out of foiling the QRM in a way I couldn't before making the modification. I've talked with several others who have made the same modification, and all have been very pleased with the results. I will be happy to respond to anyone with questions on this modification. Please ensure my reply by sending me an SASE! ■

step up to the best...

Without doubt LR-1 is the repeater value leader! Compare its outstanding performance with any repeater -- then look at its price. LR-1 features include individual die-cast shielding of receiver and transmitter plus a separately shielded 6-stage receiver prefilter for peak performance in harsh RF environments • Front panel metering of all vital functions • CW identifier • Symmetric hard limiting for clean natural audio • Low power MOS control logic • Even the cabinet is included -- just plug in and go!

NEW

LINKING? The LR-1 is also available with control circuitry for Link Transceiver operation. Now link repeater sites with the flexible control capability you've always wanted.

HIGH POWER? Our PA-75 power amplifier is the champion! Ruggedly built to give years of dependable operation in continuous duty repeater service.

NEW

Mark 3C repeaters and controllers have no equal in performance. Both units feature auto patch, reverse autopatch, autodial, 13 Morse messages and a total of 39 functions. Both feature microprocessor control and both have been proven in the field from icy Alaska to tropical Brazil. A Mark 3C supercontroller can make any repeater a super performer. The Mark 3CR repeater is in a class by itself. It combines superbly designed RF circuitry in one handsome package. It is without doubt the world's most advanced repeater!

CALL OR WRITE FOR FULL DETAILS

MICRO CONTROL SPECIALTIES

49

23 Elm Park • Groveland, Massachusetts 01834 • Telephone (617) 372-3442

See List of Advertisers on page 114

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 (+ $4)

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

$49.95 (+ $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, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $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

$229.95 (+ $10)

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), 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, $189.95 (+ $10), similar but less SWR/Wattmeter.

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

MFJ-984 VERSA TUNER IV

MFJ-984

$329.95 (+ $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, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V

MFJ-989

$329.95 (+ $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

CALL TOLL FREE 800-647-1800

Master Charge VISA

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 47

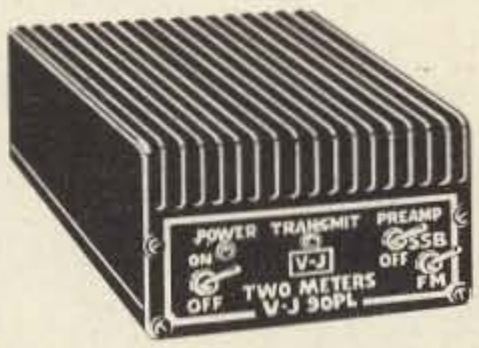
DIRECTION FINDING?

★ No Receiver Mods
★ High Sensitivity
★ 135–165 MHz Standard Range
★ Mobile, Base or Remote Use
★ Bright LED Display
★ Optional Digital Readout
★ Optional Serial Interface
★ Kits or Assembled Units
★ 12VDC Operation
★ 90 Day Warranty

New Technology (patent pending) converts any VHF FM receiver into an advanced Doppler Direction Finder. Simply plug into receiver's antenna and external speaker jacks. Use any four omnidirectional antennas. Low noise, high gain for weak signal detection. Use serial AFSK option for remote display or tape recording data. Kits from $270. Assembled units and antennas also available. Call or write for full details and prices.

DOPPLER SYSTEMS
5540 E. Charter Oak
Scottsdale, AZ 85254
(602) 998-1151 ✓425

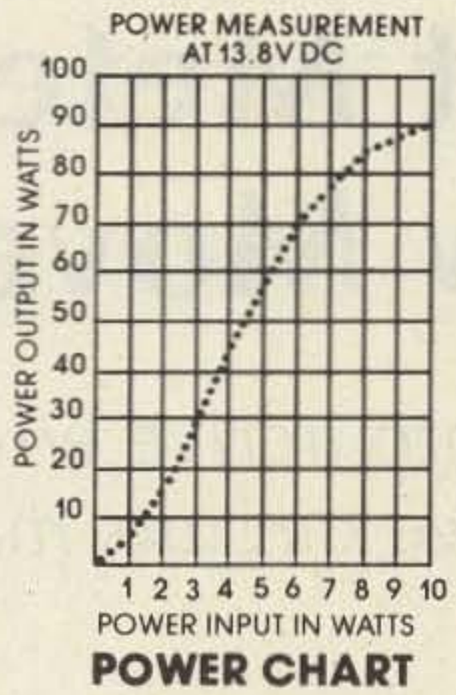
V-J POWER UP
2 METER 90 WATT OUTPUT AMPLIFIER WITH 18 DB GAIN PREAMP



Model 90PL
FOR ONLY
FACTORY DIRECT

$139.95* PLUS SHIPPING

- **FREQUENCY** range 144 - 148 MHz
- **OPERATION FM or SSB** (completely linear) Class AB1
- **RF DRIVE** 1 to 30 watts
- **KEYING RF** activated with high quality relays
- **SSB** operation built in delay
- **POWER REQUIREMENTS** typical 10 watts drive, 13 amps at 13.8 VDC
- **IDLE** current 20 mills
- **MOBILE or FIXED** operation
- **PREAMP** 18DB gain minimum
- **NOISE FIGURE** less than 1.5 DB
- **PREAMP KEYING** independent — separately RF activated relays
- **CONSTRUCTION** wrap around aluminum heat sink 2 pieces 360 degrees cooling
- **SIZE** 7"(w) x 6"(d) x 3"(h) — **WEIGHT** 3 lbs. 9 ozs.
- **IMMEDIATE SHIPMENT**



POWER CHART

SPECIAL OFFER
Matching Power Supply
$99.95* PLUS SHIPPING

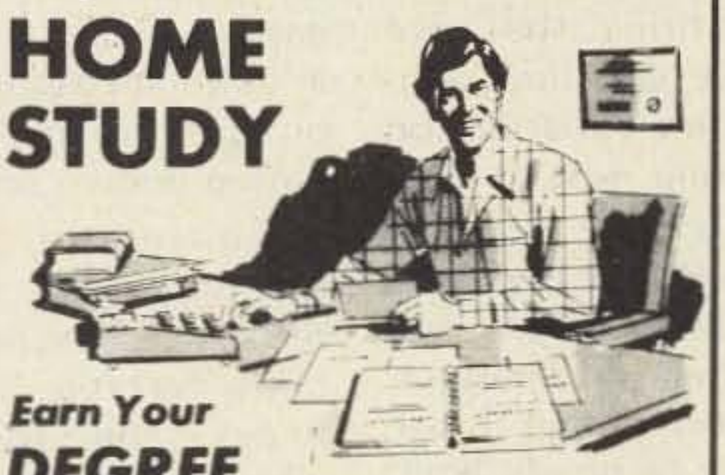
15 AMP SUPPLY wt. 13 lbs. size 8"(w) x 5"(h) x 6"(d)
IMMEDIATE SHIPMENT
ALL PARTS AND LABOR WARRANTED ONE FULL YEAR

VJ90PL Amplifier $139.95 plus $3.00 shipping
VJ15 POWER Supply $99.95 plus $7.00 shipping
***Prices USA only**

VISA, MASTER CHARGE, M.O. or C.O.D. • PHONE (713) 477-0134

V-J PRODUCTS, INC. 505 East Shaw, Pasadena, Texas 77506
SERVING THE ELECTRONICS INDUSTRY SINCE 1965

Put Professional Knowledge and a
COLLEGE DEGREE
in your Electronics Career through
HOME STUDY



Earn Your DEGREE

No commuting to class. Study at your own pace, while continuing your present job. Learn from easy-to-understand lessons, with help from your home-study instructors whenever you need it.

In the Grantham electronics program, you first earn your A.S.E.T. degree, and then your B.S.E.T. These degrees are *accredited* by the Accrediting Commission of the National Home Study Council.

Our *free* bulletin gives full details of the home-study program, the degrees awarded, and the requirements for each degree. Write for *Bulletin A-83*.

Grantham College of Engineering
2500 So. LaCienega Blvd.
Los Angeles, California 90034

AMATEUR
MICROWAVE TV ANTENNA'S
1.9 to 2.5 GHz Frequency Range
50 db System Gain

Complete System (Rod Style as pictured, 25 db Gain)
PS-3 ..... **$69.95**
Complete System (Dish Style as pictured, 50 db Gain)
PS-5 ..... **$109.95**

All systems come complete with Accessory package of
- Control Box
- 60' Coax Cable
- Mounting Hardware
- Matching Transformer
- Instructions
- 90 Day Warranty

S.E.I. Inc.
912 West Touhy Avenue
Park Ridge, Illinois, 60068
Out of State Call ***1-800-323-1327***
In State Call ***312-564-0104*** ✓261

C.O.D.'s Accepted • Special Quantity Pricing
Dealers Wanted

VISA master charge

✓See List of Advertisers on page 114

L. B. Cebik W4RNL
5105 Holston Hills Rd.
Knoxville TN 37914

Smart Meters: The New Movement

Turn your passive meters into active error-correction systems. W4RNL's innovative circuits make it a snap.

The housewife doing laundry and the ham have much in common. Both depend upon indicators to tell them when their equipment is doing a good job, and their indicators often fail them. The housewife does not see the light on the clothes dryer go out, and the wash-and-wear sits in a wrinkled pile for an hour. The ham does not notice the current climb on his plate meter, and finally a fuse blows —or the final does.

Both cases illustrate a limitation in our thinking about monitoring the operation of our equipment. For the most part when we think about monitoring our gear, we picture meters or other indicators that tell us the current status of things. Then it is up to us to make the proper moves to resolve any problems. Too often, however, we fail to keep an eye on the indicator and the problem gets out of hand before we can step in with corrective action.

There is a solution to this difficulty. The first step is to change our thinking about monitoring. The second step is to put together a few handy circuits which will both reflect our new way of thinking and take some corrective action for us. Although there are many ways to control conditions that are straying, we will limit ourselves to some variations on circuits using just a few components. The heart of the circuits will be two common ICs: the 555 timer and the 339 voltage comparator. Both are very simple to use and subject to nearly limitless variations in the functions we can get them to perform. But first, a few words about thinking.

Monitoring—Detect and Control

The solution to the housewife's problem is simple: To the clothes dryer we add a buzzer which sounds off at the end of the drying cycle. Then she can come promptly to remove the clothes before they wrinkle. What has been added to the situation is a method to ensure that the harmful condition—namely, the clothes sitting and wrinkling—will not proceed unchecked for very long. The control system is not perfect, of course, but few things are. The lady may leave the house or be out of earshot of the buzzer. But to a large measure, we have brought the undesirable situation under control.

Household appliance manufacturers have long recognized the problem and built buzzers into appliances (and added bells, whistles, lights, and other control signals). Hams have not been nearly so up to date in their methods. We continue to think of monitoring our equipment almost solely in terms of a few meters to provide us with status reports—if we are in a position to see them or take the trouble to look. But meters and other indicators are only one half of the job of monitoring. Monitoring consists of two parts: detection and control.

Once we understand this fact, it is easy to see why meters can do only half the work. They provide an indication of both normal and abnormal operation, but they do nothing to control the abnormal condition. They sit there happily indicating that our equipment is going to pot without lifting a finger to help.

Unless we have unlimited time and money, developing a perfect control system to correct any and all undesirable conditions is not a practical solution to the second part of the monitoring problem. Neither does the housewife have a dryer that will remove and hang the wash-and-wear clothing when the cycle is complete. She depends on the monitoring device—the buzzer—to ensure that something appropriate gets done. And that is the task we should have in mind when we try to design effective monitors for our ham equipment. We may not be able to have every circuit self-adjust, but we can take steps to make sure that when the gear acts up the monitoring system will

take an action that will protect the equipment.

There are several types of control actions at our disposal. Let's list them by categories as a convenient way to decide for each case we run into what the best system may be.

1. *Self-adjustment.* Although this step is not practical for every monitor, it is relevant to many and much more common than we might believe. Automatic gain control and automatic frequency control are just two of the many self-correcting control actions that occur in ham gear. But in most of the places around the shack that call for detection and control, automatic adjustment would be too complex and costly, and often simply unnecessary.

2. *Automatic Switching.* In some cases, an out-of-spec condition can be controlled by switching to a safe mode of operation—perhaps a lower power setting. We can go so far as to switch the equipment off, but let's save this possibility for a special category.

3. *Warning.* If we can detect a harmful condition while it is on the borderline of trouble, we can take preventive action manually. However, we need to catch the problem promptly, which requires a warning method that we cannot ignore. Bells, buzzers, lights, and sirens are all quite effective in waking most of us. These are some of the easiest and most important systems to design.

4. *Shutdown.* Ultimately, the final safety measure is to have our monitor shut down the equipment before a problem has the time to cause a catastrophe. In most instances we would prefer to keep the equipment going if we can, but some conditions call for total removal of power. Thus we have a new way to look at the common fuse: It monitors current and, in the event of serious overload, it protects the equipment by sacrificing itself—poor fellow. Nonetheless, the fuse is a clue to when we should think about shutdown as our control step. We pull the plug when the condition is dangerous or destructive.

These four categories cover almost all the types of detection and control systems you will encounter or develop. Translating these general ideas into practical ham designs may seem to be a complex task. However, with just two or three ICs, we can make a good start toward effective monitoring.

Some Basic Methods for Monitoring

Since we need both a method of detection and a method of control, let's start with separate devices for each job. For our detector, we can use the LM339 voltage comparator. Our basic controller will be the ubiquitous NE555 timer. We may add a few chips along the way, but together these two inexpensive ICs will allow us to design a large number of useful monitoring systems for both the ham shack and the home.

The LM339 voltage comparator is but one of a vast array of op amps that could perform the detection role well. I chose the 339 for several reasons. First, unlike some op amps, it requires only a single power supply and it operates in the 5-to-15-volt range of the 555 timer. This is also the range of voltages we may need for other devices we add to the system, and it is also the range we are likely to find or can derive from existing power sources in the equipment to which we add the monitor. Second, the 339 comes four comparators to a DIP for a low cost per section. Fig. 1 shows the pinout. Finally, for basic comparator work, the chip is easy to use.

Fig. 1 also shows the basic circuit for voltage comparison work. The 339 will drive

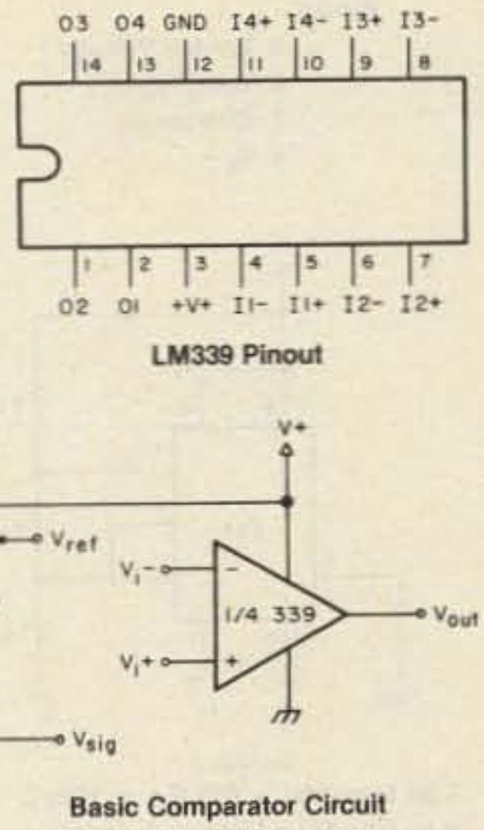


Fig. 1. Pinout and basic comparator circuit of the LM339.

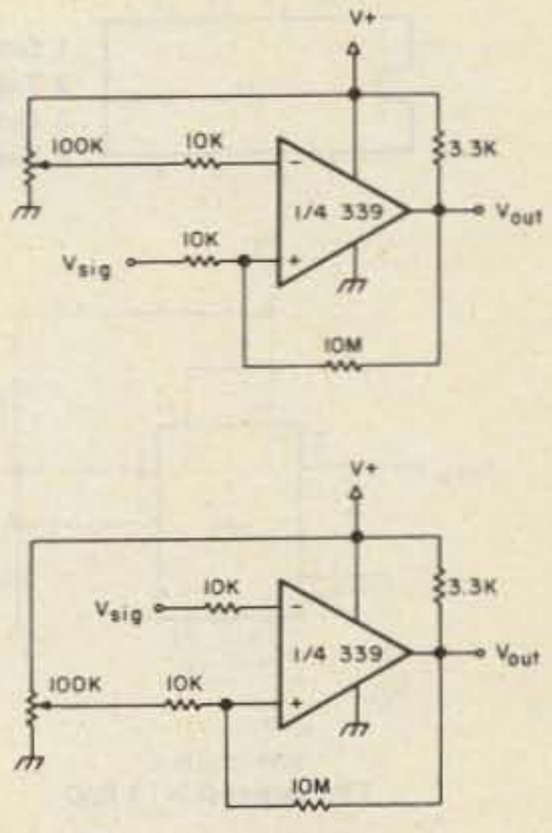


Fig 2. Two practical comparator circuits for the 339. Inverting and non-inverting (bottom) comparators.

either CMOS or TTL chips. For a non-inverting comparator, that is, one that changes its output from low to high as the input voltage rises, connect the reference voltage to the inverting input (Vi−) and the signal voltage to the non-inverting input (Vi+). To make an inverting comparator, reverse the input connections and the output will drop from a high to a low as the signal voltage rises above the reference level.

Fig. 2 shows more practical circuits recommended by National Semiconductor. Each adds feedback for hysteresis in order to prevent oscillation and chatter. Since many of the applications of the comparator as a detector for monitoring will be faced with noisy or slowly-changing voltages, the feedback is wise and inexpensive. Too, the exact values are not critical.

Although the input voltage should not exceed the supply voltage by much (as a general rule of thumb, not at all), we are not limited only to monitoring voltages from 0 to the chip's supply voltage. We can drop high dc voltages through a series-resistance voltage divider, using high-value resistors to minimize the current load on the monitored circuit. Fig. 3 shows a sample case (a) lowering the nominal 1000-volt supply to 10 volts. The voltage at the op amp input will proportionally track the changes in the 1000-volt line.

As long as the input voltage to the comparator is

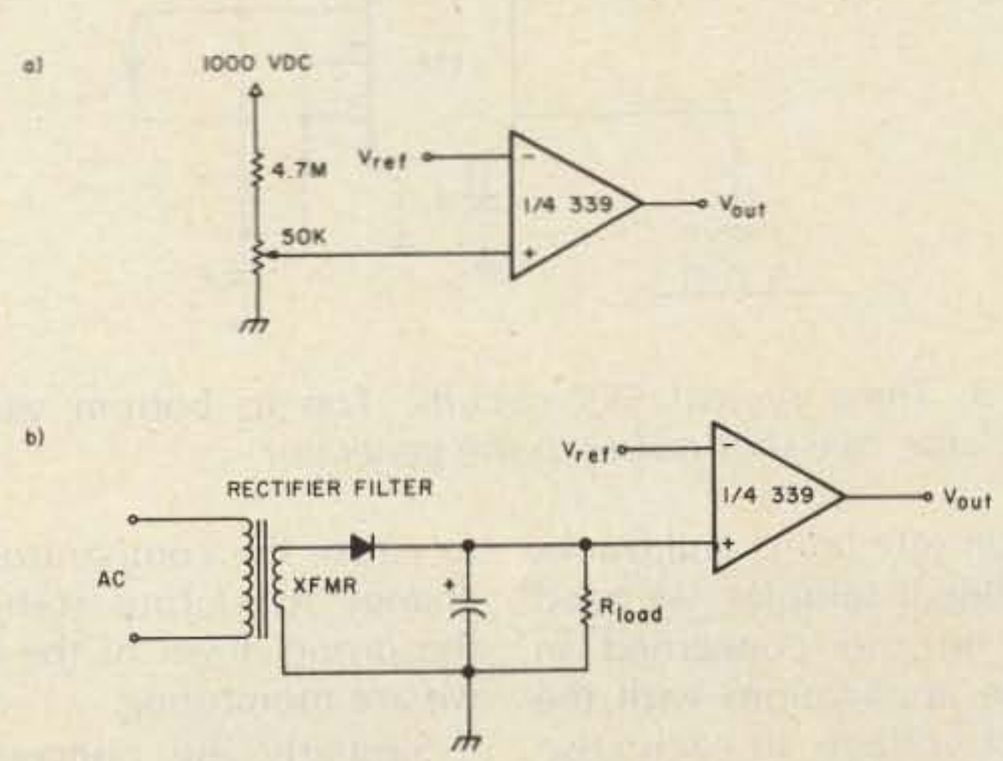


Fig. 3. Deriving input voltages from high ac and dc sources. (a) Using high dc sources. (b) Using high ac sources.

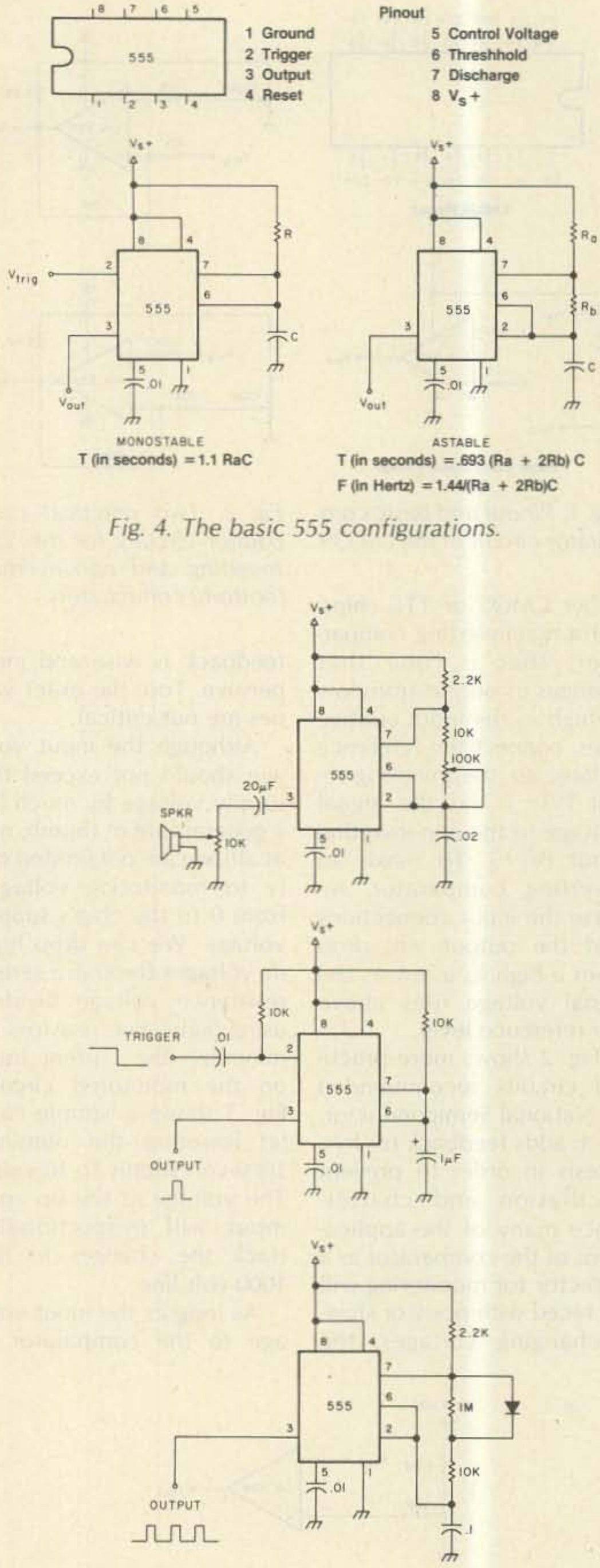


Fig. 4. The basic 555 configurations.

Fig. 5. Three typical 555 circuits. Top to bottom: audio oscillator, one-shot pulser, pulse generator.

within safe limits and tracks the line it samples, we need not be too concerned in these applications with the exact voltage. In each case we will set the reference voltage for the other input to cause the comparator to change its output state at the proper level of the line we are monitoring.

Similarly, by converting ac voltages to a safe level of dc, as shown in (b), we can use the comparator to monitor ac levels. The only precautions in this case are these: First, have a steady minimum load on the transformer so that it will track correctly, and second, the more sensitively you want to track, the more filtering you will need in the ac-to-dc conversion.

The 339 detector portion of our system is most applicable to the last three categories of monitoring. For cases in which we need automatic adjustment, the comparator is not often the best way to achieve our goal. However, for automatic switching, warning, and shutdown, the definite change of state of the comparator is ideal to trigger control devices such as the 555 timer. Moreover, since changes in voltage, current, resistance, and power can all usually be converted into changes of voltage, we can effectively monitor most of the important functions within our equipment.

The 555 timer has become an instant legend as a versatile timing and control device. Fig. 4 shows the pinout, the basic monostable and astable circuits, and the timing formulas for the IC. Since the output stage will supply up to 100 mA of current, it is ideal for driving lamps, relays, small buzzers, sirens, and a host of other units. By chaining 555 stages, we can build delays into the control system to allow for self-correction or other factors. Too, the 555 makes a excellent square-wave oscillator for audible warnings, and it can be used to generate pulses for various applications. Fig. 5 shows an audio oscillator, a one-shot pulser, and a continuous-pulse generator as samples of what the 555 can do.

With all these tools at hand, we are now ready to look at some practical circuits. In one form or another, all of them are at work in pieces of equipment around the shack and house here. A few have actually prevented some expensive disasters, and one is at work keeping my wash-and-wear shirts from being wrinkled in the dryer.

Some Practical Circuits

Let's begin with a pure ham application. On occasion, the plate current to my final amplifier has risen to dangerous levels—at least to levels which threaten to shorten the lifetime of the tubes. This has occurred as the tubes aged and lost their perfect balance, as well as in the case of a number of careless retunings. Noting that the high voltage dropped with the rise in current, I added the circuit in Fig. 6 to warn me of excessive current. The resistor divider samples less than 4/10 of a percent of the high voltage. When the voltage drops due to excessive current, the 339 triggers the oscillator and a transistor switch for the warning lamp. The 100-μF capacitor in the signal-voltage line counteracts brief voltage drops caused by normal peak demands of speech or CW keying. You may have to experiment with this value for your system. The object is to have the monitor respond only to the relatively slower changes of current. I set the reference threshhold of the comparator by monitoring the current levels at which the comparator triggered the system.

The circuit is placed well away from heavy rf fields, with only the low-voltage signal line emerging from the amplifier. The line is shielded and well filtered to keep rf out of the monitor itself. The unit is in a small box of its own behind a panel directly in front of me, so that I cannot miss the warning light—or sound. Perhaps the most significant event in the life of this little monitor was when it sounded off to

warn me of an over-current condition, and the fuse in the high-voltage line refused to blow. What that might have cost me had the monitor not been in place, I shudder to think about.

In case you may be wondering about my shirts, an old but perfect clothes dryer lacked a warning buzzer to signal the end of its cycle, although a light in the timing wheel did go off. Fig. 7 shows the answer to the problems created when someone did not see the light go dark: Another 339 responding to the shutdown triggers a 555 monostable, which in turn lights a light and sounds a buzzer that can be heard throughout the house. The monostable has a variable duration of 10 to 40 seconds (it calculates at 8 to 32 seconds, but most electrolytics are a bit leaky and extend the time period). A reset button allows one to cut the sound if nearby. The input circuit uses the smallest 12-volt transformer I could find, since the current requirements are minimal, most going to the 1k bleeder resistor and to the LED. The reference potentiometer setting is non-critical: about midrange does well. The goal is to convert the slowly decaying voltage from the ac-to-dc converter to something sharp enough to trigger the 555 reliably. By setting the reference low enough, the circuit will not falsely respond to line-voltage drops occasioned by the central air conditioner compressor when it starts to compress.

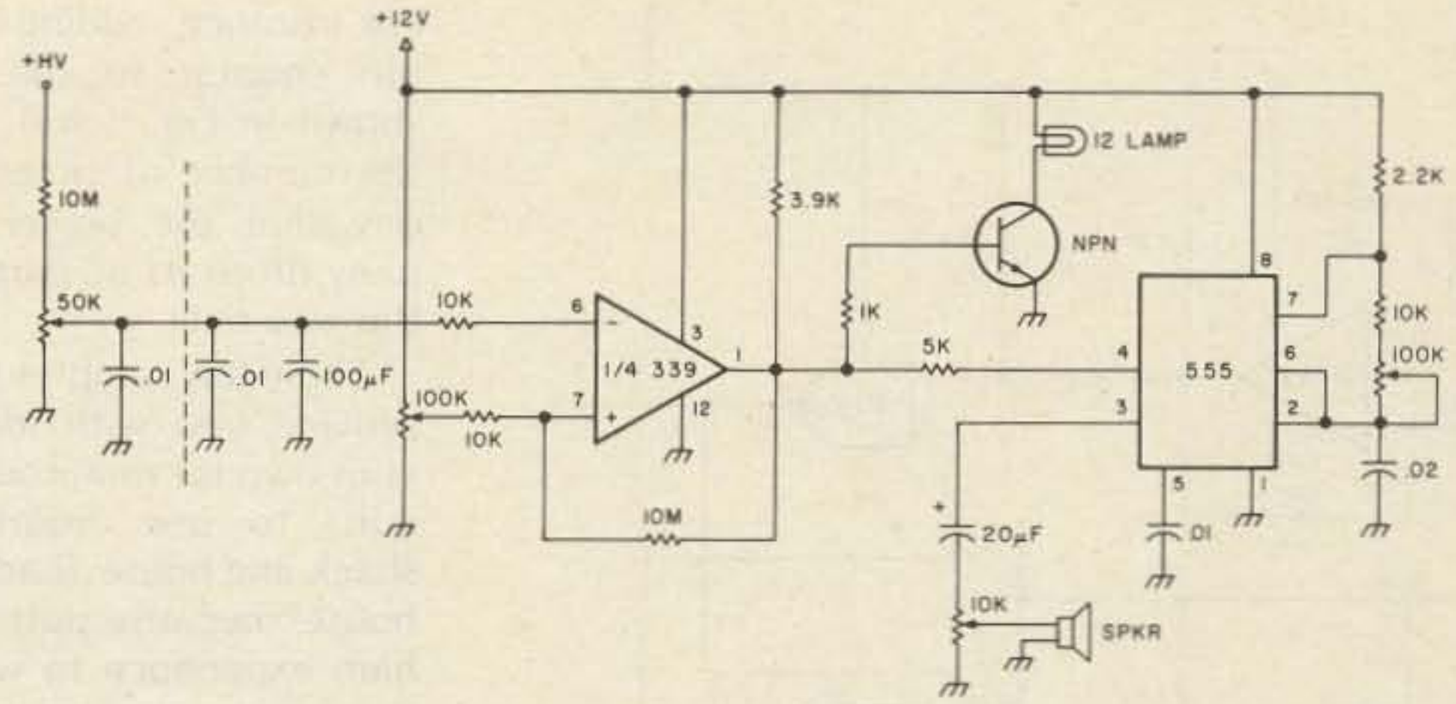


Fig. 6. An excess-current-warning monitor.

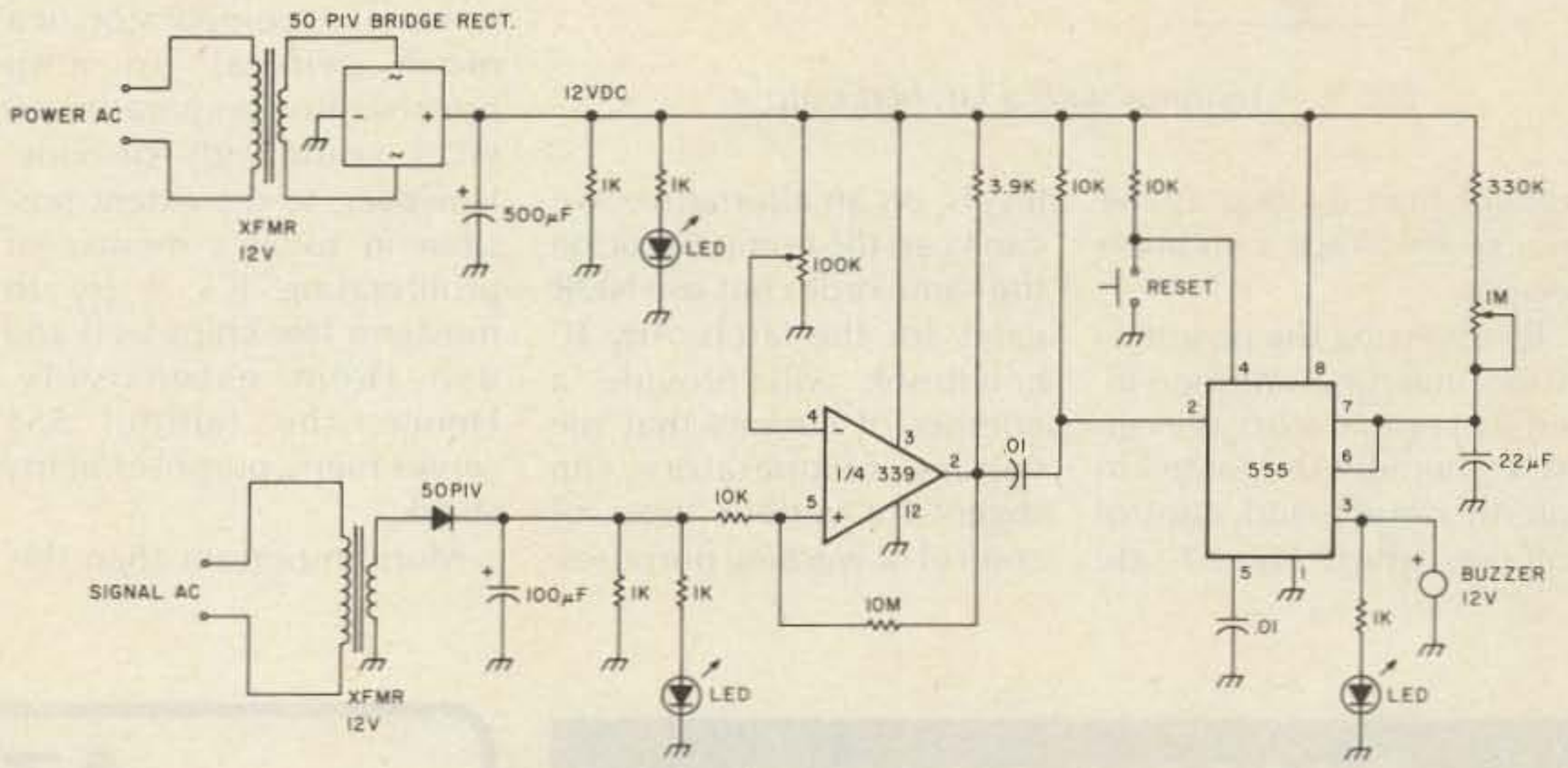


Fig. 7. An end-of-cycle monitor for ac equipment.

ond comparator might be set at about 50 volts so that a generator will not start with even some of the power company's voltage on the line. The second 555 output can be tied to the starting circuitry of the generator through a relay. Other applications of this circuit for both ac and dc conditions can readily be imagined.

As a variation on this two-level circuit, Fig. 9 shows a 339 coupled to a 7400 NAND latch. Section #1 of the 339 pulls the latch output high as its input voltage drops below the threshhold, while section #2 pulls the output low as the voltage climbs again. For reverse action, take the output from the other NAND gate. The input to the two comparators can be ac- or dc-derived, with the two sections having any desired differential. The NAND gates are separated from the comparator so that they respond to pulses created by the capacitor discharges; hence, the latch never faces dual low inputs. The output of the latch, unlike the 555 timers,

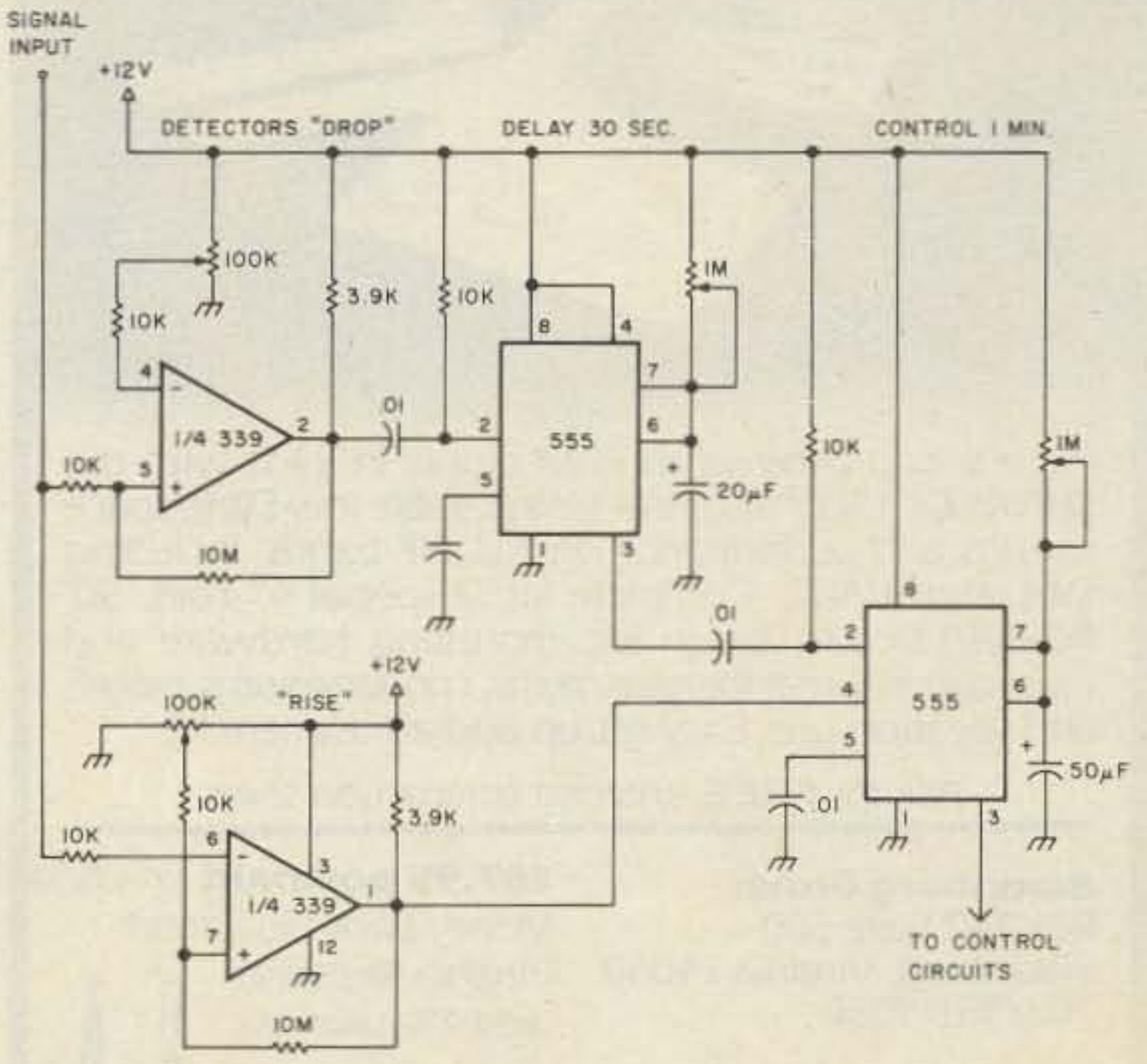


Fig. 8. A monitor with delay and cancel features.

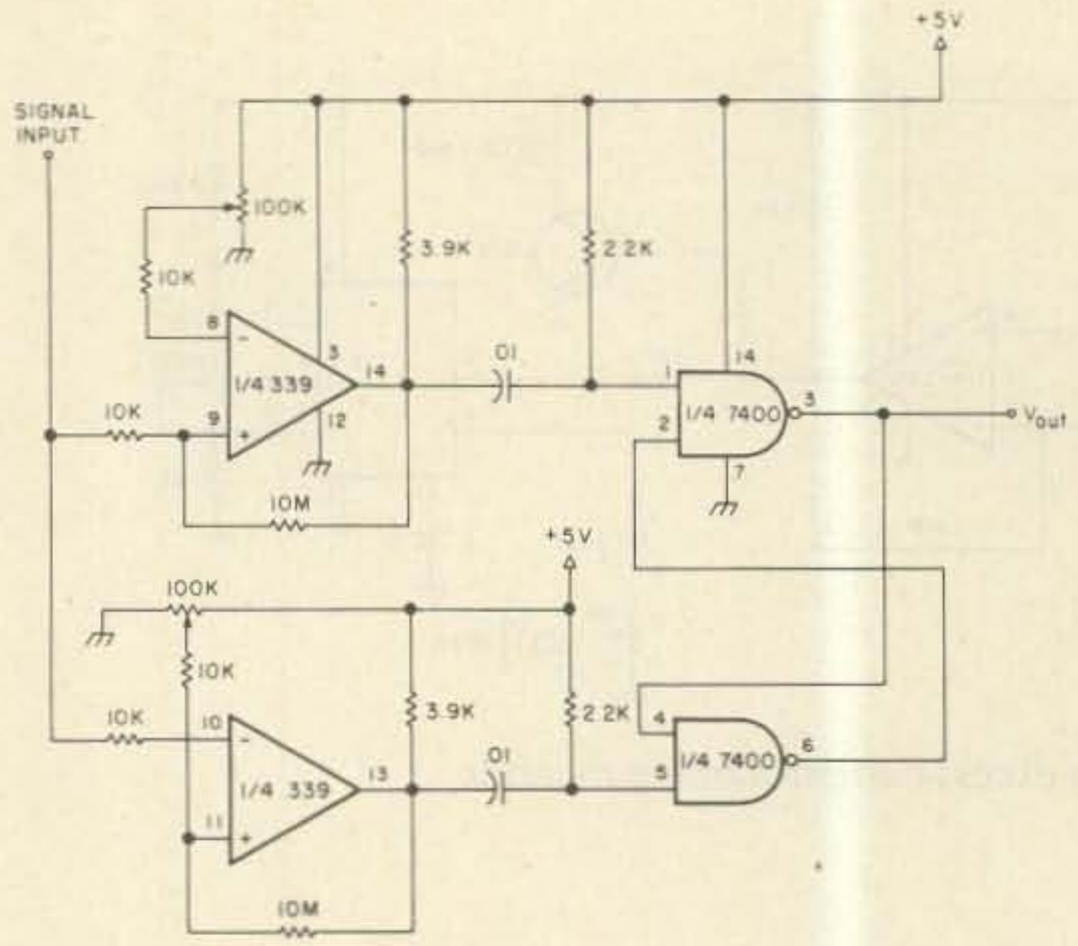


Fig. 9. A monitor with a latched output.

remains high as long as the low- or 0-voltage condition persists.

By reversing the positions of the inverting and non-inverting comparators, we can use essentially the same circuit to detect and control voltages which exceed safe levels. As an alternative, we can keep the comparators in the same order but use NOR gates for the latch. Any IC handbook will provide a number of circuits that the voltage comparators can trigger for various types of control or warning purposes.

For instance, adding a simple counter to the latch shown in Fig. 9 will reveal the number of times each day that the power company drops its ac part or all the way out.

These few samples should provide you with ideas of your own for monitoring circuits to use around the shack and house. (I add "the house" because putting my ham experience to work in the laundry room earned me several points toward the new rig I wanted.) There is little magic in the 339 that some other comparator (or a more general op amp pressed into comparator service) could not provide. However, to the extent possible in today's morass of proliferating ICs, I try to master a few chips well and use them extensively. Hence, the faithful 555 serves many purposes in my shack.

More important than the particular circuits and components we use for our systems is the general conception of monitoring. The presence of meters and even of lights may not suffice to protect our equipment from dangerous or harmful conditions. Monitoring must have a control function as well as a detection function. It is not always necessary for our control systems to correct the situation as long as they at least protect the equipment from its effects. And if the system requires action on our parts, the warning must be undeniable in its effort to capture and direct our attention to exactly the right place to make adjustments.

Hopefully, these circuits and ideas will bring us a few steps beyond mere metering (as important as that may be) toward more effective monitoring. What we save in the long run just might be more than money. ■

Proven Success

Our best salesmen don't even work for Kantronics

Dear Sirs:

I am writing first of all to say how much I enjoy my Kantronics Interface and the software that I bought for my VIC-20 micro-computer. For a very reasonable price I have had a whole new world of amateur radio--not to mention some commercial tansmissions I have been able to copy--opened to me.

P.S.
Am "tickled pink" with this setup and having a ball. Thanks for a nice product !

Dear Phil:

I recently purchased a VIC 20 computer and your companies "Interface" and software for RTTY and CW and I must say it does a magnificent job. I have worked over twenty countries on RTTY on 15 and 20 meters in one month. The copy on CW is unbelievably excellent.. adding a new dimension to amateur radio for me. "you done good," as we say here in Tennessee.

I must tell you, Ihave the equipment in operation and it works super good! I think it is an outstanding piece of electronics.

Your directions f
CW state the

Gentlemen:

It's nice to find someone like you that responds to user suggestions - keep up the good work.

The interface is available with software for six popular computers. Hamsoft is our original program for the Apple II, II+, or IIe; Atari 400 or 800; Radio Shack Color Computer, VIC-20, or Texas Instruments TI-99/4A. Hamtext, our advanced program, works with the Apple II, II+, or IIe; VIC-20, or Commodore 64.

The interface and Hamsoft or Hamtext combination has put computerized communications at a reasonable price. Contact your local Kantronics dealer or write us for more information.

Kantronics

(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044

Bob Scott WB8JEY
1310 Cheshire Road
Delaware OH 43015

A QSL Assembly Line of Your Very Own

The problem: a stack of QSL cards as high as Mt. Everest. The solution: a program that will make your TRS-80 climb the mountain.

After a recent contest, I got started on the job of filling in the QSL cards for all the contacts with foreign stations that I had worked, as is my policy. As soon as I started, I knew that there was something wrong—I was slaving away filling in the QSL cards and the TRS-80 was only watching.

Instead of giving Wayne all my money for QSL cards, why don't I use the TRS-80 and the line printer to print my own QSL cards and have the computer fill them in while it is printing them?

It seemed like a good idea to me, so I set out to write a program to do it. Sometime later, the program was finished in Level II BASIC and I happily began printing QSL cards.

After I had finished the

Program listing.

```
10 POKE16425,0
30 CLS
40 CLEAR 30000
42 X$="!"
45 DIMA$(99)
50 INPUT"CALLSIGN";A$:IFA$="END"GOTO154
70 INPUT"GMT";B$
80 G$=""
90 PRINTC$" ";:INPUT"DATE";C$
100 IFG$<>""THENC$=G$:G$=""
110 PRINTD$" ";:INPUT"BAND";D$
120 IFG$<>""THEND$=G$:G$=""
130 PRINTE$" ";:INPUT"RS/T";E$
135 IFG$<>""THENE$=G$:G$=""
140 PRINTF$" ";:INPUT"MODE";F$
141 IFG$<>""THENF$=G$:G$=""
143 A$(I)=A$+X$+B$+X$+C$+X$+D$+X$+E$+X$+F$+X$
145 CLS
147 PRINT FRE(Z$)
151 I=I+1
152 PRINT"THE NUMBER OF QSL'S TO PRINT NOW IS  ";I
153 GOTO50
154 I=0
155 INPUT"NUMBER OF QSL'S TO PRINT";P
157 IFI=PGOTO500
170 LPRINTTAB(20)"AMATEUR RADIO STATION"
190 LPRINTTAB(10)CHR$(31)"W B 8 J E Y"
210 LPRINTTAB(10)"W B 8 J E Y"
211 LPRINTTAB(10)"W B 8 J E Y"
212 LPRINTTAB(10)"W B 8 J E Y"
230 LPRINT" "
231 G$="":K=1
232 FORJ=1TOLEN(A$(I))
233 H$=MID$(A$(I),J,1)
234 IFH$<>X$THENG$=G$+H$:GOTO245
235 ONKGOTO236,237,238,239,240,241
236 A$=G$:GOTO244
237 B$=G$:GOTO244
238 C$=G$:GOTO244
239 D$=G$:GOTO244
240 E$=G$:GOTO244
241 F$=G$
244 G$="":K=K+1
245 NEXTJ
250 LPRINTCHR$(30)TAB(10)" Confirming The QSO With : "
260 LPRINTSTRING$(57,CHR$(240))
270 LPRINTCHR$(255)TAB(15)CHR$(255)TAB(25)CHR$(255)TAB(
    35)CHR$(255)TAB(42)CHR$(255)TAB(49)CHR$(255)TAB(56
    )CHR$(255)
290 LPRINTCHR$(255)TAB(5)"Station"TAB(15)CHR$(255)"  G
    M T  "TAB(25)CHR$(255)"  Date"TAB(35)CHR$(255)" Ba
    nd "TAB(41)CHR$(255)" RS/T "TAB(46)CHR$(255)" Mode
     "TAB(53)CHR$(255)
310 LPRINTCHR$(255)TAB(5)A$TAB(15)CHR$(255)"  "B$TAB(25
    )CHR$(255)" "C$TAB(35)CHR$(255)"  "D$TAB(42)CHR$(2
    55)"  "E$TAB(49)CHR$(255)"  "F$"  "TAB(53)CHR$(255
    )
331 LPRINTSTRING$(57,CHR$(195))
350 LPRINTCHR$(29)TAB(15)"Operator & QTH: Bob Scott WB8
    JEY"
370 LPRINTTAB(30)"1310 Cheshire Road"
390 LPRINTTAB(30)"Delaware,                    (DELAWARE
    County)
410 LPRINTTAB(30)"OHIO 43015   U.S.A."
430 LPRINTTAB(30)CHR$(30)"Tnx QSO 73    Pse QSL"
470 LPRINT" "
479 IFK=PTHENGOTO500
480 IFPEEK(16425)=>50THENGOTO551
485 I=I+1:GOTO157
500 LPRINTCHR$(11):END
501 END
551 LPRINTCHR$(11):GOTO485
```

contest logs, there seemed to be two improvements needed. One was that it took 45 seconds to print each card, which meant that I had to wait for the printer to finish so that I could enter the data for another QSO. The second was that the date, band, mode, and report were quite often the same for each QSO, in which case I wanted to hit only the Enter key instead of having to type in all of that info for each QSO when it was the same as for the previous one. The first problem was solved by using arrays in the input statements, and the second was done with line 143 in the program listing.

Let's go through the program so that you can modify it according to the amount of RAM and graphics ability of your printer. On power-up of your TRS-80 you are allowed 50 spaces for strings. This will not be enough for this program. In line 40 I have increased to 30000. This line will have to be adjusted according to the amount of RAM that you have available. It will be very easy to see when you have made the number too high—you will see "overflow in line 40" when you try to run the program. If this happens, just reenter line 40 using a lower number. In line 45 I have set the dimensions of the array to enter 100 QSL cards to be printed at one time. However, I would not suggest printing that many at one time, as the more you enter into memory, the longer it takes for the callsign prompt to return. What I do is enter one page from the log book at a time, then print the QSL cards before going on to the next page.

Lines 50 through 140 input the log data for each QSO. After the info for the first QSO is entered, you will see a number in the top right-hand corner of the screen. This is the amount of string space left. Do not take this number down to zero unless you want to crash the program. Under the amount of string space available is the number of QSOs that you have entered into memory. This number will be needed later.

After you have the string memory available and the number of QSOs entered, you are prompted for the next QSO's callsign, then GMT. On the next line you will see a number which represents the date on the previous QSO logged and the date prompt. If the date is the same for this QSO as for the previous one, then all that is necessary to do is to hit the Enter bar. If the date is different, type in the new date before hitting the Enter bar. Use the same procedure for band, RST, and mode.

After you have entered the log data for all the QSLs you want to be printed or the number in the top left-hand corner approaches zero, it is time to print the QSL cards for the QSOs in memory. This is done when you have the callsign prompt by entering "End." You will then get a prompt asking for the number of QSLs to be printed. This number is available from the top right-hand corner of the screen. Just enter that number and the printer takes over, and you can go back to the receiver while the printer is busy printing.

If your printer does not have graphics or elongated or condensed print, you will want to make the following changes in the printing routine. Omit lines 260 and 331. Delete the CHR$(31) in line 190. Next take out all of the CHR$(255) in lines 270, 290, and 310 and delete the CHR$(29) in line 350. If your printer does have graphics and elongated and condensed print, it is possible that the software command, CHR$(N), is different than mine. I suggest you check your printer manual to be sure.

```
                AMATEUR RADIO STATION
                W  B  8  J  E  Y
                W  B  8  J  E  Y
                W  B  8  J  E  Y
                W  B  8  J  E  Y

Confirming The QSO With :

| Station | G M T | Date | Band | RS/T | Mode |
|  XX1XX  |  0000 | DD.MM.YY |  NN  | NNN  |  XX  |

Operator & QTH: Bob Scott WB8JEY
                1310 Cheshire Road
                Delaware,                    (DELAWARE County)
                OHIO 43015  U.S.A.
                                Tnx QSO 73      Pse QSL
```

Sample QSL.

At first I bought 3"×5" tractor-feed forms to print my cards on, but I soon learned that they were too large and bulky. Most of my cards go via the ARRL Outgoing Bureau, and they now charge by the pound, so I am using the lightest weight paper that I have and using the scissors to trim after the printing is done.

This program was written by a novice programmer. I am sure that many of you more experienced programmers can make vast improvements on it. The purpose was to get the seed planted, in hopes that you experienced programmers might come up with some real exotic cards (how about a computer-generated QSL contest, Wayne?), and also to show other novice programmers that perhaps they might be able to come up with a useful program.

This program should be convertible to the BASIC used in other computers. ■

↙See List of Advertisers on page 114

Paul Danzer N1II
2 Dawn Road
Norwalk CT 06851

Get Accurate with the Digital-Grid Power Meter

Your final input power is instantly accessible with this easy add-on.

FCC regulations still require measurement of the input power to a rig. This is normally accomplished by multiplying the plate voltage times the plate current and adding to it a few Watts for screen power and drive power if these are applicable.

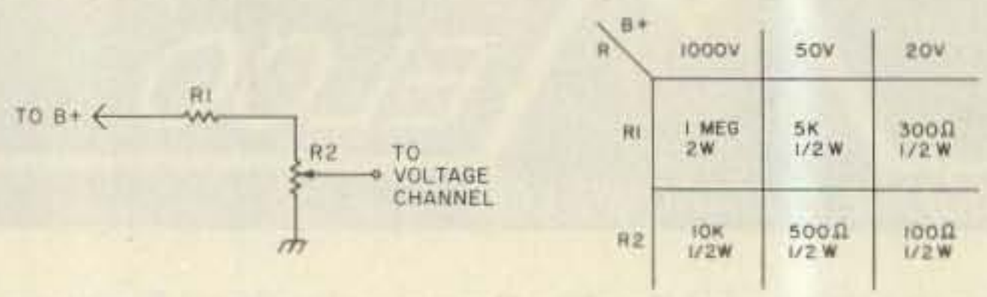
The LED power meter, whose faceplate is shown in Fig. 1, provides a direct readout of the plate or collector input power not only in the tune or key-down position, but also as you either talk on SSB or key the rig in CW. I would not go so far as to claim that it shows peak envelope power—PEP—on SSB, but it comes very close!

The meter operates in a single simple mode. After connection and calibration, simply find the highest LED energized in both columns, trace to the intersection, and read the input power directly. For example, if LED 8A (on the voltage scale) and LED 5B (on the current scale) are the two highest LEDs energized, their intersection tells you that the input power is 400 Watts.

A block diagram of the meter is shown in Fig. 2. Two similar LED voltmeter channels are used, one to measure plate current (or collector current) and the other to measure plate or supply voltage. Each channel is independently calibrated so that the maximum voltage or current it will see corresponds to the highest LED shown. The unit pictured here had the highest LEDs corresponding to 1000 volts and 1000 mA.

The LED voltmeter connected to the voltage-monitoring channel consists of a simple zero-to-1.2-volt sensor. An adjustable voltage divider is used to scale the plate or collector supply voltage to the 1.2-volt range. A similar circuit is used for the current channel, but the LED voltmeter sensitivity is increased so that the approximately ¼ volt (250 millivolts) is the full-scale sensitivity.

A schematic of the meter is shown in Fig. 3. Resistors R1 and R2 are selected according to Table 1 for various supply voltages. Note that R1 is shown mounted in the rig. In this way if the lead from the rig connecting R1 with R2 accidentally shorts



B+ / R	1000V	50V	20V
R1	1 MEG 2W	5K 1/2W	300Ω 1/2W
R2	10K 1/2W	500Ω 1/2W	100Ω 1/2W

Table 1. Voltage channel divider and calibration resistors.

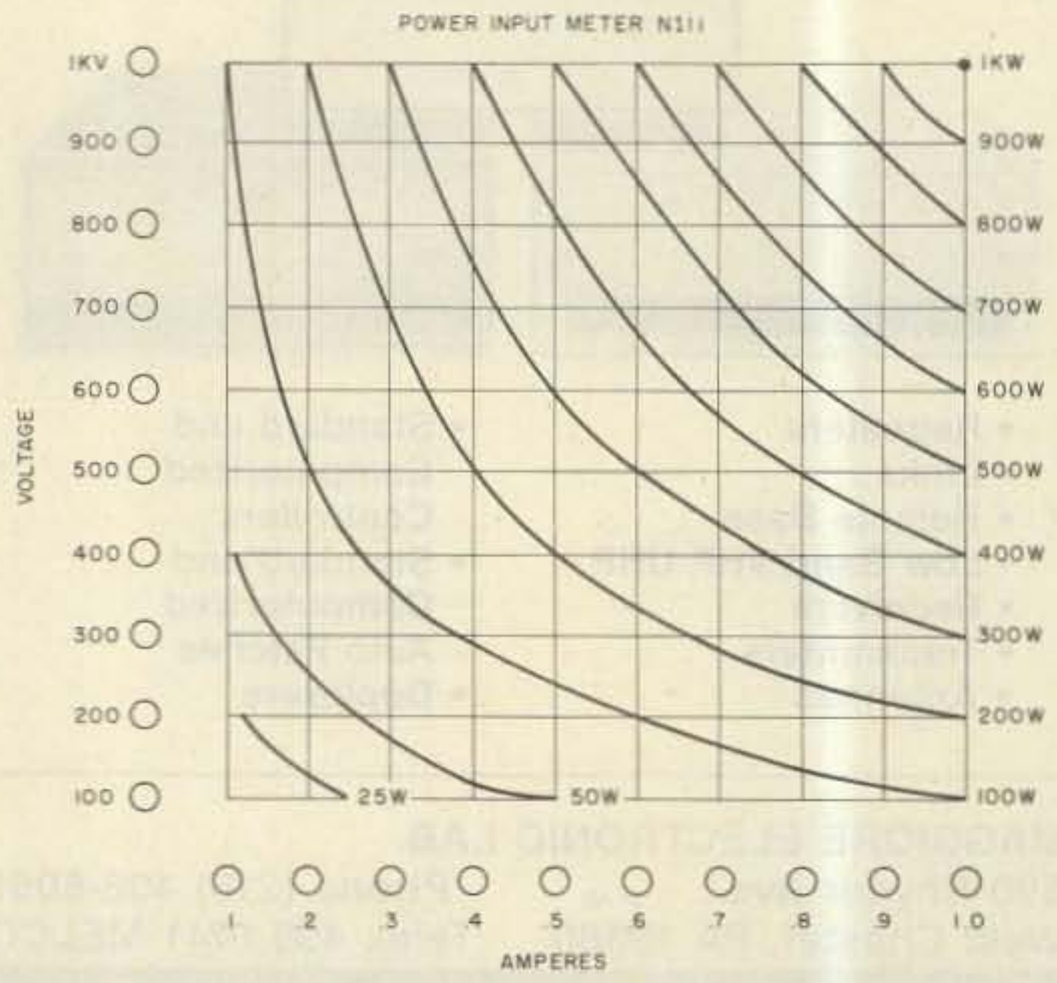


Fig. 1. Faceplate of power input meter.

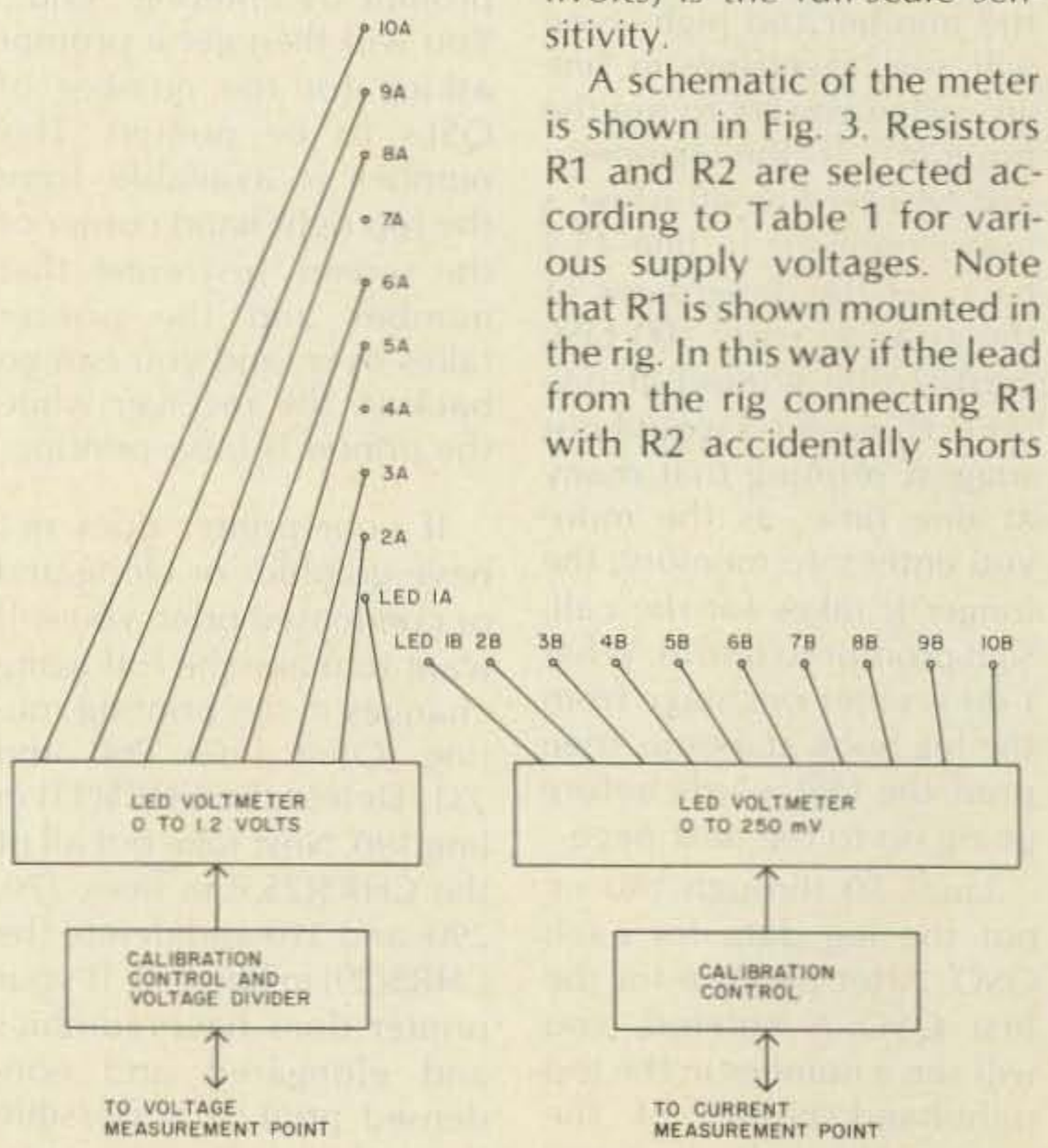
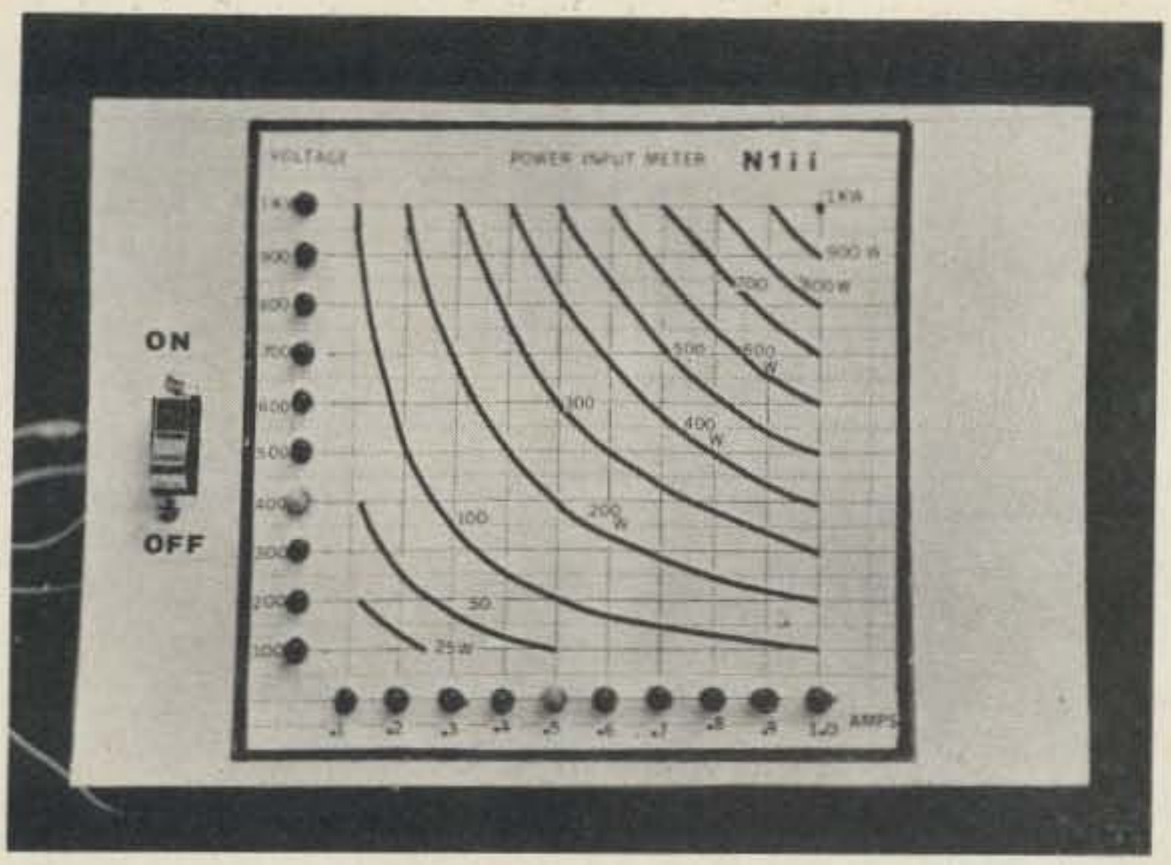


Fig. 2. Block diagram.



Front panel of the LED power input meter. (Photo by Jerry Goldman K1NPE)

to ground, the current drawn will be limited by the value of R1. If you are using a tube transmitter: *CAUTION—HIGH VOLTAGE!*

You will have to look at the schematic of your rig to figure out where to connect the current channel. Most rigs, tube or transmitter, use a meter with one side connected to ground, in which case the current connection lead probably goes to the top (non-grounded) side of the meter. A typical connection is shown in Fig. 4. To check that the connection point you have selected will work, connect a voltmeter between the point and ground. No current should correspond to zero volts and maximum current to at least ¼ volt (250 millivolts).

Construction of the meter is not critical. A 6½" × 6½" plastic panel was used as the faceplate with the two sets of LEDs mounted on ½-inch centers (Fig. 5). To avoid the use of a custom PC board, a general-purpose board such as Radio Shack 276-170 provides a good chassis for construction. As usual, sockets for the two ICs are recommended to aid in troubleshooting, if necessary. The layout used for the breadboard of this meter is shown in Fig 6.

After drilling the holes for the LEDs on the front panel, a piece of graph paper marked with half-inch intervals (such as K & E 10 × 10 to the half inch) is glued onto the plastic for the scales. A clear plastic spray or drawing fixative can be applied to protect the writing.

You can scale the meter to match your rig. As an example, for a typical vacuum-tube rig using 800 volts and around 250 mA, the voltage scale should be left at 1000 volts maximum but the current scale changed to 500 mA maximum. To do this, simply relabel the current scale so that LED 1B corresponds to 50 mA, 2B to 100 mA, 3B to 150 mA, and so on until 100 corresponds to 500 mA.

When you divide the current scale by 2, you must divide the power curve labels by 2. Therefore, the 100-Watt curve is now labeled 50 Watts, the 200-Watt curve relabeled 100 Watts, and so on. If you reduce both current and voltage scales by 2, the power curves go down by 4 (i.e., 400 Watts is relabeled 100 Watts).

After construction, the checkout and calibration should take only a few minutes. Double-check your wiring and look for extra solder splashes, especially around the IC sockets. Disconnect (unsolder) the wires at points X and Y (Fig. 3) and connect both TP1 and TP2 to the 5-volt supply. Set R5 to its midpoint.

Now apply the 5-volt supply and check that you can sequentially light each of the LEDs in each of the channels by turning R2 and R3. Assuming that you can, it means that each channel works and you are ready to calibrate the system.

To calibrate the voltage channel, turn off the 5-volt supply, disconnect the jumper from TP1 to the 5 volts, and reconnect the lead at point X which you previously disconnected.

With the rig off, attach both the ground lead and the B+ end of R1 to either the high voltage of your rig or any other similar high-voltage supply. Take a standard voltmeter and also connect to the same high-voltage supply. Next, turn on the high-voltage and +5 supplies and adjust R2 so that the proper LED is ener-

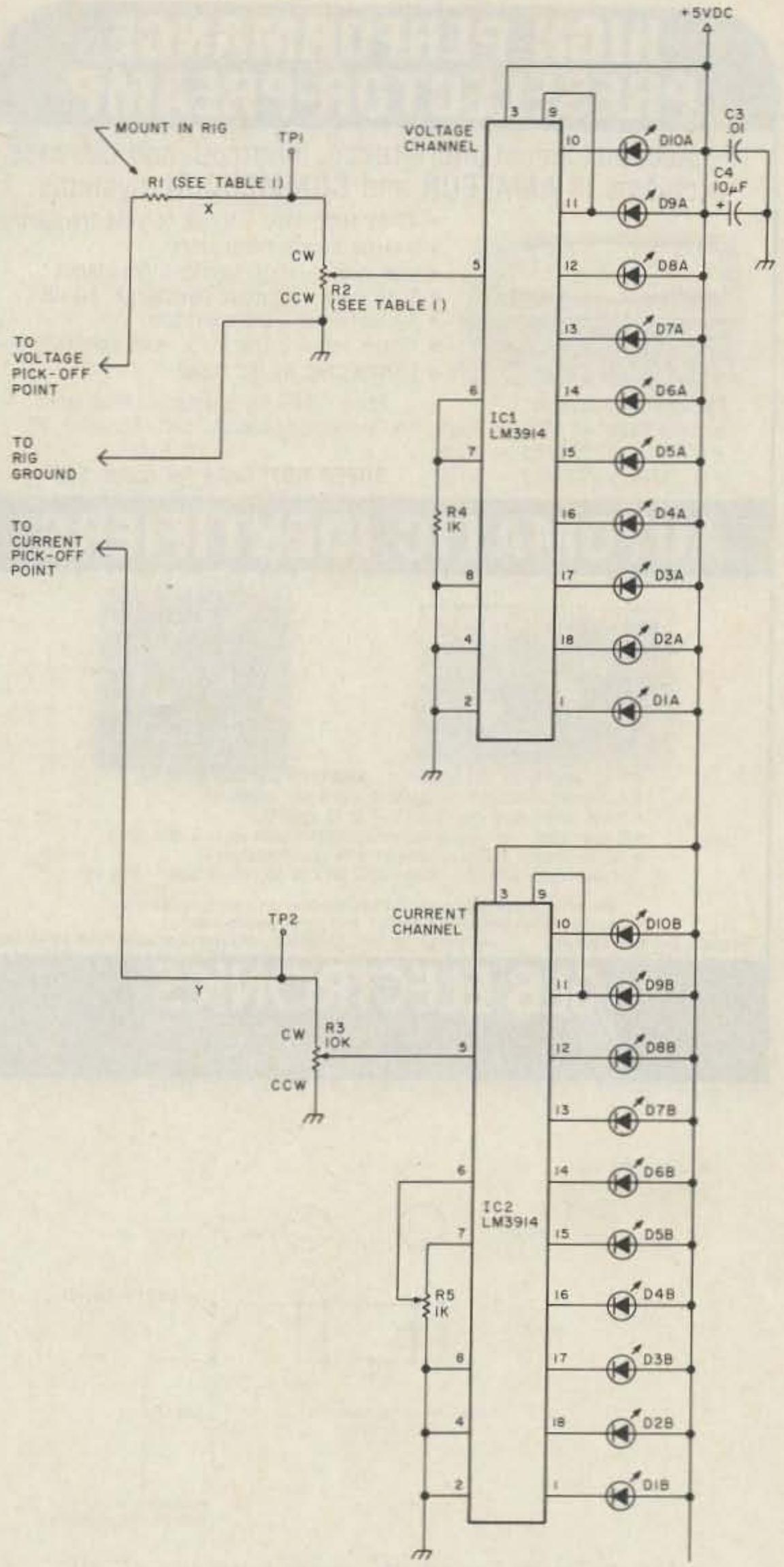


Fig. 3. Schematic. IC1, IC2—LM 3914 (Radio Shack 276-1707). All other resistors ½ Watt. All capacitors 50 V dc.

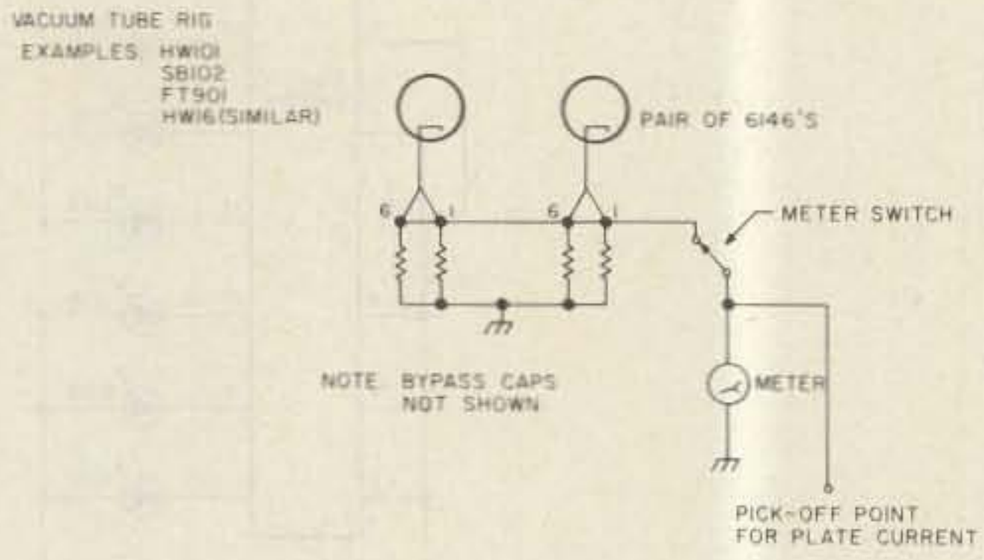


Fig. 4. Typical connections for current pick-off.

gized. As an example, if you use an 800-volt supply, LED 8A (for the scale shown in Fig. 1) should be on. Finally, turn off the rig and the 5-volt supply. The voltage channel is now calibrated.

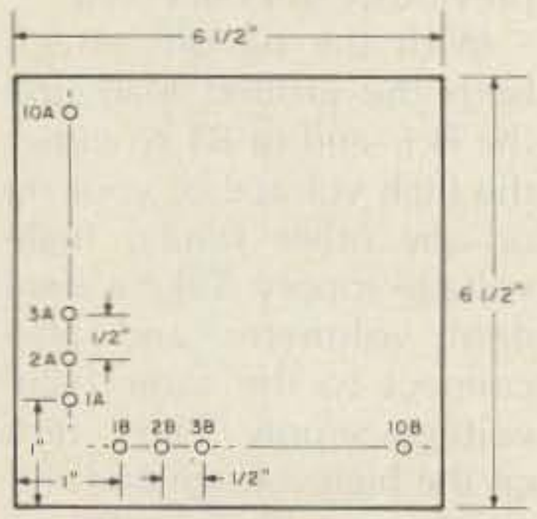


Fig. 5. Front panel layout.

Calibration of the current channel is very similar, but first the sensitivity must be set since the current channel is a 250-millivolt unit rather than the basic 1.2-volt sensitivity of the voltage channel.

Remove the jumper you previously connected from TP2 to the 5-volt supply and jumper TP2 to ¼ volt by building the circuit in Fig. 7 and adjusting the 1k pot so that the voltmeter reads the needed ¼ volt. Turn R3 full clockwise and adjust R5 so that the last LED (10B) is energized.

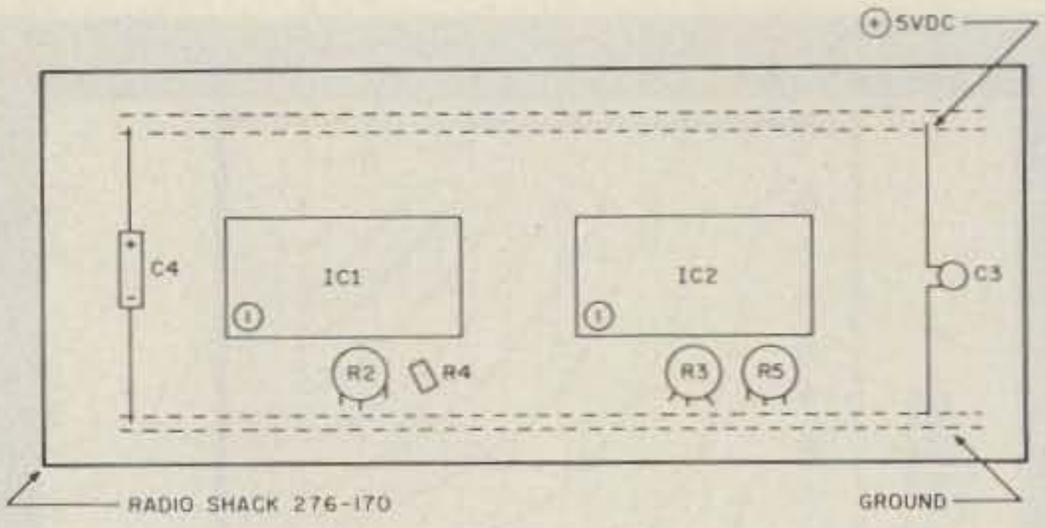


Fig. 6. Top view, mechanical layout.

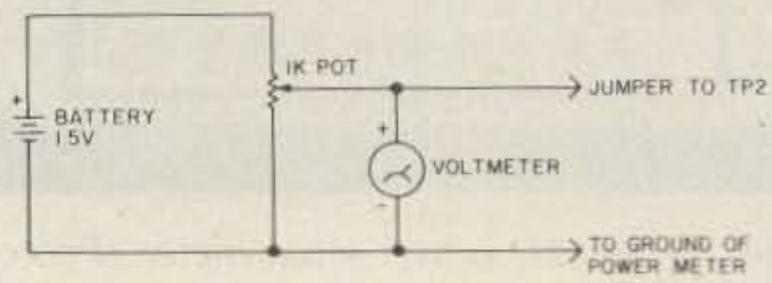


Fig. 7. 250-millivolt source.

Finally, turn off the 5 volts from TP2, reconnect the lead at point Y, and connect the current input to the meter on the rig or wherever you are going to measure current.

The final step is identical to the one you already did for the voltage channel. Turn on both the rig and the 5 volts. Key the rig and measure the plate current using the existing plate-current meter. Set R3 so that the LED corresponding to the current is energized. As an example, if the meter reads around 300 mA, then LED 3B (for the scale shown in Fig. 1) should be on.

Checkout, installation, and calibration are now complete. Simply talk or key the rig, look for the highest LEDs lit, and read input power directly.

If you insist on being very precise, this meter does not account for drive power and uses the plate voltage instead of the screen voltage in measuring the tiny contribution of the screen-input power. However, in most cases you will be within a few percent for vacuum-tube rigs and within 10 percent for transistor finals.

On some rigs the voltage regulation is very poor and you might notice the energized voltage-channel LED changes under current peaks. In this case, the lower of the voltage LEDs shows actual voltage under load corresponding to the power input. Use the highest current LED and the lowest voltage LED to determine the intersection on the scale.

This write-up almost never got finished. The integrated circuits used (LM 3914) are much more fun to play with than to write about! As examples, they can be "chained" or put in series so that 20 or more instead of 10 LEDs can be used to better show the current or voltage. Expanded scales are also possible. If your rig uses about 500 volts, the LED voltmeter in the voltage channel can be set to show 10 or 20 points between 450 and 550 volts for better measurement resolution.

The display can be blinked or can trigger an alarm for over-voltage or over-current; black displays are possible, and either bar- or dot-display modes are available. For further information, you can look at the manufacturer's data sheets from National Semiconductor, and possibly others. ■

ICOM - Check the Big Savings at AES!

HF Transceivers:	Regular	SALE
IC-730 8-band 200w PEP Xcvr w/mic	$829.00	649.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44 455 KHz SSB filter	159.00	129.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
HM-10 Mobile scan microphone	39.50	

	Regular	SALE
IC-740* 9-band 200w PEP Xcvr	$1099.00	949.95

*plus **FREE** PS-740 Internal power supply &
$50 Factory Rebate until 7-31-83

IC-740 Internal power supply	159.00	149.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-44 455 KHz SSB filter	159.00	129.95
FL-45 9 MHz 500 Hz CW filter	59.50	
FL-54 9 MHz 270 Hz CW filter	47.50	
FL-52 455 KHz 500 Hz CW filter	96.50	89.95
FL-53 455 KHz 250 Hz CW filter	96.50	89.95
MB-12 Mobile mount	19.50	
HM-10 Mobile scan microphone	39.50	
IC-720A 9-band Xcvr/.1-30 MHz Rcvr	$1349.00	999.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 KHz AM filter	49.50	
MB-5 Mobile mount	19.50	
IC-7072 transceiver unit, 720A/R-70	112.50	

Common accessories: 720/730/740	Regular	SALE
PS-15 External 20A power supply	$149.00	134.95
EX-144 Adaptor; CF-1/PS-15	6.50	
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
CC-1 Adaptor; HF radio to PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
SM-5 8-pin electret desk mic	39.00	
SP-3 External speaker	49.50	
Speaker/phone patch (specify radio)	139.00	129.95
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile ant w/tuner	289.00	259.95

HF Linear Amplifier	Regular	SALE
IC-2KL 160-15m/WARC solid state linear	1795.00	1299

VHF/UHF Multi-modes:	Regular	SALE
IC-251A* 2m FM/SSB/CW Xcvr/AC ps	$749.00	599.95

***$50 Factory Rebate** until 5-31-83

IC-551D 80w 6m Xcvr	699.00	599.95
PS-20 20A switching ps/spkr	229.00	199.95
CF-1 Cooling fan for PS-20	45.00	
EX-106 FM adaptor	125.00	112.95
IC-451A 430-440 SSB/FM/CW Xcvr/ps	899.00	769.95
IC-451A/High 440-450 MHz Xcvr/ps	899.00	769.95
AG-1 15 db preamp for IC-451A	89.00	79.95

VHF/UHF FM:	Regular	SALE
IC-25A 2m, 25w, up-dn-ttp mic, grn leds	$359.00	319.95
IC-25H as above, but 45 watts	389.00	349.95
IC-25A '82 model; 25w, ttp mic, red leds	349.00	289.95
IC-45A 440 FM xcvr, 10w, TTP mic	399.00	359.95
IC-120 1.2 GHz FM mobile	TBA	
RP-1210 1.2 GHz, 10w repeater	TBA	
IC-22U 10w 2m FM non-digital Xcvr	$299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-471A 430-450 MHz, 10w base	TBA	
RP-3010 440 MHz repeater	TBA	
IC-290H 25w 2m SSB/FM Xcvr, TTP mic	549.00	489.95
IC-560 10w 6m SSB/FM/CW Xcvr	489.00	439.95
IC-490A 10w 430-440 SSB/FM/CW Xcvr	649.00	579.95

VHF/UHF Portables:	Regular	SALE
IC-202S 2m port. SSB Xcvr, 3w PEP	$279.00	249.95
IC-505 3/10w 6m port. SSB/CW Xcvr	449.00	399.95
BP-10 Internal nicad battery pack	79.50	
BC-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
IC-3PS Power supply	95.00	89.95
IC-20L 2m amp, 10w PEP or FM	98.00	89.95
IC-30L 432 amp, 10w PEP/FM	105.00	94.95

Shortwave receiver:	Regular	SALE
R-70 100KHz-30MHz digital receiver	$749.00	649.95
EX-257 FM unit	38.00	
FL-44 455 KHz SSB filter	159.00	129.95
FL-63 9 MHz 250 Hz CW filter	48.50	
SP-3 External speaker	49.50	
EX-299 (CK-70) 12V option	9.95	

HOURS: Mon thru Fri 9-5:30; Sat 9-3
E-X-P-A-N-D-E-D WATS HOURS
Milwaukee **WATS** line 1-800-558-0411 answered evenings until 8:00 pm; Monday thru Thursday.
Please use WATS line for Placing Orders
For other information, etc. please use Regular line.

ICOM Handhelds

The Transceivers. The IC-2A features full coverage of the 2 meter ham band. The IC-3A covers 220 to 224.99 Mhz, and the IC-4A, 440 to 449.995 Mhz. Each comes with BP-3 rechargable battery, AC wall charger, flex antenna, earphone, wrist strap, and belt clip. Accessories are interchangable. Slide on, removable battery pack allows quick change and may be charged while removed from transceiver.

2 meters:		Regular	SALE
IC-2A	.15/1.5w 2m HT/batt/wall cgr	$ 239.50	214.95
IC-2AT	.15/1.5w 2m HT/batt/cgr/TTP	269.50	219.95
220 MHz:			
IC-3A	220 HT/batt/wall cgr	269.95	229.95
IC-3AT	.15/1.5w 220 HT/batt/cgr/TTP	299.95	239.95
440 MHz:			
IC-4A	.15/1.5w 440 HT/batt/wall cgr	269.95	229.95
IC-4AT	.15/1.5w 440 HT/batt/cgr/TTP	299.95	239.95

Hand-held Accessories:	Regular
BC-25U Extra 15-hour wall charger	$10.00
BC-30 1/15-hour drop-in charger for BP-2/3/5	69.00
BP-2* 450 ma, 7.2v 1w extended time battery	39.50
BP-3 Extra standard 250ma 8.4v 1.5w battery	29.50
BP-4 Alkaline battery case	12.50
BP-5* 450 ma, 10.8v 2.3w high power battery	49.50
**BC-30 required to charge BP-2 & BP-5*	
FA-2 Extra 2m flexible antenna	10.00
CA-2 Telescoping ¼-wave 2m antenna	10.00
CA-5 ⅝-wave telescoping 2m antenna	18.95
CA-3 Extra 220 flexible antenna	9.12
CA-4 Extra 440 flexible antenna	9.12
CP-1 Cigarette lighter receptacle charger for BP-3	9.50
DC-1 DC operation module	17.50
HM-9 Speaker/microphone	34.50
LC-2A Leather case without TTP cutout	34.95
LC-2AT Leather case with TTP cutout	34.95
ML-1 2m 2.3/10w HT amplifier (Reg. $89)	SALE 79.95
ML-25 2m 20w HT amplifier (Reg. $199.50)	SALE 179.95

Marine band:
IC-M12 12 ch Marine hand-held **SPECIAL $199.95**

Misc. accessories:	
24-PP 24-pin accessory plug	$ 4.00
BC-10 Memory back-up; 551/720/730/740	8.50
BC-20 Nicads & DC-DC charger for portables	57.50
BU-1 Memory back-up; 25A/290A/490A	38.50
EX-2 Relay box w/marker; 720A/730/701	34.00
HM-3 Deluxe mobile mic, specify radio	17.50
HM-5 Noise canx mobile microphone, 4 pin	34.50
HM-7 Amplified mobile microphone, 8 pin	29.00
HM-8 Touch-tone mic; 255A/260A, 8 pin	49.50
HM-10 Scan mic.; 255A/260A/290A/25A	39.50
HM-11 Scan mic.; 490/25A/290A	39.50
HM-14 Scanning/TTP mic; IC-25A/45A	49.50
SM-2 4-pin electret desk microphone; 551D	39.00
SM-5 8-pin electret desk mic.; 251A/451A	39.00
Mobile mount, specify radio	19.50

MasterCard VISA

Order 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 — Associate Store

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

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

CLEARWATER, Fla. 33575
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

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

See List of Advertisers on page 114

Daniel J. Graham WA6CNN
25173 Van Leuven Street
Loma Linda CA 92354

Diary of a Partially-Sighted Ham

Eyesight is not a black and white issue.
Here are some tips for hams in the grey area.

"Stand by a second; let me get my nose down to my S-meter and I'll give you a signal report."

As a partially-sighted ham, I've said this and several other standard phrases many times as I've gone to special lengths to operate my gear. Just for reference, my vision is rather limited. I am totally blind in my left eye and have about 20/400 vision in my right (that's with glasses; without them, forget it).

In amateur radio, as in everyday life, most people think of eyesight in a binary way: either a person has it or he doesn't. The issue of eyesight, however, is not black and white. It is, in fact, a continuum of greys. Partial vision can range from slight nearsightedness to resolution loss so severe that the person can read only foot-high letters at eight inches. Much has been written for the blind ham, and that is as it should be. I write here for the partially-sighted ham, the one who, even with glasses, cannot read easily, cannot drive, or cannot recognize people at any distance.

The partially-sighted, as a rule, do not like to be treated as though they were totally blind, because they are not. At the same time, they cannot function as a fully-sighted person, because they are not. Being an amateur with partial vision has presented some rather unique problems and some rather intriguing solutions.

There are five basic areas where the partially-sighted ham needs assistance: reading meters, reading frequencies, reading controls, logging, and QSLing. There are two methods for making these easier to deal with for the amateur with partial vision: Make it larger or make it brighter. Let's look at each of the areas of difficulty with these solutions in mind.

Reading Meters

It seems as though the entire hobby revolves around what any one of several meters reads. There are antenna-rotor meters, S-meters, swr meters, etc. With few exceptions, one must be able to read them to practice the hobby successfully. To read the meters on my Yaesu FT-101B and my rotor, I use a large five-cell flashlight, a police model equipped with a very bright beam. That extra illumination is enough for me to judge the relative position of the needles. If, however, I need an exact reading, I use magnification. At the Rand Corporation, about twelve years ago, Dr. Samuel Genensky developed a simple method for the partially-sighted person to get a lot of magnification at distances from six inches to many feet. This is useful if you cannot or don't want to get your nose right next to something. The idea is to take a small hand-held telescope or pair of binoculars and bring the focus much closer than it normally is. To do this, you simply place a positive lens over the objective end of the instrument. What I have done is take a Bushnell Minocular telescope, which is an 8×20, only four inches long, and mount a positive three diopter lens at the end.

I took the supplied lens cap and cut the entire top of it out, leaving just the sides and a one-eighth-inch lip at the top. I obtained a lens of the proper size from Edmund Scientific Co., glued it on the cap, and slid it over the end of the telescope. Now I have an eight-power telescope that is in sharp focus at seven inches. Exactly what the optometrist ordered. As you vary the power of the lens you place over the end of the scope, you change the distance where it comes into focus. I have another telescope that fits the same purpose; however, it is a ten-power and manufactured especially for the partially-sighted. This instrument focuses from nine inches to infinity with a very long-range focuser. It is available from Sam Walters Optical, 412 West Sixth Street, Los Angeles, California 90014, and costs about $75.

Back to meters. Using my scope I can read any meter as accurately as I need to. There is another way to read a meter—bring it closer. An swr meter with a remotable head is particularly useful.

Reading Frequencies

On my rig, with no digital readout, I use my flashlight or telescope. The newer digital rigs are of special advantage to the partially-sighted ham. With these there is no guesswork as to your frequency. The transceivers with green displays are more visible than ones with red digits. Green is much easier to see. Some of the digital rigs are also broadbanded; it

is wonderful because tuning up a radio is one of the more difficult tasks for the partially-sighted operator.

If your vision is bad and, like me, you are stuck with an older non-digital rig, you can use either more light or more magnification. Calibrating the radio accurately is a bit tricky, but with the telescope it is easily accomplished. I cannot emphasize enough the value the telescope with the add-on lens has been to me and many other visually-handicapped people I know. I strongly urge hams with visual difficulties to get one.

Reading Controls

Here the partially-sighted ham can come into his own. Any person with limited eyesight has had to memorize many different things that a normally-sighted person never thinks about. For instance, I have memorized the touchtone™ pad on my telephone. No big deal, you say. Well, I am the only person I know who can dial one without looking at the phone. If you have vision problems, you have probably already memorized all the controls on your radios. It's easy and a little operating time will let them into your mind. Again, the telescope or magnifying glass will make them large enough to see and memorize.

If you want to know the position of a rotary control, simply place a small piece of tape on the mark on the knob. This will allow you to feel the control's position without having to strain and look.

Logging

Thanks to the FCC's relaxed logging requirements, logging is not too difficult. You must always log all third-party traffic, though. What I did was get a printer to prepare me a pad of paper with very heavy lines that were spaced about three-quarters of an inch apart. They are ruled the long way on fourteen-inch paper. You may be able to use a regular log book, but if not, try this alternative.

This brings up reading and writing. There are a number of ways a partially-sighted amateur can write and read books and QSLs. The most inexpensive and easiest is to use a magnifying glass of some sort. I wear glasses, so I found a small jeweler's magnifier that fits over my glasses. It is eighteen power and allows me to read anything I want or need. Magnifiers come in a plethora of sizes and powers. The Jensen Tool Company of Mesa, Arizona, and US Business Specialties, 34848 Yucaipa Blvd., Yucaipa, California 92399, both carry a large line of jewelers' loupes for use with and without glasses.

Another key to logging and writing in general for the partially-sighted amateur is to use a writing instrument which produces writing you can see. I cannot see pencil writing at all and cannot see ball-point very well. The new generation of broad-line pens is just the item for us. Pens like the Flair, Pentel, and Pilot are heavy-lined and easy to see. If you still have difficulty, use a marking pen and have the printer make even wider lines on your log forms. It's nice to have the printer make up some forms for traffic handling, too. I cannot use the standard ARRL traffic forms, so I had one blown up four times as big. They are a bit cumbersome, but they get the job done.

QSLing

The problem a partially-sighted ham is most likely to run into with a QSL card is size. Most of the cards are just too small for you to write your information on the back if you write with large letters or use a heavy-lined pen. My solution was to get my local printer (he gets a lot of business from me, as you can guess) to make me some cards with large enough spaces to write in. The maximum size a card can be and go through the US Mail is 4.25" by 6". That's a pretty good sized card.

If you have a computer, you might get creative and have the computer place all the information on your card, leaving no writing for you. By the way, the telescope I mentioned earlier is perfect for reading a CRT or computer printout.

VHF and UHF

For the partially-sighted ham, VHF and UHF are a virtual snap. It is now rare to find a rig for these bands that doesn't have a digital readout. Beware, though, for some radios have automatic dimmers; if you get too close and cast a shadow over the display, it will dim, making it even harder to read. I've found that the best radios for two meters are those with separate controls for megahertz and hundreds and tens of kilohertz. With these you don't even have to see the display—just count the clicks! The radios with one-knob frequency control aren't as easy, but they still have clicks to count for the person who cannot easily see the display.

For the visually-handicapped ham, the hand-helds are a boon. Since we, for the most part, cannot drive, we don't have mobile rigs. Don't hesitate to use your HT in others' cars and on buses.

Speaking of HTs, some of the new synthesized ones are wonderful for the partially-sighted ham and others are a real pain. The ones with the LCD and LED displays are fine rigs (many features, etc.), but they are hard to read if you have low vision. Much easier, although with fewer functions, are the synthesized hand-helds with thumbwheel switches. Even though I cannot see the numbers on my Tempo S-5, I have no trouble dialing up frequencies by counting clicks (as long as I remember where I was when I started clicking).

Construction

I have only ventured into the areas of construction a little. There are some drawbacks to using a soldering iron an inch from your nose. I have found, however, that wire-wrap methods are quite useful and can be handled by someone with low vision. Dealing with high voltages can be a problem; if you are careful, *very careful*, you can handle the problem. The new digital multimeters are great for the partially-sighted ham. One other thing: Keep especially good tabs on polarities; if you mix up plus and minus with several hundred volts dc, you've got problems.

When it comes to construction, I have little real advice. I do very little but I know totally-blind and severely-handicapped hams who do a large amount of building. You must judge your own vision limits and act accordingly.

Conclusions

The world of amateur radio is particularly suited to the partially-sighted and blind. They cannot participate in other forms of entertainment as readily as those with normal vision. There is nothing wrong with their ears or voices, however. From AM to SSTV, the entire spectrum of ham radio is open to the partially-sighted ham. In emergency work, ARES, RACES, and with Red Cross, we make wonderful base stations. If you are partially-sighted and have been limiting yourself, stop it! Your only limit is what you make it.

If you know someone who has low vision, interest them in amateur radio; they will discover an entire world that they don't have to strain to see. ■

Hot-Spot Metering– Automatically!

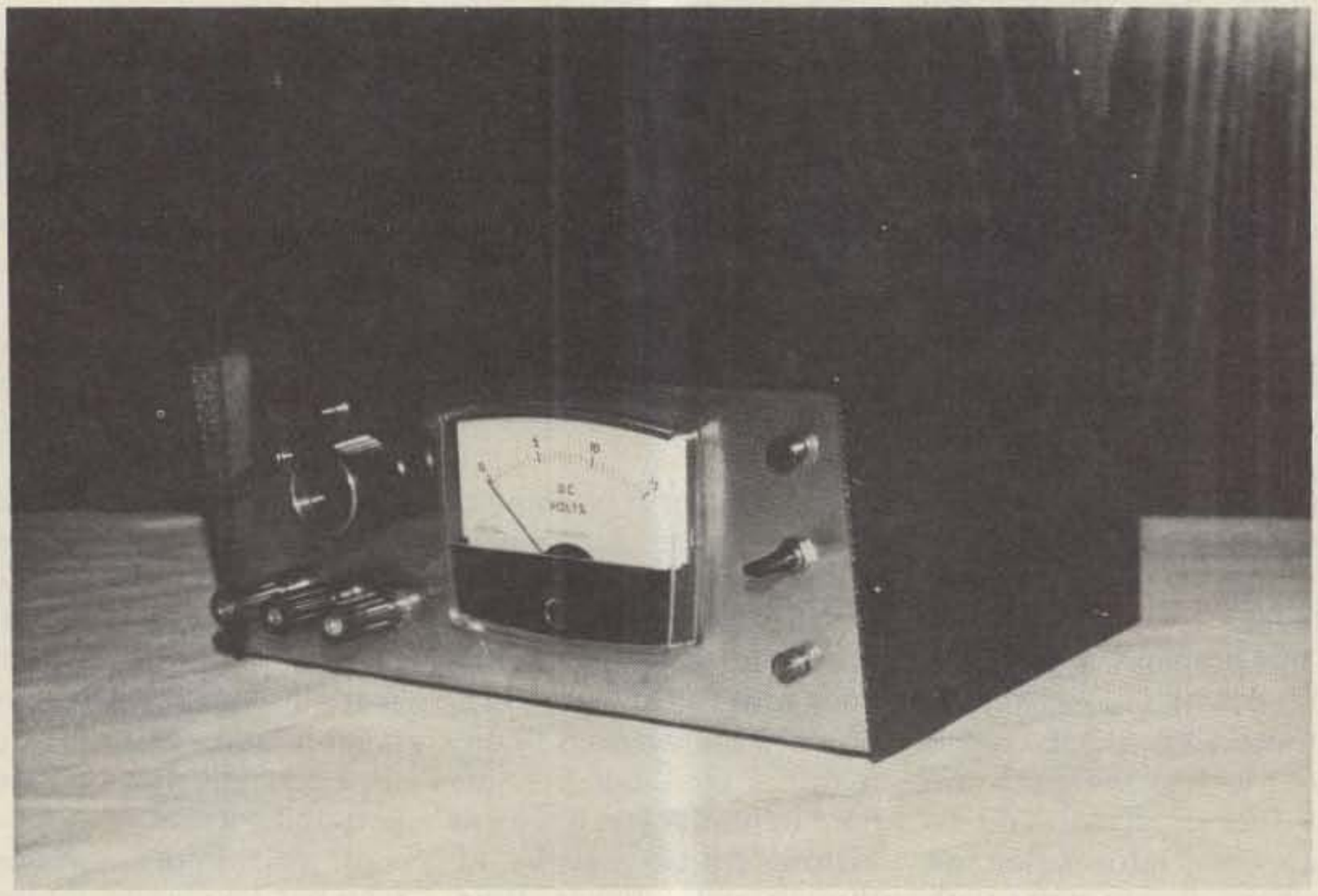
Here are money-saving designs that will let one meter do the work of several. Keep in control and keep your change, too.

L. B. Cebik W4RNL
5015 Holston Hills Road
Knoxville TN 37914

Metering is one of the best ways to monitor the operation of almost any piece of equipment in the shack. However, meters have two faults which have suppressed their use in home-brew ham gear: They are expensive and they are large. Even the least expensive panel meters cost eight to ten dollars each, and surplus meters in the correct range and size run as much or more. If that were not enough to cut down our use of them (and it is enough), meters also take up large areas of panel space. In this age of miniature electronics, we often do not want to waste space for just a few meters. There are a few lines of tiny meters, but they are hard to read.

There are compromises. We can, as do most equipment manufacturers, use one meter and manually switch functions. However, this option also has drawbacks. Ordinarily, we leave the meter set to register the most important value—relative output or plate current, for example—and we hardly ever look at the remaining values. Something can go very wrong inside a piece of equipment, and we might not know it until much too late.

If only we had a meter which could switch itself automatically from function to function, we could keep track of all parameters without raising a finger. We might also add a switch to lock the meter on a single reading in order to make adjustments. Ideally, when we returned the switch to Auto, the cycle would pick up where it left off. The circuit for accomplishing this trick should be fairly simple, or at least straightforward, so that we can adapt it to any number of devices we might build. But, alas, this is probably too much to ask of a circuit.



An external view of the dual-voltage power supply shown in Fig. 2. The meter alternately reads the positive and negative voltages, while the LEDs to the right indicate which reading is on the meter scale. The switch between the LEDs permits the user to lock the meter onto the desired voltage.

Automatic Meter Switching

In fact, the trick is easy to perform. With a combination of ICs—CMOS digital, linear, and op amp—and transistor switches, we can develop any number of switching schemes for meters. Fig. 1 shows in block form what we need. First, there is a clock to control the cycling period. Since we want to allow the meter needle to settle down so

that we can read the value clearly, something around 3 to 4 seconds per reading is desirable. We will need a pulse output to control the selector stage. On the whole, this looks like a job for the old reliable 555.

The second step is to select the metering circuit which will be read by the moving needle. Some form of a 1-of-N selection device or circuit will do the job. If we have only two values to monitor, a flip-flop would do. For more than two, there are selector chips such as the CMOS 4017 and 4022. I doubt that we would need more than 8 or 10 readings from one meter. In addition to selecting the circuit for the meter to read, this circuit should present the proper pulse to the next stage.

The next stage is a trigger for the transistor switches. At this point, we should be able to stop the cycle at any time for manually selected readings and then return to the automatic mode. These extra features may require one or two more chips, but the circuit design should not be difficult.

If we want to select voltages of opposite polarity, then the problems call for a slightly different technique. We will need to trigger switches that respond to different polarity voltages, and thus the standard high and low of digital ICs will not be the easiest route to follow. However, a digital output can drive an op amp to both positive and negative limits, and we can then use these pulses for our switches.

The final step is a series of transistor switches to connect the meter to the right metering circuit at the right time. The switches must be able to handle the voltages and currents involved, but there are techniques to keep these to a minimum so that a 1-milliamp meter can read almost anything we want to monitor. Also, we must ensure that one switch goes off before the next goes on, so that the meter sees one value at a time. Depending upon what we are monitoring, if the meter sees two values at once, we might end up with a bent needle, a fried meter, a blown fuse, or equipment destruction. Care in selecting our meter-switching circuits can overcome this potential problem. In some cases, we may also have to design some compensation into the circuit to cover slight losses in the transistors or in some other components. In most instances, these compensatory measures are simple.

In order to see these prin-

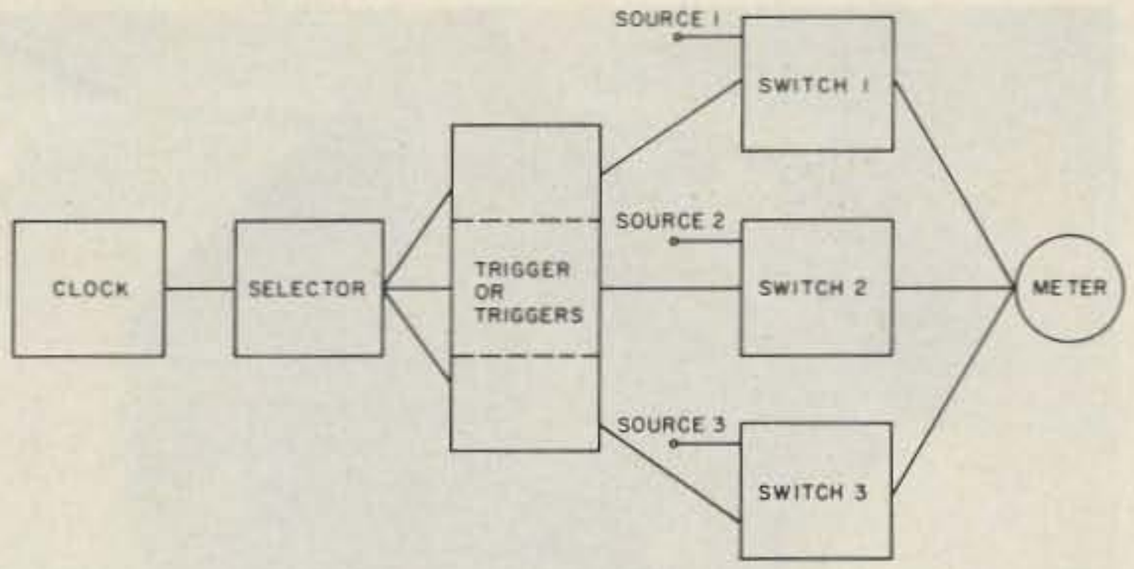


Fig. 1. Block diagram of an automatic metering system.

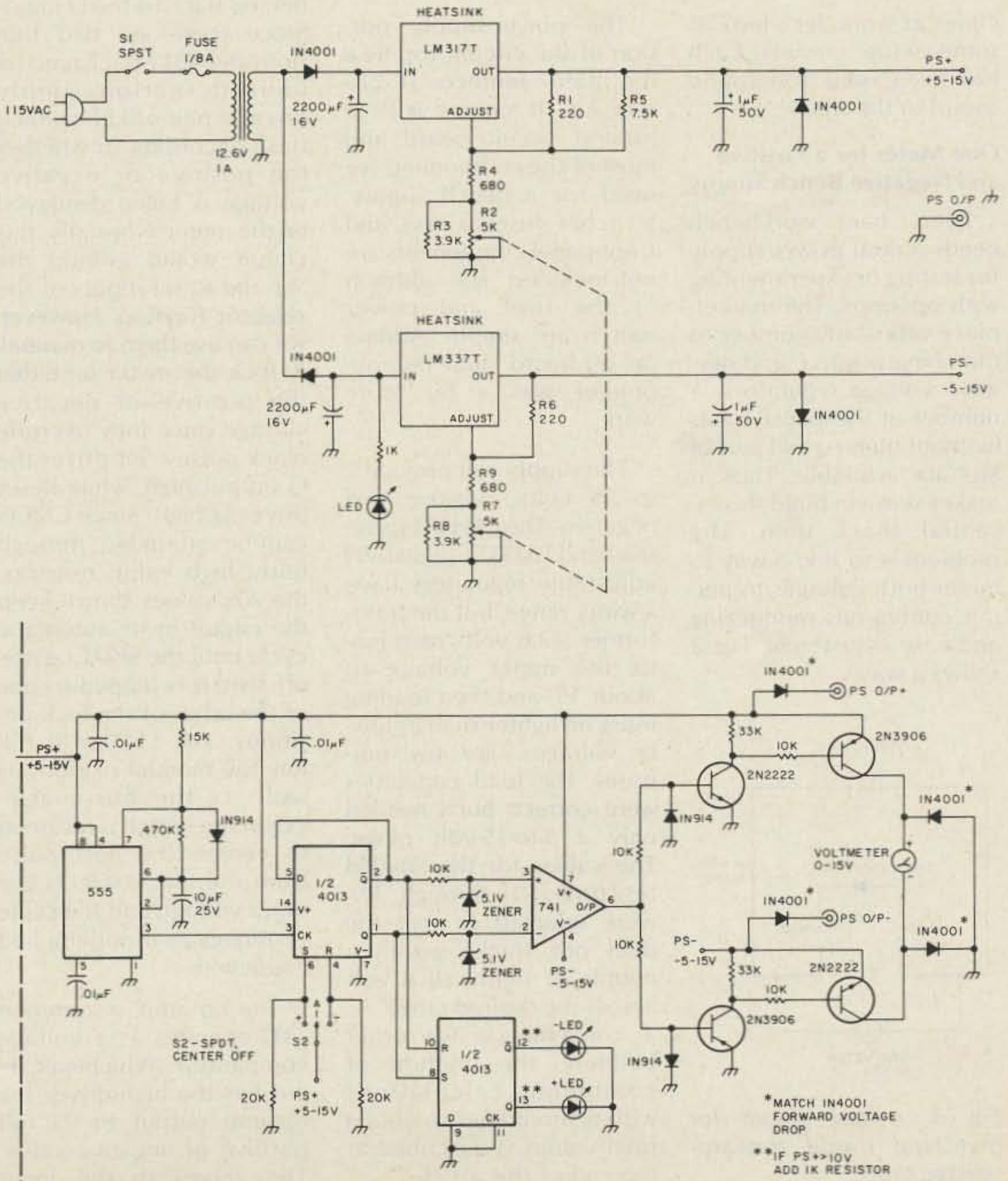
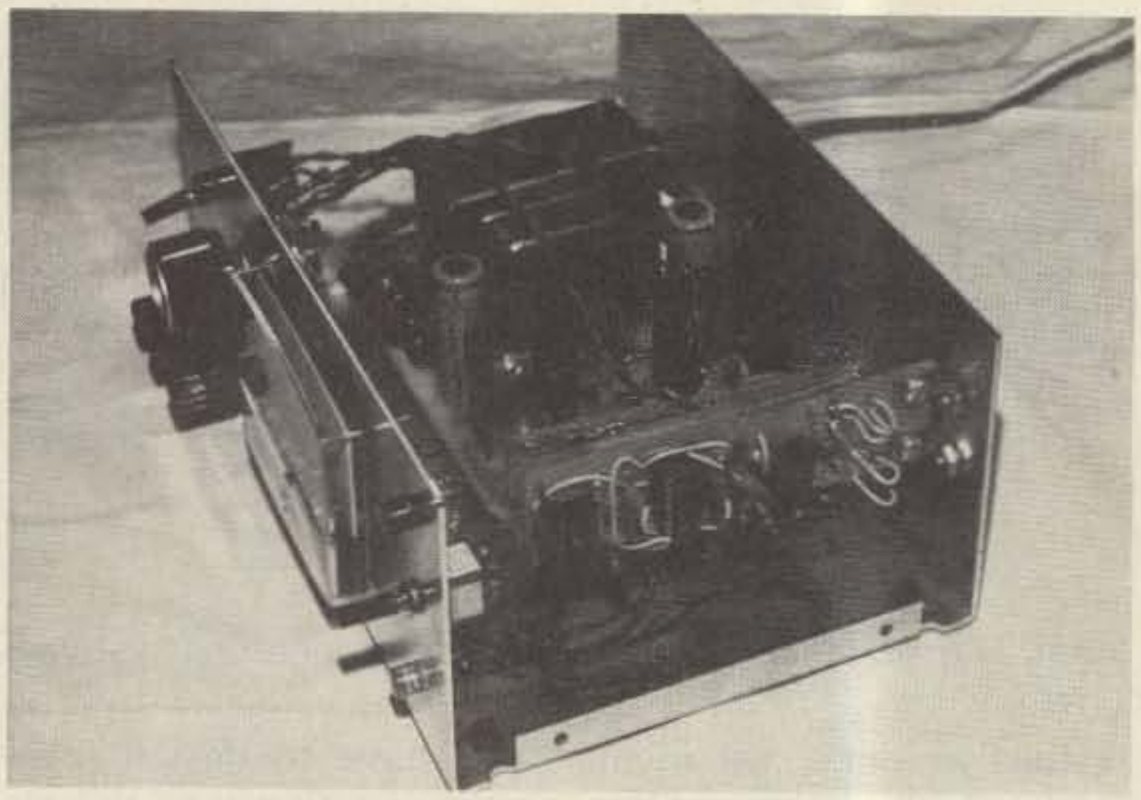


Fig. 2. Circuit of a dual power supply with automatic meter switching. All resistors ¼ Watt. 1N4001—50 piv, 1 A. 1N914—silicon signal diode. LED—color to taste. Basic power supply—modified Jameco JE-215. 2N2222—40-V, 100-mA NPN. 2N3906—40-V, 100-mA PNP. S1—SPST toggle. S2—SPDT center-off toggle. R2, R7—dual 5k pots.



An interior view of the dual-voltage power supply. The power components are in the background, while the double strip of perfboard in the foreground contains the metering circuit. The forward board holds the ICs, while the second board contains the transistor switches. Construction is noncritical, and any convenient layout will work.

ciples at work, let's look at some actual circuits. Each has been tried and found useful in the shack.

One Meter for a Positive and Negative Bench Supply

Every ham workbench needs a dual power supply for testing or experimenting with op amps. The marketplace offers any number of matching positive and negative voltage regulators. A number of inexpensive kits (without meters) and partial kits are available. Thus, it makes sense to build this essential shack item. The problem is to find a way to meter both voltages to permit continuous monitoring and easy adjustment. Fig. 2 shows a way.

Fig. 3. A test circuit for matching diode forward-voltage drops.

The power-supply portion of the circuit, top, is a modified Jameco JE-215 semi-kit. It comes with a printed circuit board and most of the components we need for a bench supply. Switches, fuses, a case, and front-panel components are not included. The addition of the fuse and power switch are simple. Adding an off-board dual potentiometer was a bit more work.

The supply will provide 2 to 15 volts, positive and negative. The LM317T (positive) and LM337T (negative) adjustable regulators have a wider range, but the transformer (12.6 volts rms) limits the upper voltage to about 15, and then loading must be lighter than at lower voltages. For my purposes, the load capacities were correct, but I needed only a 5-to-15-volt range. The values for the labeled resistors, R1 through R9, were selected so that the dual pot tracks within a couple of tenths of a volt across the desired range. As a convenience for other builders, the method of combining calculations with test readings to obtain final values is described at the end of this article.

The metering circuit appears at the bottom of Fig. 2. It consists of a clock, a selector flip-flop, an op-amp switch trigger, a pair of two transistor switches, and the meter itself. As predicted, the clock is a 555, timed to give a brief positive pulse every 3.5 seconds. The diode across the 470k resistor allows the 15k resistor to control the positive pulse, while the off time is dependent upon discharging the 10-uF capacitor through the high-value resistor in this astable circuit.

The pulses clock the CD4013 D-type flip-flop, causing the Q and $\overline{Q}$ outputs to alternate, because the $\overline{Q}$ output is also connected back to the D input. Since there are two flip-flops per 4013 package, the unused section simply drives a pair of LEDs which flash according to whether the positive or negative voltage is being displayed on the meter. Normally, this circuit would ground the Set and Reset inputs of the selector flip-flop. However, we can use them to manually lock the meter on either the positive or negative voltage since they override clock pulses. Set drives the Q output high, while Reset drives $\overline{Q}$ high. Since CMOS can be grounded through fairly high value resistors, the 20k values shown keep the circuit in its automatic cycle until the SPDT center-off switch is flipped to one or the other of the lock positions. The LEDs will follow the manual readout as well as the automatic. When the switch is returned to center, the next pulse from the clock selects the other voltage and the cycle continues as if nothing had happened.

The op amp, a common 741, operates as a voltage comparator. Whichever input has the high drives the op-amp output to its full positive or negative value. The zeners in the input leads of the op amp limit the voltage, since only a distinct difference is needed to flip the op amp. The high-low contrast between the outputs of the 4013 more than suffices, and since they change together, proper comparator action would be guaranteed even if the difference were much less.

The op-amp output simultaneously feeds two switching circuits which are mirror images of each other. The 1N914 diodes at the first transistor bases eliminate opposite polarity excursions, hence the need for the 10k input resistors to the transistor switches. In fact, the switching circuits have been optimized on a breadboard to use the least current while still permitting clean switching with almost any replacement transistor. The transistors shown are available from numerous sources, but any 40-volt, 100-mA transistors will work. If there is a significant voltage drop across the output transistor for either circuit, decrease the base resistor of the output transistor (10k), then reduce the collector resistor of the input transistor (33k), or try another output transistor.

Using a two-transistor switch for each of the voltages is necessary. First, op-amp output voltages often do not rise to the level of the supply voltage. However, if the output transistors are to be cut off, the base voltage must be very close to the supply voltage. Using an input transistor switch solves this problem. Second, the meter must be isolated from the line by the switch, and one switch must be off before the other comes on. This circuit achieves both results with relative simplicity.

The meter itself appears to be connected across the collectors of the output transistors. However, the diodes to ground complete

✓See List of Advertisers on page 114

the voltage-reading circuit for each of the supplies. Thus, you can think of the meter as being in two separate circuits which do not interact. The 1N4001 diodes do introduce between .5 and .6 volts error in the meter reading. To correct this, we might design a complex compensating circuit. In this case, simplicity is serendipity. The 1N4001 diodes in the power-supply output, forward-biased, lower the voltage by just the same amount so that the meter is accurate with respect to the voltage reaching the outside world. Since small power diodes (anything with a 50 piv rating will do) are available at many for a dollar, matching four within a tenth of a volt is easy. Fig. 3 shows a test circuit for doing this job, although many new DVMs have a special resistance position that will reveal the forward drop of diodes.

The circuit is adaptable to many other applications. The ICs will all operate with supply voltages from 5 to 15 volts (positive and negative for the op amp only). Fig. 4 shows three different ways to power the circuit. The scheme labeled (a) was used in this supply, its only negative aspect being that the brightness of the tracking LEDs changes with the supply voltage. For voltages higher than 15 or lower than 5, (b) and (c) show ways to tap unregulated voltage and use zeners to supply the ICs. For voltage limits between 15 and 18, (b) is convenient, requiring one less zener diode. All the ICs in this application draw negligible current, allowing fairly high values for the zener dropping resistors. Since only the switches need to see the actual supply voltage, you can run the ICs at any value recommended in the spec sheets. If the op-amp output voltage runs too far above the supply voltage to the input

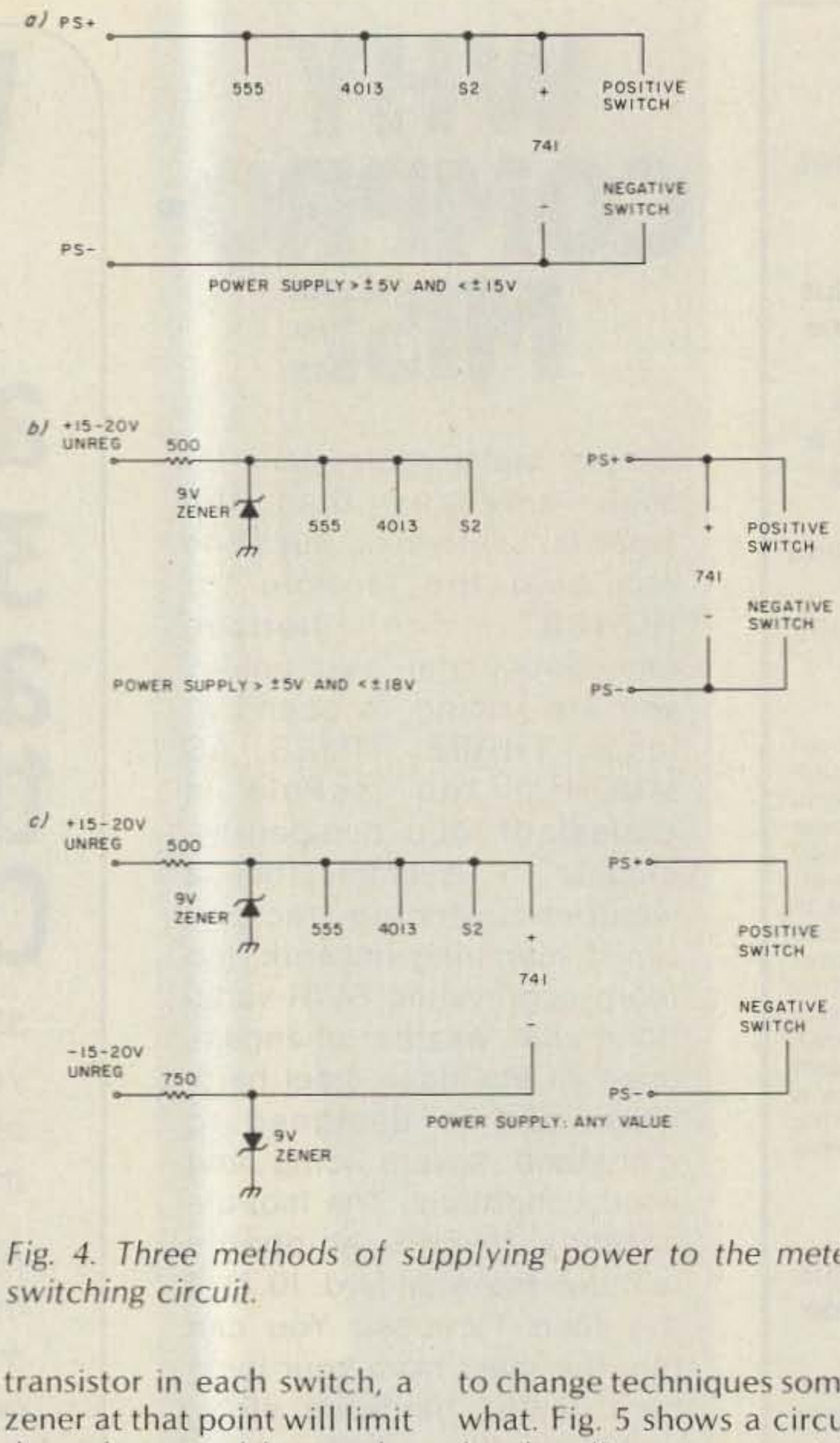


Fig. 4. Three methods of supplying power to the meter-switching circuit.

transistor in each switch, a zener at that point will limit the voltage and hence the base current.

Construction is noncritical. The photograph of the supply shows the use of two strips of perfboard—one for the ICs, the other for the transistors. T46 vector pins hold the boards together, with insulation material between. Besides its compactness and the fact that I was able to use up some scraps of perfboard, there is nothing in particular to recommend this form of construction. However, note that not only are the ICs in sockets, but so too are the transistors. Eight-pin IC sockets work very well for low-current pairs of switching transistors.

One Meter for Many Readings

In order to switch more than two voltages, we need to change techniques somewhat. Fig. 5 shows a circuit for handling up to eight voltage readings on one meter. Despite appearances to the contrary, the circuit is similar to the earlier one. We begin with a 555 clock to provide counting pulses at 3.5-second intervals. Instead of using a flip-flop as our selector, we insert a CD4022 one-of-eight selector. This counter is simply a string of flip-flops, the output of each coming on in turn and going off as the next one comes on. If we need fewer than eight readings, then we cut the count short. Suppose, as in the schematic, we need 4 readings. We use outputs 0 to 3 to turn on the switches. Output 4 is coupled to the Reset pin via a capacitor. The very brief pulse returns the counter to output 0 (our first reading) without any significant delay or meter needle lag. For some other interesting switching possibilities, see WA2FPT's "No More Rotary Switches" (*73*, September, 1979, p. 118).

Between the 4022 and the switches, we insert a hex buffer, the CD4503. We need this device in order to be able to lock the meter manually in case we wish to make adjustments. The 4503 is a tri-state device; that is, it acts as a normal buffer when the Enable pin is low. When the pin is high, the buffer outputs are effectively open circuits (more correctly, very high impedance circuits), unaffected by and not affecting anything else on the output lines. This is ideal for manual switching. We place a high on the Enable pin and simultaneously turn on the desired switch so that the meter reads the desired voltage. At the same time, we also place a high on the clock Enable pin of the 4022, which locks its output wherever it last was. Then, when we return the switch to the Auto position, the readout cycle picks up just where it left off.

Note that the clock pulse is guided to the 4503 Enable pin through a diode (and is isolated from the 4022 Enable pin by another diode). The function of this system is to ensure that one switch goes off before the next comes on. The delay is of the order of .1 second, so that the meter needle drops about a third of the scale before rising to the next measurement. By reducing the 15k resistor in the 555 clock circuit (about 2k minimum), we can reduce the pause almost to the point where the needle will not react to it. However, we do preserve meter isolation as we move from voltage to voltage.

Because there are no usable leftover IC sections, we have to add a hex buff-

YOUR SICK RADIO NEEDS US!

We're the High Technology Service Center and we specialize in 2-Meter FM transceiver repair. We have the expertise, trained staff, and equipment for this because we have been the national authorized warranty and non-warranty Azden service center for many years now. But now, for the first time ever, our service facilities are open to other brands of 2-Meter FM transceivers. Our expert staff of trained technicians have been trained to service the models specified below, and all major replacement parts for these models are now in stock. So don't hesitate to make your sick radio better. Send it to the specialists - High Technology Service Center.

Models we are now accepting

Kenwood	Yeasu
TR7400	FT-227R
TR7730	
ICOM	**KDK**
IC-2	FM2016
IC-25A	FM2025
IC-255A	

Service Rates

First hour is $39.00. Each additional hour is $29.00. Shipping and parts are additional. Radios with common component failure will not exceed one hour. Radios that we cannot find a problem with will be subject to a ten dollar charge to cover the extensive testing we will perform to try to make the problem show up. All repairs will receive a 90 day warranty on work performed. We reserve the right to refuse any repair for any reason at no charge to you.

VISA

High Technology Service Center
8825 S.W. 129 Terrace ✓184
Miami, Florida 33176
(305) 255-7660

MasterCard

MFJ 24 HOUR CLOCKS

Your choice: dual 24 hour LCD display, or 24/12 hour with ID timer, or 12 inch quartz analog.

$39.95 DUAL 24 HOUR LCD MFJ-104

Two independant 24 hour LCD displays! Read both GMT and local times at a glance.

Six digit main display has seconds readout. Four digit auxiliary. Switch reverses main/aux.

Alarm plays 4 selectable melodies. Alarm "ON" indicator. Snooze button.

Quartz timing. Synchronizable to WWV.

Flip-top cover serves as stand.

Night light. Forward/reverse, fast/slow set buttons. Lock function prevents mis-setting. Display main time only, main/auxiliary or main/alarm time. Includes battery. 4x2x1/2 inches.

24/12 HOUR, ID TIMER MFJ-102 **$32.95**

Switchable 24 hour GMT or 12 hour format.

ID timer sounds every 9 minutes after reset.

Switchable seconds readout.

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

Bright blue 0.6" vacuum fluorescent digits.

Alarm with snooze function. Synchronizable with WWV. Fast/slow set buttons. Lock function prevents mis-setting. Power out, alarm "ON" indicators. 110 VAC, 60 Hz (50 Hz with simple modification). UL approved.

Black, brushed aluminum top/front. 6x2x3".

24 HOUR QUARTZ MFJ-105 **$49.95**

True 24 hour quartz wall clock has huge 12 inch diameter face. Gives excellent visability across computer /radio room.

Fifteen seconds per month accuracy.

Single "AA" battery provides over one year operation, immunity from power line failure and eliminates power cord.

Sweep second hand. Brown hi-impact case. Glass front. 24 hour military time format.

Order from MFJ and try it. If not delighted, return within 30 days for refund (less shipping).

One year unconditional guarantee.

Order yours today. Call toll free 800-647-1800. Charge VISA, MC. Or mail check, money order. Add $4.00 each for shipping and handling.

CALL TOLL FREE 800-647-1800

Call 601-323-5869 in Miss., outside continental USA, tech/repair info. Telex 53-4590 MFJ STKV

MFJ ENTERPRISES, INCORPORATED
Box 494, Mississippi State, MS 39762 ✓233

TOLL FREE ORDERS • 1-800-826-5432
AK, HI, CA OR INFORMATION • (213) 380-8000

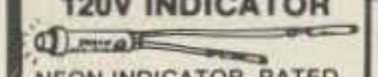
5 KEY ASSEMBLY $1.00 EACH

CONTAINS 5 SINGLE-POLE NORMALLY OPEN SWITCHES. MEASURES 3 3/4" LONG

6 KEY ASSEMBLY $1.25 EACH

CONTAINS 6 SINGLE-POLE NORMALLY OPEN SWITCHES. MEASURES 4 1/4" LONG.

120V INDICATOR



NEON INDICATOR. RATED 120 V 1/3 W. MOUNTS IN 5/16" HOLE . . . RED LENS.
75¢ EACH
10 FOR $7.00
100 FOR $65.00

MINIATURE 6 VDC RELAY

SUPER SMALL SPDT RELAY; GOLD COBALT CONTACTS. RATED 1 AMP AT 30 VDC; HIGHLY SENSITIVE, TTL DIRECT DRIVE POSSIBLE. OPERATES FROM 4.3 TO 6 V. COIL RES. 220 OHM.
1 3/16" × 13/32" × 7/16"
AROMAT # RSD-6V
$1.50 EACH
10 FOR $13.50

13 VDC RELAY

CONTACT: S.P.N.C. 10 AMP @ 120 VAC
ENERGIZE COIL TO OPEN CONTACT . . .
COIL: 13 VDC 650 OHMS
SPECIAL PRICE **$1.00 EACH**

SEND FOR FREE 40 PAGE CATALOG!

MINIATURE TOGGLE SWITCHES
AVAILABLE IN EITHER P.C. OR SOLDER LUG
PLEASE SPECIFY TERMINAL STYLE DESIRED
ALL ARE RATED 5 AMPS @ 125 VAC

SPDT	DPDT	SPDT CENTER OFF
$1.00 EACH	$2.00 EACH	$1.00 EACH
10 FOR $9.00	10 FOR $18.00	10 FOR $9.00
100 FOR $80.00	100 FOR $175.00	100 FOR $80.00

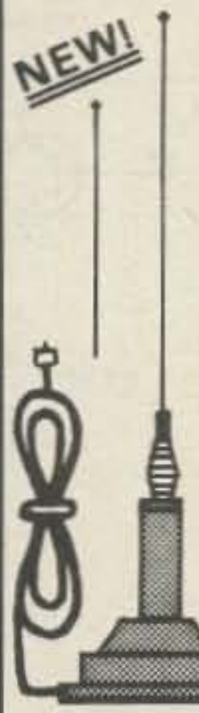
CALL FOR LARGER QUANTITY QUOTES

ALL ELECTRONICS CORP.
ALL ELECTRONICS CORP.
905 S. VERMONT • P.O. BOX 20406 • LOS ANGELES, CA 90006
• QUANTITIES LIMITED • MINIMUM ORDER $10.00 • USA: $2.50 SHIPPING NO C.O.D. • FOREIGN ORDERS INCLUDE SUFFICIENT SHIPPING • CALIF. RES. ADD 6%
✓20

AZDEN

PHASE II TWIN ANTENNA

NEW!



- SUPER 80-POUND, 100-MPH GRAY MAGNETIC MOUNT WITH MYLAR BASE
- 5/8 WAVE FOR **PHASE II** SIGNAL * AND *
- 1/4 WAVE FOR CLOSE-IN AND RESTRICTED HEIGHT AREAS
- INSTANT CHANGE-OVER
- SUPERIOR PERFORMANCE
- STAINLESS STEEL SPRING AND WHIP
- CHROME ON BRASS BASE-COMPARE!
- BOTH ANTENNAS ARE FREQUENCY ADJUSTABLE
- COMPLETE WITH 17 FEET OF FOAM COAX AND PL-259 CONNECTOR
- MADE IN U.S.A.

INTRODUCTORY PRICE:
$29.95
COMPARE!!

TWO ANTENNAS FOR THE PRICE OF ONE!

AMATEUR-WHOLESALE ELECTRONICS
8817 S.W. 129th Terrace, Miami, Florida 33176
Telephone (305) 233-3631 - Telex: 80-3356
HOURS: 9 - 5 Monday thru Friday
• U.S. DISTRIBUTOR • DEALER INQUIRIES INVITED

VISA master charge ✓243

ORDER NOW TOLL FREE
800-327-3102

✓See List of Advertisers on page 114

The four-meter switching circuit of Fig. 5 is shown in a test configuration prior to installation. For initial testing, the four transistor switches along the bottom of the board are all connected to the test supply line, and temporarily mounted LEDs in the upper right corner (later to go on the front panel) indicate which parameter is being measured. T46 pins provide convenient points for final assembly.

er, the CD4049, to drive indicator LEDs. The inputs can be connected to the 4503 output lines since the input requirements do not appreciably load the sources. However, if the supply voltage is at or above 10 volts, add a current-limiting resistor to the LED line, scaling it from 500 to 1k for voltages from 10 to 15. For voltages under 10, the IC provides sufficient current-limiting. In this circuit, all voltages between 5 and 15 will provide equal performance, so that any convenient tap with an isolating resistor and a zener diode (say about 9 volts) will power everything. The switches, of course, will be powered by the voltage being read.

The switching circuits for each line are the same. If the voltages vary widely, you may wish to optimize the resistor values on a breadboard before building a final unit. If the voltages vary by as much as 10 to 1 or more, then you may want to add multiplier resistors to the meter. Most voltmeters are simple microammeters or milliammeters with a series resistor to limit the current to the full-scale meter value at the highest value of voltage to be read. Since they are more common and cheaper, let's assume we start with a 1-mA meter. If our basic voltage range is 10 volts, then we would add a 10k resistor in series with the meter according to the formula $R = Ef/Af$, where Ef is the desired full-scale voltage and Af is the full-scale limit of the meter, all in basic units. Thus, our desired 10 volts divided by 1 mA (.001 A) yields 10,000 Ohms.

Suppose one of our readings requires a 100-volt scale. To calculate the required multiplier to insert at any of the "x" points in Fig. 5, we can use the formula $Rm = (Ef/Af) - R$, where Ef is our new full-scale voltage, Af is the current full-scale reading, R is the series resistor we just put in place, and Rm is the new multiplier. If we divide 100 volts by 1 mA, we get 100,000 Ohms. However, we already have 10k in the circuit, so the extra multiplier in the collector circuit will be 990,000 Ohms, or the closest catalog value we can find. The closer the tolerance resistor we can obtain, the better. One-percent resistors are used in VOMs; for our purposes, a close value culled with an accurate resistance meter from a batch of 5% resistors will usually be good enough. If the multiplier is a variable PC board trimmer, then the value can be set to compensate for any voltage drop across the transistor, and the basic resistor in the voltmeter circuit can also be made variable. Some quick tests with a well-calibrated VTVM will permit you to optimize the circuit readily.

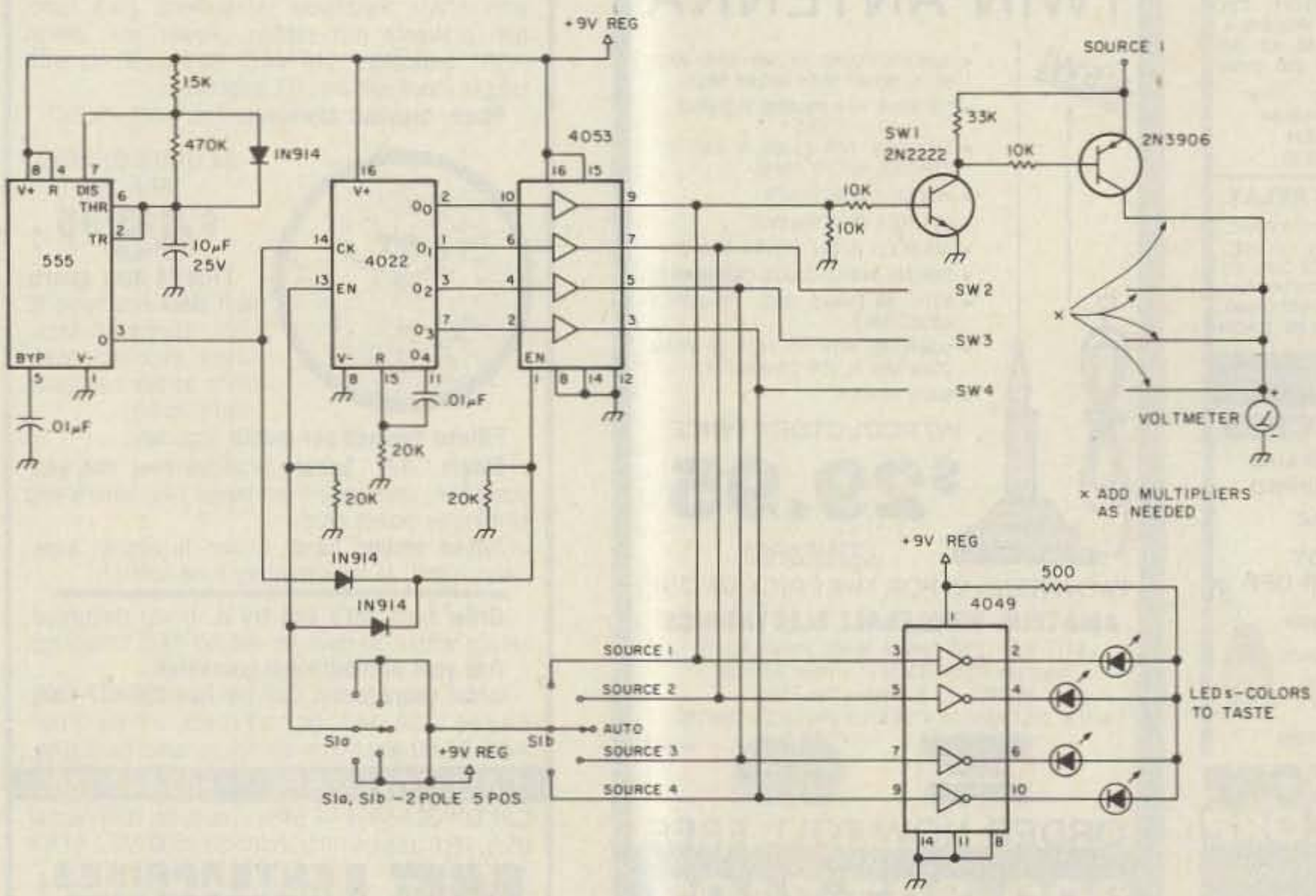


Fig. 5. Circuit for switching several meter readings automatically.

In this all-positive circuit, there is no need for guiding diodes to complete the meter circuit. Since the switching output transistors isolate the meter from the voltages except when one is conducting, the meter will see no more than a single voltage at a time. The circuit can be modified further for current readings; however, this requires switching isolation at both terminals of the meter, which adds complexity to the circuit. Identical switches controlled by the single selector or trigger IC will function with appropriate shunts to bypass the operating current. In fact, we can make the circuit about as fancy as we wish. How cost-effective this technique is will be a function of how many panel meters we save in the process.

Multiple Positive and Negative Readings

The selection system used in Fig. 5 can be adapted to a mixture of positive

✓See List of Advertisers on page 114

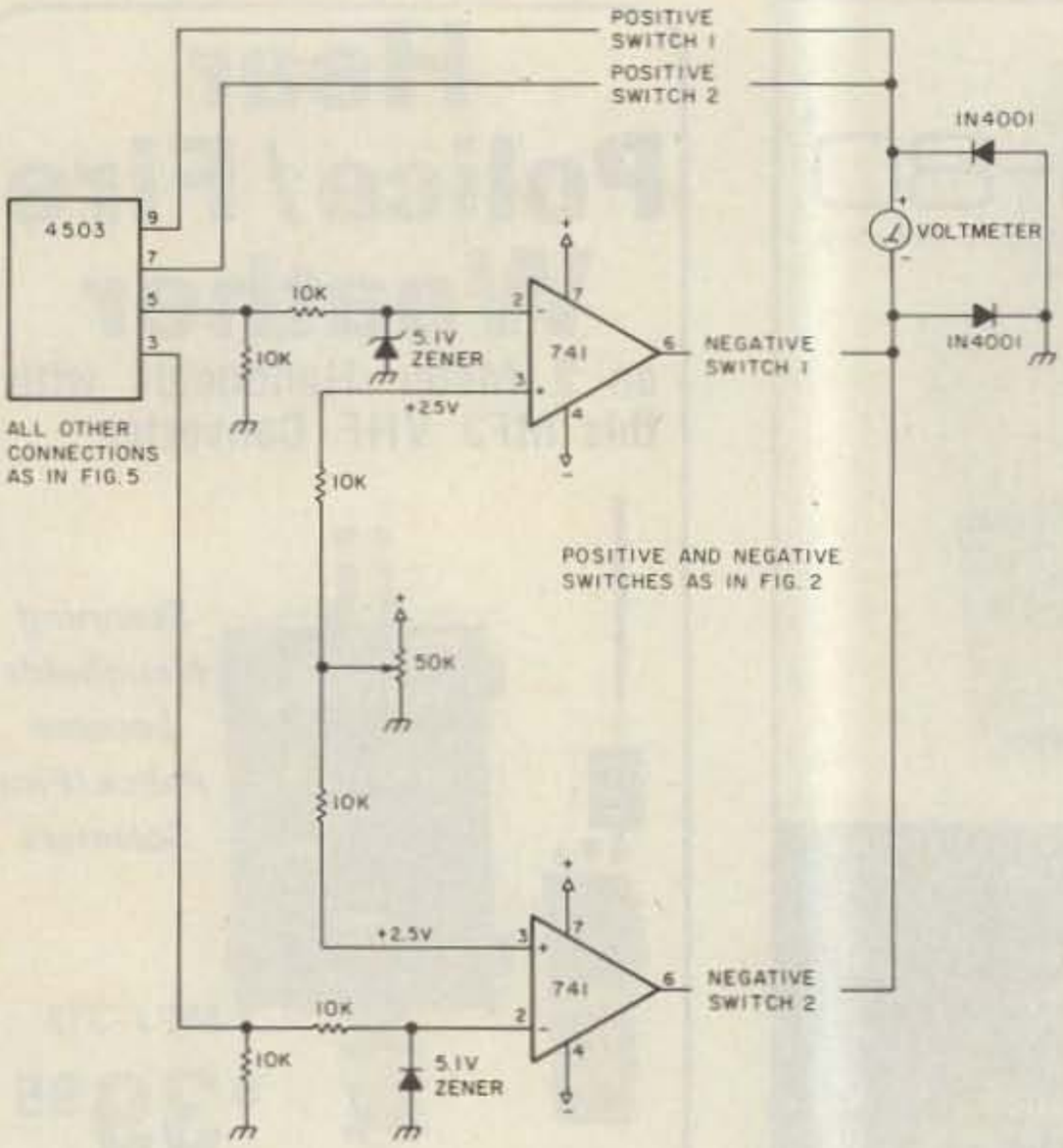
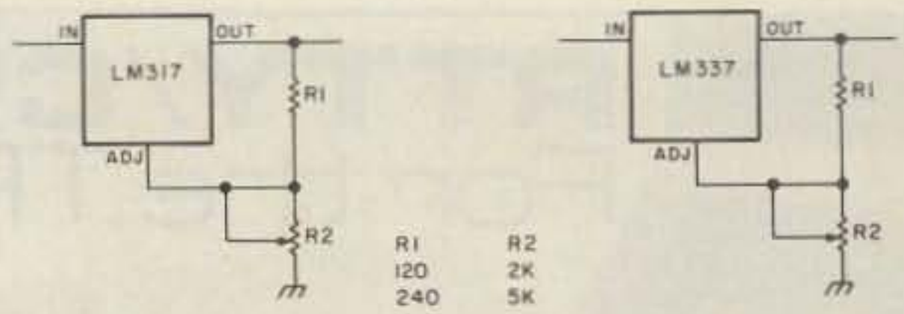


Fig. 6. Revisions to Fig. 5 for multiple positive and negative readings.



R1	R2
120	2K
240	5K

Fig. 7. Basic control circuit for the LM317/LM337 regulators.

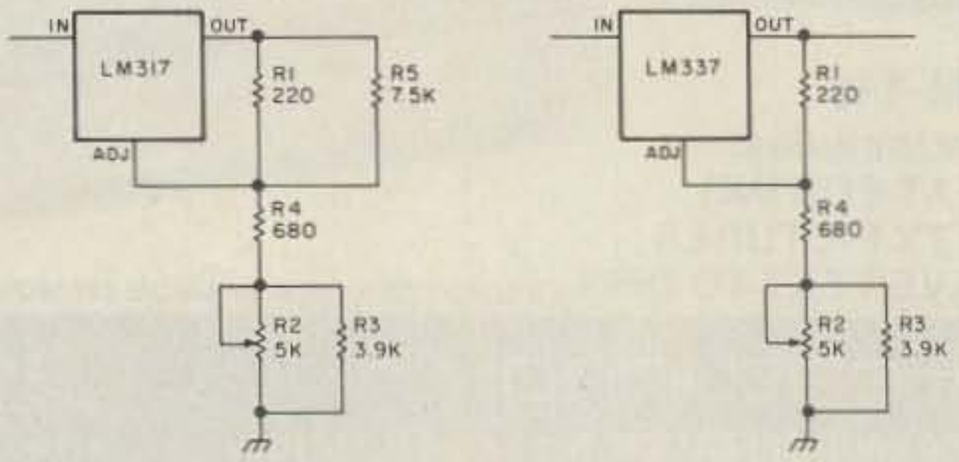


Fig. 8. LM317/LM337 control circuits with range limit and tracking adjustments.

and negative readings by the addition of op amps and guiding diodes. Fig. 6 provides the details of what we need to add. Assume that we have two negative readings to take in addition to a couple of positive ones. A pair of 741s solves the problem. Since we do not have a flip-flop to provide automatic output reversal, we provide the positive input of the op amp with a reference voltage. It should be about half the supply voltage, although 2.5 volts positive will handle almost any supply voltage. When the 4503 output goes positive, driving the inverting input, the op amp swings negative. It drives a negative switch identical to the one in the power-supply circuit, with a 1N914 at the transistor base to limit the positive swing at that point. Of course, we provide the op amp with positive and negative supplies, tapped and regulated from some convenient circuit point. The only other addition to the circuit is the diodes at the meter to provide isolated completion to the meter circuit.

Since, once again, there is a definite diode voltage drop to make readings inaccurate by that amount, we need compensation. If the trick in the power supply is not applicable (for example, if we are metering the voltage in circuits within a piece of equipment), then variable multipliers may be the best means to make readings accurate over the region of the scale of most concern to us.

A Note On Tracking Power-Supply Voltages

As promised earlier in the article, here are some notes on getting positive and negative supplies to track with common components available from sources such as Radio Shack. Fixed resistors are rarely a problem because we can find matched pairs with an ohmmeter. The problem lies with dual potentiometers that may be readily available. They may vary by up to 10 percent from section to section. But we can compensate. Fig. 7 shows the positive and negative control circuits recommended for the LM317 and LM337 regulators. The values shown for R1 and R2 in each case call for either a 1k or a 2k pot in the variable part of the circuit. Dual 1k pots do exist, and if you have one, then your problem is solved, assuming you wish the regulator voltage to go down below 5 volts.

Fig. 8 shows the requisite circuit in my case, which called for R3 to limit the low voltage and R4 to parallel the potentiometer. Here is how to proceed through the problem, calculating and measuring your way to final values. The manual covering the regulators provides this formula for determining output voltage: $Vo = 1.25 (1 + R2/R1)$, where R1 and R2 are the components shown in Fig. 7. If we assume that R1 will be 240 Ohms (we will calculate an actual value shortly), then we can solve for R2 at the 5-volt lower limit of the supply. $R2 = R1(Vo - 1.25)/1.25$, or 720 Ohms. At 15 volts, the upper limit of my supply, R2 would be 2640 Ohms. A slight compromise of using a 680-Ohm resistor at R3 would permit use of a 2k pot to vary the voltage from just under 5 volts to just over 15 volts.

To find a 2k dual pot is nearly impossible when you are in a hurry. However, dual 5k audio pots are common, and a parallel resistor will bring them to 2k without spreading or contracting the ends of the scale too radically. Since manuals always print the parallel resistor formula in terms of Rt and never in terms of the resistor you need to put with what you have to achieve a desired value, here it is: $Rp = (Rt \times Rg)/(Rg - Rt)$, where Rg is the resistor you have, Rt is the total parallel resistance desired, and Rp is the value to be placed in parallel with Rg. The value we need to convert the 5k pot into a 2k pot is 3.3k.

Remember, however, that the pot sections will not be very accurate. Measurements forced me to use 3.9k resistors. The two sections of series-parallel combinations had ranges of 688 to 2756 Ohms and 699 to 2819 Ohms respectively. Using 688 Ohms as the lowest value with 5 volts output, the next calculation was R1.

$R1 = 1.25\ R2/(Vo - 1.25)$, or 229 Ohms, with the values given. 220-Ohm resistors for R1 were the obvious trial choices. In measuring values on hand, a slightly low value was used with the

✓See List of Advertisers on page 114

688-Ohm circuit and a slightly high value was used with the 699-Ohm circuit. Since the output voltage is a function of the ratio of R1 and R2 in Fig. 8, this move tended to stabilize the ratio.

Upon wiring the circuit, one voltage was slightly above the other. Resistors with values in the 5k to 10k range were soldered in parallel with R1 in the lower voltage circuit, increasing its output. The 7.5k value provided tracking within a couple of tenths of a volt across the range.

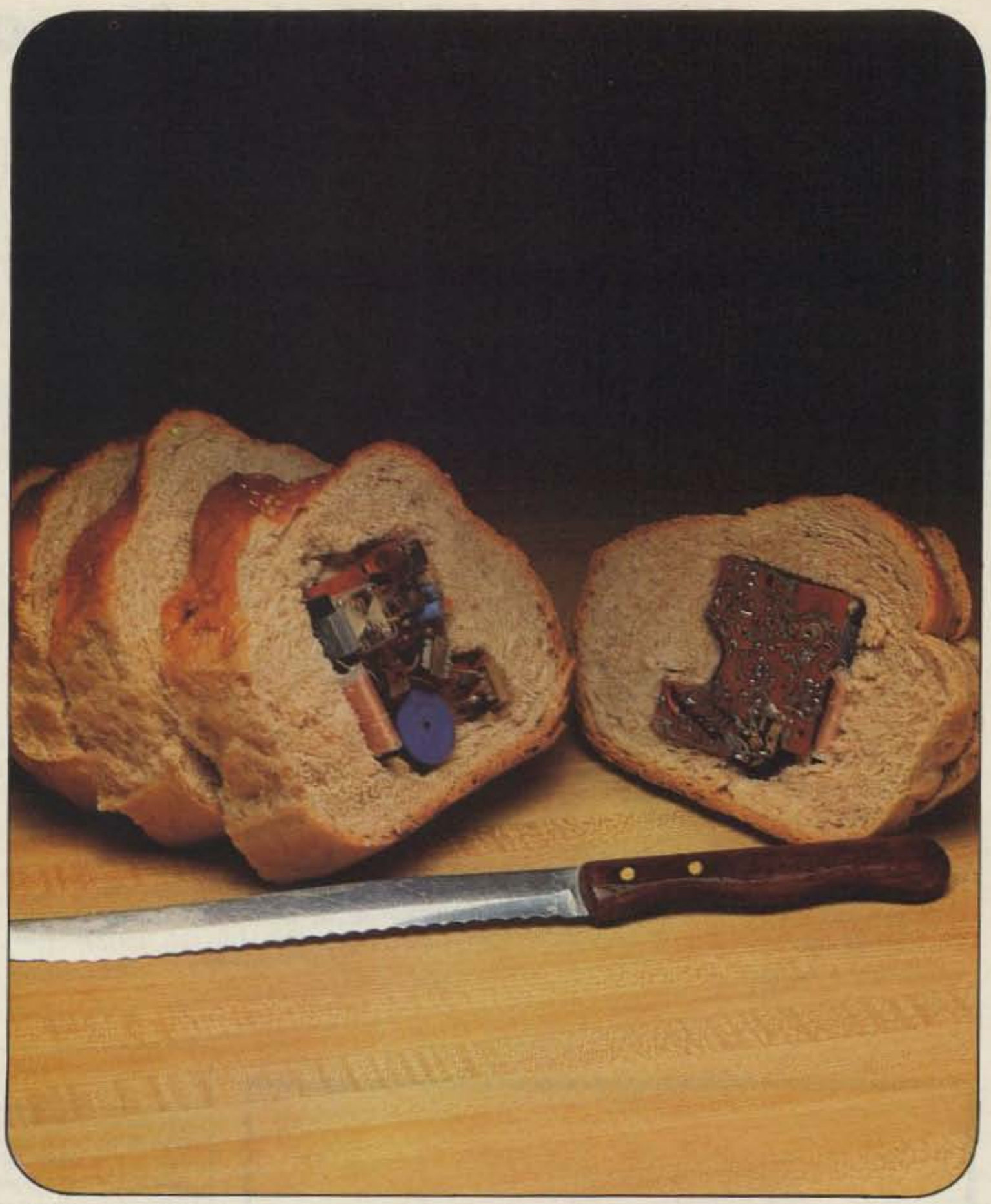
Although the procedure sounds difficult, a hand calculator makes the calculations simple. Breadboard resistance measurements are quick with an accurate ohmmeter. Only the final parallel resistor was added after construction and testing. The entire procedure took about an hour, and some of that time was devoted to converting the formulas and to scrounging in the parts bins. A little extrapolation will permit you to design for any range you wish (within limits of the regulators, of course). Since most regulators have formulas similar in form, although different in detail, to the ones used here, these notes may help you custom design your own supply rather than accepting only what is offered on the market.

Combined with the meter-switching circuits, the article may help save you some money and space, since together these ideas provide a foundation for a compact bench supply that still offers complete control and monitoring. The circuits, of course, have a wide potential for application to other projects. They fit about anywhere you need to know several voltages, whether high or low, positive or negative, or all of the above. ■

Electronics Made Easy

For Your Computer

the electronic breadboard



With The Electronic Breadboard you can:

- *Test and analyze any analog circuit, such as transmitting and receiving equipment, amplifiers and the like.
- *Add or remove components.
- *Calculate impedance at a specific point.
- *Obtain voltage at a specific point (or at all points).
- *Save circuit designs on cassette tape.
- *Determine causes of circuit failure, reducing time spent troubleshooting.
- *Evaluate the frequency response of any circuit.
- *Learn and verify electronic theory by entering sample circuits.

The Electronic Breadboard program is ideal for:

- *Audio component repairmen
- *Ham radio technicians
- *Hobbyists
- *Electrical engineers
- *Telecommunications engineers
- *Audiophiles
- *Students of electronics

Requires:
*TRS-80 Tape MOD I & MOD III 16K #0287R
TRS-80 Disk MOD I & MOD III 32K #0222RD
**APPLE Disk Applesoft 32K #0428AD

If you're an electronic doughboy, then you need this breadboard. Order yours today. Use the coupon or call toll free:

1-800-258-5473

Instant Software.
The best software under the sun.

*TRS-80 is a trademark of the Radio Shack division of Tandy Corp.

**Apple is a registered trademark of Apple Computer Inc.

Yes! I want Electronics made easy—send me:
_____copies of #0287R @ $49.95
_____copies of #0222RD @ $59.95
_____copies of #0428AD @ $59.95

Please add $2.50 for postage and handling

____VISA
____MC
____AMEX
____CHECK/MO

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

CARD# _____ EXP. DATE _____

SIGNATURE _____

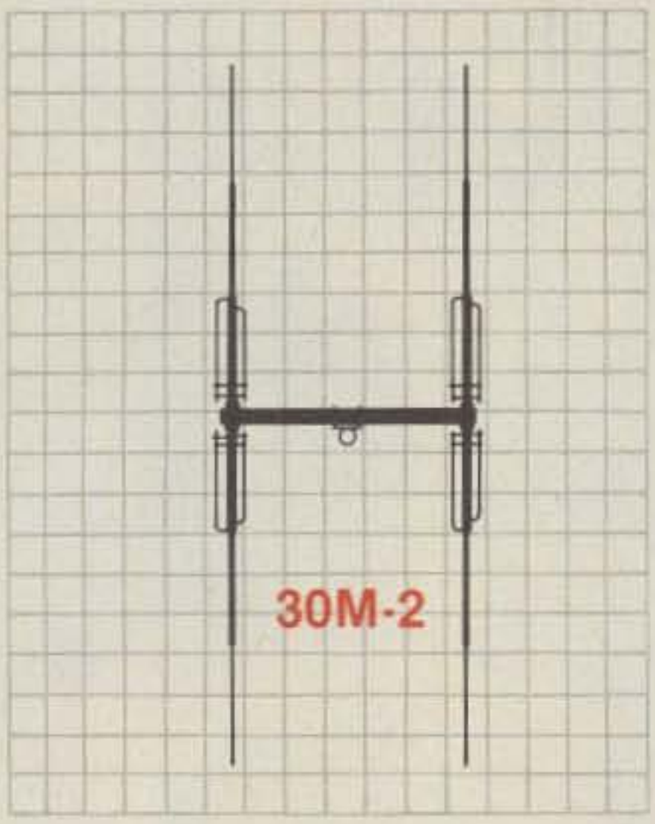
Instant Software™

Rte. 101 and Elm Street,
Peterborough, N.H. 03458

1-800-258-5473

336B6B

KLM 30 Meter Monoband Yagis



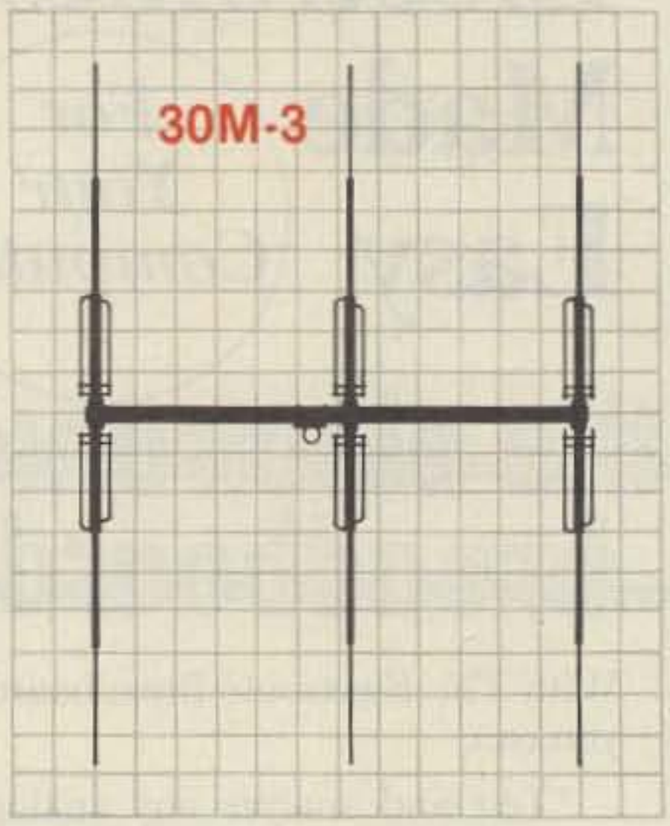
KLM is proud to announce two new high performance monobanders for 30 meters. The KLM 30M-2 and 30M-3 are carefully designed to combine moderate size with superior performance. Either of these compact powerhouses can be a valuable addition to your antenna system without overloading the tower or rotator.

- Construction materials feature strong 6063-T832 alloy aluminum element and boom tubing, massive Lexan insulators, and stainless steel hardware for years of reliable service.

- A DC grounded Beta match and KLM's proven 4:1 DC grounded Balun make the 30M-2 and 30M-3 as lightning/static proof as possible. The unique linear loading system keeps element lengths manageable without sacrificing performance.

- The adventure of a new band awaits you. Double your pleasure with the great gain and broadband response of the KLM 30M-2 or 30M-3. See your KLM dealer now!

KLM Electronics, Inc.
P.O. Box 816,
Morgan Hill, CA 95037
(408) 779-7363



30M-2: SPECIFICATIONS
Bandwidth: **10.1 to 10.150 MHz**
Gain: **4.5 dBd**
VSWR: **less than 1.5:1**
F/B: **12 db**
Feed Impedance: **50 ohms**
Element length: **35'3"**
Boom: **3"0.D. x 12'**
Turn Radius: **18'6"**
Weight: **35 lbs**
Windload: **4 sq ft**

30M-3: SPECIFICATIONS
Bandwidth: **10.1 to 10.150 MHz**
Gain: **7 dBd**
VSWR: **less than 1.5:1**
F/B: **20 dB**
Feed Impedance: **50 ohms**
Element length:**35'3"**
Boom: **3"O.D. x 24'**
Turn Radius: **21'5"**
Weight: **50 lbs**
Windload: **7 sq ft**

⌐See List of Advertisers on page 114

73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*

1NDIA

DX George tunes in the 40-meter ham band—he hears a local SSB rag-chew in progress. The next moment he hears a QSL in AM followed by a CW ham happily thumping through the progressive conversations. The round-robin mixed-mode net goes on merrily for hours. This must be VU2-land. Nowhere else on Earth will you find such an accommodative ham spirit of coexistence with World War II surplus equipment alongside the latest ham gear of Kenwood, Yaesu, Icom, and home-brew QRP transistor transmitters with modified broadcast transistor receivers—ham spirit to the core! Hi!

The latest Indian callbook accounts for 1,300 callsigns including 45 club stations. Considering a population of 700 million, each callsign holder represents over half a million people. Seventy-five percent of the hams are in the cities like Bangalore, Bombay, Calcutta, Delhi, Hyderabad, and Madras. The remaining hams are spread over the country. Of these, only about 300 have multiband equipment, and it is mostly for CW operation. A few have been able to acquire modern transceiver rigs providing SSB operation—and those are the stations that are heard overseas on SSB.

The CW stations use the surplus and disposal equipment or use home-brew rigs made out of components of disposal equipment. The receivers will be of the type AR-88 (RCA), SX-28, BC-779, HRO, R-1155, etc. The aircraft receivers of the BC-348 series also are used, suitably modified for mains operation. The transmitter is invariably home brew, using an 807/1625 final. The power is limited to 100 Watts.

These surplus bargains are no longer available, so the younger generation of hams has to look for transistors and ICs for home brewing. While technical know-how is available for home brewing, poor availability of suitable components and cost are the limiting factors. Club stations and many of the old-timers help SWLs get started with licenses and rigs.

There are two types of licenses—Grade I and Grade II. The Grade I license requires a 12-wpm Morse speed as against 4 wpm for Grade II. Both grades must also pass a theory test. Initially, only CW operation is allowed. The license-issuing authority is "Wireless Adviser to Government of India, Ministry of Communication," located at New Delhi. The examination fee is Rs. 15/—($2.00) and license fee for two years is Rs. 40/—($5.00).

There are two major organizations which look after hams' interests: the Amateur Radio Society of India (ARSI) and the Federation of Amateur Radio Societies of India (FARSI). The only ham magazine, *Radio*, is published by FARSI and contains articles of interest reprinted from ham magazines elsewhere in the world, like *QST*, *73*, *CQ*, etc., in addition to covering local news.

Gaining experience and equipment, Indian hams are breaking new ground in national service. They handled emergency communications during the Morvi disaster in Gujarat State. They provide base station and mobile communications for the 4000-km Himalayan rally and the Mysore Safari every year during November/December. They take part in the International Scout Jamboree, which spreads ham activities to the younger generations. They carry their stations to schools and enable children to speak and listen on the ham net all over the world; they create awareness and interest that may germinate and grow in the future.

The Andhra Pradesh Amateur Radio Society (APARS) is the only organization which has received government support. The state of Andhra Pradesh has a large coastline in the east similar to the US Florida coast, subject to heavy cyclonic weather every year. To provide information and communications in emergencies, the AP government has joined hands with the hams and they are in the process of establishing a number of communications networks long the east coast of India. This is a pioneering venture of a state government which may prove fruitful and can pay itself off during a single bout of cyclonic weather.

In spite of many hurdles and limitations, the meager ham population proudly includes veterans who were licensed before 1920—and also stations communicating through OSCAR and tracking other satellites. It is a wide contrast and a difficult point for overseas hams to understand—that with few facilities and finances, these hams are propagating the ham spirit as well as sustaining ham activities.

HONG KONG

John H. Holstead VS6HJ
1 Sugar Street, 20/Floor
Causeway Bay Commercial Building
Causeway Bay
Hong Kong

ADVENTURE AND QSOING FROM BY-LAND

It goes without saying that the BY call is in one of the rare DX areas! But to be able to make the trip into China and have the BY next to our own call as a portable or mobile seems almost too good to be true. It was not, however, for Robin Maule VS6HH (formerly G3OEF and 9V1RR), who last February realized this dream. He is probably the first and only foreign ham operator since 1949 to have an authorized portable/mobile BY attached to his call.

Maule works in Hong Kong as sales manager for East Asia, with Motorola, Inc., and worked with the Hong Kong Motor Association which sponsored and was chiefly responsible for the international car rally from Hong Kong, going all the way to Peking, China. This event took place early last month. There were a lot of taxing preparations for this "first" in China, and one was desperately-needed radio communications. Robin was able to lend a helping hand on more than one occasion.

One such time was 8:00 am (local time) Sunday, February 20, 1983, at the New World Hotel in Kowloon, Hong Kong. Here, the caravan of one mini-bus and two cars led by Phil Taylor of the H. K. Automobile Assocation, with Robin and a team of eleven others, began the dry-run trip to Peking.

The Radio Sports Federation of China and the China Ministry of Tele-Communications approved the granting of the BY portable/mobile call to Robin. Four frequencies were requested on SSB, two on 40 meters, two on 20 meters, and one VHF frequency. Although this was not a DXpedition but a final route trial for the rally, VS6HH was able to operate. As Robin said when I interviewed him, "It was not within our mandate to work DX." So only traffic related to the rally or greetings to families of the rally team and members in H.K. were allowed. The correspondents from Japan likewise sent some greetings home.

At 10:00 am, the group crossed into China. They missed their first radio schedule since they were going through customs and immigration. They were met by the Deputy of the Chinese Police, officials from Chinese Public Security, many interpreters, several press agencies, and a Chinese TV crew which made video recordings.

They had to take along their own fuel and other supplies. Robin said that the speed limit in China was 40 mph, but the police escort sailed down the highway with red lights flashing, flags waving, and sirens sounding at a jaunty 60 mph!

The next schedule was with Ed Nance VS6DX and Phil Weaver VS6CT at 3:00 pm local time. Robin had a Motorola (of course) Micom S, 100-Watt synthesized SSB, and used a mobile antenna. Contact was made on both 7075 and 14.160 MHz. You are right! There were two very jubilant DXers in Hong Kong as well as one very happy VS6HH/BY in China.

At times, the road was dark with mud up to the axles, but the scenery along the way was incredible. Robin said it was a unique experience to find oneself at night, in a strange place, in the rain, at an unknown QTH, hanging up a dipole antenna! L. S. Drakeford VS6EK, as well as JH1UGN and JH1IED, likewise made contact and had a good QSO with this rare call station!

Robin accompanied the trial-run group as far as the city of Wu Han. On February 25th, he flew back to Hong Kong. However, the remainder of the team continued to drive to Peking. This was probably only the second time a group of Westerners had been permitted to drive that route. (First time was last year.) At each village, the group passed by several hundred people lining the road who surrounded the vehicles when they stopped.

Robin declared, "The scenery was fantastic with gorges—cliffs below and high mountains above as we made the journey through Canton, Hunan, and Hubei provinces, with Hubei province being the most spectacular."

Another first in the episode, besides the rally, was Westerners traveling by car with the authorization to use SSB for the first time since the "liberation" in 1949.

Crossing into Hunan from Guangzhou Province, escorts hand over the caravan (VS6HH/BY in center).

KOREA

Michael Wengert KH2AC/HL
CPO Box 2961
Seoul, Korea

Thirty years after the cessation of hostilities on the Korean peninsula, the United States military still maintains upwards of 75,000 troops, civilians, and dependents in South Korea. Although the Republic of Korea has no reciprocal amateur radio licensing agreement with any country, certain foreign personnel are allowed to operate their ham stations here. The Korean government has allocated a fixed number of amateur radio sta-

tions to US military personnel stationed here, and, although it is not published, the number is believed to be 55. Licensing of the HL9-prefix stations is handled by the J-6 Office at the Frequency Coordination Office at the Eighth US Army garrison at Yongsan, in Seoul.

Unfortunately, as 1983 opened we found an actual decrease in ham activity in Korea amoung HL9 stations. The reason: Due to the increase in the number of military personnel stationed in Korea, roughly 90 percent of them must live off base, in housing in the Korean civilian community. So due to the recent enforcement of a long-ignored qualification by the J-6 Office that HL9 operation must take place from inside a US base, most of the hams, especially in the Seoul area, have found themselves involuntarily QRT. Since I neither live in a military compound nor am connected directly with the military, I am also off the air.

A recent check with the Korean Amateur Radio League indicated that they were not particularly interested in pursuing reciprocal licensing at this time. This would seem the best way to solve the licensing problems in Korea, but it seems to be impossible to hurry things in the East. Perhaps when a larger number of Koreans are permitted to visit foreign countries and the percentage of hams among them becomes greater, we might find some interest on the Korean side for reciprocal licensing.

The main theme of the column this month, then, might be a warning not to expect to hear too much from HL9 stations in the near future. But activities by HL1-5 stations is on the upswing. The Korean government seems positively behind the expansion of amateur radio in Korea as a sort of PR operation in light of the Asian Games to be held in Seoul in 1986 and the Olympics in 1988.

More on these and other topics next month. 73 from the Land of the Morning Calm.

TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

Some hams who have frequently visited Taipei and BV2A/BV2B are W9ZNY, N5RM, G4KLP, KA6LGX, JA1AN, JA1EBM, W6PN, VS6DD, N9BBQ, and W2NSD. All of them have business and personal connections in Taiwan and have an eyeball QSO with Tim Chen upon almost every arrival. K7UGA also was greeted by BV2A four times in the past few years.

By statistics, I have so far met ham friends from the US mainland, Canada, Panama, Venezuela, Colombia, Peru, Brazil, New Zealand, Australia, Vanuato (Solomon Island), Guam, Hawaii, Saipan, the Philippines, Singapore, Indonesia, Malaysia, Hong Kong, Macao, Thailand, India, Israel, Nepal, Jordan, Korea, Japan, France, Italy, England, Switzerland, Germany, Belgium, and South Africa.

W6BIP, K6IR, K4XH, K2CM, W2AMS, WA3HUP, W2IYX, JA2MTO, JG1QGT, 9V1RH/VK3QV, and JM1UXU have had frequent exchanges of letters with me to discuss RFI, QSLing, OT stories, and regional matters.

W7PHO, W6RGQ, WA7ZTL, VS6CT, and AH2G are met on the air from time to time, but the currently poor propagation is causing me to miss all the fellows who used to check in with the Family Hours Net maintained by Bill W7PHO and his associates. I occasionally check in on the SEANET hour at 1200Z Wednesdays on 14320.

Bob Mitchell N5RM and his XYL visited Taipei before the Chinese Lunar New Year holiday and dined with the Chens at the Grand Hotel, one of the ten best in the world. We exchanged personal gifts to mark the special occasion. Besides them, the president of Air Asia was also present; he was very delighted to know about the unique friendship and activities of the world's radio amateurs.

Since my retirement, I have been able to make more schedules on the air. Those who want my QSL for DXCC will have more chances. But owing to construction of iron work on my roof, I am suffering from surrounding obstacles, especially toward the direction of the States.

Frank W9ZNY is now in Taipei and is going to lend a hand in this matter, hopefully, to raise my present antennas higher for better radiation. Long-path QSOs with the US east coast are frequently open at around 1130-1330Z. I have just received an award from the South Florida DX Association. Also, try for possible US QSOs 0000-0200Z, Sundays, on 21030 or 28530.

Many enquiries are being received questioning the possibility of obtaining a temporary license and TTY operation, etc., on Taiwan. There is nothing happening with these concerns until local hams have been granted more station and operator licenses.

Regretfully, someone claimed a lost QSL via a post office box, and the International Lions Club lost a trophy which had been sent by air parcel. I have contacted the Postmaster and learned that some mail has been misrouted but sent back later.

Only Japanese IRCs are exchangable at the Chinese post office. Occasionally other IRCs are exchanged with some philatelics—who do not accept old ones exceeding two years. CRA BV QSL Bureau is to answer QSLs; it used to return 2 IRCs as reciprocal upon receiving a green stamp. If obtainable, Chinese mint stamps seem more convenient.

Noticing that the 1983 *Callbook* has deleted the BV Bureau from the QSL Bureau page, may I ask that all direct QSLs (except via QSL managers) be forwarded to my address (above) for handling, please.

Guam's Joe Frekot AH2G.

PAPUA NEW GUINEA

Siegi Freymadl P29NSF
PO Box 165
Rabaul
Papua New Guinea

Hello there and greetings to everyone from Papua New Guinea, and especially from the Island of New Britain. The 10m band appears to have recovered and I have had a great time working into the United States. It is amazing how many hams tell me that they know my QTH as they were here during the campaign in the Pacific in World War II. In those days, communications played a very important role, as the coastwatchers maintained observation over occupied areas and passed the information to Allied Headquarters for action. Rabaul was the Headquarters of the Japanese Navy then.

I have just received updated information on the number of licensed amateurs in PNG. There are 93 full calls, 22 limited calls, and 36 Novice calls, giving a total of 151. About 10 of these would be YL operators. The ranks of hams may be swelled when new callsigns are allocated as a result of the AOCP exams held in February—we can expect to hear several new operators from the North Solomons Province.

As of January, 1983, all full-call amateurs in P29 can operate the new 10-MHz band in line with VK. The Papua New Guinea Amateur Radio Society (PNGARS) has written to Radio Branch concerning allocation of the 10- and 24-MHz bands for full-call operators; these also are available to VK amateurs.

VHF activity: P29ZUK, P29QA, P29ZSS, P29ZTD, and P29ZFD are active on 6m. P29SS hopes to be active soon on 6m, SSB, and CW, upon completion of a beam. P29ZUK, P29ZTD, P29ZSS, and P29LW operate on 2m and 70cm, and P29ZSS is also on 1296 MHz.

There are two beacons in Port Moresby, a 6m beacon (P29SIX on 52.013 MHz) and a 2m beacon (P29TWO on 144.030 MHz).

On the repeater scene, the Port Moresby repeater is operational. The planned repeater on the border of the Northern and the Central Province will be ready for testing in Port Moresby before you read this. When finally installed on site, on the eastern dome of Mt. Albert Edward at an altitude of 13,000 feet, it will be the highest repeater in the southern hemisphere and possibly the highest in the world. Equipment is Philips FM-828; the transmit frequency is 146.650 MHz and the receive frequency is 146.050 MHz. Power source: three Solarex 2-Amp, 12-V solar panels, two 105-Amp/hour batteries. Antenna: AEA Isopole, 5-dB gain.

The planned North Solomons repeater (P29RBI) is being tested at Arawa. Transmit frequency, 147.0 MHz; receive, 146.400 MHz. The equipment is a modified Philips FM-828. There are three possible sites under review, two of the sites being on the coast and one high up in the mountains. The latter would bring the repeater in line-of-sight with Mt. Albert Edward (about 900 km away), but there are fears that the repeater could be vandalized at this location.

Information has come to hand about the North Solomons Amateur Radio Society. North Solomons Province, on the island of Bougainville, is one of the most active provinces in P29, amateur-wise. Most of the operators there are employed at the giant copper mine, Bougainville Copper Limited. Gatherings of the North Solomons Amateur Radio Society are held every 4 to 5 weeks at the Panguna Mine site. Bougainville Copper Limited obliges with luncheon provided in the mess, and OMs P29BG, P29QA, P29TE, P29NJW (P29ZSO), P29NML, P29NES, and YL P29NJF get together with other interested people.

Also at Panguna is Jenny VK4NIY who hopes to upgrade and receive a P29 full call, and VK4VAU, a 12-year-old student who is too young to receive a P29 license. It appears that one has to be at least 15 years old to receive an amateur license in P29!

The Radio Society also holds social outings every two months or so. The North Solomons Amateur Radio Society is in the process of affiliating with the PNGARS. A very active group, that! John P29JM from Panguna is also one of the net controllers of the Inter Island Net which operates every day on 14.315 MHz at 0800Z. Other net controllers are Tom KX6QU on Kwajalein, Bud KN6GJN and Gus AH6DR on Hawaii, and Mel KG6JHH on Guam. The net handles 2nd- and 3rd-party traffic, emergency traffic, and marine traffic, and thereby fills an important need.

Another province with a fairly large amateur population is the Eastern Highlands Province. As previously mentioned, the Highlands provinces even have their own net on 80m. At Ukarumpa in the Eastern Highlands, we have the Summer Institute of Linguistics with about 500 members, and in their ranks are a number of active hams: P29AX, P29CB, P29NPM, and XYLs P29SM, P29DI, and P29RM. It is the aim of the Institute to translate the Bible into native languages; translations into 24 languages have been completed so far. There are 150 language groups in the field—that is, family groups living with the people in villages and studying their languages. A gigantic undertaking in a country of 700 different languages amongst a population of 3 million!

GUAM

James T. Pogue KH2AR
68 Banyan Circle
FPO San Francisco 96630

THE VIEW FROM GUAM

If you have sent or received a QSL card through the Guam Bureau during the last 10 years, then you can thank Joe Frekot

AH2G. Fondly known on our island as "Oscar the Grouch," Joe traces his ham-radio roots back many years.

Using a UX201A as the heart for his first receiver as well as his first transmitter, Joe was first licensed and went on the air in 1931. Signing W3CHH from Philadelphia, Joe managed on more than one occasion to work California with just over 3 Watts.

Prior to WWII, he worked for the Ballistics Lab at the Frankford Arsenal in Philadelphia. In 1944, he went to work for Western Electric as a field engineer. When WWII ended, Joe signed on with Philco as a tech rep and started traveling. His new duties made the entire Pacific his backyard and took him to Guam, Iwo Jima, Eniwetok, the Philippines, Okinawa, Japan, Hawaii, Vietnam, and Thailand, to mention just a few destinations. During this time he held the calls KX6BT, KR6FT, and KG6JAR in addition to the two callsigns already mentioned.

Today, Joe is in many ways like the avid angler who has plenty of fish stories to tell. "I've worked over 300 countries and never used a beam," he says. The only difference between Joe and the fisherman whose catch got away is that Joe has a huge pile of QSL cards to prove his stories.

When asked about what constitutes a rare DX station, Joe says, "A DX station is any station that I haven't worked yet." Judging from the towering stack of filled log books next to his operating table, there can't be too many stations left in that category.

Retired since 1977, Joe is the exclusive dealer for Kenwood gear on Guam, along with several other lines of antennas and accessories. This, along with the QSL Bureau, contesting, and just plain rag chewing keep him occupied most of the time.

Along with his many accomplishments over the years, Joe is listed as an "A-1 Op," a member of the "First Class CW Operator's Club," and is a life member of the IEEE.

When asked about the future of ham radio and whether he thought it was a dying hobby, Joe just smiled and pointed at the brand new "930" on his desk. It looks as though Joe and ham radio will both be around for a long time.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

The New Zealand Association of Radio Transmitters (NZART) is the New Zealand equivalent of the ARRL and represents ZL amateurs within New Zealand and internationally.

NZART is controlled by a president and 17 councillors, all elected by the members every two years. The councillors represent the four Districts on a proportionate basis as follows: 1st District, 6; 2nd District, 6; 3rd District, 3; 4th District, 2. The vice-president is appointed from amongst the elected councillors. There is one salaried officer of the NZART, the general secretary, and our headquarters are in Astral House, Upper Hutt, near Wellington. All other NZART departmental managers and officers are honorary positions carried out in conjunction with the members' normal vocational or professional duties.

The business of NZART is conducted during the year between Annual Conferences by the Executive Council, a Secretarial Committee, and the various departmental managers. The NZART Council has at least two meetings during our Annual Conference, which is held the first weekend in June every year. At these meetings, members consider policy and domestic matters before and after the conference and receive reports from the various departmental managers and officers. The Council also meets every month on the air on 80 meters, where members discuss and decide on matters relevant to the day-to-day running of the organization.

The Annual Conference, our association's annual general meeting, is held in different towns and cities, and each of the 80 branches may send a delegate. Individual members may attend the conference and speak and vote on any motion discussed on the business agenda of the conference if they so desire.

The business conducted consists of the Annual Report and Accounts, reports from departmental managers, and remits. Remits (submissions for conference consideration) may come from the Executive Council, any branch, or any five members; subjects covered are association policies, domestic matters, and regulatory matters, and if carried by the vote of conference are (with the exception of regulatory matters) actioned by the Executive Council. Remits on regulatory matters carried by conference vote can only be sent forward to the regulatory body, the New Zealand Post Office, with a suitable recommendation. The New Zealand association is probable unique in that its members control its policies through the annual general meeting.

NZART publishes a monthly magazine, *Break-In*, operates the ZL QSL Bureau, ZL Contests and Awards, a Radio Training Scheme, the Amateur Radio Emergency Corps (AREC), and an Intruder Watch, has a liaison officer to deal directly with our regulatory body, and has three overseas liaison officers who represent New Zealand at IARU and other overseas conferences such as WARC.

BITS 'N' PIECES

IARU Region 3 Monitoring Service Coordinator, Alf Chandler VK3LC, has been forced to retire for personal reasons, after many years of Monitoring Service and Intruder Watches. He has been replaced by Bob Knowles ZL1BAD/ZL6IW, who has been New Zealand Intruder Watch Coordinator for the last four years. He has applied to the IFRB for "direct access" on behalf of the Region 3 Monitoring Service which, if granted, will enable that service to submit reports of "harmful interference" to the Amateur Service without going through the National Administration concerned. In the past, National Administrations, with a few exceptons, have been noticeably reluctant to act as provided for in ITU Radio Regulations. An approach along similar lines has been made also to the New Zealand Administration, and these moves to obtain direct access to the administrations concerned should make it possible to achieve better results in the future.

A point of interest regarding Bob's ZL6IW callsign: The New Zealand Post Office recognizes the value of NZART's Intruder Watch, and in what could be a world first, issued the special callsign for Intruder Watch business. It is not permitted for amateur QSOs, but is to be used expressly for transmissions, mainly on CW, to non-amateur stations intruding into the exclusively amateur portions of our various bands.

ZL HAPPENINGS

WCY Activity Day in ZL, 0000 GMT to 2400 GMT, May 21, 1983: special callsigns on all bands, all modes, during the 24-hour period. Remember, commemorative QSL cards for contacts with these special callsigned stations will be sent via the Bureau, but if you want a direct QSL, send an SAE plus 3 IRCs, with details of the QSO, to the ZL WCY station worked, c/o NZART QSL Bureau, PO Box 40-212, Upper Hutt, New Zealand. No QSL cards necessary—only the details of the QSO.

NZART Annual Conference and Convention, Dunedin, June 3-6 in the heart of ZL4-land. Overseas visitors welcome; enquiries to PO Box 6050, Dunedin, New Zealand.

Remember, if you have any queries, don't hesitate to write me at my ZL address; include 2 IRCs for airmail postage for my reply.

CHILE

Patricio Fernandez H. CE3GN
PO Box 14781
Santiago de Chile

Chile is an extremely long, narrow, and mountainous country, all of which means, of course, difficult communications.

With the advent of the mass-produced Japanese 2-meter transceivers in the early 70s, Chilean hams began to discover the wonderful possibilities of this band, and it was not too long until the first repeater was installed at the Radio Club de Chile headquarters, on an 80-foot tower, in downtown Santiago.

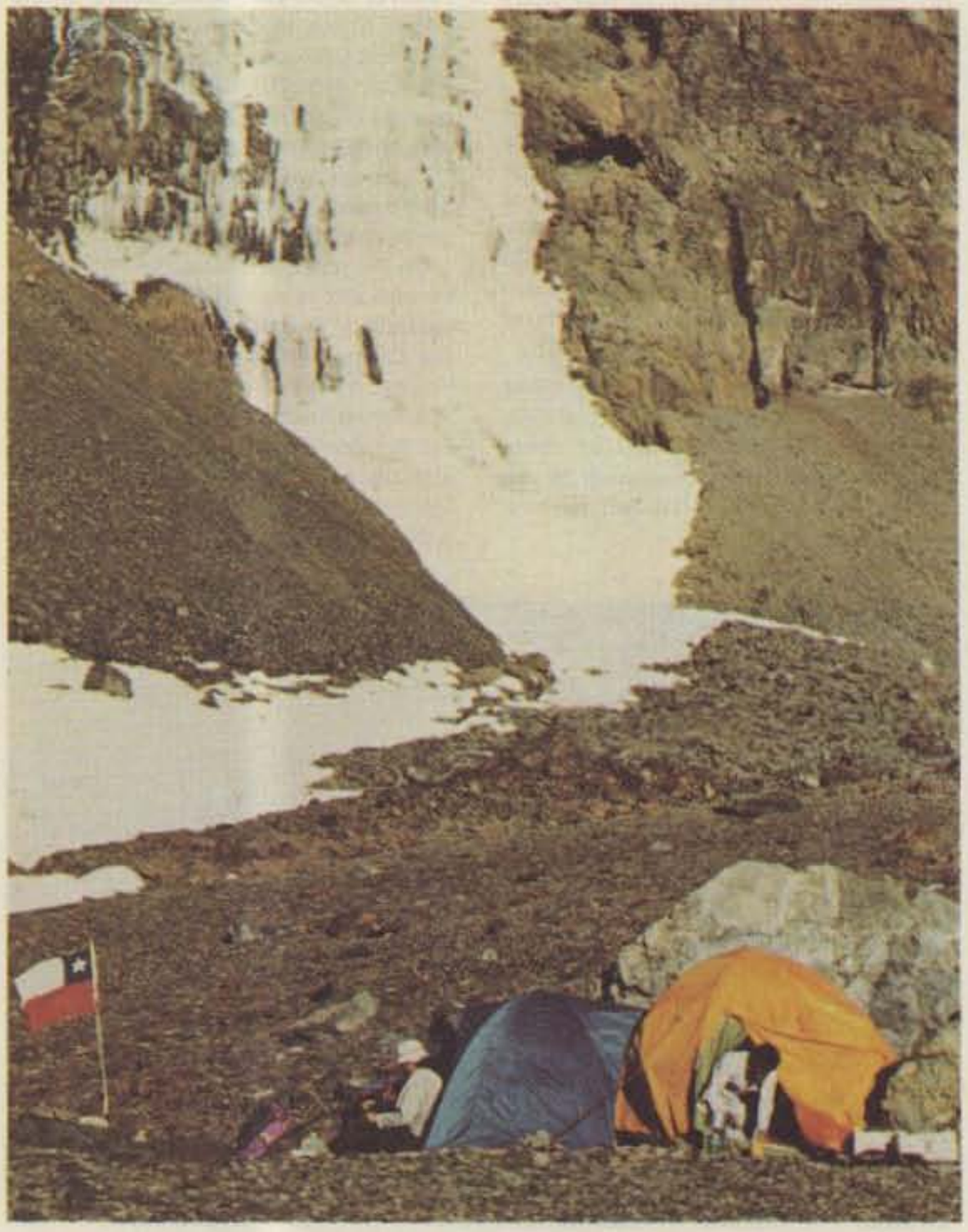
Experimenters soon discovered that although this repeater had a very nice coverage for normal purposes around the city, the mountains that surround Santiago presented a barrier which made any contact over 20 or 30 miles completely impossible.

In addition to the Andean range, which is a natural borderline between Chile and Argentina, the country has another coastal range which runs parallel to the Andes and is situated very near the coast. These mountains were the cause of the problem in trying to establish 2-meter contacts from the capital to various cities situated along the coastline, such as Valparaiso, Vina del Mar, and San Antonio.

After much investigation and tests from various spots, other repeaters were installed by the Radio Club de Chile during the late 70s. Of these, the most successful have been La Cantillana at 7,500 feet, La Dormida at 4,700 feet, and San Ramon at 3,900 feet. Some firsts have been established via La Cantillana. The most important was the commencement of mobile communications between the continent and Robinson Crusoe Island (Juan Fernandez Arch. CE0Z) some 480 miles from the coast; contacts between Chile and Argentina across the Andes, which are, of course, a formidable natural barrier, were also made.

Back in July, 1982, Radio Club de Chile, which is the largest amateur radio organization in the country, decided to study the possibility of placing a repeater on a very high spot in the Andes. This repeater would have to be high enough to permit reliable communications between Santiago and all the coastline and south of Santiago. This repeater would be the first of a series of linked repeater systems north and south of the capital.

The project was assigned to Ricardo CE3XJ and Saul CE3ZI, who, in addition to being hams, are also experienced elec-



Base camp at 9,100 feet with a frozen waterfall in the background.

IC-271A

NEW!

25 Watts of FM, SSB, CW for 2 Meters

OFFSET WRITE

PL TONES BUILT IN

MODE SCAN

NEW DISPLAY

32 CHANNELS OF MEMORY

1 MHz UP/DN BUTTONS

ICOM presents the most advanced all mode, two meter base station available today . . . the IC-271A.

25 watts of power from 12 VDC or from 117 VAC with the optional internal power supply/32 full function memories/multimodes/subaudible tones/PLL locked to 10Hz/high visibility, multi-color flour-escent display/RIT readout/ scanning/dual VFO's/new size.

25 watts. Now a 2 meter base station with 25 watts of power and an optional internal power supply. The IC-271A is a complete station.

32 full function memories. Each memory holds frequency, offset, offset direction, mode, and subaudible tone. Frequency, tones and offset are selected by rotating the main tuning knob.

Subaudible tones. Subaudible tones are selected by rotating the main tuning knob and may be stored into memory.

PLL locked to 10Hz. Extremely low noise and a good signal-to-noise ratio PLL allow synthesizer lock to 10Hz.

High visibility display. ICOM's new high visibility, multi-color display gives easy to read at-a-glance display of frequency, mode, offset, VFO in use, memory channel, and RIT offset direction and amount.

Scanning. The IC-271A can scan memories, programmable sections of the band, or modes. Mode-S scan is a mode scan and can be used to scan memories with a particular mode or to lock out frequencies continuously busy so that the receiver will not stop at that memory channel each time.

Dual VFOs. ICOM's dual VFO system is now even more versatile with the ability to transfer from memory to VFO. This allows frequencies from the tunable memories to transfer directly into another memory without moving a VFO to the new frequency first.

New size. Only 11¼"W x 4⅜"H x 10¾"D the IC-271A is styled to look good and engineered for ease of operation.

Other features. To make the IC-271A functional and easy to use, ICOM has incorporated many asked for features: UP/DN buttons, dial lock, switchable preamplifier, duplex check, all mode squelch, receive audio tone control, S meter, center meter, computer interface, and 7 year lithium battery memory backup.

ICOM

The World System

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

tronics technicians actually working for the Chilean TV net, which covers over 1,500 miles using over 100 repeaters.

As the project involved mountain-climbing knowledge, they contacted Flavio CE3CHH, an experienced climber, and did some research work studying most of the high peaks of the Andes near Santiago.

They finally came to the conclusion that it would be possible to install a solar-powered repeater on top of Cerro El Plomo, which has an altitude of 18,000 feet.

During the next months, both Saul and Ricardo, assisted by other hams, designed, built, and tested a double repeater (15 W on 146.7 less 600, and as a backup repeater, 1.5 W on 146.73) using factory and custom-made parts. An automatic system was included in order to disconnect the batteries if their charge level falls beyond tolerable limits. The same circuit connects them again after 70-percent charge has been regained.

The system was installed on top of Cerro San Cristobal, a hill situated practically at the side of Santiago, and was given a test run of over two months.

In the meantime, CE3CHH had organized the mountain climb to El Plomo with five friends, all members of the Rama de Andinismo of the University of Chile. They had studied the route and had come to the conclusion that the project was feasible, although the biggest problem would be to carry almost 900 pounds of electronic equipment, food, and other gear up to 18,000 feet and then spend at least one day at that altitude in order to assemble everything and make it work.

At that height, even in summer, temperatures can easily reach 20 degrees C below zero, and the oxygen available is about 50 percent less than normal at sea level.

A helicopter would have to transport most of the gear up to at least 13,000 feet, and then mules would have to be used as much as possible above that altitude.

The operation started on January 25. On that date, Flavio and the rest of the team and gear were transported to Farellones by car. Farellones is a skiing resort village about 30 miles from Santiago and has an altitude of about 6,200 feet.

The next morning at 6:30 am, the helicopter from Santiago arrived, piloted by Maj. Pulgar, a most experienced flyer from the Chilean Highway Patrol Police. Two climbers boarded the BO-105 with the mission of getting as far up as possible on the slopes of El Plomo.

Unfortunately, flying at those altitudes is extremely difficult and dangerous, as downdrafts are common—and that day was no exception. Several attempts were made to reach a flat spot at about 13,000 feet, and on the last attempt, the craft was caught by a vicious downdraft which carried them down for about 2,000 feet, almost scraping the rocks on the mountain slope.

After that experience, it was decided to carry the gear to another spot located at about 9,100 feet at the base of El Plomo. Seven flights were made from Farellones to that spot, carrying all the gear and men. On a final successful attempt, the helicopter loaded the batteries, each of which weighed 80 pounds, and landed safely at 10,500 feet. From then on, the climbers had to hand-carry most of the gear up to 15,700 feet in successive trips; this took 3 days.

On the fourth day, they had to bear a heavy storm with hail and snow which kept them under their tents for over a day. On January 29, the mules that had been requested some days before finally arrived, so the batteries and other heavy gear were loaded on the animals. After two days of very difficult climbing, they reached 17,000 feet with all of their gear.

Fred PY0ZZ operates from Fernando de Noronha.

At this height, the mules were so exhausted and the terrain so rugged that it became impossible to use them any more, and they had to be left aside. The route from this point to the top of the mountain goes through a very steep glacier over one mile in width, very difficult and dangerous to cross.

It took the climbers another three days to reach the top with all of the gear on their backs. At this altitude, and without the mules, the task was almost unbearable. Finally, on February 2, after ten days of climbing, they reached the top and the repeater and two antennas were assembled, placed into position, and the first contacts were made that afternoon with Santiago.

The group then returned to the night camp at 17,000 feet and Flavio waited until the next day to climb to the top again and further check all the system. At 10:30 they started their way down, arriving at Farellones that night, where they were greeted by various hams from Radio Club de Chile.

The system has been working very nicely since, and there is reason to believe that it will survive many winters. The coverage is enormous, and the sensitivity is such that hams situated on the coast can work through the repeater using only hand-held gear. After all, it's the world's highest repeater.

BRAZIL

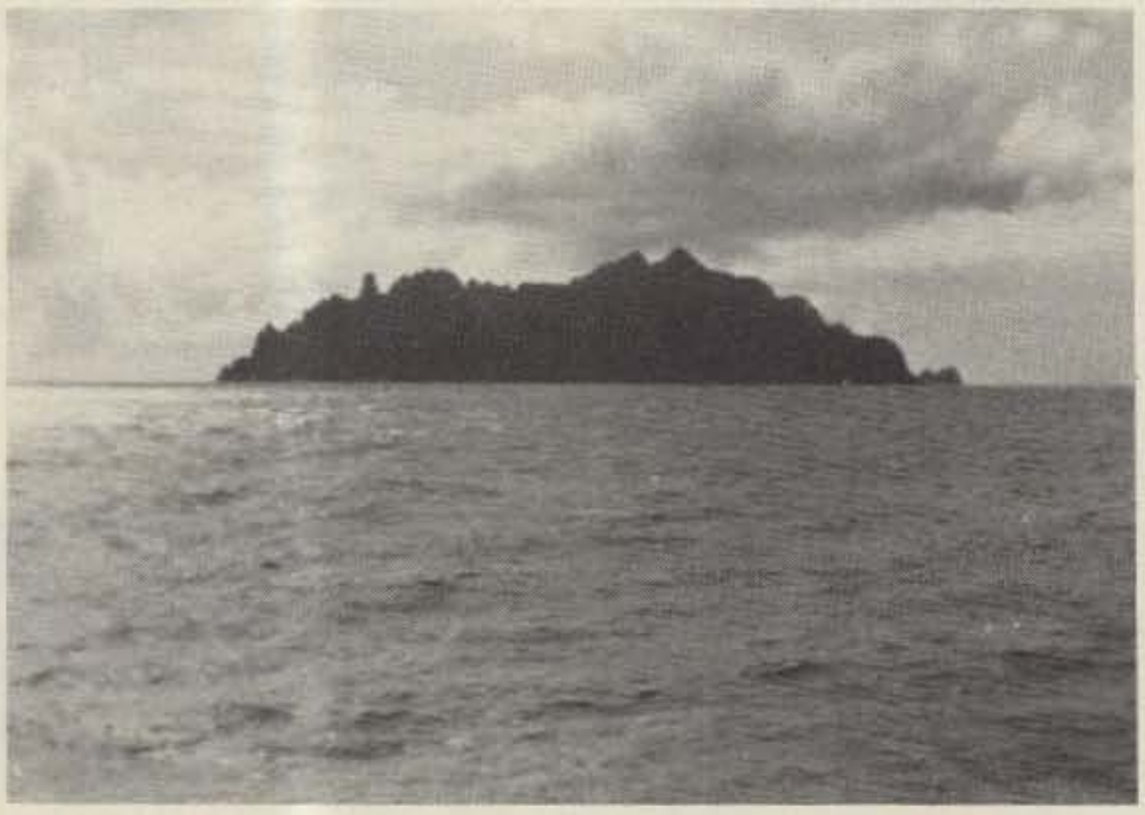
Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

Carlos Vianna Carneiro PY1CC
Rua Alfonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

FERNANDO DE NORONHA ISLAND EXPEDITION

Last October, PY0ZZ and PY0CW were again on the air from Fernando de Noronha Island. Fred PY0ZZ operated from October 9 to 10 and Andre PY0CW operated from October 9 to 26. They operated on all bands in spite of the heavy noise, especially on 80 meters, produced by the generator located in front of the hotel. Fred made about 8,000 QSOs and Andre 3,000. Andre took advantage of the trip to work on the island, so he did not have too much time to operate.

They used a Yaesu FT-201, which burned out the fourth day of operation, and a Delta 500, a Brazilian transceiver. After this accident, they could not be on the air at the same time. The antennas were a dipole for 40 and 15 meters and a Hy-Gain 18 AVT.



Trindade Island.

Fernando de Noronha Archipelago lies in the South Atlantic, 300 miles northeast of Natal. Its geographic coordinates are 30°50'27"S, and 32°24'52"W. It is composed of twenty islands among which Fernando de Noronha, Rata, and Rasa are the main ones. Its area is only 10,422 square miles. Its average temperature is 77° F.

Fernando de Noronha is called The Emerald of the Atlantic by Brazilian and foreign tourists. It has a population of about 1,500 and is the smallest unit and the only military territory in the Federation of Brazil. It is under the direct control of the Ministry of Army. There are Army troops as well as Air Force people working there. Civilians living on these islands have several activities—fishing being the main one.

AWARDS

ABCW Award: Sponsored by the ABC Group of CW, the ABCW Award is available to all licensed amateurs for confirmed contacts with 5 (five) different ABCW members. Contacts must have been made after March 29, 1980, on any amateur band. Only two-way CW mode. No QSLs. Send GCR log of stations worked (call, date, time, band, mode, and report), your personal QSL, and 10 IRCs for mailing expenses to: ABCW, PO Box 285, 09700 Sao Bernardo do Campo, SP, Brazil.

Endorsements: For confirmed contacts with 10, 20, 30, and 40 PY2 stations.

SWL: Same rules.

ABCW Members: PY2AAW, PY2AFG, PY2AMU, PY2ASI, PY2CQM, PY2DEH, PY2DMY, PY2EJX, PY2FKD, PY2FWZ, PY2FXK, PY2FXR, PY2HAB, PY2IAP, PY2IAT, PY2IBE, PY2ITA, PY2JM, PY2RAN, PY2SHC, PY2SHI, PY2THM, PY2TNG, PY2USC, PY2VHW, PY2VIW, PY2VTJ, PY2XA, PY2XR, PY2YDD, PY1AEE, PY1AJK, PY4AUB, PY4BNL, and PY4SS.

TRINDADE ISLAND

One of the Brazilian ocean islands with DXCC status, and 620 miles from Victoria City on the coast of Brazil's Espirito Santo state, Trindade is a savage volcanic island rising from 5,500 meters depth to form a surface of 8.2 square kilometers.

Abruptly steep and covered by low grass and herbs, with trees five and six meters high and giant samambaias, Trindade Island seems to be a lost paleozoic forest in the middle of the Atlantic Ocean.

Giant sea tortoises look for Trindade as an ideal place to lay their eggs, and year after year they come by the hundreds. Wild goats and pigs brought to the island many years ago are inhabitants. Crabs by the thousands live there, and so do sea birds—the newborn tortoise's worst enemy in nature's struggle for life.

A five-minute daily rain was named Pirajá (Peer-ar-jar) by Marines who have a 4-month stay at Trindade, joining a Navy detachment for weather-prediction programs.

Fishing is the main hobby, and it sure is fun there—a paradise of the finest fishes you can imagine, lobsters and barracudas, and also little black fish who are such fools that you can catch them barehanded. "Fish me, please," is what the men call them.

Fresh drinking water comes from the tops of the sloped volcanic hills of this impressive 600-meter-high mountain, with its lava flows and volcanic sand all around. The mountain was discovered in 1501 by a Spanish captain who was serving the Portugese king at the time.

Every two months, a Navy supply boat lands for a few days, bringing 50 percent of the island's crew and returning home with another 50 percent who have fulfilled their 4-month tour of duty. This is the chance for radio amateurs to get ashore

WE BACK EVERYTHING WE SELL WITH OUR PERSONAL GUARANTEE

PRICES F.O.B. HOUSTON

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

ITEMS SUBJECT TO PRIOR SALE

MADISON
Electronics Supply

We will open and inspect all equipment at your request. Accessories purchased will be installed and tested without charge.

NEW TELEX-HYGAIN TRIBANDER EXPLORER 14, extremely broad-banded, 14 ft. beam, add-on 30 or 40 meter. COMPLETE TOWER PACKAGE-tower, beam, CD 45 rotor, coax arms, and prepaid freight to the 48 states. ..... LIST ... $1767.00
MADISON ... 1250.00

AMPHENOL
831SP silverplate, PL-259 ..... 1.00
UG-176 adaptor ..... .30
831J dbl female 2.00
82-61 N-Male 3.00

BELDEN CABLE
9258 RG8x ..... .19/ft.
8214 RG8 foam ..... .39/ft.
8237 RG8 ..... .33/ft.
8235 300 Ohm kW twinlead ..... .20/ft.
8000 14 Ga. stranded ant .... .10/ft.
8267 RG213 ..... .46/ft.
8448 rotorcable ..... .27/ft.
9405 heavy rotor cable ..... .45/ft.

CONSUMERS wire RG214 nonmil spec ..... .70/ft.
HYGAIN TH7DXS 329.00
TH5MK2S 318.00
Ham 4 ..... 199.00
Ham X 249.00
Explorer 14 ..... 279.95

EXPLORER PACKAGE
Beam, with balun and kit for either 7 or 10mHz option... LIST ... 399.95
UPS shippable MADISON ... 269.95

CUSHCRAFT A3 ..... 179.00
A4 ..... 229.00
YAESU FT77 ..... 519.00
FT102 ..... 969.00
FT980 ..... 1299.00
KANTRONICS Interface 149.00
Software in stock now!
SHERWOOD, W6TOG kits 10% off list
CURTIS K5B, K5 Littlebugger ..... 29.95 ea.
AEA MM2 ..... 149.00
CK2 ..... 119.00
CP1 Computer Interface for RTTY and CW 169.95
HUSTLER 6BTV 139.00
SIGNAL ONE Milspec 1030 4995.00
Wait 'til you see the trade-ins you can get on this one!
TCG 2.5A/1000PIV epoxy diode 19¢
SPRAGUE
500pF/30kV doorknob cap ... 16.00
1000pF/500V feedthru 1.95
CDE .001/20kV cap 1.95
SANTEC ST144μP 279.00
ST440μP 299.00
ANTECO 5/8 wave mag mount antenna 25.00
NYE MB1-02 100 W Tuner ..... 179.00 w/balun
MB4 3kW Tuner w/balun ... 345.00
FINCO antennas ..... In stock 30.00
YAESU FT-ONE + acces.... 2300.00
FT-208R 269.00
FT-708R 269.00
ROBOT 800 (limited amt.) 447.00
HAM KEY HK-3M 19.95
HK-1 ..... 29.95
BUTTERNUT HF6V 125.00

ICOM ICOM R-70 Call
ICOM IC 730 $669

REPEATERS:

1.2 gHz!

CALL FOR QUOTES

IC-RP3010 - 440 mHz
IC-RP1210 - 1200 mHz
10 watts, PLL freq. (1.2 gHz), DIP switch, CTC55 acces., DTMF control functions, selectable hang time.

IC-120
1.2 gHz FM

Six memories, 2 VFO's, programmable tones and offsets, memory or band scans programmable, 3 tuning rates, R1T on FM, green LED readout.

All items guaranteed.

Brought to you by:
W5GJ, W5MBB, K5AAD, N5JJ, WB5RTC, WB5WHR, WD5ABR, KB5PE, WB5AYF, W5EGP, K7WOC, WB8FQO, and LIONEL

Houston COM-VENTION '83
The 1983 ARRL National
Oct. 7-9, 1983
Astro Village Hotel

Service Department

ICOM

IC25A $309.00
IC25H $349.00

- Green LED • 5 Memories
- Priority Channel • NOR/REV
- HM14 Microphone
- Scanning
- 25H-45 Watts

IC 471A

32 full function memories / subaudible tones / PLL locked to 10 Hz / two color florescent display / RIT readout / scanning / new size

ALPHA DELTA

R-T - $30
HV Mk II - $33
LT - $20
HT - $25

Transi-Trap Protection

JUNE BUGS

$110.00 Vibroplex **$69.00**

BRASS RACER EK-1
The iambic paddle with the keyer already in.

BRASS RACER IAMBIC
Used with your favorite keyer.

1-800-231-3057

SANTEC HT-1200

SPECIAL PACKAGE
$250.00
Radio, 2 battery packs, antenna, DC power cord, AC charger, and charger interface

KDK 2030 - $269.00
2 meter mobile

Antennas and Towers
Call us first!

SHOW CALENDAR
Dayton 4/29-5/11
Baton Rouge - May 7-8

ETO ALPHA

SALE SALE

77DX
$3785.00

78
$2485.00

IF IT'S NOT LISTED, CALL ME!!

SPECIAL SALE

KENWOOD

TS-430S
Great Price!
Call for Quote.

KENWOOD R-2000

We stock what we advertise, and much more.
TOLL FREE - ORDERS ONLY
1-800-231-3057

45

713-658-0268 * **CALL FOR QUOTES**

1508 McKINNEY
HOUSTON, TEXAS 77010

After a four-month stay on Trindade, it's back to the continent.

and put Trindade on the air: a sure pileup as long as the stay lasts! Landing at Trindade is not easy; stone walls surround the island and there are very few places where a small boat can get in.

If radio amateurs are lucky enough to have a helicopter aboard, that is wonderful, and this is how they will be taken ashore. But if not, a boat is sent close to the island and a rope is shot out so that they can pull the cable through a pulley and back to the ship. Then a raft about three by three meters, made from boards tied to empty oil drums, is shuttled between the island and the ship until everything is landed—men, goods, and equipment.

It's all very easy until you get near strong breakers close to shore, with waves sometimes covering men and supplies alike, including all amateur gear, thus causing much distress. Although gear may be perfectly wrapped in plastic, there will always be water dripping from transceivers.

Even so, Trindade Island is a marvelous challenge to Brazilian amateurs, and the tremendous fun of an operation from the much-awaited PY0T is a permanent push to an adventure never to be forgotten. This means that if you ever hear someone calling "CQ...CQ...de PY0T...Trindade Island," you can bet he's in paradise.

Radio amateurs can count on Navy sympathy when possible. Of course, there is no Waldorf Astoria Hotel at the island, but the people there are extremely friendly and do their best to help amateurs. And this is why friends who have been operating from there are always dreaming about "the next time I go to Trindade Island." I have never been there, but I dream of it myself...

1982 GARTG* SSTV CONTEST SUMMARY RESULTS

	Call	1st part	2nd part	Total points
Group A (Shortwave transmitting stations):				
1.	JA1XGI	12750	37600	50350
2.	LZ1MH	8008	24552	32560
3.	EA3PE	7547	15336	22883
4.	LZ2OV	1155	12320	13475
5.	I3BQC	3145	6804	9949
6.	I4LRH	900	2426	3326
7.	DF7XA	-	1672	1672
8.	HA1ZH	600	-	600
9.	F5WF	-	312	312
10.	YU2CDS	-	168	168
11.	DK7UG	84	60	144
12.	DJ8WL	-	60	60
13.	YU2CB	-	8	8
Group B (Shortwave Listeners):				
1.	DL7FAB	1950	-	1950
2.	DG6DAF	-	418	418
3.	NL 4483	-	192	192

*German Amateur Radio Teleprinter Group.

WEST GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
Federal Republic of Germany

Hans J. Schalk DJ8BT
Hammerskjold-Ring 174
D 6000 Frankfurt 50
Federal Republic of Germany

The Deutschland-Diplom (DLD Award) sponsored by the German Amateur Radio Association (DARC) is not too difficult to get and it is issued in the form of a beautifully-designed certificate in full color. But effective January 1, 1983, new regulations apply. Here are the essentials.

Two classes of DLDs are available—DLD 100 and DLD 200. For European applicants, 80m contacts only are valid while all other amateurs may use 80, 20, 15, and 10 meters. Two-way communications are required in any legal mode of operation. Each confirmed DOK number (see below for explanation) is counted as 1 point except for non-Europeans who may count 2 points for each DOK number confirmed on 80m. 100 or 200 points respectively are needed to get the DLD 100 or 200. Contacts on or after January 1, 1956, are valid.

For 40m contacts, the DLD 100/40m and DLD 200/40m are available. Uniform regulations exist for European and all other applicants, i.e., 1 confirmed DOK number is counted as 1 point. Contacts on or after May 7, 1959, are valid.

Lapel pins are offered in the following categories: Bronze for DLD 300, i.e., DLD 100 + DLD 200/40m, or DLD 200 + DLD 100/40m, or DLD 200 + 100 additional DOKs on 80m, or DLD 200/40m + 100 additional DOKs on 40m. Silver for DLD 400, i.e., DLD 200 + DLD 200/40m, or DLD 200 + DLD 100/40m + 100 additional DOKs on 80m, or DLD 200/40m + DLD 100 + 100 additional DOKs on 40m. Gold for DLD 500, i.e., DLD 200 + DLD 200/40m + 100 additional DOKs on 80m, or DLD 200 + DLD 200/40m + 100 additional DOKs on 40m. Non-Europeans may use 80, 20, 15, and 10 meters to fulfill the 80m requirements. And in addition to the lapel pin in gold, stickers are available in green, red, silver, and gold for 600, 700, 800, and 900 confirmed DOKs. Top of the line is the DLD 1000 award which requires a total sum of 1000 confirmed DOKs. The DOKs confirmed on 40m are counted separately if one applies for stickers or for the DLD 1000 award.

DOK Designations

The Distrikts- und Ortsverbands-Kenner (DOK) is composed of a letter and a numeral representing a particular district and the local group of DARC in that area. For example, the DOK H03 represents the district of Niedersachsen and one of the local groups in Braunschweig/Germany. Several groups may exist in larger cities. (See the table.)

The letter Z is employed by radio amateurs who are affiliated with the German Department of Telecommunications. Their organization, Verband der Funkamateure der Deutschen Bundespost e.V. (VFDB), is a corporative member of DARC. And there are special DOK numbers from time to time as, for example, WCY for 1983, IBO33 from 1st April to 31st July, 1983, and IR33 from 1st August to 30th November, this year.

Confusing? If so, get your feet wet by starting with the DLD level having the simplest rules: the DLD 10m. Only 50 DOK numbers confirmed on 10m are required—that's all. Contacts on or after January 1, 1976, are valid.

The fees are moderate, on the order of 10-15 DM($4.00-$6.00 approx.). Complete information and application forms may be obtained from the DLD manager, Mr. H. P. Guenther DL9XW, Am Strampel 22, 4460 Nordhorn 1, Federal Republic of Germany.

AMATEUR RADIO SATELLITE

AMSAT/DL has been notified by ESA (European Space Agency) that the launching date for the AMSAT Phase IIIB Amateur Radio Satellite, DL0WCY, is expected for May 27, 1983. This means the satellite will be shipped to Kourou (French Guiana) in mid-April, followed closely by the launch control crew. If no unexpected delays in the pre-launch procedures happen, the satellite should be in orbit about 3 years after the disastrous false start from the ARIANE L 03 flight in 1980.

Negotiations concerning the launching of a Phase IIIC satellite from Vandenberg, California, are presently unsuccessful.

QSL MANAGERS

A listing which contains over 2000 QSL manager addresses can be obtained for 15 DM or equivalent from Arthur Maurer DL8BL, Beim Weisenstein 9, D-6602 Dudweiler, West Germany.

A	Baden
B	Franken
C	Bayern/South
D	Berlin
E	Hamburg
F	Hessen
G	Koeln/Aachen
H	Niedersachsen
I	Nordsee
K	Rheinland-Pfalz
L	Ruhrgebiet
M	Schleswig-Holstein
N	Westfalen/North
O	Westfalen/South
P	Wuerttemberg
R	Nordrhein
T	Schwaben
U	Bayern/East
Z	VFDB

Table of DOK designations.

CONTEST CALENDAR 1983

Date	UTC	Name	Bands	Mode
May 8	1100-1700	*DARC "CORONA" Contest	10m	RTTY
June 11	1200-1600	*GARTG Short Contest	80/40m	RTTY
July 17	1200-1500	2nd DARC 10m Contest	10m	CW + mixed
Aug. 13-14	0000-2400	WAEDC—CW	80/10m	CW
Aug. 28	0700-1100	GARTG Short Contest	80/40m	RTTY
Sept. 3	1100-1700	DARC "CORONA" Contest	10m	RTTY
Sept. 10-11	0000-2400	WAEDC—Phone	80/10m	SSB
Oct. 8	1200-1600	Z Contest	80/40m	CW
Oct. 8-9	0600-0600	GARTG SSTV Contest	80/40m	SSTV
Oct. 15	1300-1700	GARTG Short Contest	80/40m	RTTY
Oct. 29-30	1400-1400	2nd DARC FAX Contest	80/10m	FAX
Nov. 6	1100-1700	DARC "CORONA" Contest	10m	RTTY
Nov. 12-13	0000-2400	WAEDC—RTTY	80/10m	RTTY
Nov. 13	1200-1500	3rd DARC 10m Contest	10m	CW + mixed

*DARC—Deutscher Amateur Radio Club (National Amateur Radio Society).
GARTG—German Amateur Radio Teleprinter Group.
WAEDC—Worked All Europe DX Contest.

MIRAGE

American made RF Amplifiers and Watt/SWR Meters of exceptional value and performance.

•5 year warranty • prompt U.S. service and assistance

RF AMPLIFIERS

2 METERS-ALL MODE

B23 2W in=30W out $89.95
(useable in: 100 mW-5W)

B108 10W in=80W out $179.95
(1W=15W, 2W=30W) RX preamp

B1016 10W in=160W out $279.95
(1W=35W, 2W=90W) RX preamp

B3016 30W in=160W out $239.95
(useable in: 15-45W) RX preamp
(10W=100W)

220 MHz ALL MODE

C106 10W in=60W out $199.95
(1W=15W, 2W=30W) RX preamp

C1012 10W in=120W out $289.95
(2W=45W, 5W=90W) RX preamp

C22 2W in=20W out $89.95
(useable in: 200mW-5W)

RC-1 AMPLIFIER REMOTE CONTROL $24.95
Duplicates all switches, 18' cable

WATT/SWR METERS

- peak or average reading
- direct SWR reading

MP-1 (HF) 1.8-30 MHz
MP-2 (VHF) 50-200 MHz
$119.95

430-450 MHz ALL MODE

D24 2W in=40W out $199.95
(1W=25W)

D1010 10W in=100W out
(1W=25W, 2W=50W) $319.95

Available at local dealers throughout the world.

MIRAGE
COMMUNICATIONS EQUIPMENT, INC.

P.O. Box 1393, Gilroy, CA 95020 (408) 847-1857

See List of Advertisers on page 114

ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
20219 Milano
Italy

The scene has been dominated by the VKØ expeditions. Even if difficult to understand, the reason for two expeditions to this same spot in the same period of time has been the thrill to be on frequency there. Signals from VKØHI were very strong the first days of operations, but then the propagation dropped. When VKØJS appeared, the demand for Heard was still tremendous. The pileups on 14195 were incredible, and sometimes VKØHI was on 15 in the same period, working his own frequency with no customers.

Italian operators have been very lucky because, with such propagation, many North Europeans were not able to copy Heard. Most of the contacts have been made on 20, a few on 15, and very few on 10. 40 and 80 have been dominated by CW with few contacts on SSB.

RADIO IN ITALY

The national body for amateur radio in Italy is the Associazione Radioamatori Italiani, or ARI. It has an elected council of 8 members in charge for a term of 3 years.

The first honorary president was Guglielmo Marconi. Today, the council consists of a president, a vice-president, a secretary, and five other members. Others who play important roles are the various managers, one for each kind of activity: DX, VHF, Awards, RTTY, QRP, ATV, SSTV, SWL, Repeaters, Reciprocity, etc. I will report on the above topics in the future.

The official monthly magazine, *Radio-Rivista* (it means Radiomagazine), also known as *RR*, is somewhat in between *CQ*, *73*, and *QST*. Like *QST*, *RR* gives ample reporting on League activities like meetings, division activities, hamfests, and others. As *73* and *CQ*, it widely covers DX, awards, new rigs, and antennas.

The magazine has changed substantially during the last months with the new management of two professional journalists: Nax Di Marco I2DMK and Angelo Pinasi I2PKF, who is also the DX editor. The new format of *RadioRivista* resembles *Time* and consists of about 120 pages, of which 40 are devoted to advertising. Advertising is more or less the same in Italy as in the States, but there are no toll-free lines and prices are never mentioned in the newspaper. Dealers do not like to compete too much against each other (the market is relatively small); they do prefer to squeeze the customers.

The total number of hams in Italy is around 24,000, and 50% of them are members of ARI. The cost of membership is 38,000 lire (about $27.00), which includes the handling of incoming and outgoing QSLs without other costs and without any limit in quantity (I personally send 6,000–7,000 cards per year). To top it off, an antenna insurance policy and some other small additional benefits are included in the fee.

In our country, we are very proud of the fact that the first radio amateur (as he liked to call himself), G. Marconi, was Italian. If it happens that you work IY4FGM, you will be interested to know that this club station is transmitting from the same room Marconi used to make his experiments! And to your surprise, if you visit the Manhattan World Trade Center, on one of the observation decks of "The World at Your Feet," you will find: "The radio—an American invention"!

MALTA

C. A. Fenech 9H1AQ
35 Main Street
Attard
Malta

THE MALTESE ISLANDS

The Maltese Islands, consisting of Malta, Gozo, Comino, and two other small, uninhabited islands, are situated in the middle of the Mediterranean Sea about 93 km south of Sicily and 288 km from North Africa. The total area is 315.6 square kilometers, with Malta having approximately 246 of them. The longest distance in Malta southeast to northwest is about 272 kms, and the widest east/west distance is about 14.4 km. The population of Malta is 320,000. Valletta is the capital city of Malta. The main seaport is the Grand Harbour at Valletta, which is surrounded with magnificent bastions recalling great historical moments in the history of the Maltese Islands. The only airport is situated at Luqa, about 6.25 km from the capital city.

Malta boasts of a very temperate climate. There is no snow, fog, or frost. Rain falls only during short periods, usually between October and April, averaging about 55.9 cm in a whole year.

On such a small island as Malta, there are about 150 licensed amateurs, of which only about 90 are active. The two types of licenses issued consist of License A and License B. Holders of the A license must pass an examination in radio theory and operating procedure and a Morse test of 12 words per minute. Holders of such a license are allowed to operate on all bands with 150 W dc input (10 W on 1.8 MHz). License B holders also have to pass the theoretical examination but do not need to sit for a Morse test. Holders of such a license are allowed to operate only on VHF, i.e., from 144 MHz upwards. The following are the callsigns issued in the Maltese Islands: 9H1 followed by one or more letters denotes a category A license holder. 9H5 followed by one or more letters denotes a category B license holder. 9H4 followed by one or more letters denotes a category A license holder living in Gozo. 9H3 followed by one or more letters denotes a category A license issued to a visitor who comes to Malta for a short period. (There are no licensed radio amateurs on the Island of Comino.)

A license to set up an amateur radio station in Malta costs three Malta pounds (about $1.20), renewable every year. Such a license is not transferable.

The Malta Amateur Radio League (MARL) is the society that represents the majority of radio amateurs in Malta. It has IARU recognition and is affiliated with the ARRL and the RSGB. The club is situated at The Parochial Centre, Attard, and the official address is Malta Amateur Radio League, PO Box 575, Valletta, Malta. Meetings for members are held every Tuesday and Thursday evenings and every Sunday morning. Courses, free of charge, are also given for those members who would like to obtain a license. The society also runs a very efficient QSL Bureau.

How To Apply

Following are the requirements to apply for permission to establish and use an amateur (sound) station; applications should be made to: The Chief Inspector of Wireless Telegraphy, Castille, Valletta, Malta, Europe, and should include:

A.1. Name of applicant (with full Christian names)
A.2. Date and place of birth
A.3. Home address
A.4. Details of occupation
A.5. Telephone number
A.6. Citizenship and passport number
A.7. Father's name
A.8. Mother's name and maiden surname
A.9. Address of where the amateur station is to be set up
A.10. Duration of stay in Malta (from . . . to . . .)
A.11. Qualifications (amateur license); copy of current license is to accompany the application
B.1. Transmitter(s). Type, class(es) of emission, power, frequency coverage, etc. Circuit diagram to be enclosed with the application. (Maximum dc power energizing the final stages or any device energizing the aerial shall not exceed 150 Watts. Hand portable equipment is not allowed. Mobile operation is likewise not permitted.)
C.1. Receivers. Types, modes of operation, frequency coverage, etc.
D.1. Details of any other equipment
E.1. A declaration by applicant that (s)he will adhere to all the conditions of the radio amateurs in Malta

Applications for such a license should be made at least 3 months in advance of arrival on the island.

SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S-155 00 Nykvarn
Sweden

Rainer Martinsson SM2DMU
Sikea 3178
915 00 Robertsfors
Sweden

SCANDINAVIAN HORIZON

The amateur radio world is divided into three regions. Europe, Africa, and parts of Asia belong to Region 1, North and South America belong to Region 2, and Southeast Asia, Australia, and the South Pacific belong to Region 3. Region 2 has the most favorable frequency allocations compared to the two others. In Region 1, the amateur bands 50 MHz and 220 MHz are assigned to other services. The 160-meter band was, with a few exceptions, not assigned to hams until 1982, and we are still restricted to just a few kHz and limited power up to maximum 10 W input. Both the 80- and 40-meter ham bands are 200 kHz wider in Region 2 (America) than in Region 1 (Europe/Africa).

LICENSING IN SWEDEN

The Swedish Amateur Regulations were revised during 1982. Generally speaking, these put tighter restrictions on the hams, which is unfortunate. For example, Swedish hams initially were forbidden to participate in satellite communications on the 432-MHz band. We still are strictly forbidden to operate on the 21-MHz band if we may interfere with radio and TV broadcasts when the affected receiver has an i-f with this frequency or a harmonic thereof. Furthermore, we were told that having a transmitter capable of transmitting outside the ham bands was illegal after October 1, 1982. This made all commercially-marketed ham rigs illegal at once! Practically all equipment has some overlapping, and a rule like this will only degrade the respect for regulations.

SSA, the Swedish amateur radio league, is trying to negotiate with the authorities, and the restriction on 432 MHz for satellite communications has been lifted.

Since the early 70s, Sweden has had four classes of ham licenses. The fourth class we got ten years ago was a Technical class for VHF with no Morse code requirement.

Looking at the license class structure in Sweden (see the table) makes one wonder why there are four classes when the difference is so small. In fact, most countries have only two classes, a Novice class and a General class. Basically, the requirements for achieving a license in various countries is much the same. The most common code speed for the highest license class is 12 wpm (60 characters a minute). Sweden with 16 wpm and the US with 20 wpm are two exceptions. The written exam covers about the same but is of course structured according to the different classes in each case.

LOW INCENTIVES

There used to be a gain in privileges by upgrading in Sweden. During the last decades, the difference has become less obvious and there is not much of an incentive any more, especially since the recent change increasing the power levels for class B licensees from 75 W to 250 W and class C from 10 W to 100 W without giving the class A anything new. The concern for TVI/RFI has been the major reason for keeping the old 500 Watts input as maximum.

In the late 50s, when I got started, I had to wait till I turned 16 before I could try for my Novice ticket. This gave me 15 kHz on the 40m band CW (7035-7050 kHz) with 5 W input crystal-controlled. Much the same as your Novice ticket, but we sure envied your 75 Watts. Ours was not renewable either, and we had to upgrade before turning 19 or find something else to do. (This limit has also been changed.) The code speed was and is still 8 wpm for class C.

NOVICES IN FINLAND

I never forget those days when the Novices in Finland always did beat me with their marvelous 15 Watts. When an OH ham popped up on my crystal frequency, he usually stayed there for about two weeks. That was the time it took him to work the 250 QSOs required before he could upgrade. It did not take many days until there was a new one with the same crystal on "my" frequency for another two weeks. I had to work one year before I could upgrade and "go vfo."

OTHER NORDIC COUNTRIES

Finland and Norway have two classes of license, a Novice and a General, while Denmark has four classes structured the same way as the Swedish system. Their age limits differ, though, starting with 13-year-old Novices. Finland does not have age limits as the other countries. Hams in OH-land can use up to 600 W output which can be compared with 600 W input for the Norwegians. The Norwegians are even prohibited from owning a transmitter capable of more than that limited dc power. Denmark and Sweden have an upper limit of 500 W dc input. Another peculiarity I have found is that in Norway you have to identify with your callsign every 5 minutes. Most countries have followed the 10-minute recommendation made by the ITU.

WARC BANDS

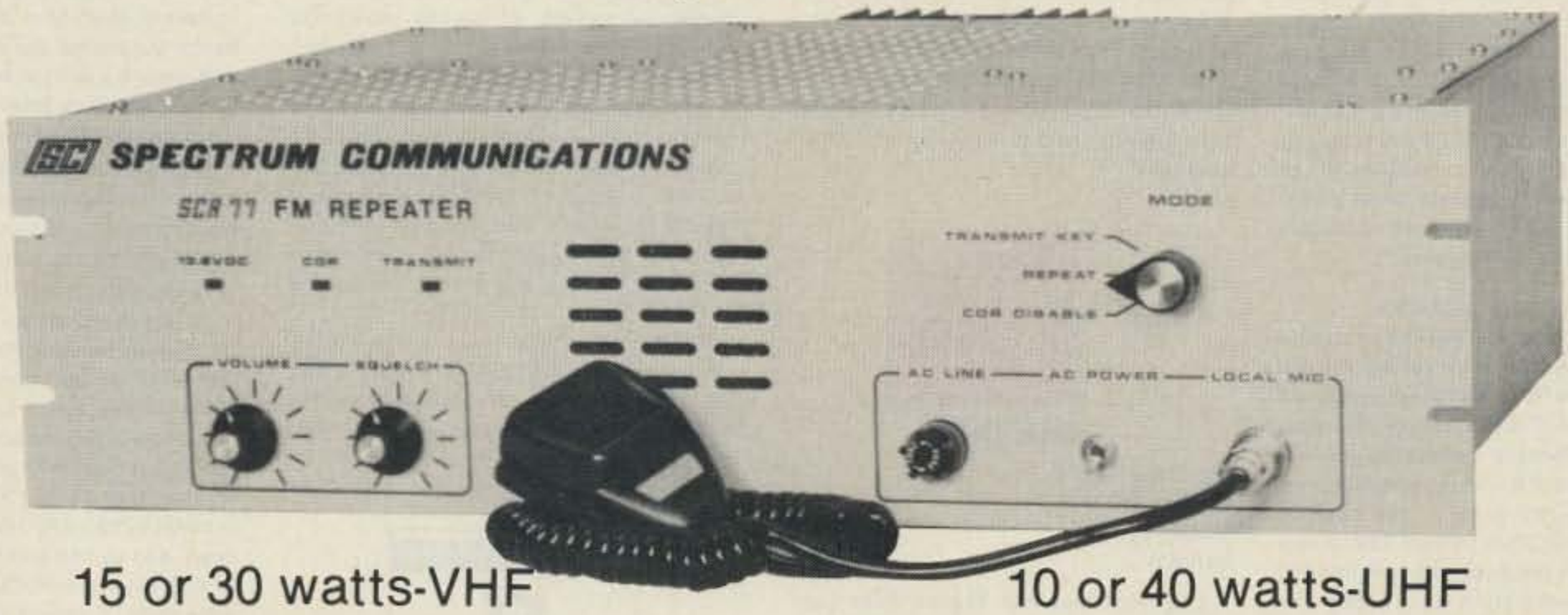
Denmark has opened all the three new bands for their hams. This, of course, also includes OY, the Faroe Islands. Norway was also heard on 10 MHz right away on

SCR77 'Basic' Repeaters
Simply The Finest Quality
'Low Cost' Repeaters Available!

New

From Spectrum-'The Repeater Specialists'

For 2M, 220 & 440 MHz



15 or 30 watts-VHF

10 or 40 watts-UHF

Includes:
- **0.3 μV Rcvr. 8 Pole IF Filter**
- **Crystals—high stability .0005%**
- **Local Mic**
- **Your Call programmed into IDer**
- **Provision for Auto-Switchover to Btry. Pwr.**
- **High stability TX Oscillator/Oven on UHF unit**
- **Built-in 115/230V AC Supply; basic Panel Controls, Spkr., LED Indicators**

If you're looking for a new Repeater, but you really don't need (or can't afford) all the features and options on our world famous, 'Super Deluxe' SCR1000/4000, then our new economy line of SCR77 Repeaters is ideal for you!

These new Repeaters maintain the quality of design, components and construction which made Spectrum gear famous. However, all of the "bells & whistles" which you may not need or want have been eliminated—*at a large cost savings to you!* The SCR77 is a real "workhorse" basic machine designed for those who want excellent, super-reliable performance year after year—*but no frills!* ('PL', 12 Pole IF Filter, Front End Preselector, and a 30/40 Wt. Transmitter are the only "built-in" options available, but Autopatch, Remote Control, and other equipment can be connected via the rear panel jack.)

A complete line of duplexers, antennas, cabinets, cable, etc., is also available.

Of course, if you do want a full featured/super deluxe repeater, with higher power and a full list of available 'built-in' options, then you want our SCR1000 or 4000 "Dream Machine". These units will continue to be available for those who want 'The Ultimate in Repeaters'.

SCR77 Pricing (15Wt.): 2M or 220MHz, $999.95 Amateur Net. 440MHz, $1150.00. For no 'plug-in' ID board (Export), deduct $40.00. *Call or write today for a data sheet, or to place your order!* Sold Factory Direct or through Export Sales Reps only.

Now located in our new, larger plant! Thanks for your 9+ years of support!

SPECTRUM COMMUNICATIONS

1055 W. Germantown Pk, S6 • Norristown, PA 19401 • (215) 631-1710 • Telex: 846-211

See List of Advertisers on page 114

Class of License	Minimum Age	Modes of Operation	Max. Power Input	Amateur Bands
A	17	All	500 W	All
B	16	CW, RTTY On 28 MHz and above, also phone	250 W	All
C	14	CW, RTTY On 28 MHz and above, also phone	100 W	All but 20 meters
T	17	All	75 W	144 MHz and above

License class structure in Sweden.

January 1, 1982, when that band could be opened for the first time. Finland has had operating privileges on 160 meters for years. It is still unknown when we in Sweden may get any of the new WARC bands, and the 15 kHz we got on April 1, 1982, on 160m are only opened on a trial basis and "can be revoked immediately if other services are interfered with or if there are put forward any objections internationally of fundamental nature against these transmissions." Our power limit for this band is 10 W input, only CW (class A1A).

CODE-FREE LICENSE

A possible code-free license in the US has been discussed a lot lately. We got such a license ten years ago—the so-called T license (T for Technical). The idea was to give CBers a chance to get into ham radio without having to put in that extra effort required to learn the code to start with. It was obvious that lots of people got into CB because of some interest in radio communication as a hobby and not to use CB as it originally was intended to be used.The hope was that these people would get a deeper interest in amateur radio and upgrade, and the national amateur league accepted this new license.

Many became genuinely interested and eventually upgraded, but a majority of these people stay on 2-meter FM and this is and continues to be their only experience in the wide field of ham radio. The most unfortunate thing, in my personal opinion, is that many of these T licensees degrade themselves by indicating a feeling of inferiority because of not mastering the code. This, however, is apparently not enough to make them go through the effort required by everyone for learning this skill. In some cases, this fact has produced an unnecessary strain between groups of hams which is difficult to avoid.

A summary of our ten years' experience with a code-free VHF license is that the Swedish ham population has grown considerably. There are now almost half as many T licensees as class-A licensees. About 90 percent of all new licenses issued are class T. Some of them are indeed technical people, but most of them stay strictly on 2-meter FM.

You have probably heard 3 or 4 different Swedish prefixes on the air. Most common is SM, which is granted to all persons passing the exams. SK is a club station either in a ham club or from a school. These stations are run on a voluntary basis, and two amateurs having the highest level of certificate are responsible for all traffic from such a station. You will find a lot of SK stations on the air when the major contests are on. SL is the prefix of stations belonging to the Swedish defense forces. These are manned by trainees or amateurs doing their national service.

The fourth and most rare prefix is SJ, which is held by one station, SJ9WL, situated in Morokulien—an imaginary country on the border of Sweden and Norway. This "country" was founded during a radio show in the middle of the 1950s. There is a nice hut at the disposal of any visitor, and a licensed amateur can have a choice between using SJ9WL or LG5LG. The station is equipped with gear covering all HF bands as well as 144 and 432 MHz.

Sweden is divided into 8 districts and a ham must change the number in his prefix if he moves from one district to another. The suffix is the same and nowadays lost calls are not given to a new amateur for a long time.

BAHRAIN

Ian Cable A92BW
PO Box 22381
Muharraq
Bahrain

The third biannual Middle East Communications Exhibition (MECOM) took place in Bahrain, February 7-10, and as usual, ARAB (Amateur Radio Association Bahrain) was there. We operated special-event station A99A on the HF bands during the hours that the exhibition was open, with somewhat disappointing results in terms of QSOs made. Unfortunately, the move from the original temporary exhibition site to the new permanent one at the Central Market was not without its problems. In the radio receiving sense, the new location is extremely noisy, with an S7 noise level commonplace on the HF bands; we assume the power line radiated. It didn't help that the tower exhibitor, whose products we had hoped to use to hold up the A99A antenna, was located so far away from our stand that we would have needed a second mortgage to fund the purchase of feeder cable! The best that we were able to manage under the circumstances was a trapped multiband vertical on the roof of the building with an swr on the feedline low enough not to cause any problems. Our apologies to those who called loud and long and didn't make it through the noise.

Amateur radio visitors to the ARAB stand at MECOM included stations licensed by the administrations of A71, DL, EA, G, HZ, K/W, OD5, OZ, SV, VE, 5B4, and 9K2. We even had to drag some of the exhibitors, who were also amateurs, away from their own stands in order to sign in at ours.

Also present whilst MECOM was in progress were Lloyd and Iris Colvin W6KG/W6QL, fresh from their exploits in A71. We were more than somewhat startled when they emerged from the Airport Customs Hall complete with transceiver and amplifier on their own suitcase wheels! Regrettably, that was when good luck deserted them; no license was forthcoming. Our Association president, the Minister of Information, was willing to license, but the Security and Intelligence Service of the Ministry of the Interior said no.

Our 2-meter repeater, A92RP, 145.150 MHz in, 145.750 MHz out, 1750-Hz tone-burst access, has recently undergone a retrofit involving the installation of a higher gain antenna. All of the previously marginal scratchy signals are now fully quieting. Maritime mobiles in the Gulf are welcome to make use of the repeater; there normally is activity at around 1830 local time. Future plans are to move the repeater from its present site atop the National Bank of Bahrain to the Gulf Hotel, which will effectively remove it from the downtown repeater rat race. There is absolutely no truth in the rumor that we leaned on Ted A92CE in order to persuade him to move from the Ramada Inn to the Gulf Hotel—but every little bit of influence helps!

Our 28.245 IBP beacon, A92C, has been running recently on the tribander at the clubhouse except, of course, when the club station is in action. The replacement meter switch for the club's FT-101E has recently become available, so we will be able to tune up on the meter rather than by maximum smoke. Next project looks like a 2-meter beacon—we have available a Communicator IV which should be capable of generating the requisite amount of rf and the old repeater antenna to radiate it.

As the springtime propagation picks up, perhaps both A92BE and A92BW can be persuaded to devote time to 20 meters rather than to their respective computers. Let's wait and see what happens!

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office
85530
Israel

Greetings from Israel to all readers of *73*. This is to keep you informed on what's happening in amateur radio in Israel. I'll be delighted to answer any questions you have pertaining to the ham scene here, so don't hesitate to drop me a line.

If you're active on the HF bands, then it's likely that you've already heard and possibly worked some of us. We number just a touch over a thousand licensed stations at this time, with the prefixes 4X4, 4Z4, and 4X6, this being the order in which these callsigns were issued. The suffixes are two letters with the exception of Novices who have a three-letter suffix beginning with N, the N being dropped upon receiving a higher grade of license.

The Novice, or Grade C license, is the easiest to get. You need six words a minute in Morse, an elementary knowledge of electrical laws similar to that needed for the US exam, and a basic grasp of Q signals, operating procedure, and radio regulations. With this license, which, by the way, is renewable, you're permitted the use of crystal-controlled CW transmitters of ten Watts input from 7.065 to 7.085 MHz and 21.100 to 21.150 MHz.

The Grade B license is comparable in scope to the General class in the States as far as theory is concerned. Here the Morse code requirement is 12 words per minute, and the licensee can then use up to 200 Watts input on all modes and bands with the exception of 160 meters and the three new WARC bands, where power input and frequency range are somewhat limited.

After holding the Grade B license for at least a year, one may then go on to take the Grade A test. You have to copy code at sixteen words a minute, and the theory exam is oral. Although this test is supposedly on a higher level than that of the B exam, many report it to be easier since it isn't written and there is a rapport with the examiner. Besides being able to run a kilowatt input on all but the 160-meter and WARC bands, the holder of this license may receive authorization to connect a phone patch to his station or let others use his equipment under his own direct control.

Examinations take place twice yearly—in the spring and in the fall. There is a higher failure rate here than in the US, but this is probably due to the form in which these examinations are given. The code must be written down solidly in Latin letters—a difficult task for native Hebrew speakers used to a different script. The exam questions are different each time and require a written answer—no multiple choice, and Dick Bash or his Israeli equivalent has yet to appear here.

However, if you already hold a foreign license similar in requirements to either the Grade A or B tickets, you will be exempted from the above ordeal. And the reciprocal licensing here is quite liberal.

How does a visitor to Israel go about getting on the air? He simply appears at the office of the Ministry of Communications on the tenth floor of The Shalom Tower on Ahad Ha'am Street, downtown Tel Aviv's highest building. (It really isn't all that high, but it's all we've got!) He presents his valid license, not a photocopy, and will be granted on the spot, free of charge, a reciprocal license. I've heard American, Canadian, South American, European, and South African callsigns on our repeaters, so it's a fairly easy procedure. Office hours of the Ministry are 9:00 am to 1:00 pm, Sundays through Thursdays, and the phone number is (03)-610278.

Interested in working Israel? Your best bet is on 10, 15, or 20 meters, depending on propagation. These bands are where the local hams are most active, especially on SSB, but there are fellows on the other bands and modes as well. Ricki 4X4NJ is a 160-meter enthusiast, and this winter has improved his antenna farm and has made quite a few QSOs with stateside stations both on SSB and CW. David 4X4VL has been cracking out a lot of DX QSOs on 40 meters with his delta loop, and Dov 4X4DX has been cooking up a storm on 80. I get on 10 MHz from time to time myself, and there are many others. Bear in mind that Israel is two hours ahead of Greenwich Mean Time, and that we are on the Eastern Mediterranean, so if you're hearing Greek or Italian stations, there's a good chance a 4X or 4Z station is sandwiched somewhere in between the QRM.

Our national organization is the Israel Amateur Radio Club, presently consisting of some 700 members including SWLs. The club takes care of in- and outgoing QSL bureaus, publications, VHF and UHF repeaters, liaison with the Ministry of Communications, special events and field days, and the transmission of weekly bulletins. In the near future, the IARC hopes to set up beacons both on ten meters and VHF. All the officials and helpers in the club are voluntary, so we do have our ups and downs. After a low period, in the last few years our QSL bureaus have really picked up and we've received many compliments from abroad.

There is certainly a lot more to tell you, such as the awards offered, special events, the VHF and repeater scene, DX-ing in this part of the world, amateurs of note here, etc., but I'll leave that for another time.

Great Minds Think Alike.

Hertz . . . Marconi . . . Armstrong . . . they all would have read **73**. Why?

Great pioneers get their ideas from great pioneering articles. Armstrong read detailed accounts of Marconi's Cornwall to St. Johns transmission. Marconi was inspired by an article about the experiments of the late Heinrich Hertz. And Hertz was guided in his experiments by the theories of the English mathematician Maxwell.

Throughout its 22-year history, **73** has been a leader in the field of radio communications, publishing more articles that helped to pioneer new areas of amateur radio than any other ham magazine. Articles on single sideband, solid state, repeaters, narrow band communications, satellites . . . the list goes on and on.

Today, the spirit of the pioneer lives on in each and every issue of **73**.

You need **73**.

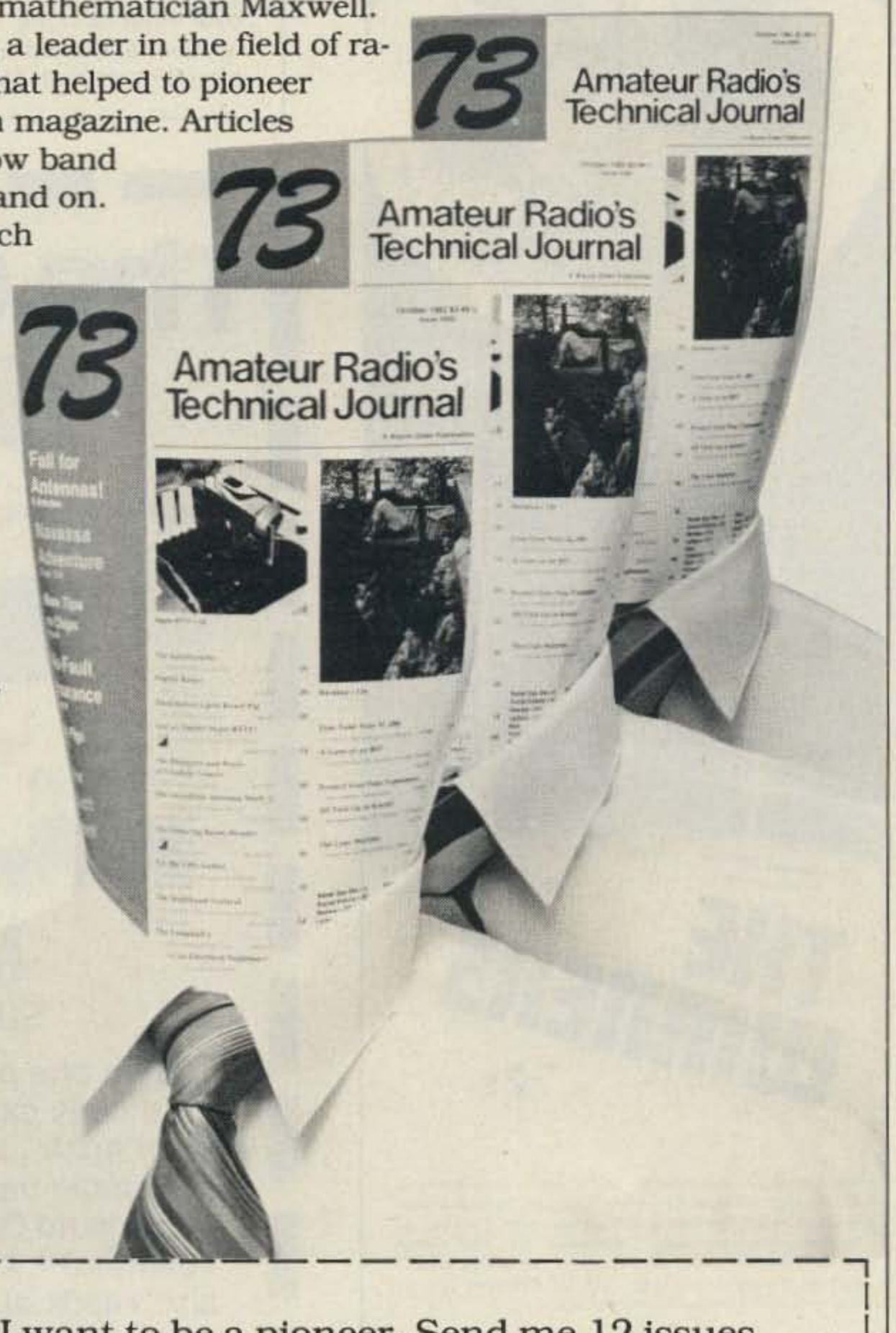
You need it to keep up with the latest radio news. You need it to stay abreast of the most recent technological developments. You need it to find out what your future rig will be like, and how you can modify your present rig to get more out of it, and what the word is on the latest gear, contests, DX . . . You need **73** to help you be the best ham you can be.

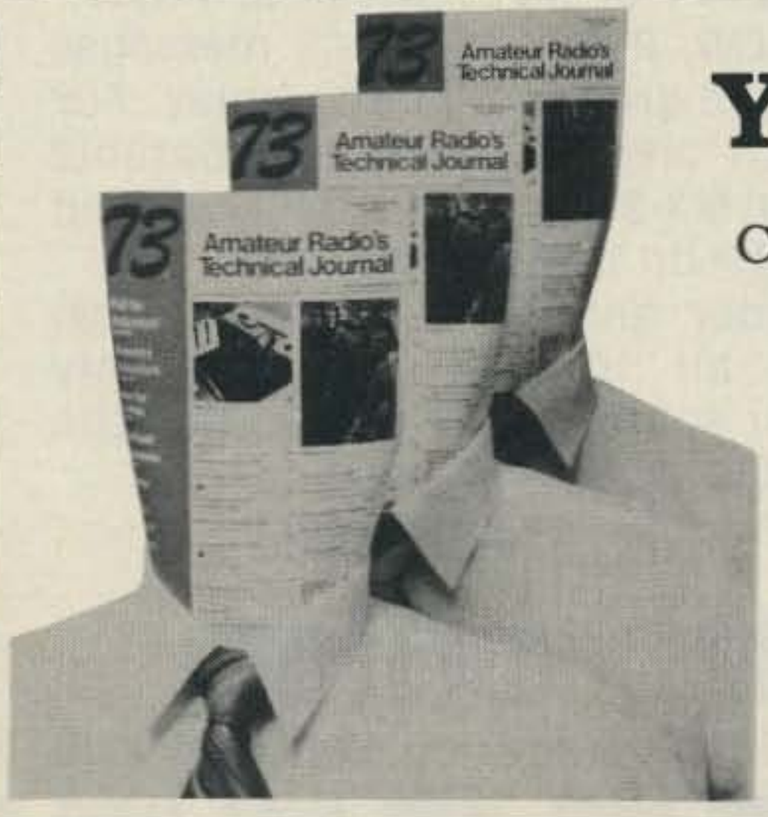
And who knows? Maybe the pioneering articles in **73** will inspire you to heights you never thought you could achieve . . . right up there with Hertz, Marconi, and Armstrong.

To order simply fill out the coupon below and send it in, or dial toll free

1-800-258-5473.

Be a pioneer.
Subscribe to 73.





YES! I want to be a pioneer. Send me 12 issues of **73** for only $19.97. Canada $22.97 US funds. Foreign $39.97 US funds drawn on US bank

Check☐ MC☐ VISA☐ AE☐ BILL ME☐

Card # _____

Interbank # _____ Exp. Date _____

Signature _____

Name _____

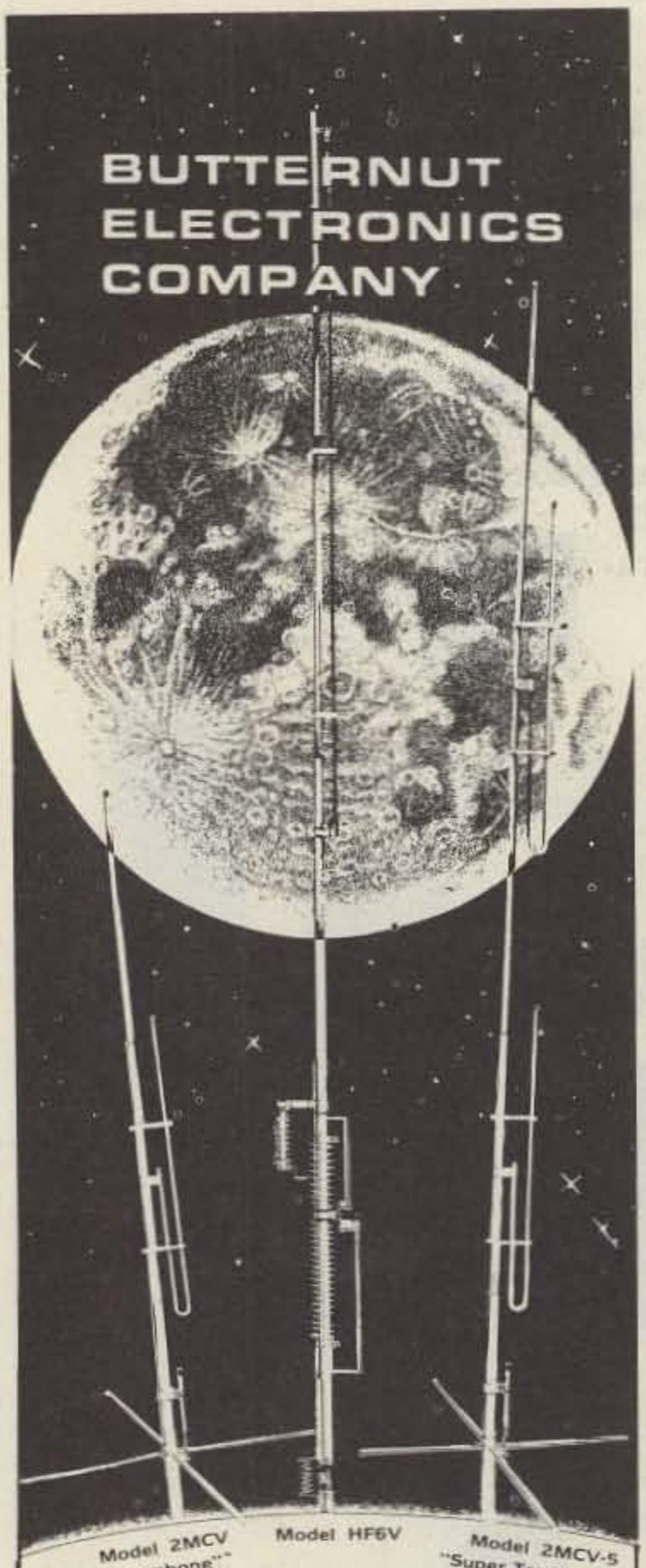
Address _____

City _____ State _____ Zip _____

73: Amateur Radio's Technical Journal 336R6

Subscription Dept., P.O. Box 931, Farmingdale NY 11737

Your first issue will arrive in 6 to 8 weeks.



THE WINNERS

Model HF6V—Completely automatic bandswitching 80 through 10 **plus** 30 meters. Outperforms **all** 4- and 5-band "trap" verticals of comparable size. Thousands in use worldwide since December '81! 160 meter option available now; retrofit kits for remaining WARC bands coming soon. Height: 26 ft/7.8 meters; guying not required in most installations.

Model 2MCV "Trombone"* —omnidirectional collinear gain vertical for 2 meters having the same gain as "double-⅝λ" types, but the patented "trombone" phasing section allows the radiator to remain unbroken by insulators for maximum strength in high winds. No coils, "plumber's delight" construction and adjustable gamma match for complete D.C. grounding and lowest possible SWR. Height: 9.8 ft/2.98 meters.

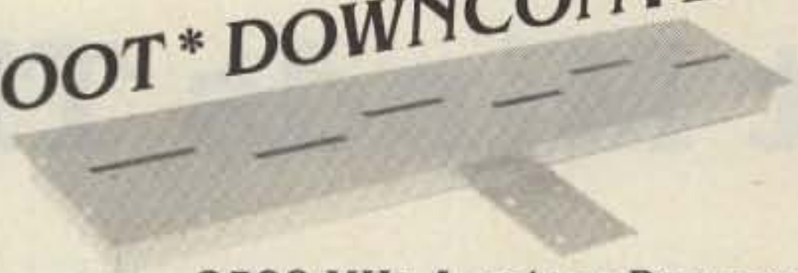
NEW

Model 2MCV-5 "Super-Trombone"* —Same advanced features as the basic 2MCV but a full wavelength taller with additional "Trombone"* phasing section for additional gain. Height: 15.75 ft/4.8 meters.

All BUTTERNUT ANTENNAS use stainless steel hardware and are guaranteed for a full year. For further information on these and other BUTTERNUT products write for our FREE CATALOG!

BUTTERNUT ELECTRONICS
GARY AIRPORT BOX 356 E RTE 2
SAN MARCOS, TEXAS 78666

HI ZOOT* DOWNCONVERTER



$149.95

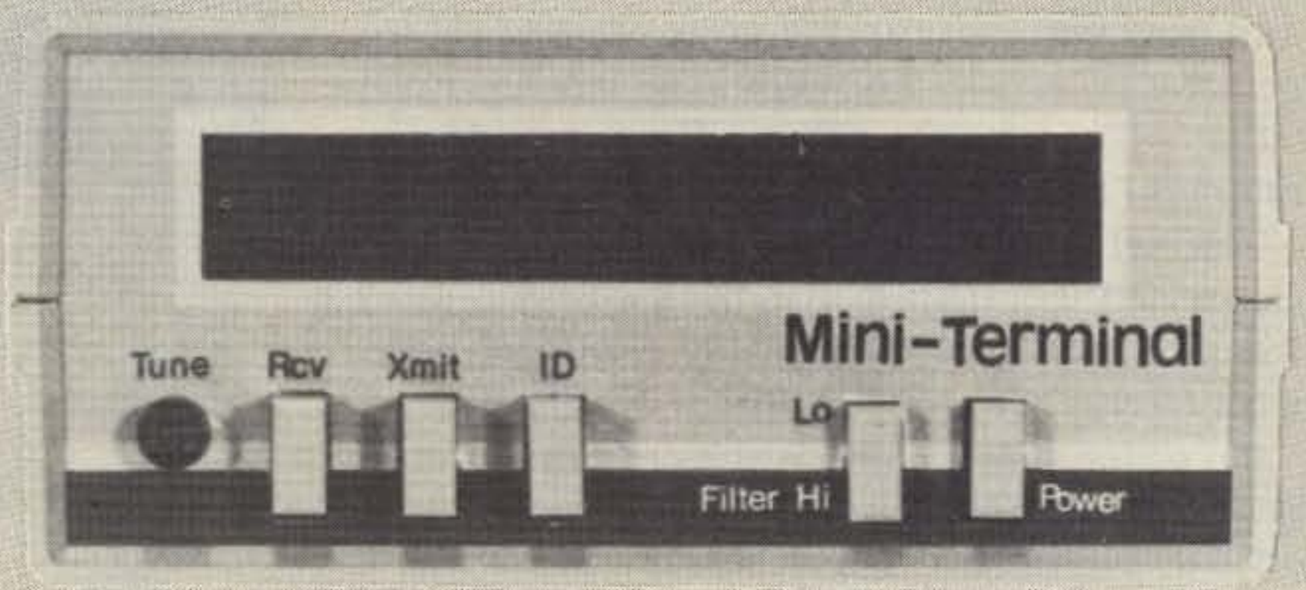
API ELECTRONICS
P.O. Box 4532
Las Vegas, Nevada 89106
(702) 386-7029

2300 MHz Amateur Downconverter ↙213
Unequaled in performance at any price.

- 55+ db system gain.
- Special image rejection circuitry gives additional 3 db improvement over other designs.
- Unique temperature compensation circuit gives high stability.
- Highly sensitive for very weak signal reception.
- Tunes 2000 to 2500 MHz.
- 120° low noise amplifier in front end.
- Complete with power supply, cables and mast mount.

*Hi Zoot = total absolute ultimate performance.

The Code Reader That Sends



Mini-Terminal™
suggested price $299.95

All in one package—CW, RTTY, ASCII send/receive and hard copy capability for under $300. Unbelievable, but true! Again, **Kantronics** puts all the features you want in a single unit: The **Kantronics Mini-Terminal.**™

You send CW with your key or keyboard, and the **Mini-Terminal**™ converts to RTTY or ASCII. **Mini-Terminal**™ also reads all incoming CW, RTTY, and ASCII messages and reads out on a bright green 10-digit display. For hard copy simply attach any Centronix compatable printer, such as the Epson MX-80 or the Paper Tiger, and watch the **Mini-Terminal**™ do the rest.

A complete code reader and RTTY terminal, with printer compatability all in one package only 2½"x5"x5¼". Get all you can for your dollar; get the **Kantronics Mini-Terminal.**™

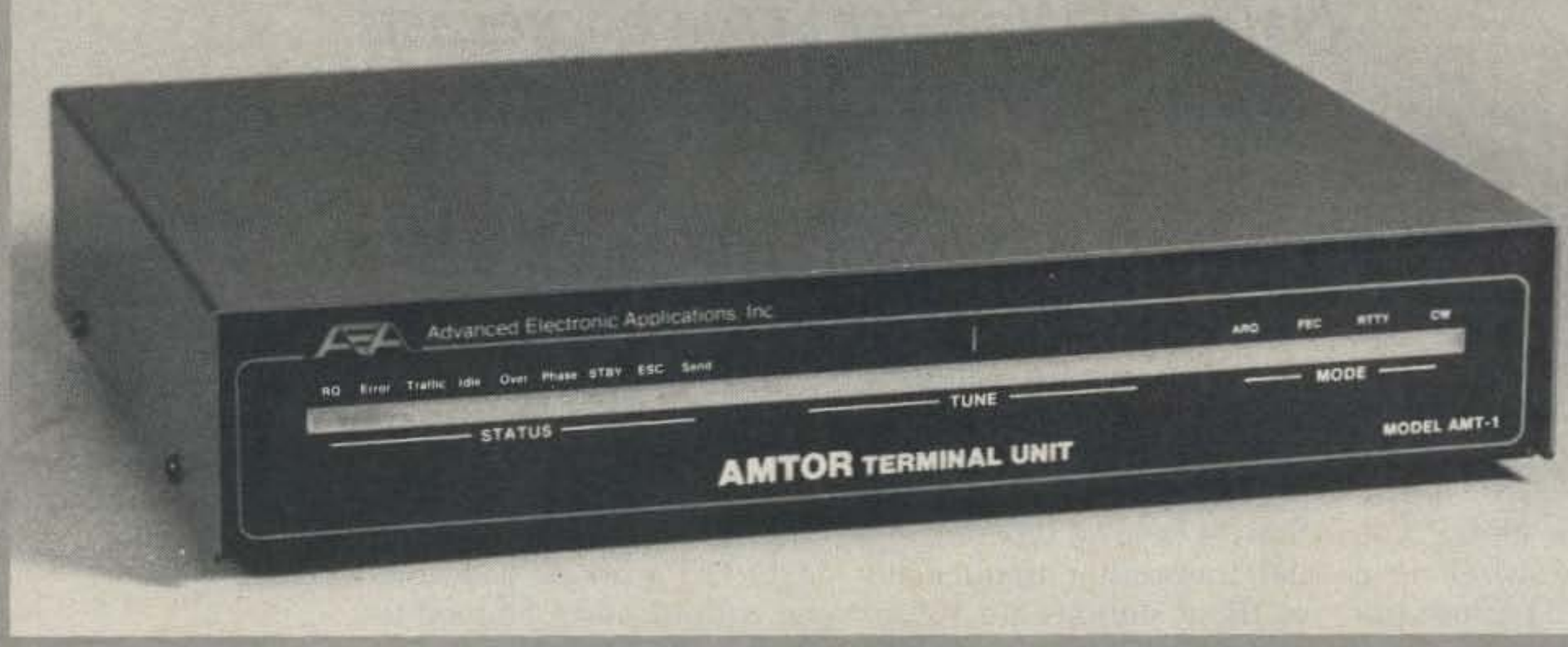
See your local **Kantronics** dealer, or contact

Kantronics

(913) 842-7745 1202 E. 23rd Lawrence, Kansas 66044

STOP PRESS
AMTOR NOW OFFICIALLY APPROVED IN U.S.A.

AMT-1
The Definitive AMTOR Terminal Unit



$499.95 Introductory Price

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

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

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

Driven from a 12 volt supply, the AMT-1 connects to the speaker, microphone and PTT lines of an HF transceiver and to the RS-232 serial interface of a personal computer or ASCII terminal. All mode control is via ESCAPE and CONTROL codes from the keyboard (or computer program).

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

OMAR ELECTRONICS
11989 East Lansing Road
Durand, MI 48425
(517) 288-2789

265

AEA Brings you the Breakthrough!

See List of Advertisers on page 114

Build the Weather-Grabber

Don't know why there's no sun up in the sky? With this simple converter, you can listen to National Weather Service forecasts on your 2-meter rig and find out.

N1II received an extra $50 for this Home-Brew I Contest Honorable-Mention entry.—Eds.

Paul M. Danzer N1II
2 Dawn Road
Norwalk CT 06851

Does it look like rain? As you drive along, you can find out by switching in a converter and tuning your two-meter FM rig to receive the continuous broadcasts of the National Weather Service. In 1981 there were almost 100 stations scattered throughout the US and additional stations in Canada providing weather information 24 hours a day. The usual transmitter frequencies of these stations are 165.40 and 165.55 MHz. Two FETs serve to convert these frequencies to two frequencies of your choice in the 144-to-148-MHz band.

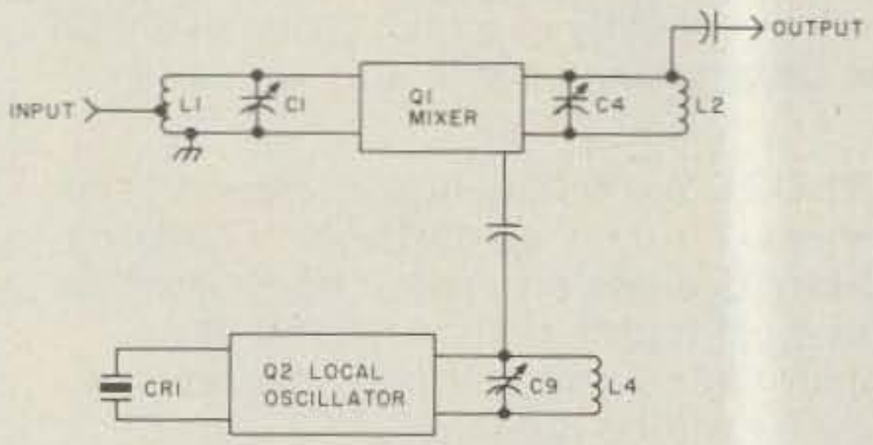


Fig. 1. Block diagram of converter.

How It Works

Referring to the block diagram in Fig. 1, Q1 is a dual-gate FET working as a mixer, with L1 and C1 tuned to the weather frequency. The output of the mixer is selected by L2/C4 and is within the 144-to-148-MHz range of your 2-meter rig. Q2 is also a dual-gate FET, but in a circuit which acts as both an oscillator and a multiplier. Its frequency is set by crystal CR1. If you compare the two weather frequencies with the limits of the two-meter band (162.55−148=14.55; 162.40−144=18.40), you can see that for a synthesized rig, any oscillator frequency in the range of 14.55 to 18.40 MHz will allow you to receive both weather frequencies.

The oscillator is both an oscillator and a multiplier. C9 and L4 are tuned to the 14-to-18-MHz range. You can use either a fundamental crystal in this range, a crystal at half this frequency, or a crystal at one-third this frequency.

If you happen to have a crystal in this frequency range, the oscillator operates as a straight-through circuit. Alternately, if you are the owner of an old two-meter or six-meter rig, perhaps you might have some 8-MHz crystals. They will operate fine with the oscillator acting as a doubler. Your third choice is an overtone crystal which is actually one-third this frequency. In any case, try what you have. Just make the subtraction and hopefully the two-meter output will not fall on the same frequency as the local 500-Watt repeater, in which case you might have some feedthrough of hams on top of the weather.

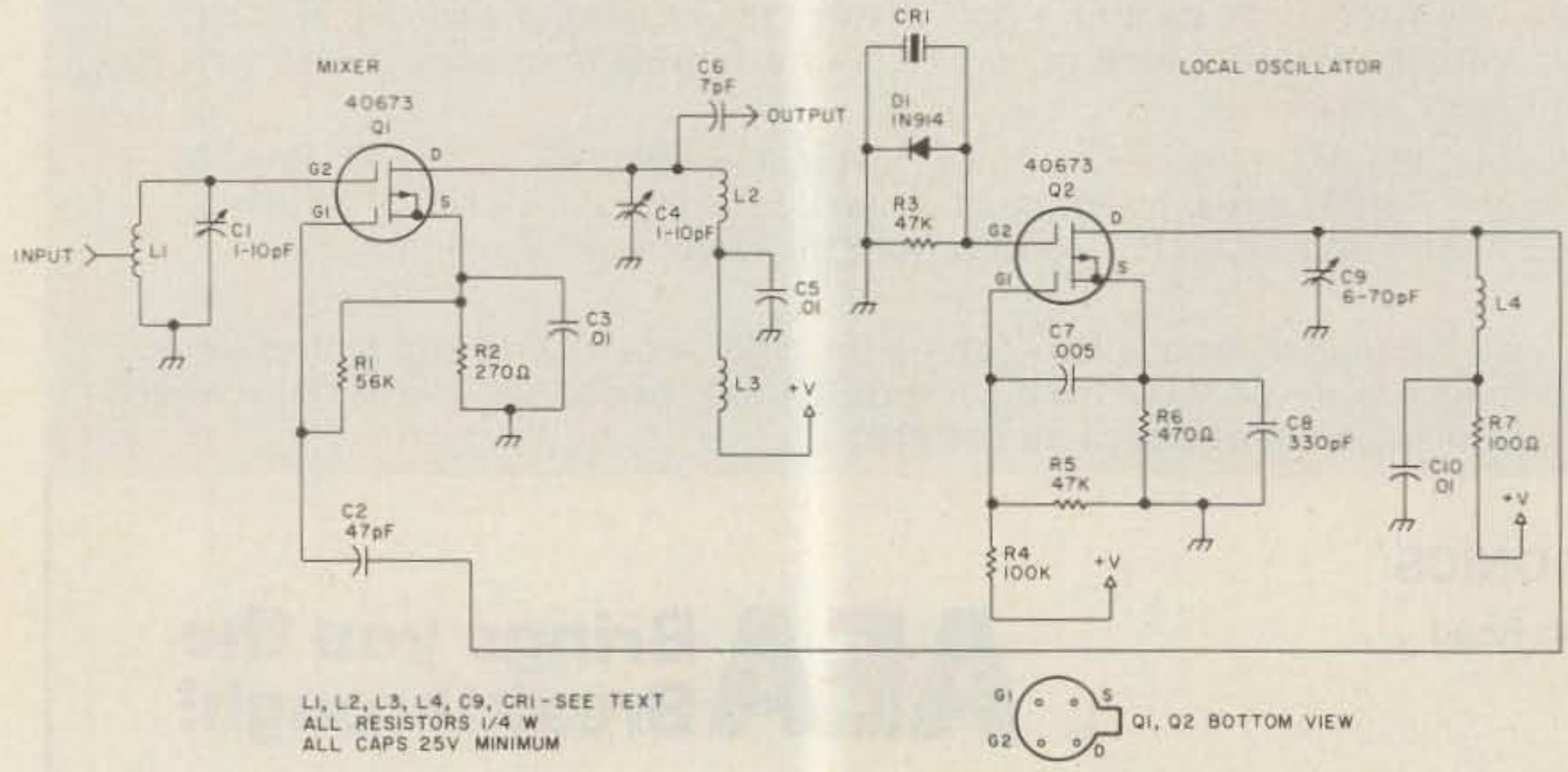


Fig. 2. Converter schematic.

Circuit Design Details

Many hams, including

myself, firmly believe in starting with an existing circuit rather than starting from scratch. If you would like to get into the details of the self-biased mixer used here, you can start with the ARRL *Electronic Data Book*. You might also want to glance at the popular two-meter preamp in the UHF/VHF receiving section of the ARRL *Radio Amateur's Handbook*.

The schematic of the converter is shown in Fig. 2. Both Q1 and Q2 are dual-gate FETs of the 3N211 or 40673 variety. Radio Shack sells them under part number 276-2045. Ideally, miniature trimmer caps C1 and C4 should be variable from 1 to 10 pF, but either the Jameco Electronics TC 2-8 (2 to 8 pF) or the Calectro A1-245 (1 to 7 pF) will do.

L1 is three turns of a tinned number 20 wire wound on a ½-inch rod. After winding, remove the rod. Space the turns so that L1 is about 1 inch long. L2 is also wound on a ½-inch rod and consists of 3 turns without any tap. It is spaced to be about 1¼ inches long. L3 is a commercially wound coil. Any value of 10 uH or more will do (Radio Shack 273-101). If you want to wind your own, take a 100k, 1-Watt resistor and wind 3 or 4 layers of number 30 wire over it. Neatness does not count in this case!

The oscillator is characterized as a "parallel mode Miller oscillator" in an excellent survey of oscillators by VK2ZTB, published in the March, 1976, issue of *Ham Radio Magazine*. C9 and L4 resonate in the range of 14 to 18 MHz. I used a T50-2 core with 12 turns of number 24 wire in parallel with a 6- to 70-pF variable (Jameco TC 6-70). You can use whatever you have as long as it resonates at the proper frequency range. Just be careful that it is not tuned to 7 to 9 MHz or some other related set of frequencies.

Construction

A tracing of the layout used is shown in Fig. 3. Before you make the board, note that the entire board remains covered with copperclad. The lines shown are the *only* areas of bare board. Each of the copper lands is surrounded by a thin line of bare board. Outside of these areas, the remaining board is covered with copper and acts as the ground plane.

The prototype board for this circuit was made by first taking a section of bare printed circuit board and carefully shining it and cleaning it using soap and steel wool. After drying, the entire board was covered with a single layer of masking tape. The edges of the masking tape strips were slightly overlapped and pressed down firmly.

A piece of carbon paper was cut to slightly over the size of the board and placed, carbon side down, on the masking tape. The excess carbon paper is bent over the back of the board and held in place with additional tape. A copy of the layout is now placed on top of the masking tape. With a hard pencil or ball-point pen the layout is copied onto the masking tape by tracing over it on the top sheet.

When you remove the layout paper and the carbon paper, you should end up with a "carbon copy" of the layout on the masking tape. With an X-acto® knife, cut away a thin strip (perhaps 1/16 to 1/32 inch thick) over each of the lines. When finished, you end with the layout in bare copper and the entire rest of the board covered with masking tape.

Now you have two options. Either immerse the board in etching solution and etch until all of the exposed copper disappears, or use a miniature hand grinder and grind away this exposed copper.

The layout and component placement in Fig. 3 is shown from the copper side, but note that all components except the variable caps are placed on the other (bare board) side. Before drilling the holes which connect the bulk of the components from one of the isolated copper pads to the ground plane, check the size. You may want to move the hole in the ground plane in or out to fit the exact component length you are using.

Tuning and Testing

After checking your construction job for solder bridges, missing or incorrect component placement, and cold solder joints, recheck that the FETs are correctly oriented. Remove crystal CR1 and install the converter between your rig and antenna. Apply power and tune your rig to a local repeater. When the repeater is transmitting, you should get some gain through the converter. Tune C4 for maximum signal. You may have to place a 5- or 10-pF cap across C1 to resonate the input to the 144-MHz band from its normal 162-MHz resonance.

Caution: Do not go key down and transmit. There might be a tendency to press the PTT button on your rig to bring up the repeater. If you do, Q1 will probably go up in a tiny puff of smoke and you might damage the finals in your rig.

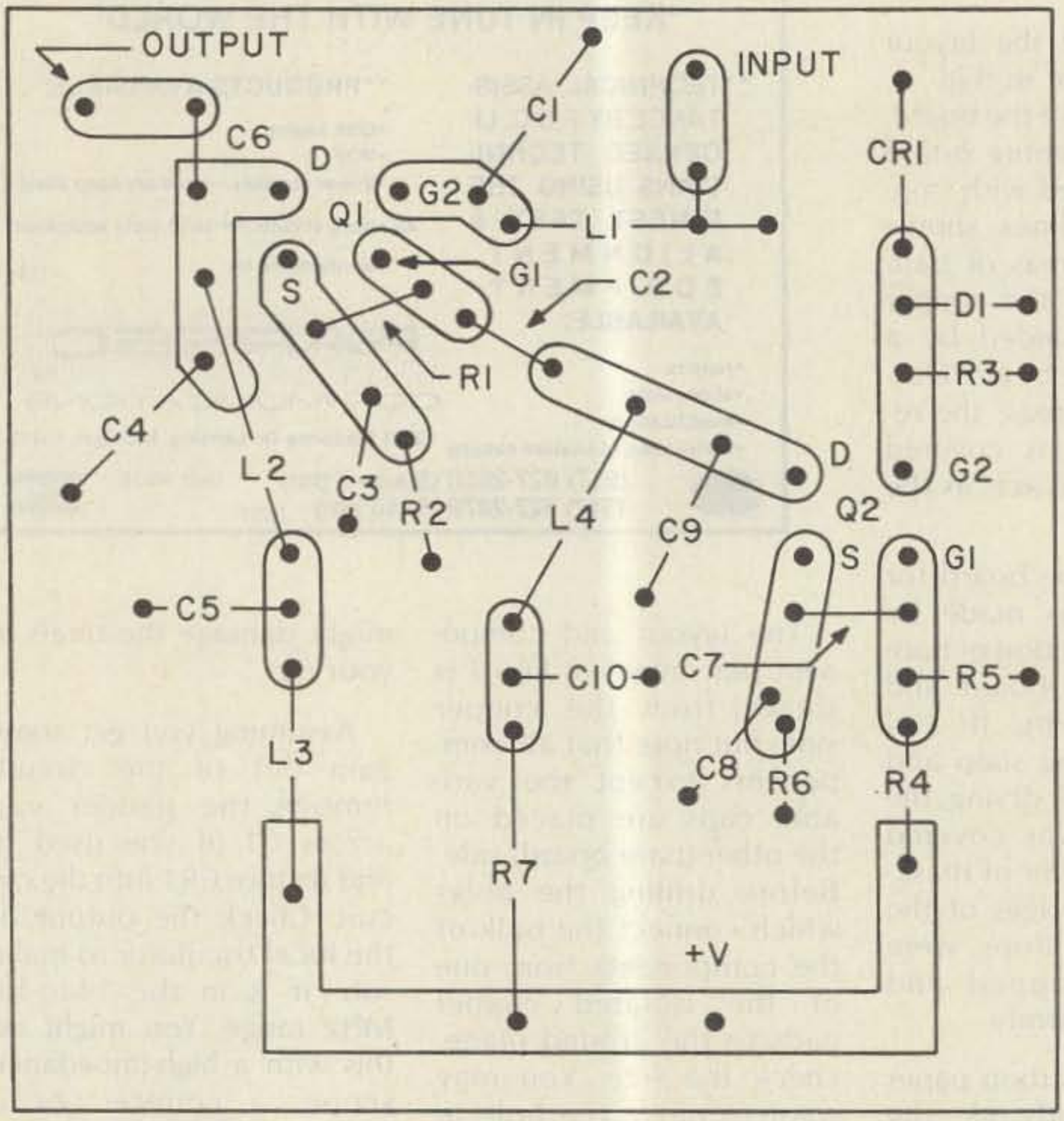
Assuming you get some gain out of the circuit, remove the padder cap across C1 (if you used it) and restore CR1 into the circuit. Check the output of the local oscillator to make sure it is in the 14-to-18-MHz range. You might do this with a high-impedance scope, a counter, or a general-coverage receiver.

If you use a general-coverage receiver, tune it from 6 MHz to 30 MHz and make sure that the strongest output detected is in the 14-18-MHz range. A grid-dip meter can also be used by wrapping one turn of wire around the core and around the coil of the GDO. Again check that the strongest output is in the proper frequency range.

The last step in checkout is to once more make the subtraction: weather frequency − your oscillator frequency = rig frequency. Tune your rig to the proper frequency and there should be the weather station. Gently peak all variable caps and you are in business.

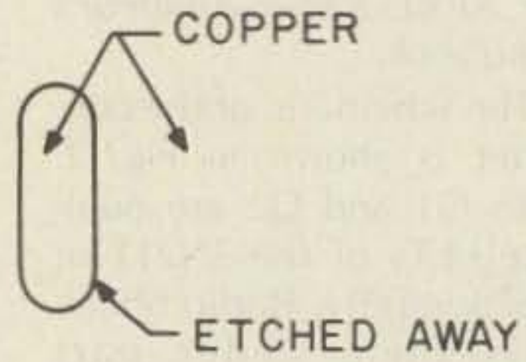
Installation

The weather converter is simply placed between the rig and the antenna. Power of 9 to 12 volts will do; however, if you decide to use the car battery as the power supply, a noise filter



COPPER CLAD SIDE SHOWN. COPPER LANDS SHOWN ARE ETCHED FROM REST OF BOARD, BUT REMAINING SURFACE AREA IS COPPER.

EXAMPLE



ALL COMPONENTS MOUNTED ON OTHER SIDE OF BOARD EXCEPT: C1, C4, C9.

Fig. 3. Layout and parts placement.

✓See List of Advertisers on page 114

such as in Fig. 4 should be added.

You might also consider installing the converter as shown in Fig. 5. The selector switch (Radio Shack 275-1384) places the converter between the rig and the antenna. In addition, the microphone cable is brought to the enclosure and the PTT line is interrupted, thus preventing you from transmitting with the converter in the line. If your rig is conventionally wired (Fig. 6) with the PTT line going directly to a relay and the 12-volt line, you can even pick up the power for the converter from the PTT line since the converter draws less current than needed to energize most relays.

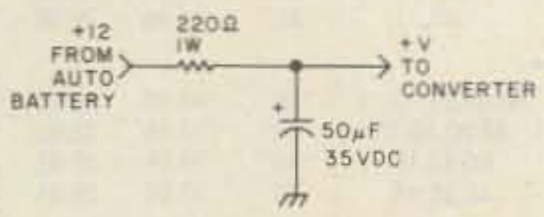


Fig. 4. Noise filter.

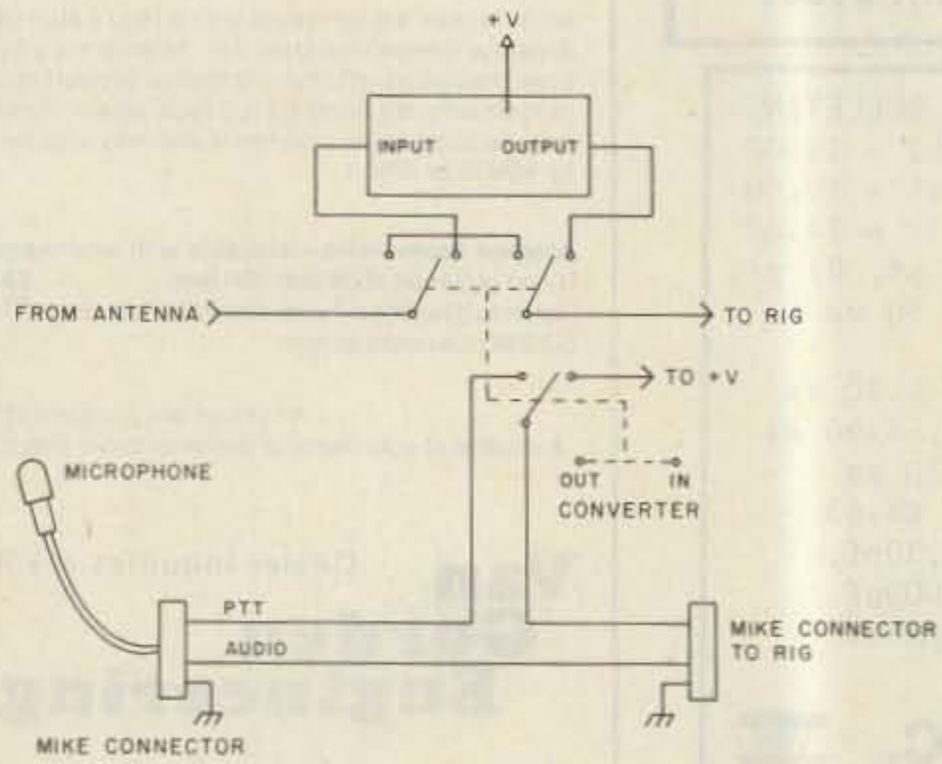


Fig. 5. Converter installation.

Possible Problems and Cures

If you have never built anything at VHF, this could be a good first project. Remember that Murphy's Law applies to all things, and especially at VHF the law states, "Resonant Circuits Usually Don't." Therefore, you might have to add a turn, cut a turn, squeeze the coil, or spread it out to resonate the input and output of the mixer.

Dual-gate FETs, especially those capable of VHF operation, also like to oscillate at weird and wonderful frequencies. If this happens, you will notice a large increase in noise when you connect the converter to your rig. You also might notice fragments of conversations, music, and general instability. The usual cure is to add a ferrite bead by unsoldering the gate leads of Q1 and Q2 and slipping the gate lead through the hole in the bead. Usually one bead per FET is enough, although you will have to try yourself to see which of the two gate leads cures the problem. Alternately, a 100-Ohm, ¼-Watt resistor could be added in series with the gate lead.

A problem of a different variety is faced by most hams—obtaining parts (see Parts List). Most of the parts used in the converter are not critical and are available at your local Radio Shack store.

Miniature variable caps can be a problem. The Calectro line is available at many independent electronics supply houses. Jameco Electronics is another source, at 1355 Shoreway Rd., Belmont CA 94002.

In mixed average terrain, the weather stations are usually good for over 25 miles, although 40- to 60-mile coverage is not unusual. If you are in a very hilly area or well out of the coverage, you could add a preamp such as the standard one in the ARRL handbook. One or two turns will have to be taken off the input and output coils of the preamp.

Want to hear the weather? At home or in your car? Two FETs plus a few hours work and you can make your two-meter rig do double duty. ■

Converter Parts List

R1 56k, ¼ W
R2 270 Ohms, ¼ W
R3 47k, ¼ W
R4 100k, ¼ W
R5 47k, ¼ W
R6 470 Ohms, ¼ W
R7 100 Ohms, ¼ W
L1, L2, L3, L4—See text
Q1, Q2—Dual-gate FETs, 40673
CR1—See text
C1 1-10 pF trimmer
C2 47 pF, 25 V dc
C3 .01 μF, 25 V dc
C4 1-10 pF trimmer
C5 .01 μF, 25 V dc
C6 7 pF, 25 V dc
C7 .005 μF, 25 V dc
C8 330 pF, 25 V dc
C9 6-70 pF trimmer
C10 .01 μF, 25 V dc
D1 1N914
Noise filter (Fig. 4) 220-Ohm, 1-Watt resistor, 50 μF, 35 V dc capacitor
Switch (Fig. 5) 3PDT

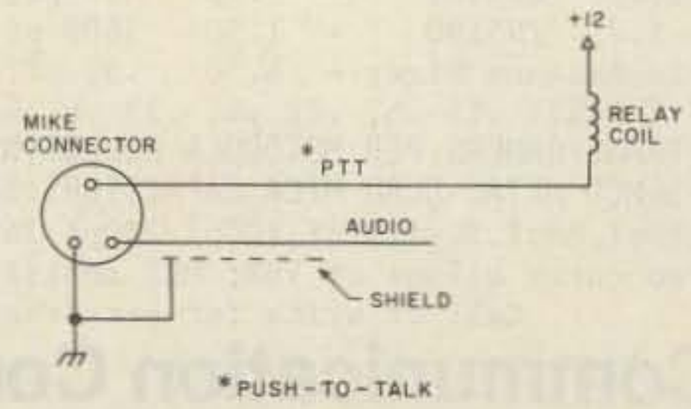
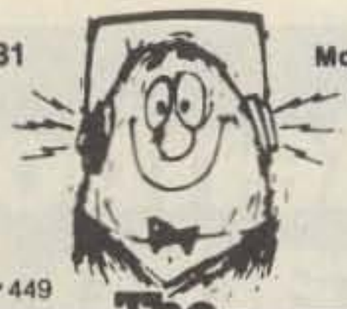


Fig. 6. Conventional rig wiring for PTT.

✓See List of Advertisers on page 114

812-422-0231



Mon-Fri 9AM-6PM
Sat 9AM-3PM

✓449

The HAM SHACK

808 N. Main
Evansville, IN 47711

Prices and Availability Subject to Change

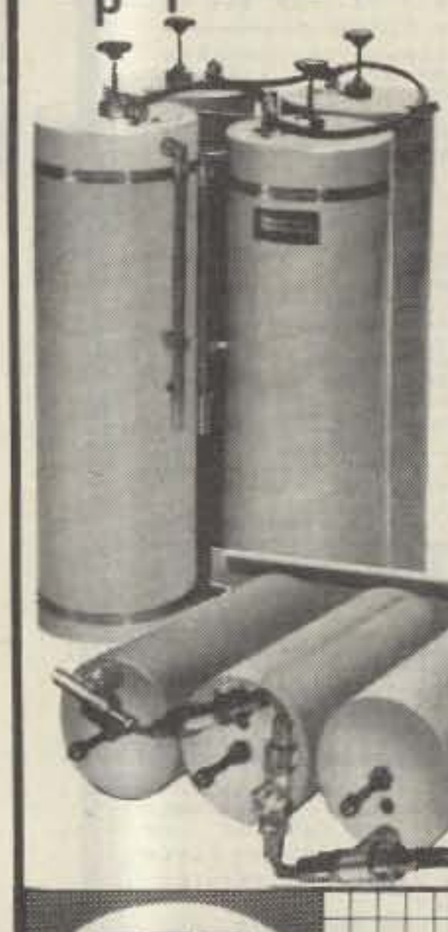
AEA	
CP-1 New Computer Interface	call
MBA-RO Reader	$259.00
MBA-RC Rcv/Code Conv. Xmt	385.00
MM-2 MorseMatic Ultimate Keyer	149.00
CK-2 Contest Memory Keyer	125.00
KT-2 Keyer/Trainer	99.00
BT-1 Trainer	72.00
Hot Rod Antenna	17.95
ALLIANCE	
HD73 (10.7 sq. ft.) Rotator	$99.00
U-100 Small Rotator	45.00
ASTRON	
RS7A 5-7 Amp Power Supply	$49.00
RS12A 9-12 Amp Power Supply	69.00
RS20A 16-20 Amp Power Supply	89.00
RS20M 16-20 Amp w/meter	109.00
RS35A 25-35 Amp	135.00
RS35M 25-35 Amp w/meter	149.00
RS50A 37-50 Amp	199.00
RS50M 37-50 Amp w/meter	225.00
AZDEN	
PCS 4000 2M Xcvr	$280.00
PCS 300 Handheld	275.00
B&W	
Folded Dipole 80-10 Meter	$135.00
BENCHER	
BY-1 Paddle/BY-2 Chrome	$36.00/$45.00
ZA-1-A Balun	16.50
BUTTERNUT	
HF6V 80-10 Meter vertical	$119.00
CUSHCRAFT	
A3 Tribander 3 EL	$179.00
A4 Tribander 4 EL	225.00
214FB Boomer 14 EL FM	69.00
32-19 Super Boomer 19 EL 2M	83.00
ARX-2B Ringo Ranger II 2M	39.00
DAIWA	
CN-520 1.8-60 MHz SWR/Pwr Mtr.	$63.00
CN-620B 1.8-150 MHz SWR/Pwr Mtr.	110.00
DRAKE	
TR7A Xcvr	$1,375.00
R7A Receiver	1,349.00
TR5 Xcvr	675.00
12 inch Green Monitor	139.00
ENCOMM (SANTEC)	
ST-144/μP	$275.00
ST-440/μP	309.00
ST-220/μP	299.00
HAL	
DS3100/MPT/ST6000	$2,825.00
HY-GAIN	
TH7 DXS 7EL Tribander	$375.00
TH5 MK2S 5EL Tribander	319.00
V2S 2 Meter Vertical	39.00
Ham IV 15 sq. ft. Rotator	195.00
T2X 20 sq. ft. Rotator	249.00
ICOM	
R70 General Coverage Receiver	$629.00
740 Xcvr	950.00
730 Xcvr	649.00
2AT 2M Handheld	215.00
3AT/4AT Handhelds	235.00
25A new display & mic	305.00
25H 45W Mobile	349.00
290H 2M All Mode	479.00
251A 2M All Mode	575.00
KLM	
KT34A 4EL Triband Beam	$305.00
KT34XA 6 EL Triband Beam	465.00
144-148-13LBA 2M Long Boomer	79.00
KANTRONICS	
The Fantastic Interface for CW, RTTY, ASCII Only $150!	
LARSEN	
NLA-150-MM 5/8 Wave 2M Mag. Mt.	$39.00
MFJ	
989 3KW Roller Inductor Tuner	$280.00
941C Tuner	81.00
900 Tuner	45.00
313 VHF Conv for HT	36.00
MIRAGE	
B108	$150.00
B1016	239.00
B3016	205.00
ROHN	
25G	$42.00
SHURE	
444D Desk Mic	$50.00
414A Hand Mic	36.00
TEN-TEC	
Corsair Fantastic Rig!	$1,029.00
Digital Argosy	539.00
229 2KW Tuner	250.00
TOKYO HY-POWER	
HL30V 25W Amp	$63.00
HL32V 80W Amp	139.00
HL160V 160W Amp	289.00
HC200 Tuner	89.00
HC2000 2KW Tuner	289.00

Send SASE for Our New & Used Equipment List
Prices are FOB Evansville

WACOM DUPLEXERS

Our Exclusive Bandpass-Reject Duplexers With Our Patented

B_pB_r CIRCUIT® FILTERS



. . . provides superior performance, especially at close frequency separation.

Models available for all commercial and ham bands within the frequency range of 40 to 960 MHz. ✓79

TELEPHONE 817/848-4435

WACOM PRODUCTS, INC.

P.O. BOX 7127 • WACO, TEXAS 76710 • 817/848-4435

TS430S FILTER DEAL

For superior performance at lower cost, use top-rated 8-pole Fox Tango crystal filters to fill the optional spots in your rig. For example, our 1800 Hz FT2108 equivalent of the YK88SN has a 60/6dB shape factor of 1.7 compared with 2.0, a price of $55 vs $63, and squarer shoulders at the top with steeper skirts all the way down to more than – 80dB.

For more pleasant audio use our 2100 Hz for SSB and/or our 6000 Hz for AM. For CW, our 400 Hz unit is better than the YK88C, while our 250 Hz is sharper than the YK88CN. The more you buy, the more you save!

BIGGER IS *BETTER!*

Fox Tango filters are better because of their *discrete crystal* (not monolithic) construction. This makes them slightly larger than YK filters so they are patched into the circuit with short lengths of coax. Installation is easy — no drilling or circuit changes. Order with confidence.

INTRODUCTORY PRICES — Complete Kit
Any ONE filter $55
Any TWO filters. . . . . $100 *(Save $10)*
Any THREE filters. . . . . $145 *(Save $20)*

Includes all needed cables, parts, detailed instructions. Specify the type(s) desired.
AM — FT2111 (6000 Hz Bandwidth)
CW — FT2101 (250 Hz); FT2102 (400 Hz)
SSB — FT2108 (1800 Hz); FT2109 (2100 Hz)
Shipping $3 per order. ($5 air) FL Sales Tax 5%

ONE YEAR WARRANTY
GO FOX-TANGO—TO BE *SURE!*
Order by Mail or Telephone.
AUTHORIZED EUROPEAN AGENTS
Scandinavia MICROTEC Makedien 26
3200, Sandefjord, NORWAY
Other INGOIMPEX, Postfach 24 49
D-8070, Ingolstadt, W. GERMANY

FOX TANGO CORPORATION
Box 15944 H, W. Palm Beach, FL 33416
(305) 683-9587 ✓323

Homebrew Headquarters

"SMART" SQUELCH FOR SSB

73 MAGAZINE 8/82

- Detects human voice but ignores noise, steady tones and Russian woodpecker
- Works for voice signals below noise level
- Ideal for net activities
- Audio operated — no receiver modification
- Connects between audio output and speaker

KIT $49.95 ✓454
Plus $2.50 Shipping & Handling

1982 CATALOG 50c

Other Kits:
R-X Noise Bridge (hr 2/77)
General Coverage Reception Drake R-4C Receiver (QST 5/81)
2 Meter Converter (73 4/82)
40 Meter QRP Transceiver (hr 1/81)
Fun-Mitter (73 2/81) Fun-Ceiver (73 7/81)
Fun-Oscillator (73 2/82) Fun-Amp (73 5/82) and others

RADIOKIT
Box 411S, Greenville, NH 03048
(603) 878-1033

Radio equipment not included

Also Available . . . .
Floor Space: 51" Wide by 30" Deep
$199.50

. . . at last . . . your shack organized!

A beautiful piece of furniture — your XYL will love it!

$184.50 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

✓65

S-f Amateur Radio Services
4384 KEYSTONE AVENUE • CULVER CITY, CALIF. 90230 — PHONE (213) 837-4870

GOTHAM ANTENNAS

(216) 481-6590

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'	$38.95
SL-80	80	63'	$37.95
SL-40	40.15	33'	$36.95

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'	$44.95
V-80	80.40.20 15.10.6	23'	$42.95
V-40	40.20.15.10.6	23'	$40.95

FAMOUS GOTHAM QUADS

2 Elements—3 Bands Complete $149.95

CHAMPIONSHIP GOTHAM BEAMS

Full Size Complete from $99.95

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

17009 GROVEWOOD AVE.
CLEVELAND, OHIO 44110 ↙417

Alaska Microwave Labs

P.O. BOX 2049 PALMER, ALASKA 99645
(907) 376-3098 DEPT 73

GaAs FETS

MGF1400 NF 2.0DB @ 4GHZ MAG 15DB	$14.00
MGF1412 NF 0.8DB @ 4GHZ MAG 18DB	$50.00
MCF1200 NF 1.0DB @ 1GHZ, NF 2.2DB & MAG 14DB @ 4GHZ	$11.00

VTO

V72T-1 2.7GHZ TO 3.2GHZ MIN POWER OUT 10 MW TUNING VOLTAGE 0 TO 20V Vcc +15 vdc at 60 MA	$98.00
V72T-2 2.8GHZ TO 3.3GHZ REST SAME AS V72T-1	$98.00
V82T-1 SAME AS V72T-1 BUT FREQ 3.0GHZ TO 3.5GHZ	$98.00
V82T-2 SAME AS V72T-1 BUT FREQ 3.6GHZ TO 4.2GHZ	$98.00
V82T-3 SAME AS V72T-1 BUT FREQ 4.0GHZ TO 4.5GHZ	$98.00
V92T-1 SAME AS V72T-1 BUT FREQ 4.5GHZ TO 5.0GHZ	$98.00
V56T-1 .9GHZ TO 1.6GHZ POWER OUT 13 MW TUNING VOLTAGE 2 TO 50V Vcc +15 VDC AT 60 MA	$98.00
V66T-1 SAME AS V56T-1 BUT FREQ 1.5GHZ TO 2.5GHZ	$98.00

CHIP CAPACITORS

1.2, 2.2, 2.7, 3.3, 4.7, 6.8, 10, 18, 22, 27, 47, 100, 120, 180, 220, 270, 330, 390, 470, 560, 680, 820, 1K, 1.2K, 1.8K, 3.9K, 8.2K, 10K, 100K	$.60

PISTON TRIMMERS

TRIKO 201-01M	
.3-1.8PF	$2.50
.5-3 PF	$2.50
1-8 PF	$2.50

TEFLON CIRCUIT BOARD DBL SIDED 1 OZ

APPROX. 3.25"× 5.0"× .010	$5.50
APPROX. 3.25"× 5.0"× .0312	$6.50
APPROX. 3.25"× 5.0"× .0625	$10.50

MIXERS

3.7GHZ TO 4.2GHZ MIXER, LO 2.8GHZ TO 5.1GHZ, IF DC-.9GHZ SSB CONVERSION LOSS TYP 5.5DB MAX 6.5DB, TO-8 PACKAGE	$55.00
.9GHZ TO 1.3GHZ MIXER, LO .7GHZ TO 1.5GHZ, IF DC-.2GHZ SSB CONVERSION LOSS TYPE 7.0DB, TO-8 PACKAGE	$15.00

CHIP RESISTORS

50 OHM ½ WATT	$1.50
3 1% CHIP RESISTORS FOR: 50 OHM T NETWORK 3 DB PAD	$6.00

NO WARRANTEE ON SEMICONDUCTORS

OPEN AT 8 PM EST CLOSED 8PM PST
ORDERS ARE POSTAGE PAID
COD - VISA - MASTERCHARGE

Radio World

CENTRAL NEW YORK'S MOST COMPLETE HAM DEALER

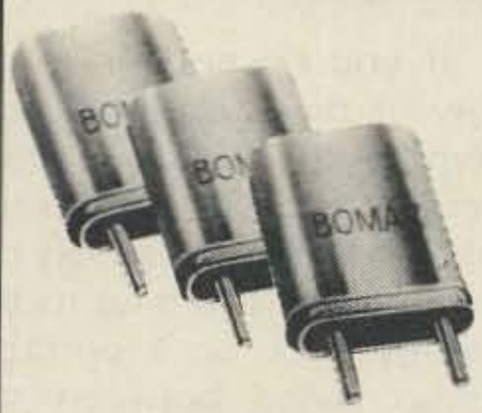
Featuring Kenwood, Yaesu, Icom, Drake, Ten-Tec, Swan, Dentron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Grain, Mosley, Larsen, Cushcraft, Hustler, Mini Products, Bird, Mirage, Vibroplex, Bencher, Info-Tech, Universal Towers, Callbook, ARRL, Astatic, Shure, Collins, AEA. *We service everything we sell!*

Write or call for quote. **You Won't Be Disappointed.**
We are just a few minutes off the NYS Thruway (I-90) Exit 32

OUT OF STATE ORDER TOLL FREE
800-448-9338

ONEIDA COUNTY AIRPORT TERMINAL BUILDING
ORISKANY, NEW YORK 13424
N.Y. Res. Call (315) 736-0184 ↙397

Warren - K2IXN
Bob - WA2MSH
Al - WA2MSI



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

(Custom Crystal Orders Accepted.)

Rolin Distributors
P.O. Box 436 Department 7
Dunellen, N.J. 08812
201-469-1219

Precision Cut Land Mobiles Available

Have You Ever Used Satellites? Let the Pathfinder Series FROM

Computer Applications

Make It Easy For You

Pathfinder II

A Satellite Tracking Package For The Apple II Plus™

Has a world AND a US map and can print BOTH on your Epson MX™ printer. Tracks in real time w/o a clock. SYSTEM REQUIREMENTS: Apple II Plus, 48K RAM, DOS 3.3.

THESE EASY TO USE AND UNDERSTAND PACKAGES ENABLE YOU TO: (1) Track circular orbit satellites in real time on a world map. (2) Print all tables. (3) Rapidly predict specific or all orbits between dates you select. (4) Rapidly compute orbital characteristics. (5) Maintain a disk resident data base of satellite reference data.

Pathfinder II is provided on a DOS 3.3 disk and Pathfinder III is on a TRSDOS 1.3 disk. Both have a comprehensive users manual.

Pathfinder III

A Satellite Tracking Package For The TRS 80 Mod III™

Pathfinder III can track TWO satellites simultaneously!! SYSTEM REQUIREMENTS: TRS 80 MOD III, 48K RAM, TRSDOS 1.3.

Each package is only
$49.95

Please add $2.00 for handling (in California add $3.00 for sales tax).

Send Check or Money Order To:
COMPUTER APPLICATIONS
629 Arbor Ave., Ventura, CA 93003
or Call (805) 644-9327

MasterCard VISA

↙222

↙See List of Advertisers on page 114

William Ringleben K3UK
Box 23, RD 1
Drums PA 18222

Kill Power-Line Interference

You don't have to be a big-game hunter to find the source of that annoying noise. All you need is your rig and your good hamming habits.

Since 1973, I have been employed by an electric utility company. One of my principal responsibilities has been to investigate power-line interference problems affecting customers. This has involved over 1800 complaints concerning reception of TV, AM radio, FM radio, Citizens Band, and amateur radio. Having had this experience, I would like to suggest a few things to my fellow amateurs to aid in the correction of many of their interference problems without having to request outside help.

The amateur affected by interference has some major things going for him:

1) He is available when the interference is occurring.

2) His station probably has far superior sensitivity and selectivity than the broadband receiver and omnidirectional antenna which some investigators use.

3) He has a working knowledge of radio principles and can make up an accurate and meaningful log of interference characteristics to see if a pattern develops.

Elaborating on the third point, experience indicates that at least 60% of all interference complaints are not due to power lines but are caused by consumer devices. By far the greatest offenders in producing interference are arcing contacts such as those found in all types of thermostatic devices. If interference is of an intermittent nature without a relationship to weather conditions, one can say with some certainty that it is being caused by a device indoors and, most likely, that that device will contain a thermostat of some kind or another.

Two of the most difficult problems in locating these culprits can be handled by having someone there while the interference is occurring, and also by determining the existence of a pattern. This is where an accurate log will help with your efforts in locating interference either on your own or with the help of an investigator.

Some of the devices that we find responsible most often include:

- *Oil burner aquastats*, usually on for 10–15 minutes every hour or so depending on the demand for heat and hot water. Quite often, one will assume that this is not the cause because the trouble clears once the oil burner is ignited. Since this interference is caused by the aquastat, the noise can and probably will occur just prior to ignition or, more rarely, just as the burner goes off.
- *Aquarium heaters* have the characteristic of being on and off somewhat more frequently, usually every 20–40 seconds throughout the whole day and night.
- *A heating pad* is another device found to be troublesome quite often. Fortunately, they seem to interfere every few seconds with a somewhat rhythmic pattern. One problem with some heating pads lies with the controller switch positions: high, medium, off, and low. Most people will, without thinking, turn the controller to the last position instead of to the off position. This practice causes the pad to cycle on and off almost continuously, resulting in arcing and eventual failure of the thermostat contacts. For the same reason, do not be fooled into assuming that heating pads cause interference only at night!
- *Door-bell transformers* are another common cause of trouble, with a sound very similar to the heating pad: on and off over a short time period (but not quite so rhythmic). These transformers are usually located in a basement or crawl space where the temperature near the device is higher than normal. With the power applied continuously to the transformer, the temperature rises and the internal thermal cutout operates long enough for the transformer to cool down. Once it reaches a safe operating temperature, power is restored and the process starts all over.
- A few others are *older refrigerators* with heated butter conditioners, *heat tapes* used to prevent pipes from freezing, and *dimmer switches*, where the interference varies with the applied voltage to the lamps. One more worth mentioning that will vary with the weather conditions is the *electric fence* with its rhythmic on and off cycle. Even if you live in a metropolitan area, do not rule this culprit out, as I have located them in the strangest places when people want to confine their household pets.

Locating these sources can be fairly simple, but a good piece of advice is to check at home first, just to save some red-faced embarrassment with your neighbors. Look the list over and see if any of my descriptions fit the bill. If so, next time the interference starts, unplug or shut off the power to the suspected device. If it stops, that is it, and you can take whatever corrective measures are necessary. One note of caution: Interference may not start right after power to the suspected device is restored; the device may have cooled down and will take a short rest before it starts driving you nuts again.

If you do not recognize any of these as your problem, while the main interference is on, go to your service panel and shut off the main while listening to the interference on a portable radio tuned between stations. Even an AM radio will usually suffice here, since spark noise is broadband. If the noise stops when you shut off the power, the cause is something fed from your panel box. Next

time it is on, proceed to the branch circuits and interrupt them one at a time until it stops. Then investigate what is fed from that circuit and you can track it down to the defective device.

If the interference should remain while your power is interrupted, the problem is external to your home. A short walk around the neighborhood is in order. Listen to your portable radio for the peak, or point of loudest interference. Avoid holding your radio near guy wires, down grounds, etc., as this may result in a false reading due to the increased coupling to your antenna. Once you have determined the home with the highest noise level, you will have to get permission from the owner to interrupt his power at his panel box.

A little tact goes a long way here, and you might ask him if he is having an interference problem with *his* radio or TV. Remember that the intensity of the interference will decrease as we go up in frequency, and if your neighbor has UHF TV, for him the problem may be non-existent or very mild. Also, the picture will be affected due to its being amplitude modulated and the sound being FM. Try not to accept his word that he is not having any trouble since he may be listening to a very strong local AM radio station which could mask the interference. In other words, try to look and listen for yourself. Most of the offending devices I have found have been within about two blocks of the complainant's location.

Should you feel that the problem is not a consumer device, you may want to take note of the weather conditions when the interference occurs. The chances are that if the problem is caused by a power line, interference that occurs on dry, sunny days will not be present when the weather is rainy or humid, and vice versa.

Since your receiver has tremendous sensitivity, a small micro spark along the power line can result in a great deal of interference. One of the problems we find often is a hardware condition where lag screws, bolts, washers, and other pole hardware loosen slightly, resulting in micro-sparking. This type of spark is seldom visible to infrared gear since there is very little heat produced, but oh what a racket in the radio spectrum!

Quite often, hardware problems will show up only on dry, cold days, since in wet weather wooden poles absorb some water, swell out, and, in effect, tighten the hardware. This particular problem can be very difficult to correct 100 percent due to the number of poles that may be affected. Also found troublesome are lightning arrestors, disconnect switches, pole grounds, neutral connections, and, of course, tree contact, kite strings with metallic cores, and other such foreign objects.

If you suspect the power line after you have made a careful, accurate log, including frequencies affected, weather conditions, temperatures, and dates and times of occurrences, for safety's sake do not try to locate the trouble by making any direct or indirect contact with the power line. Do furnish your power company with as much information as possible. Doing so demonstrates two major things to the investigator: your concern for the situation and your knowledge of power-line interference. Patience and perseverance are the two main prerequisites for the solution to these interference problems.■

✓See List of Advertisers on page 114

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 by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

ST. PAUL MN
JUN 4

The North Area Repeater Association will sponsor the Amateur Fair, a swapfest and exposition, on June 4, 1983, from 6:00 am to 6:00 pm, at the Minnesota State Fairgrounds in St. Paul MN. Admission is $4.00 and children under 12, accompanied by an adult, will be admitted free. Features will include an inside flea market but space is limited and available on a first-come, first-serve basis and tables will not be provided. There will be demonstrations, exhibits, booths, an outdoor flea market, and on Friday, June 3rd, free overnight parking for self-contained campers. There will be food concessions inside and outside, and free parking will be available. Talk-in on .25/.85 or .16/.76. For more information or dealer inquiries, write Amateur Fair, PO Box 857, Hopkins MN 55343, or call (612)-420-6000.

GUELPH ONT CAN
JUN 4

The Guelph Amateur Radio Club (VE3ZM) will hold the 9th annual Central Ontario Amateur Radio Flea Market and Computerfest on Saturday, June 4, 1983, from 8:00 am to 4:00 pm, at Regal Hall, 340 Woodlawn Road West, Guelph ONT. Admission is $2.00 and children 12 years and under will be admitted free. Vendors must pay an additional $3.00. Doors will be open to vendors only from 6:00 am and a quantity of 3′ × 8′ tables will be available for rental for $5.00 each. Features will include commercial displays, surplus dealers, computer software and hardware, indoor and outdoor displays, and a refreshment concession. Talk-in on 146.370/146.970 (VE3KSR), 147.960/147.360 (VE3ZMG), and .52/.52. For further information contact Al Krist VE3KVI at (519)-821-4337, Henry Christiansen VE3BYU at (519)-743-9022, or write VE3ZM, PO Box 1305, Guelph ONT N1H 4M9, Canada.

GRAND RAPIDS MI
JUN 4

The Independent Repeater Association will hold its annual Hamfestival on Saturday, June 4, 1983, from 8:00 am to 4:00 pm, at the Wyoming National Guard Armory, 44th Street, just east of the US-131 expressway. Admission is $3.50. Free table space will be provided to all sellers and dealer setups will be at 6:00 am. Programs will include ATV, satellites, QRP, DX, a CW rx contest, computers, technical upgrade course, MARS, and a shack-photo contest. Talk-in on 147.165/147.765. For advance table reservations or for more information, call John Knoper KC8KK at (616)-534-5501, or write IRA, 562 92nd Street SE, Byron Center MI 49315.

SALINA KS
JUN 4-5

The Central Kansas Amateur Radio Club (CKAR) will hold the 3rd annual Kansas State ARRL Convention on June 4-5, 1983, at the Red Coach Inn Convention Center, West Crawford and I-135, Salina KS. A free flea market will be held, rain or shine, in the parking lot adjacent to the Center. Other features will include programs on both days for hams, non-hams, and ladies, including a technical program involving amateur radio presented by Jerry Hall from ARRL headquarters. On Saturday evening there will be a banquet and entertainment. For further information, send an SASE to Bill Ringquist KAØCUF, RR #1, Box 155, Gypsum KS 67448.

QUEENS NY
JUN 5

The Ebonaire Amateur Radio Society will hold its 2nd annual hamfest/flea market on Sunday, June 5, 1983, from 9:00 am to 3:00 pm, at Southern Queens Park, 119-09 Merrick Boulevard (near the St. Albans Veterans Hospital), St. Albans, Queens NY. Buyers' donations are $2.00 and each exhibitor's space is $4.00. There will be cover if it rains, and free parking. Talk-in on 145.35/144.75 and 146.52 simplex. For more information, call Vince KA2CPA at (212)-528-0416 or Art WA2VYG at (212)-523-2319, nights.

LOVELAND CO
JUN 5

The Northern Colorado Amateur Radio Club will hold Superfest V on June 5, 1983, from 8:30 am to 3:30 pm, at the Larimer County Fairgrounds, Loveland CO. There will be family activities, technical talks, and a swapfest. Food will be served in the building. For further information, contact Rick Hubbard WAØDDC, 140 23rd Avenue 29, Greeley CO 80631.

ROME NY
JUN 5

The Rome Radio Club, Inc., will sponsor the 31st edition of its Rome Ham Family Day on Sunday, June 5, 1983, at Beck's Grove, Rome NY. Activities will include games, contests, technical presentations, and a giant flea market. Food and beverages will be available throughout the day, which will be climaxed by a buffet-style dinner and the Ham-of-the-Year award. Talk-in on 146.28/.88 and 146.52.

DALTON MA
JUN 5

The Northern Berkshire Amateur Radio Club will hold a flea market on June 5, 1983, at the American Legion Pavilion, North Street, Route 9, Dalton MA. Admission is $1.00 and XYLs and children will be admitted free. Tailgating is free and tables are free on a first-come basis. Refreshments will be sold by the Dalton American Legion.

MANASSAS VA
JUN 5

The Ole Virginia Hams ARC, Inc., will hold the ninth annual Manassas Hamfest on Sunday, June 5, 1983, beginning at 8:00 am, at the Prince William County Fairgrounds, VA Route 234, ½ mile south of Manassas VA. General admission is $4.00 per person (children under 12 will be admitted free) and there will be no advance sales. Activities will include 25 acres of tailgating (setups at 7:00 am), indoor commercial exhibits, breakfast and lunch menus, a YL program, and CW proficiency awards. Talk-in on 146.37/.97 (Manassas repeater) and 146.52. For more information, contact Bob Kelly KA4NES, General Chairman, Manassas Hamfest, c/o Ole Virginia Hams ARC, Inc., PO Box 1255, Manassas VA 22110, or phone (703)-361-9468.

HUMBOLDT TN
JUN 5

The Humboldt Amateur Radio Club will hold its annual hamfest on Sunday, June 5, 1983, from 8:00 am to 4:00 pm, at Bailey Park in Humboldt TN. Admission is $2.00. There will be a flea market, ladies' activities, lunches, refreshments, and RV parking. Talk-in on 146.37/.97. For more information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343.

CHELSEA MI
JUN 5

The Chelsea Swap and Shop will be held on Sunday, June 5, 1983, at the Chelsea Fairgrounds, Chelsea MI. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 2:00 pm. Donation is $2.50 in advance or $3.00 at the gate. Children under 12 and non-ham spouses will be admitted free. Table space is $6.00 per 8 feet and trunk sales are $2.00 per space. There will be plenty of parking (including for the handicapped) and there are campgrounds available in the area. Talk-in on 146.520 and 147.855. For more information, write William Altenberndt, 3132 Timberline, Jackson MI 49201.

TERRE HAUTE IN
JUN 5

The 37th annual Wabash Valley Amateur Radio Hamfest will be held on June 5, 1983, at the Vigo County Fairgrounds on US-41, ½ mile south of I-70. Advance registration is $2.00 or 3 for $5.00, or $3.00 at the gate (children under 12 will be admitted free). A covered, 12 × 12, flea-market space is $3.00; outdoor flea-market space is free. Some ac and tables will be available on a first-come basis. There will be overnight camping, food and refreshments, and a giant shopping mall nearby. Forums will include computer and ARES. For tickets and detailed information, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

COEUR D'ALENE ID
JUN 11

The Kootenai Amateur Radio Society will hold their Hamfest '83 on Saturday, June 11, 1983, from 8:00 am to 4:00 pm, at the North Idaho Fairgrounds, Coeur d'Alene ID. There will be free swap tables, a large RV parking area, and food available. Talk-in on 146.38/.98 or 146.52. For further information, contact Vladimir J. Kalina, South 1555 Signal Point Road, Post Falls ID 83854.

BOWLING GREEN KY
JUN 11

The Kentucky Colonels Amateur Radio Club, Inc., will hold the 1st annual Bowling Green Swapfest on June 11, 1983, from 8:00 am to 4:00 pm, at the Jaycee Pavilion, Morgantown Road (off US 231), Bowling Green KY. Donations are $2.50 in advance and $3.00 at the door. Indoor, air-conditioned vendor space is $1.00; outside vendor space will be available and all setups begin at 7:30 am. Proceeds will go for emergency communications equipment. There will be plenty of free parking and concessions will be available. Talk-in on .25/.85 (KA4CLL) or 146.52. For more information or advance tickets, please send an SASE to Jack Wilson WA4SAC, 451 Skyline Tr. Park, Bowling Green KY 42101, or Ed Schwab KA4REF, 1546½ Chestnut Street, Bowling Green KY 42101.

DEAL NJ
JUN 12

The Jersey Shore Chaverim Amateur Radio Club will hold the Jersey Shore Hamfest and Electronic Flea Market on June 12, 1983, from 9:00 am to 3:30 pm, at the Jewish Community Center, 100 Grand Avenue, Deal NJ. Admission is $3.00 per person (children under 12 and XYLs will be admitted free). Indoor space is $5.00 for an 8-foot table and outdoor tailgating is $2.50 per space. Refreshments will be available. Talk-in on 147.045 + .6 and 146.52 simplex. For space reservations, send an SASE and check (payable) to Jersey Shore Hamfest, PO Box 192, West Long Branch NJ 07764 by May 15, 1983.

QUEENS NY
JUN 12

The Hall of Science Amateur Radio Club will hold its annual indoor/outdoor, rain-or-shine hamfest on Sunday, June 12, 1983, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th Street (1 block from Queens Boulevard), Kew Gardens, Queens NY. Sellers' donations are $3.00, buyers' donations are $2.00, and XYLs and children will be admitted free. Talk-in on 146.520. For additional information, contact Tony Russo WB2OLB at (212)-441-6545 or John Powers KA2AHJ at (212)-847-8007.

BELLEFONTAINE OH
JUN 12

The Champaign Logan Amateur Radio Club, Inc., will hold its annual hamfest and flea market on Sunday, June 12, 1983, beginning at 7:00 am EDST, at the Logan County Fairgrounds, Bellefontaine OH. Tickets are $1.50 in advance and $2.00 at the door. Tables are $3.00 in advance. Talk-in on 147.60/.00 (CLARC/Hi Point Repeater, W8EBG). For more information, tickets, or tables, contact Michael DeVault KU8I, 7157 Road 158, East Liberty OH 43319.

WILLOW SPRINGS IL
JUN 12

The Six Meter Club of Chicago, Inc., will hold its 26th annual hamfest on Sunday, June 12, 1983, beginning at 6:00 am, southwest of Chicago at Santa Fe Park, 91st and Wolf Road, Willow Springs IL. Registration is $2.00 in advance and $3.00 at the gate. There will be a large swapper's row, picnic grounds, plenty of parking space, displays in the pavilion, refreshments, and an AFMARS meeting. Talk-in on 146.52 (K9ONA) or .37/.97 (K9ONA/R). For advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650, or any club member.

GRANITE CITY IL
JUN 12

The Egyptian Radio Club, Inc. (W9AIU), will hold its 54th anniversary celebration and annual hamfest on Sunday, June 12, 1983, at the club grounds near Granite City IL.

AKRON OH
JUN 12

The 16th annual Goodyear ARC Akron Hamfest will be held on Sunday, June 12, 1983, from 10:00 am to 5:00 pm, at Wingfoot Lake Park, near US 224 and SR 43, east of Akron OH. Family admission is $2.50 in advance or $3.00 at the gate. The pavilion is $5.00 per table and the flea market is $2.00 per space. A picnic area and refreshments will be available, as well as free parking. The gate will open at 7:00 am for flea-

market and exhibitor setups. Talk-in on 146.04/.64. For advance tickets and/or reservations, send an SASE to Don Rodgers WA8SXJ, 161 S. Hawkins Avenue, Akron OH 44313, or phone (216)-864-3665.

LEWISBURG PA
JUN 12

The Milton Amateur Radio Club, Inc., will hold its 12th annual hamfest on Sunday, June 12, 1983, from 8:00 am to 5:00 pm, rain or shine, at the Winfield Fire Company grounds on Route 15, south of Lewisburg PA and 8 miles south of exit 31 on I-80. This is a location change from last year and more covered spaces are available. Registration is $3.00 and wives and children will be admitted free. There will be a flea market, an auction, and contests. Talk-in on 146.37/.97 and 146.025/.625. For further details, write Ken Hering WA3IJU, RFD #1, Box 381, Allenwood PA 17810, or phone (717)-538-9168.

DALLAS TX
JUN 16-19

The YL International Single Sidebander's 1983 Convention will be held on June 16-19, 1983, in Dallas TX. Activities will include the DX Roundup, slide shows from Japan and Egypt, and the System Awards Banquet (barbeque style) on Saturday night (with speeches, awards, and a country-western band and dance). Pre-convention activities will begin June 13. Golfing, fishing, and side trips are planned to fill in the hours between ham-radio activities. For more information, please send a business-size SASE (40 cents postage) to Joe Parsons W5UJO or Mary Parsons KC5UO, 1639 Evergreen Drive, Mesquite TX 75149.

COLUMBUS OH
JUN 18

The Battelle Amateur Radio Club will hold its 3rd annual Columbus OH Hamfest on Saturday, June 18, 1983, at the Battelle Memorial Institute Auditorium parking lot, Rte. 315 and King Avenue. Admission is $1.00 and trunk sales are $2.00 per space. There will be free parking. Talk-in on .75/.15 and .52. For more information, call Bill W8LLU at (614)-261-7053 or Kevin WA8OHI at (614)-891-2205.

CORTLAND NY
JUN 18

The Skyline Amateur Radio Club (SARC) will hold its hamfest on June 18, 1983, from 9:00 am to 5:00 pm, rain or shine, at the Cortland County Fairgrounds, I-81, Exit 12, Cortland NY. There will be indoor and outside flea markets. Talk-in on .52. For additional information, write Robert H. Partigianoni, Advertising Chairman, Skyline Amateur Radio Club, PO Box 537, Tully NY 13159, or phone (315)-696-8476.

DUNELLEN NJ
JUNE 18

The Raritan Valley Radio Club will hold its 12th annual hamfest on Saturday, June 18, 1983, beginning at 8:30 am, at Columbia Park, Dunellen NJ. Donations are $2.00 for lookers; sellers' spots are $3.00 each and no tables will be supplied. Food and drink will be available at the refreshment stand and advance tickets may be purchased from any club member. Talk-in on 146.025/.625 (W2QW/R) and 146.52. For further information, call Bob KB2EF or Mary WA2JWS at (201)-369-7038 from 10:00 am to 10:00 pm.

PAYETTE ID
JUN 18

The Treasure Valley Amateur Radio Association will hold its hamfest on June 18, 1983, in Payette ID. Pre-registration is $5.00. There will be games, swap tables, ladies' activities, family fun, and a banquet. For more information, send an SASE to PO Box 790, Payette ID 83661.

LANCASTER OH
JUN 19

The Lancaster and Fairfield County Amateur Radio Club will hold its annual Father's Day Hamfest on Sunday, June 19, 1983, from 8:00 am to 4:00 pm, at the Fairfied County Fairgrounds, Lancaster OH. Admission is $2.00 in advance and $3.00 at the gate. Tables under cover, food, and plenty of free parking will be available. Talk-in on 147.03/.63 or 146.52. For additional information, write Box #3, Lancaster OH 43130.

SANTA MARIA CA
JUN 19

The Satellite ARC will hold its 1983 Santa Maria Amateur Radio Swap FEST and BBQ on June 19, 1983, from 10:00 am to 4:00 pm, at the Union Oil Company New Love Picnic Grounds, south of Santa Maria, off US 101. Admission is free for the swapfest; BBQ tickets are $7.50 for adults and $3.50 for children 6-12 years of age (children under 6 will be admitted free). Swap tables (2' × 6') are available for $2.50. Talk-in on 146.34/.94. For tickets and more information, write Santa Maria Swap FEST, PO Box 2616, Orcutt CA 93455.

CROWN POINT IN
JUN 19

The Lake County (Indiana) Amateur Radio Club will hold its 11th annual Dad's Day Hamfest on June 19, 1983, beginning at 8:00 am, at the Industrial Arts Building at the Lake County Fairgrounds, Crown Point IN. Tickets are $2.50. All events will be held indoors and there will be plenty of food and parking. Talk-in on 147.84/.24 or .52. For further information, contact Denny Tokarz KA9FCG, 6930 Lindbergh, Hammond IN 46323.

FREDERICK MD
JUN 19

The Frederick Amateur Radio Club will hold its 6th annual hamfest on June 19, 1983, from 8:00 am to 4:00 pm, at the Frederick Fairgrounds. Admission is $3.00 and YLs and children will be admitted free. Tailgaters will be charged an additional $2.00; exhibitors' tables are $10.00 for the first and $5.00 for each additional one. Gates will open for exhibitors at 8:00 pm on June 18, 1983, and overnight security will be provided. Overnight parking will be welcomed. For further information, write V. A. Simmons KA3CVD, 7301 Pin Oak Drive, Middletown MD 21769, or phone (301)-371-5735.

WILKES-BARRE PA
JUN 19

The Murgas Amateur Radio Club K3YTL will sponsor the annual Wilkes-Barre PA Hamfest on Sunday, June 19, 1983, beginning at 8:00 am, rain or shine, at the Kingston Armory, Market Street, Kingston PA. Donations are $3.00 (children under 12 and XYLs will be admitted free) with tailgating $1.00 extra per space. Doors will open at 6:00 am for setups only. There will be plenty of food and free parking. Talk-in on 146.61, 146.88, 224.66, and 142.52 simplex. For more information, contact Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703, or phone (717)-779-3882.

SHELLSVILLE PA
JUL 4

The Harrisburg Radio Amateur Club will sponsor the annual Firecracker Hamfest on Monday, July 4, 1983, at the Shellsville VFW picnic grounds, Exit #27 (follow signs 2 miles to Shellsville), I-81, north of Harrisburg. Admission is $3.00, XYLs and children will be admitted free, and there will be no charge for tailgating. There will be plenty of parking, shade trees, tables, and a pavilion. Talk-in on .16/.76 or .52/.52 simplex. For additional details and table reservations, contact KA3HZW, 131 Livingston Street, Swatara PA 17113, or phone (717)-939-4957.

SPOKANE WA
JUL 8-10

The 5-state ARRL Northwestern Division Convention will be held on July 8-10, 1983, at the Spokane Convention Center, Spokane WA. The Spokane Swapfest (normally in April) will be combined this year with the convention as will be the flea market. Registration is $5.00 and swap tables are $10.00. Events will include displays by manufacturers and dealers, seminars on antennas, computers, VHF/EME, weather, traffic handling, and repeater operation. There will be ARRL and advisory committee forums. Ladies' programs will include a luncheon and style show. The Saturday-night banquet will feature Roy Neal, NBC news correspondent, and the Royal Order of the Wouff Hong ceremony will follow at midnight ($1 admission). The DX breakfast and church services will be on Sunday morning. Close-in RV parking is available. For additional information, write Northwest '83, PO Box 3933, Spokane WA 99220.

MILTON ONT CAN
JUL 9

The Burlington Amateur Radio Club, Inc., will host the ninth annual Ontario Hamfest on Saturday, July 9, 1983, at the Milton Fairgrounds. For more information, write Burlington Amateur Radio Club, Inc., PO Box 836, Burlington ONT L7R 3Y7, Canada.

FARIBAULT MN
JUL 9

The Faribault Amateur Radio Club will hold its 2nd annual swapfest on Saturday, July 9, 1983, from 9:00 am to 3:00 pm, at the Rice County Fairgrounds on the north edge of Faribault MN. General admission is $1.50, admission and selling space is $3.00 (indoor or outdoor), and tables (7-foot and by pre-registration only) are $3.00 each. Lunch and free parking will be available. There will be amateur radio and computer gear as well as electronic equipment displayed. Talk-in on 146.19/.79. For more information, contact Donald Klier, 1118 NW 8th Street, Faribault MN 55021.

OAK CREEK WI
JUL 9

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 9, 1983, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a public picnic area, hot and cold sandwiches, and liquid refreshments will be available on the grounds. There will be free overnight camping. Talk-in on 146.94. For more details, including a local map, write South Milwaukee Amateur Radio Club, Inc., PO Box 102, South Milwaukee WI 53172-0102.

STATE COLLEGE PA
JUL 9

The Nittany Amateur Radio Club will hold a hamfest and computer fair on Saturday, July 9, 1983, beginning at 8:00 am, at the Pleasant Gap Firemen's Park, Route 144, Pleasant Gap PA (just off Route 26, east of State College). Tickets are $3.00; tailgating spaces are $5.00. Talk-in on 146.16/.76 and 146.25/.85. For further information, write Dave Buckwalter KC3CL, 1635 Circleville Road, State College PA 16801, or phone (814)-234-0759.

CROSSVILLE TN
JUL 9-10

The Plateau Amateur Radio Club will hold the Crossville Hamfest on July 9-10, 1983, at the Cumberland County Community Complex, Highway 70 North, Crossville TN. Admission is $1.00 for adults. Exhibit and flea-market space will be available on a first-come basis. There will be a Dutch-treat dinner on Saturday night. Talk-in on 147.93/.33. For further information, contact the Plateau Amateur Radio Club, PO Box 2621, Crossville TN 38555.

ALEXANDER NY
JUL 10

The Genesee Radio Amateurs, Inc., will hold the ARRL-approved third annual Batavia Hamfest on Sunday, July 10, 1983, from 6:00 am to 5:00 pm, at the Alexander Firemen's Grounds, Rte. 98, Alexander NY (9 miles south of Batavia). Registration is $2.00 in advance and $3.00 at the gate. Features will include a large exhibit area, OM and YL programs, contests, a boat-anchor auction, and overnight camping. Food will be available. Talk-in on 6.52 or 4.71/5.31 (W2RCX). For more information or advance tickets (make checks payable to Batavia Hamfest), write c/o GRAM, PO Box 572, Batavia NY 14020.

INDIANAPOLIS IN
JUL 10

The Indiana State Amateur Radio Convention, in conjunction with the Indianapolis Hamfest and Computer Show, will be held on Sunday, July 10, 1983, at the Marion County Fairgrounds at the southeastern intersection of I-74 and I-465. Gate tickets are $4.00 and entitle you to all activities. There will be inside and outside flea markets, a separate computer show and flea market, a commercial vendor's display

area, technical forums, club activities, ladies' activities, and professional food services. There will be setups after 12:00 noon on Saturday, July 9th. Security will be provided Saturday night and Sunday, and camper hookup facilities will be available on the grounds. For further information, contact Indianapolis Hamfest, Box 11086, Indianapolis IN 46201.

MONTANA-ALBERTA CAN
JUL 15-17

The 49th Glacier-Waterton International Hamfest will be held on July 15-17, 1983, at Waterton Homestead Campground, just north of Waterton National Park entrance on Highway 6 (Alberta, Can.). There will be a bunny hunt, technical sessions, entertainment, and swap tables. For more information and pre-registration, write PO Box 148, Milk River, Alberta T0K 1M0, Can.

CARY NY
JUL 16

The Cary Amateur Radio Club will hold its eleventh annual Mid-Summer Swapfest on Saturday, July 16, 1983, from 9:00 am to 3:00 pm, at the Lion's Club Shelter (next to Cary Senior High School), Cary NC. There is no admission or commission charge. Featured will be an open auction at 1:00 pm. Talk-in on 146.28/.88, 147.75/.15, and 146.52 simplex.

CANTON OH
JUL 17

The Tusco ARC (W8ZX) and the Canton ARC (W8AL) will present the 9th annual Hall of Fame Hamfest on Sunday, July 17, 1983, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Tickets are $2.50 in advance, $3.00 at the gate, and children under 16 will be admitted free. Flea-market parking is $2.00 and tables are available on a reserved basis at $3.50 each. A check must accompany reservations. There will be forums, dealers, a flea market, food, and XYL activities. Talk-in on 146.52 and 147.72/.12. For reservations or more information, contact Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH, or phone (216)-821-8794.

BOWLING GREEN OH
JUL 17

The 19th annual Wood County Ham-A-Rama will be held on Sunday, July 17, 1983, beginning at 8:00 am, at the Wood County Fairgrounds, Bowling Green OH. Admission and parking are free. Trunk sales and food will be available. Advance table rentals are $5.00 and are for dealers only. Saturday will be available for setups until 8:00 pm. Talk-in on .52. For more information or dealer rentals, send an SASE to Wood County ARC, c/o Craig Henderson, Box 366, Luckey OH 43443.

POUGHKEEPSIE NY
JUL 23

The Mt. Beacon Amateur Radio Club will hold its annual ARRL hamfest on July 23, 1983, from 8:00 am to 3:00 pm, at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County NY. Admission is $2.00 (XYL and your children will be admitted free), tailgating space is $3.00 (includes one free admission), and a table space is $4.00 (includes one free table and admission). Hot food, beverages, and free parking will be available. There will be an auction beginning at 2:00 pm. Talk-in on 146.37/.97 and 146.52. For additional information, write Art Holmes WA2TIF, 2 Straub Drive, Pleasant Valley NY 12569, (914)-635-2614, or Walt Sutkowski K2DPL, W. Redoubt Road, Fishkill NY 12524, (914)-897-5158.

HAM HELP

I have to say thanks to *73* for the services provided to your readers by the "Ham Help" column. This is the second time I have used it and gotten what I needed. This time I got all the parts I was looking for and even more offers. This is really amateur radio spirit.

Robert Sondack VE2ASL
260 Rue Bellerive
St. Luc, Quebec
Canada J0J 2A0

Our radio club needs the service manuals and schematics for a military-surplus diesel generator, engine PU586/G, contract number NOM72836, manufactured by Electromagnetic Industries, Inc. (Sayville NY), in 1964. I will copy the manual and pay all postage.

Robert Francis KB9RT
809 LeRoy Avenue
Rock Falls IL 61071

I am looking for the schematic and manual for the Clegg Interceptor B.

J. H. Christilaw
38700 Ann Arbor Tr.
Livonia MI 48150

I need the schematics and manual for the Hammarlund HQ-180 receiver.

Bob Johnson K7EYT
E. 16109 Longfellow
Spokane WA 99216

I need to find the schematic and parts list for the Amcomm HB-120 F-series linear amplifier with built-in receive preamp.

David A. Berger WD8EUC
26871 Alessandro Blvd. #53
Sunnymead CA 92388

I need the manual and schematics for a Rhode and Schwarz model ZWA. I will pay for the original or a copy.

John Thomas VE3BVX
58 Albert N.
Lindsay, Ontario
Canada K9V 4J8

I am looking for the schematics for a Gonset G50 6-meter transceiver. I will pay a reasonable price for the original or photocopy of the schematic.

Kenneth H. Johnson WA4TOP
#8 Fairview Drive North
Sun Air Resort
Haines City FL 33844

Wanted: manual for the Hunter Bandit linear amplifier, model 2000C. I will purchase the original or a copy.

Al Wilde W8JZZ
5580 E. Galbraith Rd.
Cincinnati OH 45236

I would like to contact any active ham or marine-service radio operator who would like to show a maritime radio buff what it is like to go "down to the sea in ships" on HF CW and telex.

Norman H. Drechsel WA3KEY
PO Box 498
Quakertown PA 18951

I would like to hear from owners of the Timex Sinclair 1000 who are using it for RTTY, CW, and SSTV.

William Alzaga XE1WAC
PO Box 26 Suc. A
53100 CD Satelite
Mexico

(So would we!—Eds.)

I need the schematic, parts list, and alignment information for two Heath frequency converters, the SBA300-3 (6-meter) and the SBA300-4 (2-meter). I will pay all costs or copy the manuals and return them.

Robert Schlegel N7BH
2302 286th St. East
Roy WA 98580

I would like to obtain an original or a copy of the manual for a 1946 National receiver, number NC-2-40D. I also need *Single Sideband for the Radio Amateur*, published by the ARRL. I will pay all costs.

Robert L. Schreiber
341 Arden Ave. #2
Glendale CA 91203

I am looking for the manual and schematic for a Demco Demon Fifty CB amplifier; I also need 10-meter conversion information for it. I will pay all costs.

Bill Edwards N8ARW
1930 Youll St. #30
Niles OH 44446

I need manuals, schematics, or other information on the following equipment: TMC low-frequency multi-coupler, model LMC-10/70U; CEI receiver, type 591; CEI signal monitor, type SM-9303A; Northern Radio Company volume- and current-level indicator, type 254, model 1; Northern Radio Company line amplifier, type 103, model 1; Hammarlund SP-600 VLF; and Collins antenna tuner, type 180L-3. I will pay for expenses.

Richard M. McClung WA6KNW/AAT6XB
6106 SW Summit
Lawton OK 73505

I have a Ballantine model 1066S oscilloscope (also known as an AN/USM 398). I would like to borrow a service manual for copying. I will pay all shipping costs.

Ken Cubilo WB8DOI
215 Huron Apt. A
Oscoda MI 48750

Wanted: maintenance manual for the AN/ART-13. I would also like to hear from anyone who has converted this unit to single sideband.

E. Patrick Harrigan N9AVO
5165 S. Magellan Dr.
New Berlin WI 53151

I need manuals and schematics for a Lafayette HA-800 receiver. I will gladly pay shipping and copying costs.

Philip Birdsong
1613 Whippoorwill Dr.
Lawrenceburg TN 38464

SATELLITES

Amateur Satellite Reference Orbits

		OSCAR 8		RS-5		RS-6		RS-7		RS-8		
	Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Jun	1	0016	87	0110	276	0056	277	0040	270	0131	280	1
	2	0020	89	0105	276	0041	275	0030	269	0128	281	2
	3	0024	90	0100	276	0025	272	0020	268	0125	282	3
	4	0029	91	0054	276	0010	270	0011	268	0123	283	4
	5	0033	92	0049	277	0153	298	0001	267	0120	283	5
	6	0037	93	0044	277	0138	295	0151	296	0117	284	6
	7	0042	94	0038	277	0122	293	0141	295	0114	285	7
	8	0046	95	0033	277	0107	291	0131	294	0111	286	8
	9	0051	96	0028	277	0052	288	0122	293	0108	287	9
	10	0055	98	0022	278	0036	286	0112	292	0106	287	10
	11	0059	99	0017	278	0021	284	0102	291	0103	288	11
	12	0104	100	0012	278	0005	281	0053	290	0100	289	12
	13	0108	101	0006	278	0149	309	0043	289	0057	290	13
	14	0112	102	0001	278	0133	306	0033	289	0054	291	14
	15	0117	103	0155	309	0118	304	0024	288	0051	291	15
	16	0121	104	0150	309	0103	302	0014	287	0048	292	16
	17	0125	105	0145	309	0047	299	0004	286	0046	293	17
	18	0130	106	0139	309	0032	297	0154	315	0043	294	18
	19	0134	108	0134	309	0016	295	0144	314	0040	295	19
	20	0139	109	0129	310	0001	292	0135	313	0037	296	20
	21	0000	84	0123	310	0144	320	0125	312	0034	296	21
	22	0004	85	0118	310	0129	318	0115	311	0031	297	22
	23	0009	86	0113	310	0113	315	0106	310	0029	298	23
	24	0013	87	0107	310	0058	313	0056	310	0026	299	24
	25	0017	89	0102	310	0043	311	0046	309	0023	300	25
	26	0022	90	0057	311	0027	308	0037	308	0020	300	26
	27	0026	91	0051	311	0012	306	0027	307	0017	301	27
	28	0030	92	0046	311	0155	333	0017	306	0014	302	28
	29	0035	93	0041	311	0140	331	0008	305	0012	303	29
	30	0039	94	0035	311	0124	329	0157	334	0009	304	30
Jul	1	0043	95	0030	312	0109	326	0148	333	0006	305	1
	2	0048	96	0025	312	0053	324	0138	332	0003	305	2
	3	0052	98	0019	312	0038	322	0128	331	0000	306	3
	4	0057	99	0014	312	0023	319	0119	331	0157	337	4
	5	0101	100	0009	312	0007	317	0109	330	0154	338	5
	6	0105	101	0003	313	0151	345	0059	329	0151	339	6
	7	0110	102	0157	343	0135	342	0050	328	0149	339	7
	8	0114	103	0152	343	0120	340	0040	327	0146	340	8
	9	0118	104	0147	343	0104	338	0030	326	0143	341	9
	10	0123	105	0141	343	0049	335	0021	325	0140	342	10
	11	0127	107	0136	344	0034	333	0011	324	0137	343	11
	12	0131	108	0131	344	0018	331	0001	323	0134	344	12
	13	0136	109	0125	344	0003	328	0151	352	0132	344	13
	14	0140	110	0120	344	0146	356	0141	352	0129	345	14
	15	0001	85	0115	344	0131	353	0131	351	0126	346	15

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

THE YEAR THAT WAS—1976

Last night, I once again played the videotape of my favorite movie, "So Goes My Love," the story of Hiram Percy Maxim W1AW and his family. You know, no matter how many times I screen this fine film, I never get tired of it. It's just a shame that the copyright laws prevent me from making copies of the film for you readers. It's an amateur-radio classic.

Every ham who has seen this motion picture seems to have his favorite scene. I don't know about you, but my favorite part is where Don Ameche (HPM's pop) gives his pal some phosphorescent hair cream so that he can woo his girl friend in the dark. Wow! Old Hiram must have had quite a family. The only time my dad ever glowed was when he had a few too many Rheingolds at the company picnic. I wonder if they still have any of that ointment in Newington? The stuff would be great to smear over a tower when you have to make emergency repairs during a dark contest night.

This month's topic is the year 1976. You remember 1976, don't you? Lots of big happenings that year, both within ham radio and the world at large. If 1976 was a good year for you, here's hoping this month's FUN! brings back some fond memories. If not, enjoy the puzzles anyway.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) The year's big celebration
7) QTH _____ Flushing NY
8) Unit of resistance
10) Thailand prefix
11) Programmable memory chip (abbr.)
13) Ham satellite
15) 5-land state or 6-land city (abbr.)
16) Certain type of transistors (abbr.)
17) Electrons in a circuit; river
19) Phone turnover
20) Peru prefix
21) 1976 presidential contestant
22) What many spouses regard ham rig as
23) Former DM-land (abbr.)
24) 2-land state (abbr.)
25) Bunny hunt (abbr.)
27) To accomplish
28) Glass _____
31) Ireland prefix
32) Hams affected by '76 rule changes

Down

1) Messy solder _____
2) Shack tools made first appearance in 1976
3) *73* state
4) Cut antenna wavelength
5) See 24 across
6) Operates 13 across
9) 1976 centennial state; host to that year's national convention
10) Ecuador prefix
12) Ham greeting (abbr.)
14) After contest: _____ wood
16) The Feds (abbr.)
17) See 21 across
18) Old-timer: prospective hams should _____ dues
19) Made Prog Line rigs (abbr.)
20) ARRL snitch (abbr.)
22) Teach hams
24) Organized on-air group
26) What you're reading
27) Canadian ham bosses (abbr.)
29) Tube amplification factor
30) Household power (abbr.)
31) Spain prefix

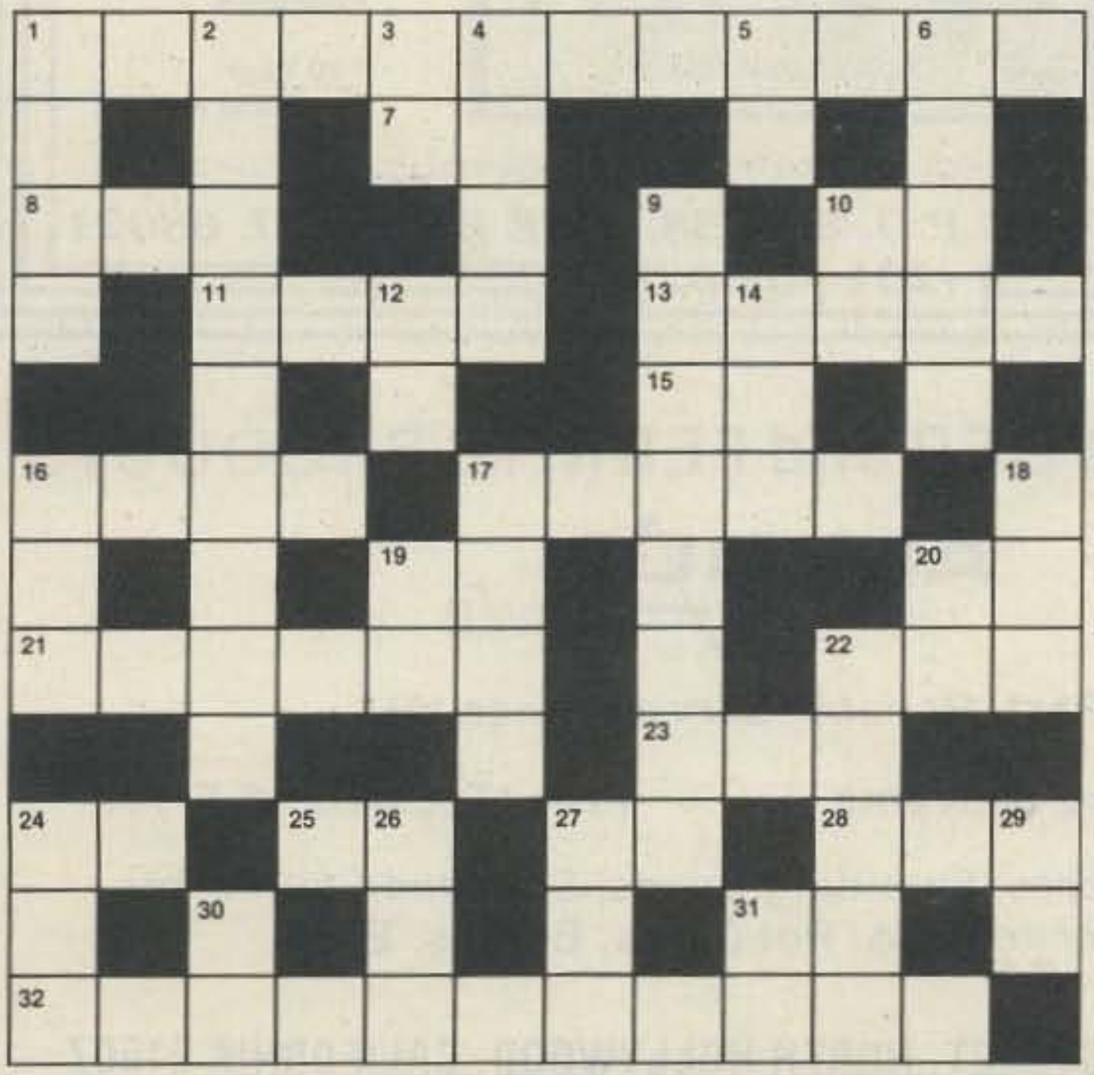


Illustration 1.

ELEMENT 2—MULTIPLE CHOICE

1) What notable contribution to amateur radio did Al Katz K2UYH make on July 29, 1976?
   1) He took part in the first intercontinental OSCAR QSO.
   2) He established the first DX net on 20 meters.
   3) He became the first amateur to qualify for the Worked All Continents award via EME (Earth-moon-Earth) communications.
   4) He became the first ham to work Africa on 2 meters.

2) When the Viking spacecraft landed on Mars, the Jet Propulsion Laboratory Amateur Radio Club relayed its photographic transmissions to amateurs via slow-scan television. What was the special event callsign used, and why was it unique?
   1) The call N6V was the first 1X1 amateur callsign ever issued by the FCC.
   2) The call WMARS was the only amateur callsign ever issued without a numeral.
   3) The call W6 was the shortest ham callsign ever issued.
   4) None of the above.

3) During 1976, the FCC:
   1) Eliminated the requirement to ID as "mobile" or "portable."
   2) Raised the Novice power ceiling from 75 to 250 Watts.
   3) Eliminated the Conditional-class license.
   4) All of the above.

4) In 1976, the first ham station was installed at UN headquarters in New York. Its callsign was:
   1) 4U1UN 2) K2UN 3) WA2MJK/4U1 4) 4U1ITU

5) During the 1976 Montreal Olympics, the official amateur station was:
   1) VE2OLY 2) VE2MTL 3) CZ2O 4) M0NTL

ELEMENT 3—SCRAMBLED WORDS

HCTAPOATU LECHQUS FFRATIC UBLAN
IDESENOT TEN RATEX

ELEMENT 4—TRUE-FALSE

		True	False
1)	A new amateur radio magazine (now defunct) introduced in 1976, was titled *Ham Radio Perspectives*.	____	____
2)	In 1976, all currently-licensed Novices received Technician-class operating privileges.	____	____
3)	The famous "WARC 76" conference gave US hams three new bands.	____	____
4)	WL2USA was a special-event station based at the Statue of Liberty.	____	____
5)	Among the prominent amateurs to die during 1976 was Dr. Webley Webster W1QSR, inventor of the repeater courtesy tone.	____	____
6)	During 1976, the Japan Amateur Radio League celebrated its 50th anniversary.	____	____
7)	It was during 1976 that the FCC took the "N" out of Novice callsigns.	____	____
8)	Special "bicentennial callsigns" allowed US hams to identfy with such exotic calls as AD2IBE and AA2MFR.	____	____
9)	Two OSCAR satellites were launched during 1976.	____	____
10)	The first ham to work all states on 2 meters completed his effort in 1976.	____	____

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—3 WAC the hard way.
2—1 Along with sister station N4V.
3—4 Busy year in Washington.
4—2 That was before the UN was a "country."
5—3 And you thought "strange calls" were a very recent development!

Element 3:
(Reading left to right): AUTOPATCH, SQUELCH, TRAFFIC, BALUN, and SIDETONE, NET, EXTRA.

Element 4:
1—False *Ham Radio Horizons.*
2—False It was the other way around.
3—False It was "WARC 79."
4—True During the 1976 Thanksgiving weekend.
5—False W1QSR is just a figment of your columnist's sick imagination.
6—True And it was attended to by much celebration.
7—True Marking the end of distinctive Novice calls.
8—True A taste of calls to come.
9—False No OSCARs were launched in 1976.
10—True Dick Hart K0QMS was the ham.

SCORING

Element 1:
Twenty-five points for the complete puzzle, or one-half point for each question correctly answered.

Element 2:
Five points for each correct answer.

Element 3:
Four points for each correct answer.

Element 4:
Two and one-half points for each correct answer.

How well have you kept the spirit of '76?

1-20 points—Licensed in 1977.
21-40 points—The body is willing but the spirit is weak.
41-60 points—The mists of time obscure much.
61-80 points—You still drink Billy Beer.
81-100+ points—"Keeper of the Flame!"

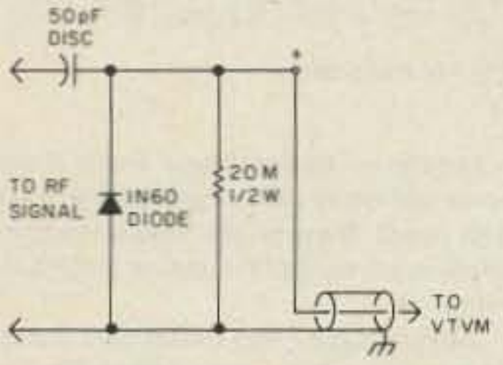
B	I	C	E	N	T	E	N	N	I	A	L
L	■	O	■	H	R	■	■	Y	■	M	■
O	H	M	■	■	I	■	C	■	H	S	■
B	■	P	R	O	M	■	O	S	C	A	R
■	■	U	■	M	■	■	L	A	■	T	■
F	E	T	S	■	F	L	O	W	S	■	P
C	■	E	■	G	O	■	R	■	■	O	A
C	A	R	T	E	R	■	A	■	T	O	Y
■	■	S	■	■	D	■	D	D	R	■	■
N	J	■	D	F	■	D	O	■	A	R	M
E	■	A	■	U	■	O	■	E	I	■	U
T	E	C	H	N	I	C	I	A	N	S	■

Illustration 1A.

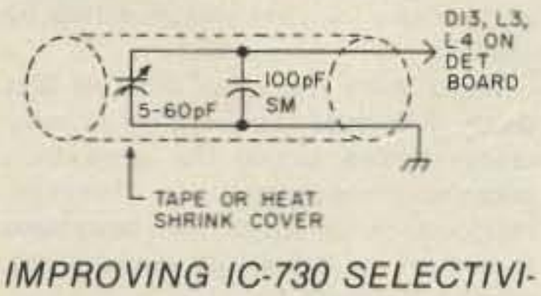
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

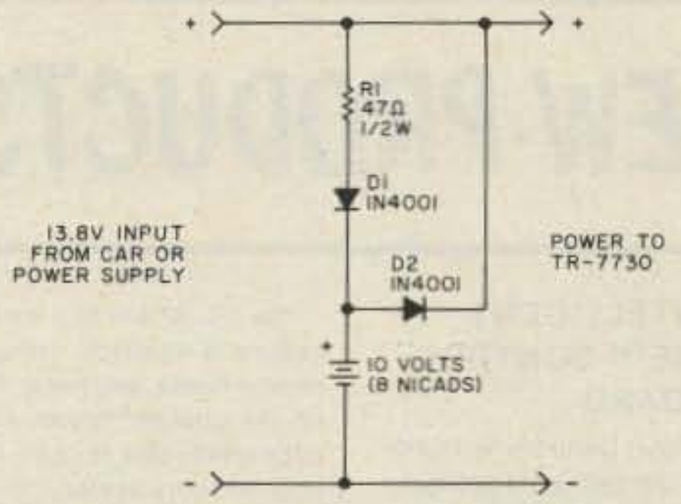


A SIMPLE RF PROBE FOR A VTVM: Your VTVM can measure peak voltage up to 200 MHz by using this probe. The maximum rf that can be measured is determined by the diode; with a 1N60, the probe is limited to 30 V. To increase the capacity, substitute a higher-voltage small-signal-detector diode. Be sure to house the circuit in a metal enclosure and use shielded wire. —Ed Schilling K5RSO, Fairfax VA.

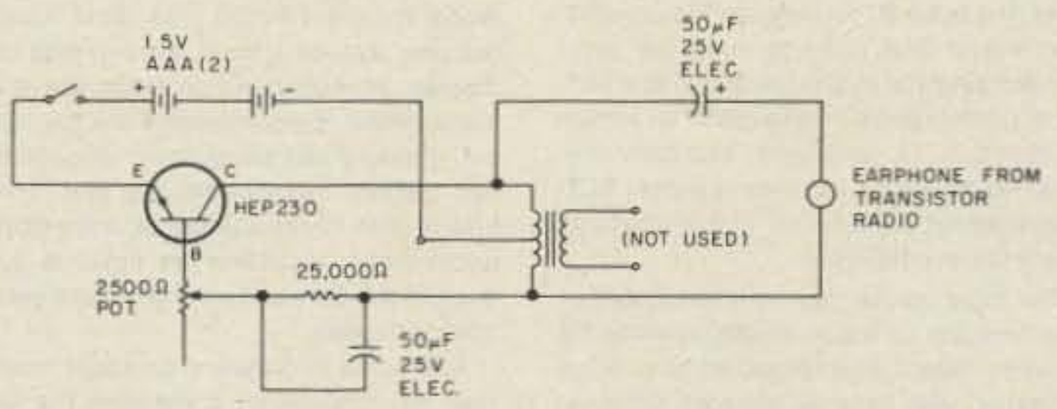


IMPROVING IC-730 SELECTIVITY FOR RTTY: This temporary modification enables the IC-730's CWN filter on LSB. On the second i-f board, connect the purple jumper from P2 to J7 and the white jumper from P3 to J6. This disables the FL-30 PBT filter and connects the FL-45 CWN filter in USB, LSB, and CW, but not CWN. However, the i-f shift still works. The figure shows a parallel capacitor network which should be connected underneath the detector board to the junction of D13, L3, and L4. The other lead goes to ground through one of the detector board's mounting screws. Keep the leads as short as possible and when you cover the network, leave room to adjust the trimmer. To tune up, put the rig in LSB, tune an incoming signal to 2200-Hz audio, and peak the trimmer capacitor for maximum audio output. You will have to retune as you trim to keep the audio at 2200 Hz. The transmitted and received AFSK tone centers will be about 1500 Hz below the LSB dial reading. Do not use modes other than LSB RTTY while this modification is in place.—Lance Holt N9CDD, Biloxi MS.

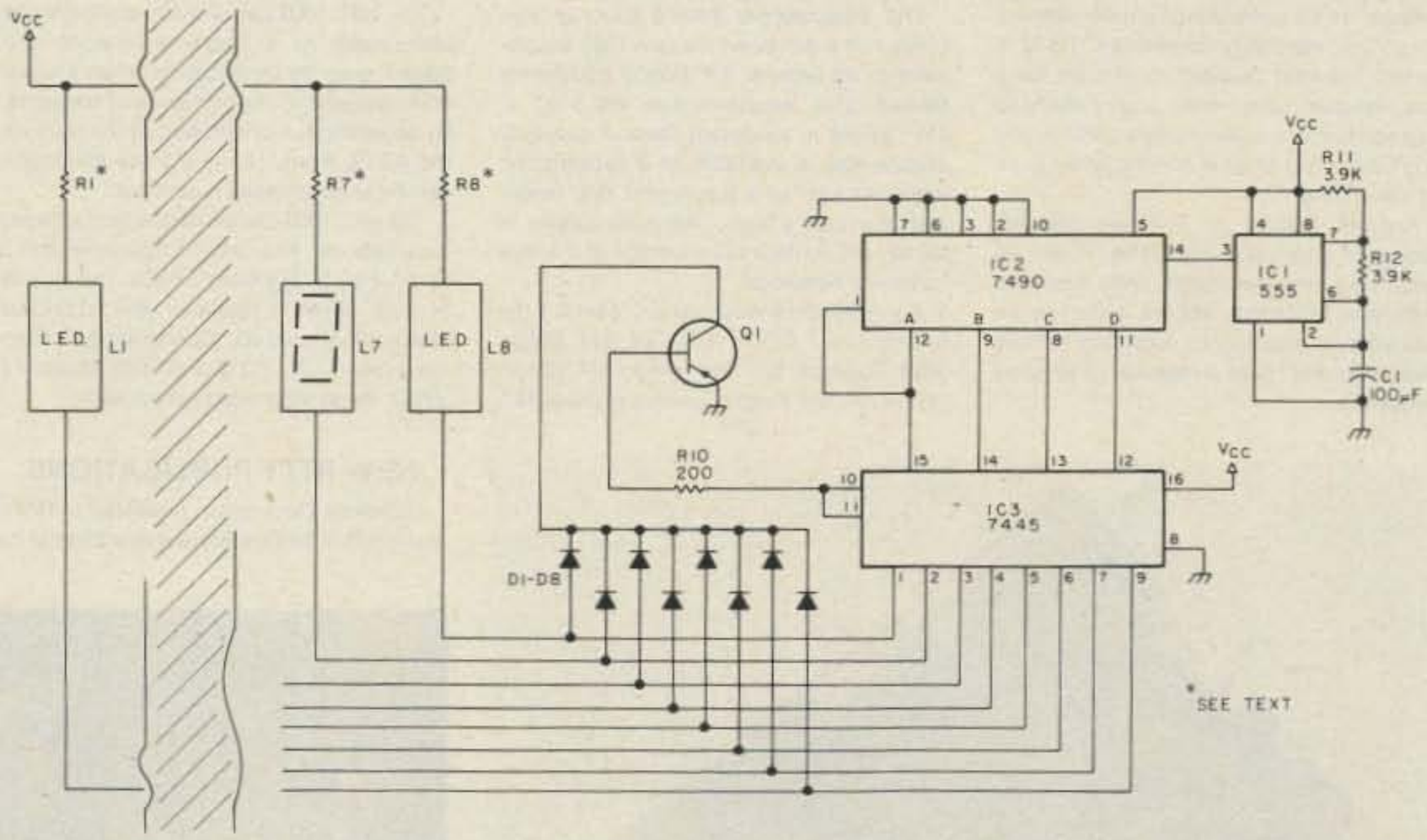
CRYSTAL FREQUENCY SHIFT: Another way of moving a crystal's frequency, besides padding with capacity, is to insert series inductance. Depending on the crystal's characteristics, frequency changes of about 1000 ppm may be obtained with 20 to 30 uH.—Bob Raker WB8ZFF, Cincinnati OH.



MEMORY BACKUP FOR THE KENWOOD TR-7730: This circuit will retain the frequencies in memory while moving the rig from car to house and vice versa. When connected to an external power source, battery B1 is charged through R1 and D1. D1 prevents B1 from discharging when connected to an external supply that is turned off. When external power is removed, D2 provides a current path to the TR-7730 to retain the memory's contents. However, the TR-7730 power switch should be turned off before external power is removed, since B1 will not provide power for normal operation.—William Gouge WB9ALH, Plainfield IN.



THE FISHERMAN'S FRIEND: The click-click sound lures fish to the vicinity, where your bait or lure can do the rest. The transformer is a subminiature type with a 500-Ohm, center-tapped primary and a 3.2-Ohm secondary. Put the circuit in a watertight container and lower it into the water.—Ed Schilling K5RSO, Fairfax VA.



PUT A NAME IN LIGHTS: This circuit will enable you to put a name or callsign in lights using seven-segment LEDs. The display will spell the desired name out sequentially. Select the correct type of LED from a Poly Paks grab bag. Solder the correct leads together to form the letters you want. After mounting the displays on perfboard, calculate the current necessary for the display. Allow 15 mA per segment. Select the appropriate current-limiting resistor. The 7445 can only sink 80 mA, so a PNP transistor is needed to handle the current required to light up the letters. The heart of the circuit is a 555 oscillator into a 7490 decade counter, which is decoded by a 7445 open-collector driver chip. Make your case with two pieces of Plexiglas™ just slightly larger then the perfboard. Space the Plexiglas with four 10-32 bolts, using chrome-plated bolts to make it extra fancy. To cut costs, use a 7-volt supply, series-up a few diodes (1N4001s), and use the .6-volt drop to kill a few volts. An on-off switch is not needed; current consumption is about ½ cent per 24 hours. In one afternoon, you can produce a unique gift! I gave one to a girl in school and now she's my wife!— Alex J. Piechocki, Edison NJ.

NEW PRODUCTS

ITC-32 INTELLIGENT TOUCHTONE™ CONTROL BOARD

Advanced Computer Controls has introduced its new ITC-32 intelligent touchtone control board. The ITC-32 addresses the universal need for touchtone control in amateur radio, commercial, and industrial applications with microcomputer-based flexibility and state-of-the-art Mitel tone decoding (no PLLs).

The ITC-32 provides 28 remotely controllable logic outputs and 4 remotely sensed inputs. Morse code or tone-encoded response messages verify command entry and enable remote interrogation of output and input logic states. Eight of the 28 outputs are buffered for high-current/high-voltage drive capability, such as for direct relay drive. The other 20 outputs are TTL compatible levels. The outputs may be commanded singly or in groups, allowing a variety of control possibilities, such as antenna direction, PL frequency, and gain controls. An additional command allows BCD programming for control of remote-base frequency synthesizers.

The logic inputs may be interrogated or may function as alarm inputs, such as for intrusion detect, over-temperature, or flood indication with external sensors. Optional connection to our telephone interface board allows land line control and auto-dial-out on alarm conditions.

The ITC-32 provides several additional capabilities. A basic repeater COR/ID/Timer function is included, so that the board may serve as a low-cost controller for simple repeaters, or for controlling remote receiver links. This capability makes the ITC-32 a perfect low-cost "starter" controller for a new repeater. Later, when you're ready to upgrade to more sophisticated control, you won't have any trouble finding other uses for the ITC-32.

Another feature is selective call decoding for use in the shack. The ITC-32 can keep your receiver silent until someone dials your touchtone access code to contact you, in addition to providing remote "home control" over a repeater or simplex frequency.

The ITC-32 will find amateur-radio applications in repeaters, remote receiver sites, remote bases, and home control. It's based on the popular Vector 4.5" × 6.5" 44-pin-edge-connector format, for easy integration into any system. It operates from a single 8- to 14-volt power supply.

For more information, contact *Advanced Computer Controls, 10816 Northridge Square, Cupertino CA 95014; (408)-749-8330.* Reader Service number 481.

2-METER MOBILE TRANSCEIVERS

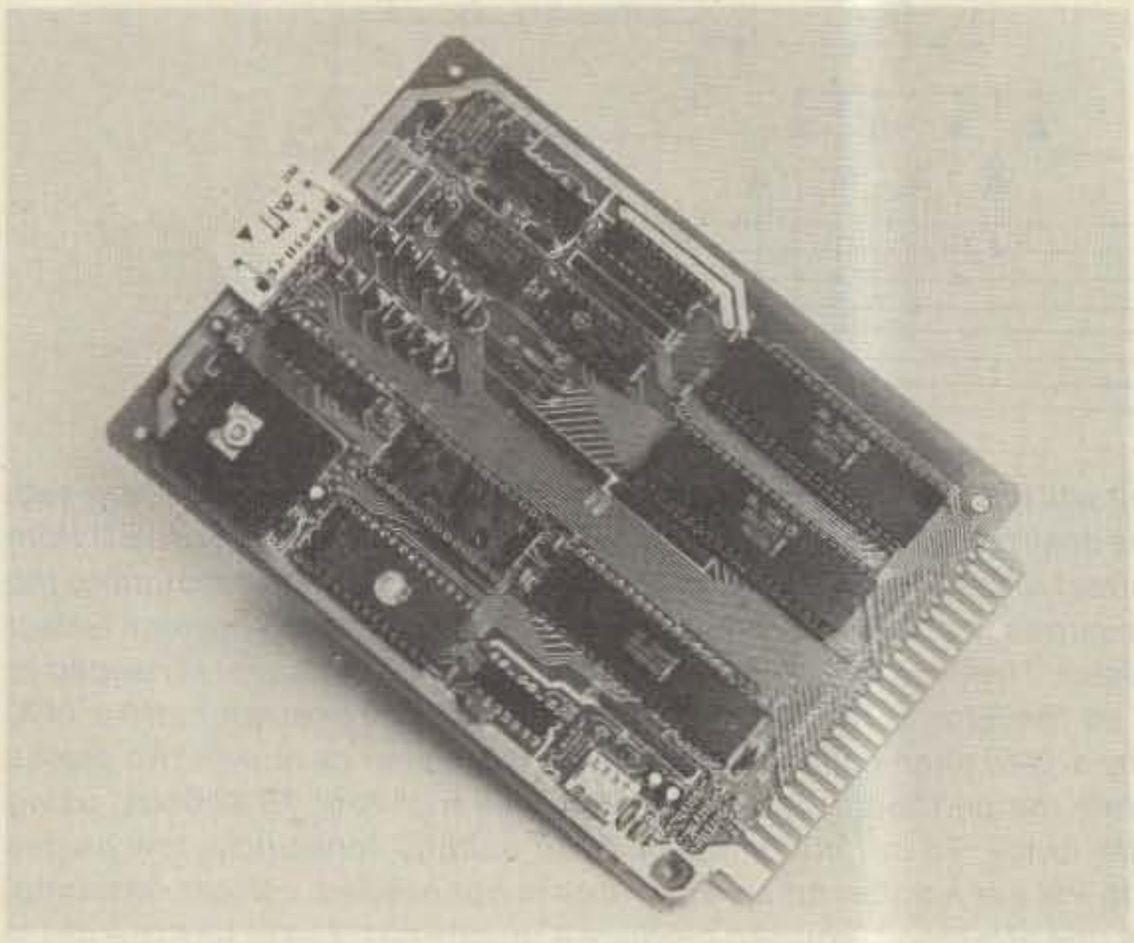
The latest additions to the Trio-Kenwood line of 2-meter mobile transceivers are the TR-7950 and the TR-7930, identical in features except for rf output: a husky 45 Watts for the TR-7950, and a more modest 25 Watts for the TR-7930. The most notable features include a large, easy-to-read LCD display, 21 multi-function memories, automatic offset, programmable priority channel, memory and band scan, long-life lithium battery memory backup (est. 5-year life), built-in 15-key autopatch, and a host of accessories, including an optional 3-frequency sub-tone unit, with keyboard-selectable sub-tones.

Additional information on these models may be obtained by contacting the local Kenwood dealer, or by writing to *Trio-Kenwood Communications, 1111 W. Walnut St., Compton CA 90220.*

SUPPLEMENT TO *SW HOBBY EQUIPMENT REVIEW*

The International DXer's Club of San Diego has announced the new 1983 supplement to its popular *SW Hobby Equipment Review.* This supplement is 194 5½" × 8½" pages in loose-leaf form. A quarterly update also is available on a subscription basis, as well as a leatherette ring binder with the club's logo. The first update in March will contain full coverage of the new Icom and Kenwood.

For additional information, contact the *International DXer's Club of San Diego, 1826 Cypress St., San Diego CA 92154; (619)-429-9728.* Reader Service number 487.



ITC-32 intelligent touchtone control board from Advanced Computer Controls.

Trio-Kenwood's TR-7950 2m FM transceiver.

NXL-1000 INDOOR SHORTWAVE ANTENNA

Contemporary Electronic Products has announced their innovative new NXL-1000 indoor shortwave antenna. Unlike other active indoor antennas, the NXL-1000 employs a Faraday shield for maximum rejection of man-made noise, which is so often a problem for the amateur or SWL. In addition, the NXL-1000 has a built-in crystal calibrator with selectable 1-MHz and 100-kHz markers. This is a great help with uncalibrated or poorly calibrated receivers.

The NXL-1000 covers the 1.5-30-MHz range in three ranges. A high-Q selective circuit provides excellent rejection of unwanted frequencies. This can be a valuable asset with receivers having poor front-end selectivity or marginal image rejection. Internally generated noise, a problem with some active antennas, has been substantially reduced in the NXL-1000.

The NXL-1000 can provide performance comparable to a long-wire antenna and allows even better reception than an outdoor antenna in high-noise environments. By adjusting the orientation of the loop via the AZ-EL mount, local signals and noise can be almost totally nulled out.

The NXL-1000 can be conveniently placed on a desktop. The cabinet measures just 3 by 5-1/4 by 5-7/8 inches (HWD). The loop is only 12 inches in diameter. For additional information contact *Contemporary Electronic Products, PO Box 570549, Miami FL 33157.* Reader Service number 480.

NEW RTTY PUBLICATIONS

Universal Electronics, publisher of RTTY station lists, has added two new titles to its publications: *Radioteletype Press Broadcasts* and *World Utility Frequency and Call Sign Guide.* These books contain the latest information on RTTY stations around the world.

Radioteletype Press Broadcasts is divided into two lists for easy access. The first list is in chronological order for each half-hour segment of the 24-hour day. Each segment lists the agency that will be on the air at that time. The second list gives detailed time and frequency schedules by press agency. Also included is an alphabetical listing of agencies around the world, with an accurate cross-reference listing by country.

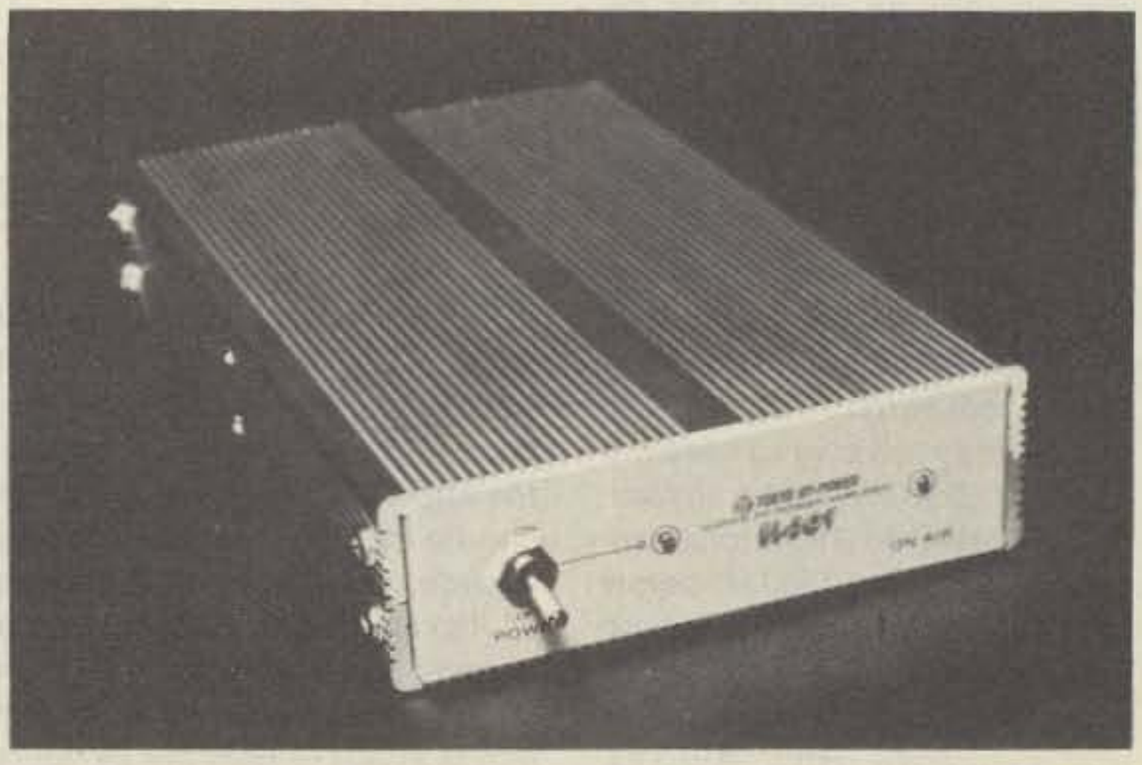
World Utility Frequency and Call Sign Guide gives detailed information on many utility stations around the world. Both books are printed in an 8½- × 11-inch format for quick reference and are guaranteed to contain the latest data available anywhere in the world.

For more information, contact *Universal Electronics, Inc., 1280 Aida Dr., Reynoldsburg OH 43068; (614)-866-4605.*

VHF LINEAR AMPLIFIER FROM ENCOMM

Tokyo Hy-Power Labs, Inc., has announced its new VHF linear amplifier, the 30-Watt HL-30V, for use with portable 2-meter radios.

The HL-30V is a high-quality, easy-to-use, 30-Watt VHF amplifier. It is designed to be driven to maximum output power with only 3 Watts drive from hand-held radios. It will take 1-5 Watts drive, with 1 Watt delivering about 10 Watts output. This neat little amplifier is perfect for turning your hand-held



Encomm's HL-30V VHF linear amplifier.

The Apollo Q-1 satellite receiver/downconverter from National Microtech, Inc.

2-meter transceiver into a powerful mobile rig (or base station with appropriate power supply).

This versatile linear amplifier operates on 13.8 volts dc and draws approximately 4 Amps maximum during transmit. It utilizes carrier-operated switching-(COX) with no delay and has SO-239 connectors. The HL-30V measures approximately 4" W × 6" D × 1" H (100 × 158 × 30 mm) and weighs 520 grams.

Also available from Encomm is the HL-32V. This amplifier is similar to the HL-30V except it has an FM/SSB switch to allow SSB/CW operation and a high/low power switch which cuts output power by one half.

For more information, write *THL Sales Department, Encomm, Inc., 2000 Ave. G, Suite 800, Plano TX 75074; (214)-423-0024.* Reader Service number 482.

SMR WEATHER FACSIMILE RECORDERS

Two weather facsimile recorders recently introduced by SMR, Inc., can take the guesswork out of weather forecasting for the cruising yachtsman.

The SMR SF-505 offers numerous features. The unit provides receiving capabilities on six crystal-controlled channels with a frequency range of 3 to 24 MHz. Designed for vertical or horizontal mounting, the compact weather recorder offers approximately 29 hours of continuous receiving time on one roll of paper. Other features of the SF-505 include a heavy-duty cast aluminum cabinet, automatic and manual phasing, 120-rpm paper speed, vfo spot and fine tuning, built-in signal meter, and contrast control.

The SMR SF-502 is a sophisticated weather recorder that features 12 channels in three different frequency bands. Frequency bands, with four channels in each band, include 3 to 6 MHz, 6 to 12 MHz, and 12 to 24 MHz. Other features include three scanning speeds, multiple voltage capacity, automatic and manual phasing, black and white inversion capacity, crystal-controlled independent synchronizing, vfo spot and vfo fine tuning, built-in receiver, and a cast aluminum housing.

For further information, contact *SMR, Inc., 1401 N.W. 89th Court, Miami FL 33172; (305)-591-9433, FL (800)-432-7142, National (800)-327-6790.* Reader Service number 488.

EX-1000 DESOLDERING HANDPIECE

Automated Production Equipment has announced the Model EX-1000 desoldering handpiece with new improved heater element. The shorter element means shorter solder-travel path, resulting in clog-free operation. The shorter heater also requires less wattage, giving cooler operation for added operator comfort as well as significant energy savings.

For more information, contact *Automated Production Equipment Corp., 142 Peconic Ave., Medford NY 11763; (516)-654-1197.* Reader Service number 484.

SATELLITE RECEIVER/ DOWNCONVERTER

National Microtech, Inc., has announced the addition of the Apollo Q-1 satellite receiver and downconverter to its broad product line. The Apollo Q-1 features push-button transponder selection, automatic polarity control, an audio-in signal-strength meter display, a built-in modulator, and many more features. The Apollo Q-1 is packaged in a wood-grain cabinet with black anodized faceplate. A separate downconverter with integral LNA power block completes the package.

For additional information, contact *National Microtech, Inc., PO Drawer E, Grenada MS 38901.* Reader Service number 483.

UNGAR 9300 SOLDERING IRON USES THERMO-DURIC™ HEATING ELEMENT

A new System 9300 soldering iron introduced by Ungar, Division of Eldon Industries, Inc., uses Ungar's recently developed Thermo-duric heating element, which heats more efficiently and recovers faster than previous models.

The element is nonmagnetic, and the iron conducts static electricity from the tip to a grounded wall plug. Both factors prevent static-electricity damage to microcircuits.

A thinner, cooler handle than those of other models was made possible by the smaller heating element. An operating temperature of 700 or 800 degrees F is determined by the heater, which can be quickly changed. Any of five standard Ungar tips can be used with either heater.

Further information is available from *Ungar, Division of Eldon Industries, Inc., 100 West Manville St., Compton CA 90220; (213)-774-5950.* In Canada: *Eldon Industries of Canada, Inc., 500 Esna Park Dr., Markham, Ontario, L3R 1H5 Canada; (416)-495-9407.* Reader Service number 485.

HAL'S CWR6750 TELEREADER RECEIVE-ONLY RTTY/CW TERMINAL

Hal Communications Corporation has announced the new CWR6750 receive-only RTTY/CW terminal. The CWR6750 is the ideal companion to a shortwave receiver for printing amateur and commercial Morse code and RTTY transmissions. Its small size, the built-in green screen video monitor, and 12-volt operation make the CWR6750 a truly portable unit. The CWR6750 will receive all standard radioteleprinter speeds from 60 words per minute (45 baud) to 300 wpm (300 baud). Both the standard press Baudot RTTY code and the computer ASCII RTTY code may be received. Stations using the continental Morse code may be received at speeds from 4 to 50 wpm. A computer-style ASCII printer may be connected to the CWR6750 to obtain a full printed copy of all received text. The CWR6750 measures only 10¼ inches wide, 6½ inches high and 11 inches deep. It weighs only 9 lbs. and operates from any 11- to 14.5-V-dc source, drawing 1.6 Amperes. The CWR6750 is easily installed in a camper or boat or right in your own home station because it occupies so little space. Connect the CWR6750 to your shortwave receiver and see what you've been missing.

Hal's CWR6750 Telereader receive-only RTTY/CW terminal.

For more information, contact *Hal Communications Corp., Box 365, Urbana IL; (217)-367-7373.* Reader Service number 486.

NAVAJO CALL-LETTER BELT BUCKLE

Lee-Art, Inc., has introduced an inlaid call-letter belt buckle hand-crafted by Navajo Indians. (The *73* logo is also available.) The nickel-silver buckle is highly polished and beautifully inlaid with genuine stones. The call letters may be inlaid with blue torquoise, rust coral, white abalone, mother-of-pearl, or ironwood brown. Each buckle has four lightning bolts carved and inlaid in yellow. The entire buckle is enhanced with carved designs around the call letters, the lightning bolts, and the outside edge of the oval, and carved feathers add a further touch. The buckles come in two sizes, medium (2.6" × 3.6" oval) and large (3" × 4" oval).

For further information, contact *Lee-Art, Inc., 112 N. Main Street, Shamrock TX 79079.*

Lee-Art's call-letter belt buckle.

REVIEW

FLICK OF THE SWITCH— KENWOOD'S TS-430S

Over the past several years, various solid-state HF rigs have been introduced to the ham marketplace. Some were small, some were large, and some recent units offered digital frequency readout, i-f shift, notch filtering, and even a memory frequency. Some of the rigs are only memories themselves.

This weekend I had the enjoyable use of Kenwood's most recent entry, the TS-430S. This small box is the most fascinating ham radio I have ever seen, and I have seen and worked on about all there is on the market. In addition to being a very state-of-the-art ham rig, the TS-430S is also a great SWL receiver.

The TS-430S is all solid-state with digital frequency readout, dual vfo's, and 8 continuously programmable frequencies, and that is just for starters.

Construction

State of the art requires careful planning and engineering in the design of a reliable and easy-to-operate piece of equipment. The TS-430S is an excellent example of state of the art.

Kenwood has maintained their usual grey colors on the new unit, and has, fortunately for my tired eyes, retained the blue fluorescent digital frequency readout. The front panel of the TS-430S is loaded with controls, 38 of them to be exact. But don't let all that scare you. This is a "no-tune" rig. Basically, you select the frequency and mode, set the volume and mike levels, and you are ready to go on the air. The other controls are used in selecting accessories such as the noise blanker, i-f shift, attenuator, etc. Also on the front panel is a small keyboard. This is the heart of the memory and program system. From here you can preselect frequencies and modes of operation to be later utilized at the flick of a switch.

Inside, the rig has a very clean layout with separate boards for each major functional block, with plug-in wiring harnesses used between them. Space has been left for user installation of optional filters and the FM unit (FM-430). The rig appears to be a technician's dream. There is even a provision for 10-Hz readout, requiring the clipping of a wire, and WARC band usage by clipping another wire. These operations are well documented in the well-written owner's manual.

On the rear panel is a very large heat sink to cool the finals, and a fan has been installed to aid in this cooling. Unlike other solid-state rigs with fans that run during all transmissions, this fan only operates when the temperature of the heat sink exceeds 122 °F (50 °C), and then it is ultra quiet.

Operation

The operation of the TS-430S proved to be more than expected from such a small package. Most of my normal hamming is on 40 and 75 meters, so naturally I started there with the new rig. Initially, I programmed the frequencies of nets I operate on into the rig, and then with a flick of the switch I was able to move from one frequency to the next. It is interesting to note that when programming a frequency into the unit, the mode (USB, LSB, AM) is also programmed. This is nice when moving from a 20-meter net to a 40-meter net. All you have to do is flick the switch. Early in the day, on 75 meters, I set the unit to scan the memory frequencies. This allowed me to monitor activity on each of several nets. I then set the squelch (yes, I said squelch) above the noise threshold and enjoyed quiet until a net became active. I note here that each programmed frequency is scanned; however, when a busy frequency is encountered, the unit will continue to scan unless you transmit, after which it will continue to scan.

Everyone I talked with remarked about the high quality of the audio signal. All said it was great, and more than one said it "must be a Kenwood." No station was apprised of what rig I was running until after signal reports had been exchanged. One glitch I found was that when using the speech processor, you must be very careful not to over-drive the unit, as distortion will result. This would no doubt vary depending upon the mike each individual uses. The only other glitch will be covered shortly.

Speaking of the speech processor, it worked quite well on DX. I found it particularly useful on 10 meters when the band was going out. Its use was the difference between QSO and no QSO.

On 40 meters SSB at night, the home of all those international broadcasting stations, I was able to enjoy easy communications; just a twist of the notch filter was needed. Herein lies the other glitch. The notch filter, while very effective, is very sensitive in adjustment. I found that I was able to silence a 20-dB heterodyne and work an S9 signal. Notice I said silence, not reduce. . . silence!

I made several DX contacts on 40 meters using split frequencies. Very easy to accomplish when you have two vfo's. I also found CW operation to be quite good, and this rig had no optional filtering installed. I utilized the i-f shift and notch filter. I have not mentioned the VOX or attenuator since they are commonplace on most rigs and work well on the TS-430S.

I had a guest over one evening, and since he is an avid SWLer, I turned the controls over to him. First he programmed in the frequencies of his favorite stations, and then we memory-hopped all over the world at the flick of a switch. The sensitivity and selectivity were judged to be just short of fantastic. Surprisingly, there are no apparent shortcomings or compromises made in this versatile little rig. It is equally suitable for SWL or ham. We did, however, agree that the 6-kHz optional filter would be an asset for SWL.

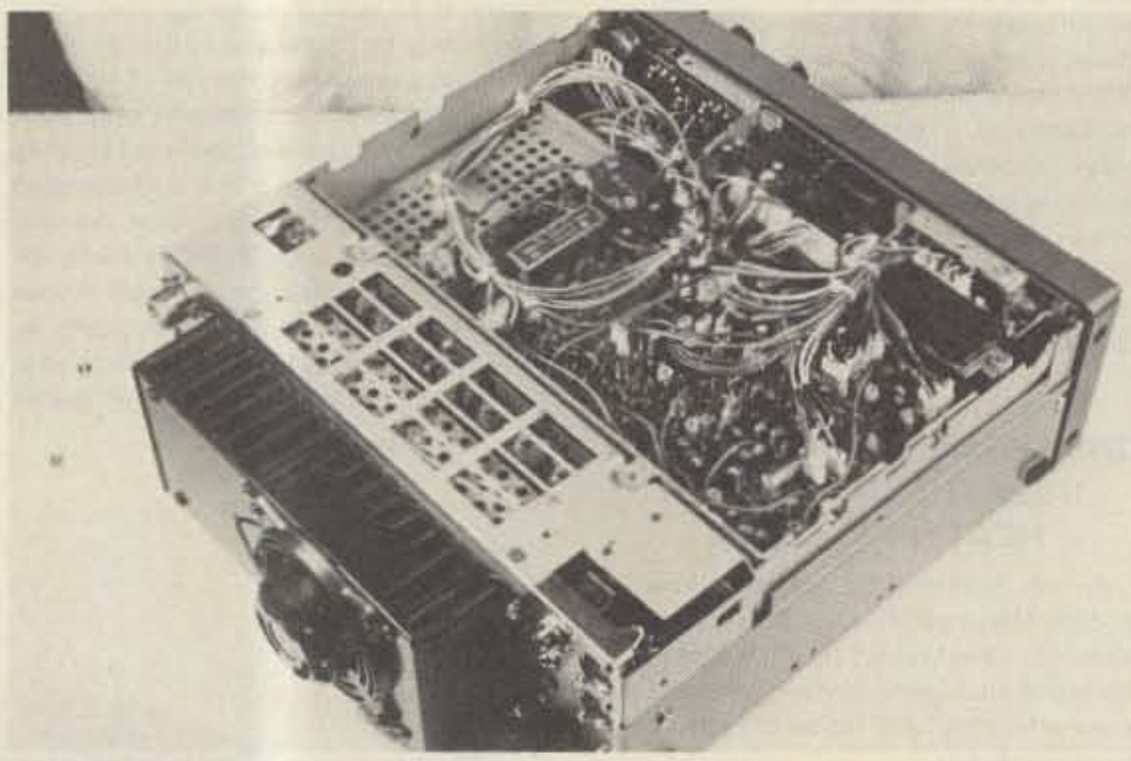
I am now able to listen to Radio Australia while I have breakfast, and the now famous

Transmitter coverage	160 to 10 meters
Receiver coverage	150 kHz to 30 MHz
Modes	SSB, AM, CW, FM
Size	10.6" × 3.8" × 10.8"
Weight	14.3 lbs.
Transmitter power	250 Watts PEP 200 Watts CW 60 Watts AM
Receiver sensitivity	SSB— .25 microvolts (160-10 meters) AM— 2.5 microvolts (160-10 meters) SSB—2.4 hKz at – 6 dB AM— 4.4 kHz at – 60 dB
Receiver i-f rejection	More than 70 dB (ham bands)
Receiver image ratio	More than 70 dB (ham bands)
Power requirements	13.8 V dc 1.2 Amps on rx, 20 Amps on tx

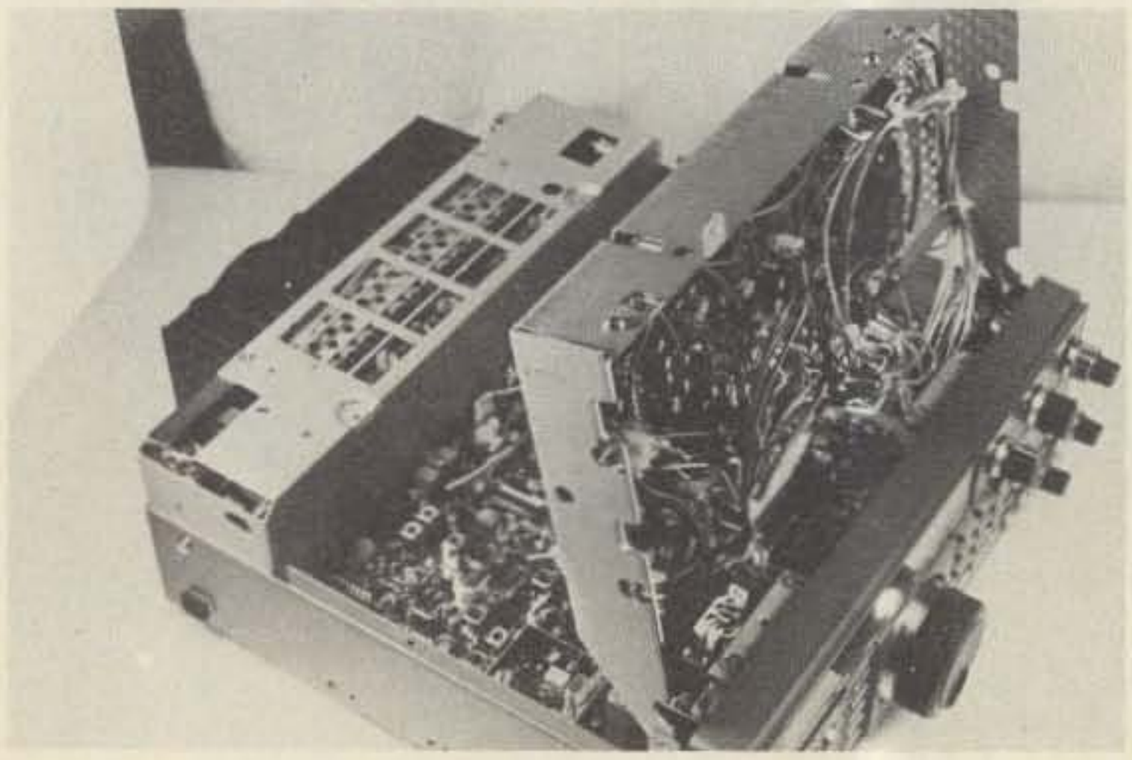
Table 2. TS-430S specs.

Antenna used	**160 meters**	**Marconi**
	10, 15, 20 meters	**Ground plane at 35'**
	40, 75 meters	**Inverted vee at 40'**
	SWL	**Marconi**
Power for operation	**12-volt storage battery**	
Mike	**Kenwood MC-50**	

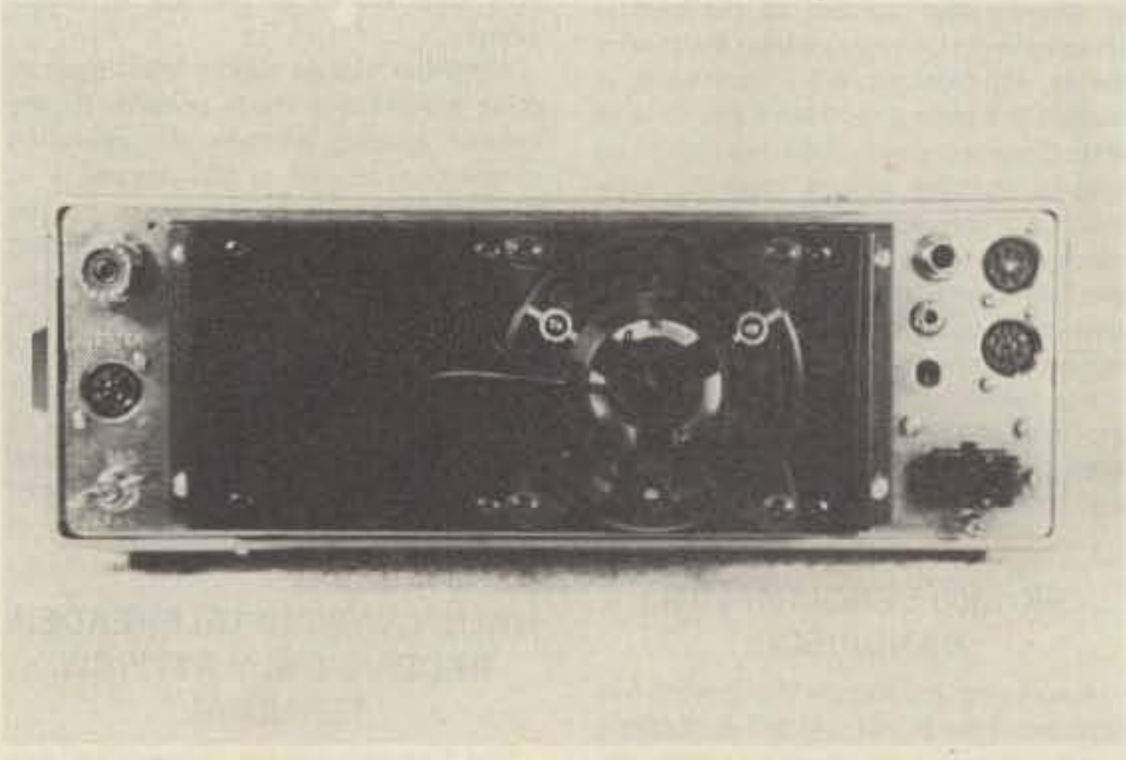
Table 1. TS-430S testing conditions.



B. Note the size of the heat sink and see all those plug-ins used for interconnects. Space for the FM unit can be seen on the left.

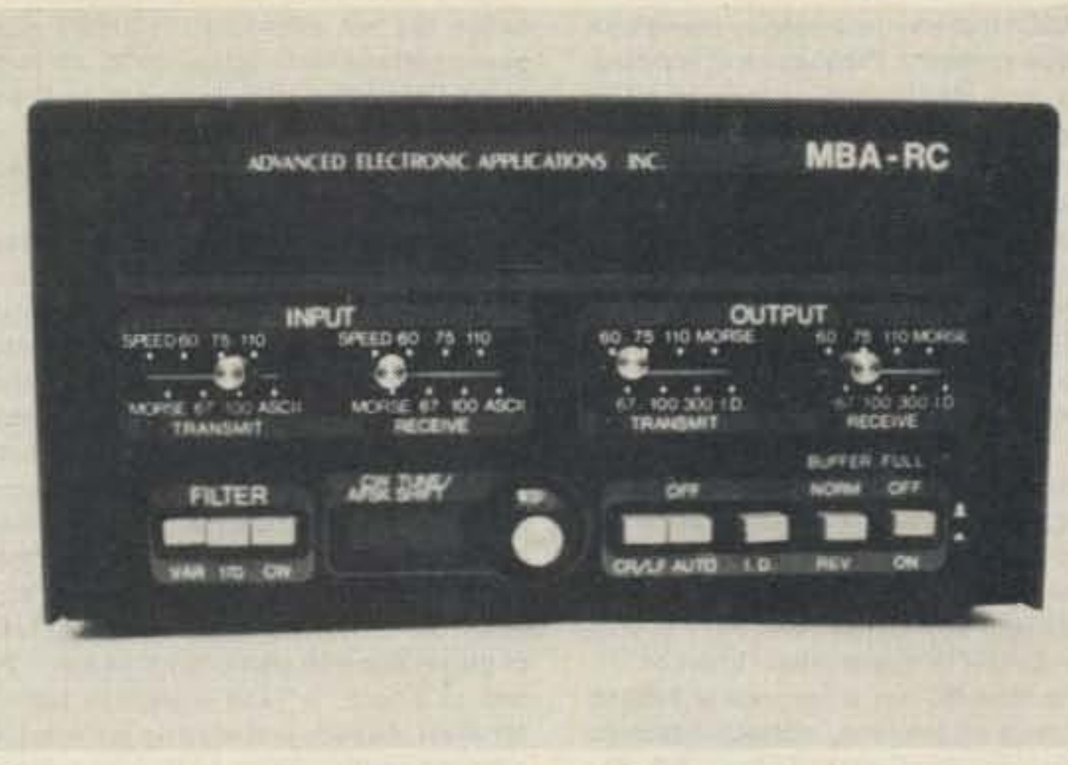


A. This rig is a technician's dream—look how it opens out.



C. The fan and sockets for future expansion (transverter, remote, and accessories).

D. The TS-430S—38 controls, count 'em!



AEA's MBA-RC.

flick of a switch switches me to my morning net on 75 meters.

Recap

All in all, I feel that Kenwood has made the TS-430S a real winner. I am able to replace a whole deskful of equipment with this one small rig. Out goes the shortwave receiver, the tube HF rig with its external vfo and digital readout. I did not attempt mobile operation; however, I can see no reason for this unit not being tops in mobile HF operation. It can work 10-meter FM with the installation of the FM-430. Besides, if you get tired of hamming, you could always program your favorite AM band stations into memory and at the flick of a switch listen to music or news (arghhh).

Now I think I'll make a flick of the switch and get back on 75 meters.

For more information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

Bill Clarke WA4BLC
Fall Church VA

AEA MORSE/BAUDOT/ASCII READER/CODE CONVERTER

Can a ham find happiness with a modest dipole antenna and a CW-only rig? Sure he can; just throw in a high-tech accessory like Advanced Electronic Applications' Morse/Baudot/ASCII reader/code converter, the MBA-RC. AEA is no newcomer to the code reader business. For two years they've been getting plenty of raves about their MBA-RO, a read-only converter that was reviewed in the January, 1982, issue of *73*.

Don't let the MBA-RC's lunch-box size fool you. A natural for portable or even mobile operation, it will also hold its own in your home shack. Hookup couldn't be simpler: You'll need a 12-volt power supply (two Amperes or better) and cables to your rig's audio output for receive and to the microphone and key jacks for transmitting. AEA even includes a small kit of connectors to make your life easy. Gone are the days when RTTY operation required a roomful of clanking Teletype™ machines and a special terminal unit.

The MBA-RC consists of two converter circuits, one for transmitting, the other for receiving. The receiving converter accepts an audio input (Morse, Baudot, or ASCII) and outputs your choice of Baudot (serial only) or ASCII (serial or parallel). The transmit converter accepts Morse, Baudot (serial), or ASCII (parallel or serial) inputs and outputs your choice of Morse, Baudot, or serial ASCII either in a two-tone audio signal or transistor-level switching. The ASCII signals can be 110 baud, Baudot speeds are 60, 67, 75, and 100 wpm, and Morse may be 3 to 80 + wpm. Working in parallel with the receive converter output is a 32-character fluorescent display. Differences between input and output speeds are accommodated by a 1000-character buffer. Still confused? Perhaps the block diagram in Fig. 1 will help straighten things out.

All of this power is made possible by using two microprocessors and 43 other ICs. Three circuit boards hold all the parts: one for analog functions, a second for digital chips, and a third for the display and front-panel controls. Even with this modular approach, point-to-point wiring is kept to a minimum to ensure maximum reliability. Good design is backed up by careful construction and a 48-hour burn-in for all units. After the sale, service starts with, but is not limited to, a 90-day warranty.

Despite an impressive array of controls (13 on the front, six on the back), the MBA-RC is easy to operate. Ten minutes after unpacking the box, I was tuning across 40 meters. First I explored the Novice subband where an abundant source of sloppy fists let me check out the unit's ability to copy CW. Just as I expected, the computer reader worked well with only about two-thirds of the signals, failing on the others either because of QRM or poor character formation on the sending end.

Tuning down to 7.080 MHz, I found W1AW spitting out code practice at a brisk 30 wpm, too fast for me to copy without the aid of the reader. A change in speed didn't faze the MBA-RC a bit, with the display's rightmost two characters quickly updated with the new rate. When a jammer showed up frequency, I just tweaked the converter's passband control and missed hardly a letter, confirming my suspicion that the MBA-RC's two-stage active filter (300 Hz to 2 kHz) helped make up for the HW-16's lack of the bells and whistles found on most newer rigs.

I really put the MBA-RC's processing circuitry to the test on 80 meters where I found a few RTTY signals immersed in noise. It took a steady hand and the aid of the converter's LED mark-space indicators to copy anything meaningful. Later, when the QRN subsided, I even found a couple of stations using 850-Hz shifts and got a chance to try the variable shift filtering. Also available but little used is a Normal/Reverse switch for signals that are "upside down."

CW reception using the converter was as good as any I had seen with dedicated readers and better than what you might get with an interface/computer combination. This came as no surprise; the MBA-RC uses the same kind of decoding algorithm found in the MBA-RO. RTTY reception was successful when signal levels were strong, equaling the performance you would expect from a low- to mid-priced terminal unit.

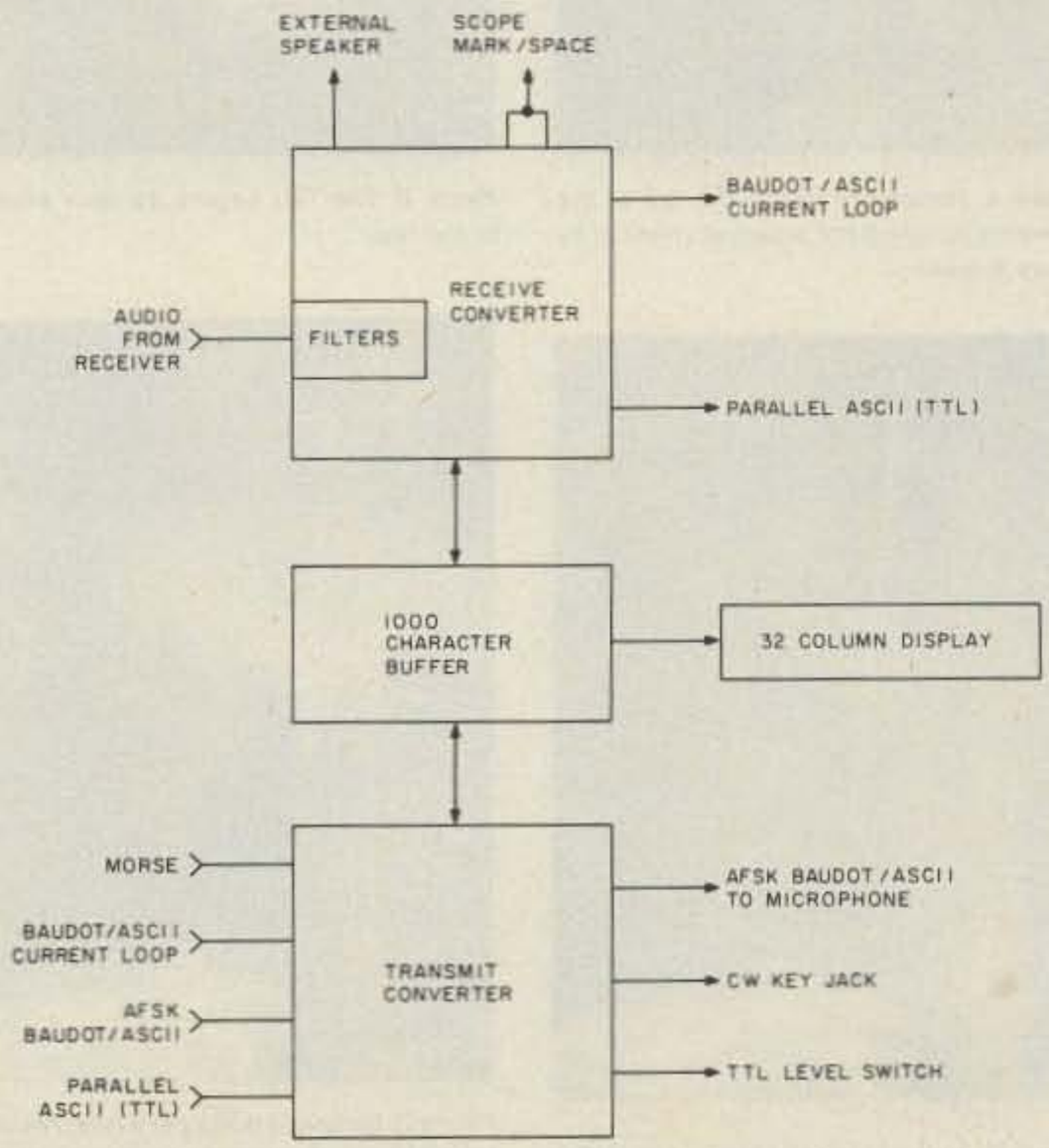


Fig. 1.

Although the 32-character display was long enough to display whole words and some sentences, it still took practice to keep up with its scrolling. Rather than rely on my head for storing information, I learned to use a pencil and paper, jotting down notes as the words marched by. At first I thought the converter was lapsing into gibberish, but later I discovered that the strange symbols I was seeing were just special teletype characters like BELL and CR (carriage return). And although I didn't encounter any, the MBA-RC is programmed to handle several foreign language characters in addition to the usual uppercase alphabet and numerals.

CW and RTTY reception turned out to be the easy part of the review. Limited to a CW-only rig, I couldn't take the quick and dirty way out and use the microphone jack for audio shift keying. My attempts at modifying the HW-16's vfo for frequency shift keying were only partially successful. The instability of the shift was enough to wreak havoc on the receiving end, but not so bad that I couldn't verify the converter's performance.

Using a straight key as an input and RTTY as the ouput, I started by just sending tones to a tape recorder and then playing them back to see how well I did. Luckily, the same forgiving CW-reading algorithim used on receive must be used for transmit, and I managed to prove that if you have a good enough fist, the fellow on the other end won't even know that you're generating RTTY without a keyboard. Of course, there is no provision for sending a carriage return or line feed with Morse code, so you have to rely on the converter to insert this automatically after each line. A nice bonus is the ID buffer. It allows you to store up to 40 characters which can then be used in any output mode. For example, you could load in your callsign and then identify in RTTY, switch to CW out, and identify again in Morse code. The ID capability is used in a similar fashion to set the transmit speed for CW output.

The strange feeling that accompanies sending RTTY via CW is topped only by the use of the MBA-RC as a speed converter for CW operation. You can rip along at 25 or 30 words per minute, storing the excess characters in the buffer, and at the same time hear what was being sent several seconds ago transmitted at ten or even five words per minute.

Moving from the unusual to the ridiculous, consider this possibility: You're receiving CW and printing it out on an ASCII printer driven by the MBA-RC's RS232 port. And on the other end, the station is receiv-

ing ASCII that you generated by typing on a teletype keyboard. The number of combinations and cross-combinations is mind-boggling. A natural for automated operating schemes, the MBA-RC could also find some interesting applications in other fields.

A bit closer to home, "Joe Ham" will find the MBA-RC to be a hassle-free way to get on RTTY. Drawbacks include the 32-character display—it's no match for the full-sized screen that accompanies a computer system. Nor is the MBA-RC's analog signal processing going to give the same performance that you would expect from an expensive dedicated terminal unit. Still, as a stand-alone unit, the MBA-RC offers more flexibility than any dedicated RTTY or computer CW/RTTY system that I know of.

The MBA-RC has a list price of $469.95. For more information, contact *Advanced Electronic Applications, Inc., PO Box C2160, Lynnwood WA 98036.* Reader Service number 476.

Timothy Daniel N8RK
Oxford OH

HY-GAIN'S TH7DX TRIBANDER

I had always wanted to have monobanders on 10, 15, and 20 meters, not only for the gain of the antennas, but also for the broadbandedness of them. When I saw the specs on the Hy-Gain TH7DX, I knew that I could get close to "the real thing" without having a monster Christmas tree array.

The TH7DX has seven elements in total. Two of these are fully-trapped driven elements. This is how the broadband effect is accomplished. The boom length is 24 feet, the longest element is 31 feet, and the turning radius is 20 feet. The TH7 will take up to a 2½-inch mast and weighs 75 lbs. The maximum wind survival is 100 mph, and the antenna turns just fine with my old Ham III rotor.

Electrically, the antenna claims 22 dB (±5) front-to-back ratio on 20 and 15 meters and 18 dB front-to-back on 10 meters. The maximum forward gain claimed on 20 meters is 8.0 dBi; on 15 meters, 8.7 dBi; and on 10 meters, 9.6 dBi. These gain claims appear to be fairly accurate according to just-calibrated S-meter readings and numerous on-the-air reports. The antenna is dc-grounded for lightning protection and can handle the maximum legal power limit.

Construction

The TH7DX is different than its predecessor, the TH6, not only in that it has one more element, but also in that Hy-Gain has included stainless steel hardware and lots of it! 724 nuts, bolts, screws, washers, tubing assemblies, and other assorted pieces of hardware have to be assembled into this monster antenna. The instruction manual is 22 pages long and includes all the information necessary to easily build the TH7DX, even if you are not technically inclined. The manual is very complete. It includes everything from troubleshooting charts to an extra copy of the pictorial page so that you don't have to constantly flip pages when referring to part numbers during construction. My only gripe is that the manual states that you "should allow at least 7 hours for assembly." This statement is not very accurate, at least for the antenna that I assembled.

Jeff DeTray WB8BTH and I had a perfect weekend to assemble the antenna. The temperature was about 65 degrees for the entire 3 days that it took us (and a few others) to assemble and raise the antenna. Hy-Gain suggests that a large clear area be chosen to assemble the TH7. The area has to be at least 24' × 31' and should preferably be a concrete driveway. My location did not afford us the luxury of a paved surface. With this in mind, we paid careful attention to how we handled the hardware. I did not relish the thought of searching the lawn for a lost bolt after all the hardware stores had closed.

The assembly started on a Saturday morning; we put in 8 hours of actual construction time that day. On the following day, we spent another 9 hours on the job, working well into the night "under the lights." Finally, after 17 total hours, the antenna was assembled. Hy-Gain had thought of everything...including ropes to install inside the elements to eliminate premature metal fatigue from wind vibrations. On Monday, the tough part came.

My tower at home consists of 100 feet of guyed Rohn-25 sections topped with 20 feet of 2"-o.d. ¼"-wall aluminum tubing for mast. Already installed on the mast is a 2-meter vertical beam on top. Six feet below that is a horizontal 2-meter yagi. The spot I had chosen for the TH7 was well below those antennas at the bottom of the mast, just above the rotor and thrust bearing. It looked very simple from the ground.

All we had to do was hoist the antenna up with the boom horizontal, and use some ropes and the guy wires as guides. After about 2 hours of preparation and horsing it around, we got the antenna close to the top. The elements ran into and got entangled with the lower 2-meter antenna. We had to lower it back down to the ground again and use a different attack. This time around, we hauled it up with the boom perpendicular to the ground. When the boom and first elements got to the top of the tower, where Chris Brown KA1D had been patient during numerous strategy sessions, we manhandled it into place. It may sound simple in prose, but it really was a Herculean task! If it were not for Chris and all the ground crew (WB8BTH, WA2VSN, W1NHJ, and WA1YZN), we would have wound up with an aluminum scrap pile instead of the fine antenna that the TH7 really is.

The TH7 has performed excellently! It is a real pleasure to take full advantage of the bands instead of having to operate only in the portions where your antenna resonates. This is especially important in these days of swr-sensitive transistor finals. The swr curve is just as Hy-Gain states...under 2-to-1 for all bands. I would wholeheartedly recommend it to anyone who is looking for a no-compromise tribander.

For further information, contact *Telex/Hy-Gain, 9600 Aldrich Ave. So., Minneapolis MN 55420.*

Bob Cunningham K1XR
73 Staff

Photo A. Ropes are run to the top of the tower for hoisting the antenna. (Photos by Cindy Brown)

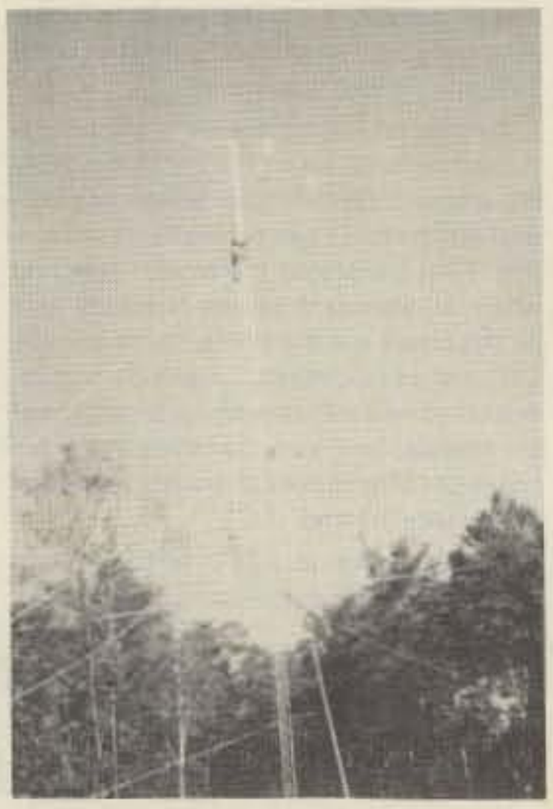


Photo B. The TH7 begins its slow ascent to the top.

Photo C. At the top of the tower, the TH7 is manhandled into place.

Photo D. Nuts and bolts get a final twist as the TH7 is locked securely into place just above the rotor and thrust bearing.

SEYCHELLES SAGA
V. C. Harvey-Brain ZL1BSO

V. C. Harvey-Brain was the first radio amateur to be licensed in the Seychelle Islands (as VQ9HB) and the *Seychelles Saga* is Harvey's story of how he got to the Seychelles in the first place. It is a cracking good adventure story, and really a saga, as it represents one man's search for his own personal paradise and the achievement of that dream through years of trial and tribulation.

Harvey (as he prefers to be called) began his adventure as the owner of a 36-foot English fishing smack called a Brightlingsea. He was living and working in pre-war England and had decided to chuck it all for a life of seafaring adventure aboard his small boat. So, in the summer of 1939, Harvey and his crew member set sail across the English Channel in the *Brian Boru*, bound for France and its extensive inland waterway to the Mediterranean Sea.

They had very little money, a cat, and enough provisions for a couple of weeks aboard the *Brian Boru*. There was minimal navigation equipment, a few spare parts, and some materials for any necessary minor repairs to sails or engine.

The engine was a gasoline-powered unit from a small pre-war Morris automobile, and its major virtue was reliability...it never failed them. By a combination of sailing and motoring, their voyage carried them through France and into the Mediterranean where his first crew, discouraged and helpless, left him. The fight with storms, damage to the boat, the interruption by World War II, adventures in Crete, Malta, and the Red Sea, and even shipwreck are woven into this fascinating story.

V. C. Harvey-Brain must be classed as untiring and unbeatable. Yes, he did achieve his dream; he made it to Mahe, Seychelle Islands, in 1946, where he lived for many years. He accompanied Gus Browning W4BPD to the Andaman Islands. He also has visited and enjoyed DX from Aldabra and other remote spots in the Indian Ocean, which he sailed for years before finally settling down to life in New Zealand and Australia. As ZL1BSO, he alternates his residence between them... alive and well, in his seventies.

Seychelles Saga is not a ham radio story *per se*, but it is an incredible tale nevertheless and bears reading for fun and education...and perhaps a bit of inspiration as well. With luck, we shall see more of Harvey as he has many more tales to spin for us, and we are hoping that he will tell us something about his hamming and DXpeditions in the pages of *73*.

Special price to hams for *Seychelles Saga* is $8 postage paid, via sea mail, or $12 air mail. Write to *V. C. Harvey-Brain ZL1BSO, 7 Hamilton Road, Surfdale, Waiheke Island, Hauraki Gulf, New Zealand.* Reader Service number 477.

Jim Gray W1XU
73 Staff

PATHFINDER II SATELLITE TRACKING PROGRAM

When UPS delivered Pathfinder II, it was like an unexpected reunion with an old friend. Pathfinder was and still is a microcomputer software package developed to assist in the location of amateur radio communications satellites. Of course, things had changed since our first meeting in 1981. The name was different, Pathfinder II instead of plain Pathfinder, and the program had been transformed into a slick commercial software package. But I was glad to see that my old friend still retained its fundamental appeal, the eye-catching graphics that earned it the label "satellite superstar" and the cover of the March, 1982, issue of *73*. Pathfinder II runs on an Apple II computer with at least 48K of memory, Applesoft Basic, and one disk drive. Optional but strongly recommended is an Epson "Graphtrax" printer.

First, a caveat: Pathfinder II is designed

to work to track any satellite with a circular orbit. That means it will work with amateur spacecraft like OSCAR 8 and the Soviet "radiosports" as well as non-amateur orbiters, including the NOAA 6 and 7 weather satellites. Pathfinder II, however, is not suitable for tracking satellites with elliptical orbits like the one planned for the Phase III amateur communications satellite.

Why pay Computer Applications for Pathfinder II when you can get it for free by using the listing in *73*? Well, for $34.95 you avoid the aggravation of lots of typing and you get about twice as much software as is presented in the published listing. Another incentive to buy is the package's "polish," including a comprehensive user's manual. With the exception of the high-resolution images and printing routine, all of the Pathfinder programs are written in Applesoft Basic. While this makes the program seem slow at times, it also makes it easy to customize. And since Pathfinder II is not copy protected, you can fiddle with a backup disk, leaving the original safe and secure.

Pathfinder II includes a program (also called Pathfinder II) that resembles the magazine version. After entering your longitude and latitude and choosing a satellite (data is pre-programmed for OSCAR 8, RS3-8, and NOAA 6 and 7), this module calculates the horizon, precision, and number of orbits in a 24-hour day. Then the orbit numbers and the equatorial crossings are calculated for a selected date. Next you choose the orbit you want to track and enter the number of intervals at which data is to be calculated (known as subsatellite points). You can choose as many as 120 points per orbit, or more than one per minute for orbits like those associated with OSCAR 8. For each subsatellite point, Pathfinder II computes the satellite's location (longitude and latitude), distance from your location, and the bearing (azimuth heading). If the satellite is visible at that point, the elevation angle is calculated, too.

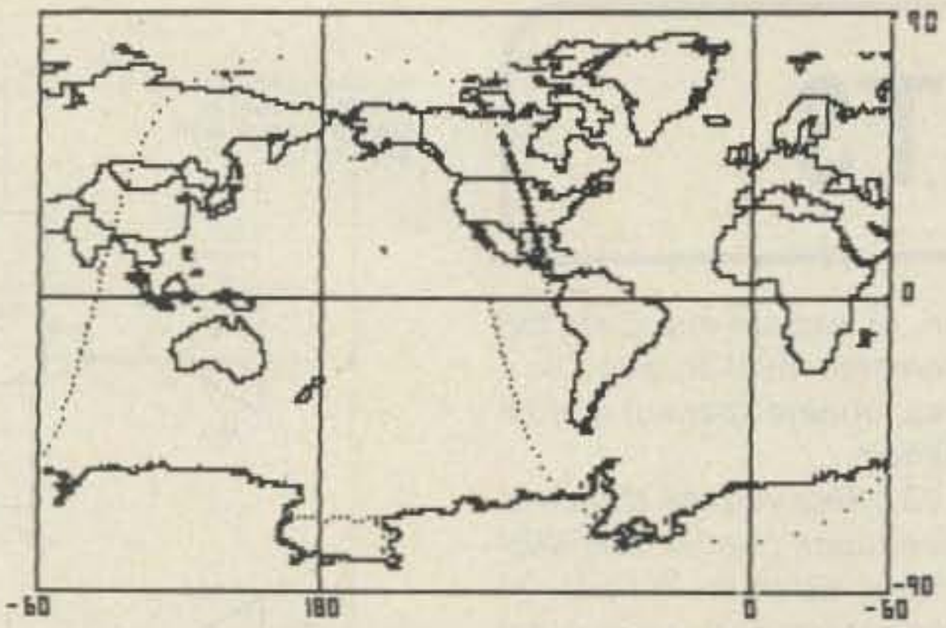


Fig. 1. Pathfinder II provides two real time tracking options. One resembles the illustrations in the March, 1982, 73 and is a map of North America with the states outlined. The second map is a Mercator projection of the world. The orbit shown crosses the equator east of Ecuador before passing through the central United States. Not shown here are several lines of text that accompany the map.

So far Pathfinder II has done what other tracking programs do: generate a bunch of numbers. But the way in which Pathfinder displays this data is unique. Oh, if you're a purist you can get the usual tabular printout, but wouldn't it be nice to see what the satellite is doing? Real Time Track allows you to do just that. Using the Apple's high-resolution graphics, Pathfinder II draws a map and then superimposes the satellite's path. Real time tracking is made possible through a software clock, with screen updates occurring at each subsatellite point.

Two kinds of real time tracking are available. One uses a map of North America, and just as shown on the March, 1982, *73* cover, the states are outlined. The second option, a Mercator projection world map, is new. The global image makes the program useful to DX stations and allows state hams a glimpse of what the satellite is doing when it is out of range.

Both real time tracking maps work pretty much like the magazine version. The main difference seems to be the absence of range circles in the commercial program. My enthusiasm for Pathfinder's real time tracking is tempered by the opinion that during an actual satellite pass, an operator can't afford to spend time looking at a computer screen; however, there is still plenty of incentive to use the program before an operating session, acquainting yourself with the upcoming orbits. Finally, Pathfinder II's graphics are a great teaching tool and I enjoyed playing—plugging in different combinations of orbital parameters and then observing the results.

Hard copy of the map images is available if you have an Epson printer with the Graphtrax option. My printer didn't qualify, but I did manage to get a "screen dump" by using a Grappler interface board and NEC 8023 printer. The result, shown in Fig. 1, is missing several lines of text but is otherwise identical to the screen display.

The package's second module, called "Pathfinder Predict," provides orbital data that can serve as the base for Pathfinder II calculations and provide quick feedback about those orbits that will be most useful. Data can be calculated for all future orbits, all accessible orbits, or just each day's first orbit. Using an "exclusive" algorithm, the program generates the acquisition of signal time, loss of signal time, total time in range, maximum elevation, range at the closest approach, and the time when the closest approach occurs.

Pathfinder Predict offers seven different kinds of printouts, making a printer almost mandatory. Using Pathfinder Predict you'll be able to generate tables of data similar to those presented in *73*'s "Satellites" column. And you can go one step further by printing out detailed data for just those orbits that will be in range. Serious satellite users may even find Pathfinder Predict to be more helpful than the graphics-oriented Pathfinder II module.

My only complaints could almost be labeled nitpicking. Error-handling leaves room for improvement, there should be a default entry for your location, and the manual has occasional misspellings. But, as with any old friend, I tended to overlook the minor defects and so I was not disappointed by my surprise reunion. Written by hams for hams, Pathfinder II does all that Computer Applications says it will do, does it well, and does it for a reasonable price. Pathfinder II sells for $39.95 and is available from *Computer Applications, 3628 A Court, Oxnard CA 93033.* Reader Service number 478.

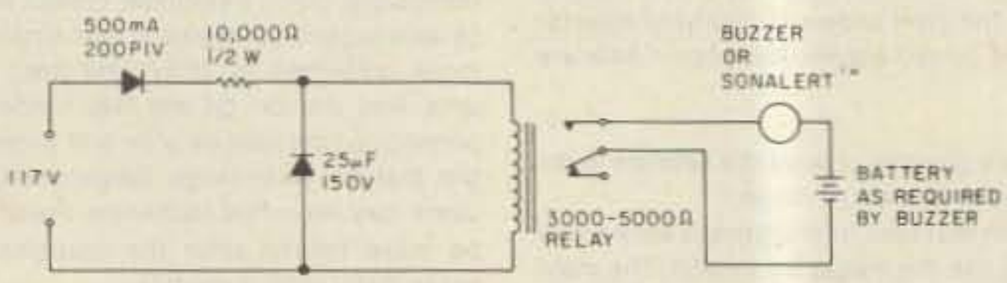
Timothy Daniel N8RK
Oxford OH

⌐See List of Advertisers on page 114

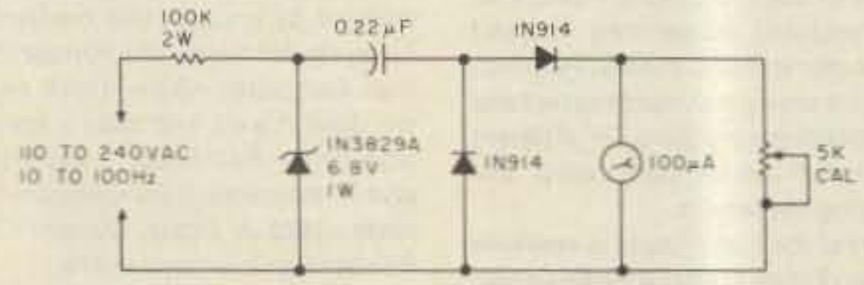
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

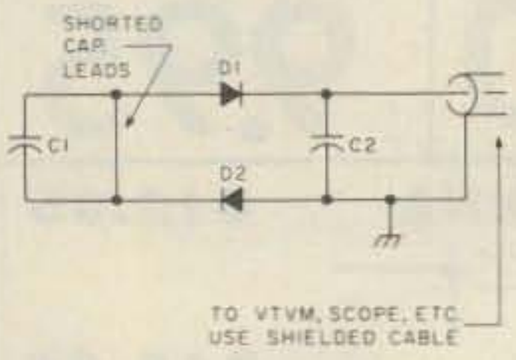
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



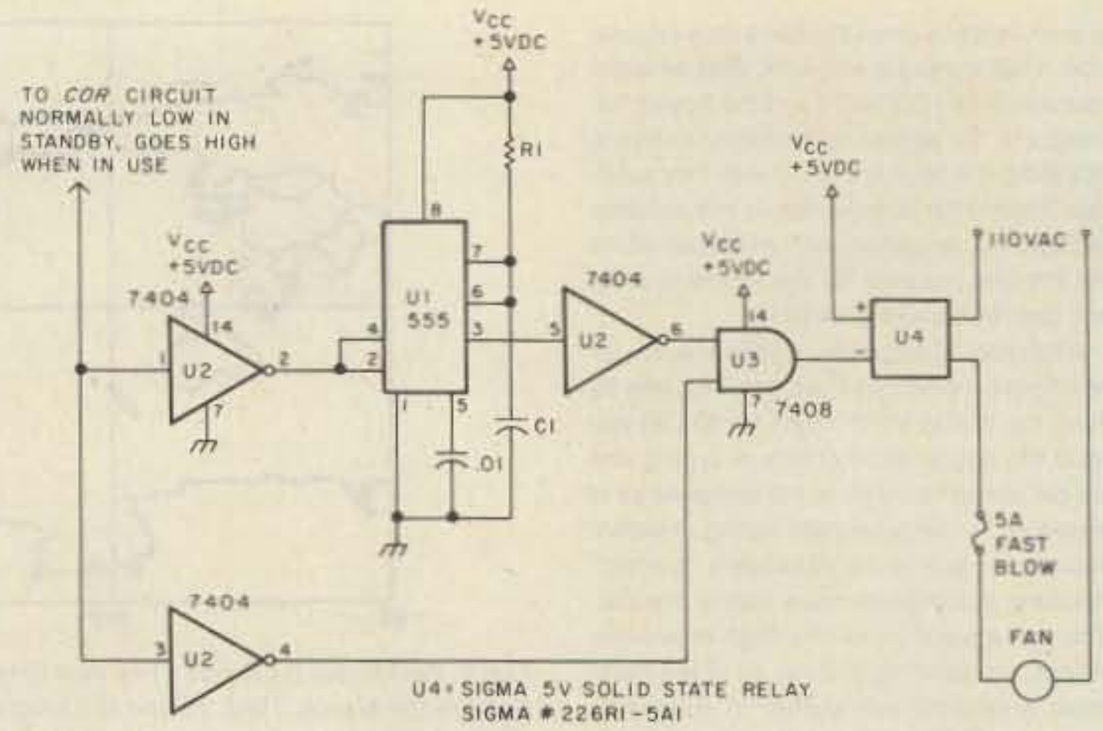
POWER-FAILURE ALARM: Don't get caught in the dark wondering what time it is. While power is on, the relay is held open, but when the power fails the buzzer-circuit contacts close. The relay can be a radio-control type with a pull-in of 3-5 mA.—Ed Schilling K5RSO, Fairfax VA.



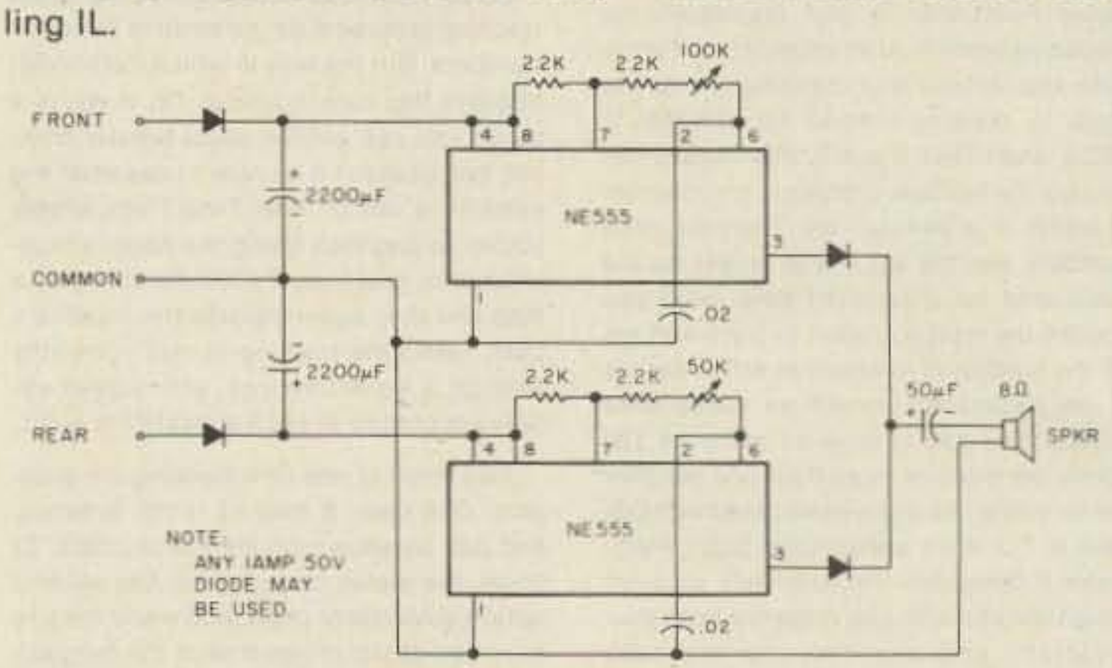
HANDY POWER-LINE FREQUENCY METER: A great piece of gear for Field Day, this meter will indicate the frequency from a power generator. Incoming sine waves are converted to square waves by the 100k resistor and the 6.8-V zener. The square wave is differentiated by the capacitor and the current is averaged by the diodes. The average current is almost exactly proportional to the frequency and can be read directly on a 100-mA meter. To calibrate, hook the circuit up to a 60-Hz power line and adjust the 5k pot to read 60 mA.—Joe Tracy K1LSP, Brookfield CT.



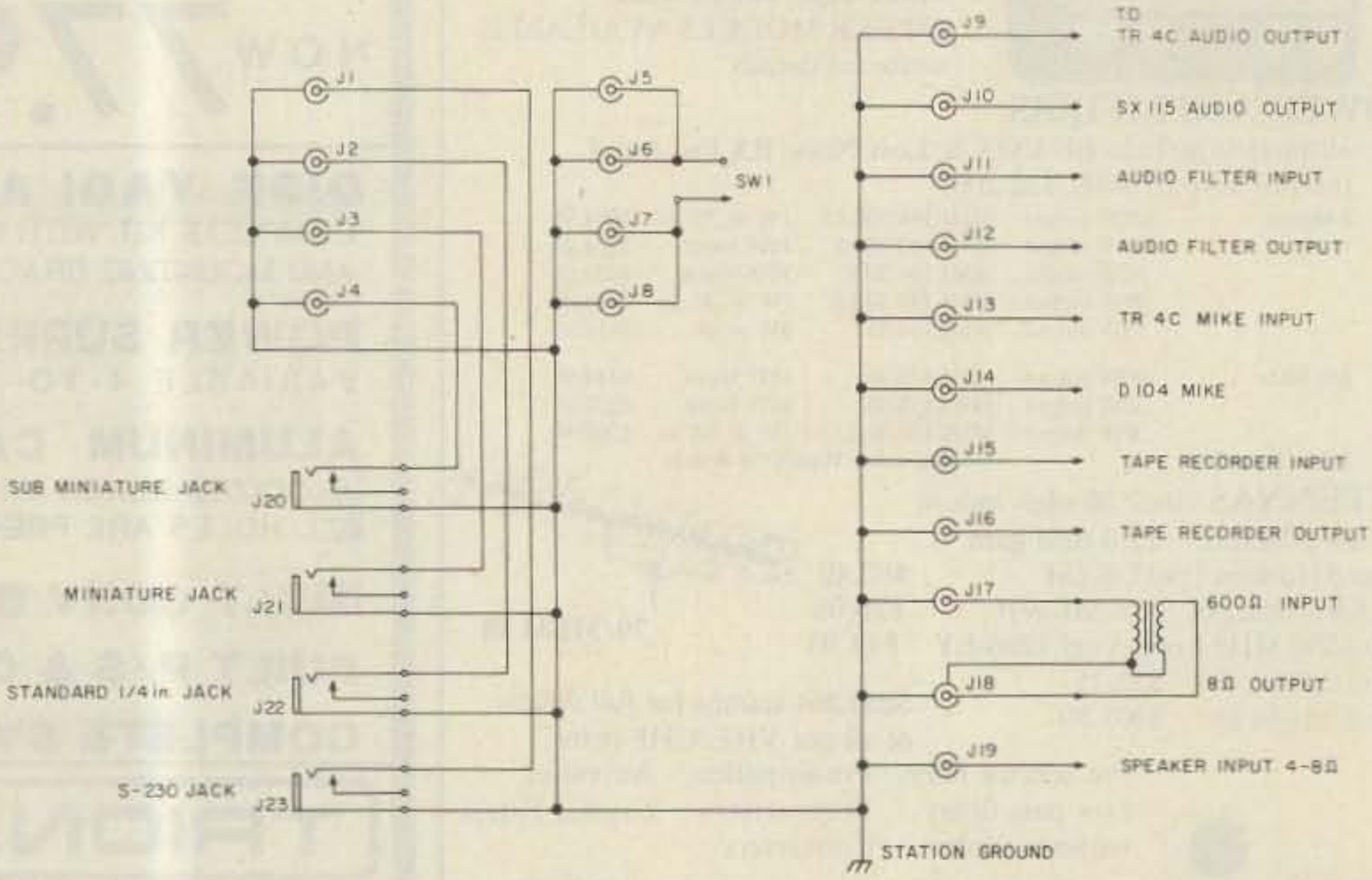
LOW-LEVEL RF SNIFFER: This simple detector will provide indication of very low levels of rf, such as those on the outside of coax or inside enclosures. C1 is a disc capacitor of any value, C2 is from .001 to .005 uF, and D1 and D2 are 1N60 diodes or their equivalent. House the circuit in a plastic enclosure with only a portion of C1 protruding. The sensitivity of the probe is a function of the indicating device being used. For example, a high-impedance meter will show several volts in the presence of a low-level field.—Edwin Lawrence W8IGN, Seminole FL.



TIME-DELAY CIRCUIT FOR A REPEATER COOLING FAN: Keep your finals cool with this circuit which will start the fan when the system is in operation and leave it on for a short time after use. The values of R1 and C1 determine the time delay.—Richard Little K9EEH, Sterling IL.



ELECTRONIC DOOR BELL: Frequently the ding-dong of a door bell is unheard because you are in a remote part of the house. This electronic alert is much louder and requires no change in the original transformer or the push-button wiring. Most door-bell transformers are 16-24 V ac and when rectified and filtered, they provide sufficient dc to operate the NE555 oscillators at an adequate speaker volume. The two oscillators may be adjusted to distinguish between the front and back doors.—W. W. Davey W7CJB, Missoula MT.



SIMPLE PATCH PANEL: This panel will provide all the necessary hookups between dissimilar equipment. The diagram shown is merely a prototype; the panel can be expanded with ease. SW1 provides for two or four multiple outputs. J1 through J19 are RCA-type phono jacks. J20 through J23 use jacks which fit your particular equipment needs.—Harry Longerich W4ANL, Fredericksburg TX.

FAST SCAN

$399

Have you tried it yet?
ATV TRANSMITTER/CONVERTER

TC—1

*10 Watts Output
*Standard Frequencies Available
*Broadcast Standard Sound
*High-resolution & color video
*Regulated AC Supply Built In
*Tuneable Downconverter & Preamp

Connect to the antenna terminals of any TV set, add a good 450 MHz antenna, a camera and there you are. . . Show the shack, home movies, computer games, video tapes, etc.

ATV DOWNCONVERTER

For those who want to see the ATV action before they commit to a complete station, the TVC-4 is for you. Great for public service setups, demos, and getting a buddy interested. Just add an antenna and a TV set tuned to CH. 2, 3, or 4 and plug in to 117 volts a.c. **$89.00**

TVC-4

TVC-4L extra low-noise version. . . $105 delivered in USA

HOMEBREWERS: ASK FOR OUR BASIC FOUR-MODULE PACKAGE

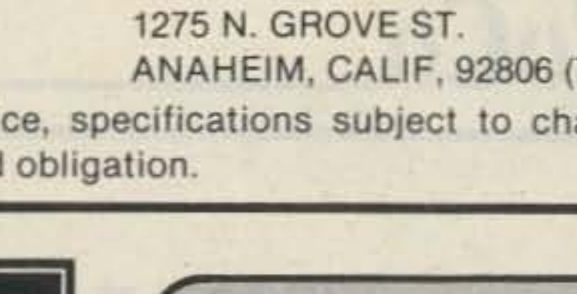
CALL OR WRITE FOR OUR COMPLETE LIST OF SPECIFICATIONS, station set-up diagrams, and optional accessories which include antennas, modulators, detectors, test generators, cameras, etc. WE ARE A FULL-LINE SUPPLIER OF ALL YOUR ATV NEEDS.

TERMS: VISA or MASTER CARD by telephone or mail, or check or money order by mail. All prices are delivered in USA. Allow three weeks after order for delivery.

P.C. ELECTRONICS
Tom W6ORG Maryann WB6YSS
(213) 447-4565
2522 Paxson Lane,
Arcadia, California 91006

15 Meter Mobile CW & USB

START YOUR DAY ON A GOOD KEY!!!
WORK OTHER HAMS LIKE: XE2BGM, ZL1PQ, KL7JFV, EA7EU, NN3SI, DJ8RR, DL0BBC, US6AK, JA3JMP, PY2-CPQ, FO8GW, KM6FF, VK2BD OE8MOK OA4ARB G3BRW VE7DYX CE1BLL W1AW



High 10W (PEP) low 2W (PEP): VFO tuning: noise blanker: fine-tuned SB, KHz ± CW off-set; digital frequency counter; 13.8V dc @ 3A, negative ground; L 9.5" × W 9" × H 2.5"; weight (2.3 kg) 5.7 lbs.; mobile mounting bracket.

N.C.G. CO.

JUST SLIGHTLY AHEAD

NOW ONLY
$279.00

DLR. INFO. & ORDER, CALL
1275 N. GROVE ST.
ANAHEIM, CALIF, 92806 (714) 630-4541

NOTE: Price, specifications subject to change without notice and obligation. ✓318

"BEEPER III"

"THE PROFESSIONAL TOUCH COMES TO AMATEUR RADIO!"

"BP-3 automatically provides a gentle high frequency beep at the beginning of each transmission and a low beep at the end. Virtually eliminates "talk-over"! Operates for up to one year on a single 9-V battery (not supplied). Can be directly interfaced to any transceiver which is keyed by grounding the PTT line (the PTT line voltage must be positive, not greater than 24 VDC, nor the current greater than 100 ma.) Works with virtually all modern gear. You've heard it; now you can have it!"

"ADD THE BEEP!"

"BP-3A	Complete with case, cable, Standard 4-pin connectors	**39.95 pp**
BP-3B	As above except without connectors. Add your own	**36.95 pp**
BP-3C	Circuit-board version for custom installation	**29.95 pp**

All units assembled, tested. OH residents add 6% Sales Tax"

FAXSCAN INC. ✓85
3148 Dorf Drive • Dayton, Ohio 45418 TM

LACOMBE DISTRIBUTORS

Louisiana's Only Authorized ICOM Dealer

Large selection of Amateur and Marine Communications Equipment Available

Call for Quotes

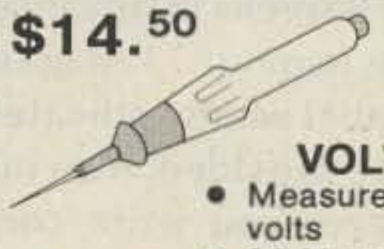
800-336-4799

Lacombe Distributors
Davis & Jackson Road ✓204
P.O. Box 293
Lacombe LA 70445
(504) 882-5355

VISA MasterCard

MEASURE MORE WITH YOUR DMM

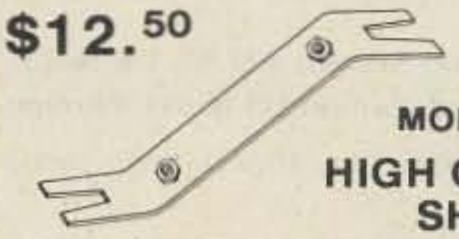
$14.50



MODEL P1
X10 HIGH VOLTAGE PROBE

- Measures up to 10,000 volts
- 90 Megohms in probe works with 10 Megohm meters to divide voltage by ten.
- 1% accuracy
- Safe operation with insulating probe of high impact plastic

$12.50



MODEL M2
HIGH CURRENT SHUNT

- Measures to 400 amps intermittently, 50 amps continuously.
- Manganin alloy for stable 1% accuracy
- Measures AC and DC currents
- Direct reading .001 ohm shunt, each millivolt read by DMM is one ampere
- Meter probes plug into jacks in the shunt
- Shunt attaches to binding posts and to car battery terminals

ORDER FROM ✓253
SCIENTIFIC INSTRUMENTS
3379A Papermill Road
Huntingdon Valley, PA 19006
ADD $2 FOR SHIPPING AND HANDLING

✓See List of Advertisers on page 114

✓See List of Advertisers on page 114

THE SELECTRIC™ INTERFACE

Daisy wheel quality without daisy wheel expense.

You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. *The Selectric™ Interface*, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer.

The Selectric™ Interface includes:

- step-by-step instructions
- tips on purchasing a used Selectric™
- information on various Selectric™ models, including the 2740, 2980, and Dura 1041
- driver software for Z80, 8080, and 6502 chips
- tips on interfacing techniques

With *The Selectric Interface* and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

Credit card orders call TOLL-FREE 1-800-258-5473. Or mail your order with payment plus $1.50 shipping and handling to: Wayne Green Inc. Attn: Retail Book Sales, Peterborough, NH 03458.

Dealer inquiries invited.

ISBN 0-88006-051-4 128 pages **$12.97**

☐ Yes, I want **Selectric Interface** (BK7388). Enclosed is $12.97 per copy plus $1.50 for shipping and handling.

☐ MASTER ☐ VISA ☐ AMEX

Card # _____ Expires _____

Signature _____

Name _____

Address _____

City _____

State and Zip _____ **336B65**

All orders shipped UPS if complete street address is given.

Make A Name For Yourself In Technical Publishing.

Wayne Green Books announces a June 1, 1983 deadline for submitting manuscript proposals for the upcoming publication list. Ideas for book-length manuscripts about any microcomputer system or area of electronics will be considered. In addition to payment and royalties, we offer our distribution channels and the marketing support your book deserves.

Send proposals or requests for a copy of our Writer's Guide to: Editor, Wayne Green Books, Peterborough, NH 03458. Or call toll-free 1-800-258-5473.

MAKE IT EASY TO SAVE your copies of

73 Magazine

Your magazine library is your prime reference source—keep it handy and keep it neat with these strong library shelf boxes. They are made of white corrugated cardboard and are dust resistant. Use them to keep *all* your magazines orderly yet available for constant reference.

Self-sticking labels are available for the following:

80 Micro	*73 Magazine*	*Radio Electronics*
Microcomputing	*QST*	*Personal Computing*
inCider	*CQ*	*Byte*
Desktop Computing	*Ham Radio*	*Interface Age*

One box (BX1000) is $2.00, 2-7 boxes (BX1001) are $1.50 each, and 8 or more boxes (BX1002) are $1.25 each. Be sure to specify which labels we should send.

Call **TOLL-FREE** for credit card orders:

1-800-258-5473

Or use the order form in this magazine and mail to:

73 Magazine

Attn: Book Sales, Peterborough, NH 03458

☐ SHIPPING AND HANDLING CHARGES $2.00 per order ☐

RADIO BOOKSHOP

HAND BOOKS FOR NEW! THE HAMSHACK

AMATEUR RADIO CALL DIRECTORY, 1982-1983 Edition. Compiled by: Jack A. Speer N1BIC and Ashok K. Anand. Here it is, and at a price you can afford! A directory of over 410,000 radio amateurs in the United States (as licensed by the U.S. Gov't). Completely updated for 1983. Easy to handle 8½ × 11 format. BK1254 $14.95

THE TEN METER FM HANDBOOK—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. BK1190 $4.95.*

THE COMPLETE SHORTWAVE LISTENER'S HANDBOOK, 2nd EDITION by Hank Bennett and Harry L. Helms. This comprehensive volume contains loads of new information from all over the world on the latest developments in SWL technology clubs, associations, practices and stations. A thorough guide to stations of the world by general continental area and frequency is included. BK1241 $9.95

THE PRACTICAL HANDBOOK OF AMATEUR RADIO FM REPEATERS—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. BK1185 $12.95.*

THE 73 TEST EQUIPMENT LIBRARY

VOL. II AUDIO FREQUENCY TESTERS—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! LB7360 $1.95.*

VOL. III RADIO FREQUENCY TESTERS—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. LB7361 $1.95.*

VOL. IV IC TEST EQUIPMENT—Become a troubleshooting wizard! Here 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. LB7362 $1.95.*

ALL THREE OF THE ABOVE ONLY $4.95 ORDER LB7365

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. BK1044 $5.95.*

FOR THE CONTESTER

THE CONTEST COOKBOOK—This book reveals the secrets of that elite group of operators who top the list when the contest results are published. It contains detailed suggestions for the first-time contester as well as tips for the advanced operator. Domestic, DX, and specialty contests are all discussed, complete with photographs and diagrams showing the equipment and operating aids used by the top scorers. For the serious contester. BK7308 $5.95.

THE 73 TECHNICAL LIBRARY

TOOLS & TECHNIQUES FOR ELECTRONICS—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 metalworking tools and the chemical aids which are used in repair shops. BK7348 $4.95.*

BEHIND THE DIAL—This book explains, in detail, what's going on on all the frequencies, from shortwave up to microwave. It gives the reader a good idea of what he can find and where to find it, including some of the secret stations such as the C.I.A. and the F.B.I. Everything is covered short of microwave monitoring. Anyone interested in purchasing a shortwave receiver should have a copy of this book. surveillance, station layout consideration, antenna systems, interface, and the electromagnetic spectrum. are included. BK7307 $4.95

THE NEW WEATHER SATELLITE HANDBOOK—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. BK7383 $8.95.*

PROPAGATION WIZARD'S HANDBOOK— by J. H. Nelson. When sunspots riddled the worldwide communications networks of the 1940s, 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. BK7302 $6.95.*

SSB . . . THE MISUNDERSTOOD MODE—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 ham. BK7351 $5.50.*

INTERFERENCE HANDBOOK—by William R. Nelson, WA6EQG—This timely handbook covers every type of RFI problem and gives you the solutions based on practical experience. Covers interference to TV, radio, hi-fi, telephone, radio amateur, commercial and CB equipment. Power line interference is covered in depth—how to locate it, cure it, work with the public, safety precautions, how to train RF/I investigators. Written by an RFI expert with 33 years of experience, this profusely illustrated book is packed with practical easy-to-understand information. BK1230 $8.95.*

OWNER REPAIR OF RADIO EQUIPMENT—by Frank Glass K6RQ. Here's a book that will teach you an approach to troubleshooting without a shack full of test equipment. Written in a narrative, non-mathematical style, it will encourage you to successfully fix your own rig problems 80 to 90% of the time. Even if you don't want to fix, you can learn a lot about how things work and fail. Add to your library and personal expertise. BK7310 $7.95.*

2 NEW RTTY BOOKS

WORLD WIDE RADIO TELETYPE STATIONS IN FREQUENCY ORDER—8th EDITION Compiled by Universal Electronics, Inc. Contains 2198 frequencies of stations that have been logged in 1982. Frequency, call sign, name of station, ITU country symbol, times of reception and details are included. All types of RTTY stations are listed including schedules of 82 press and news agencies operating on 637 frequencies. Includes 77 meteorological stations on 279 frequencies. Covers all RTTY stations from 3 MHZ to 30 MHZ, air, metro, government, military, diplomatic, covers all services. This is the most accurate RTTY list there is and a must for the serious RTTY enthusiast. BK1270 $10.95.

WORLDWIDE RADIO TELETYPE CALL SIGN LIST OF UTILITY STATIONS—8th EDITION Compiled by Universal Electronics, Inc. Contains more than 4000 call signs in alphanumerical order. All types of stations are listed. 183 utility station mnemonics and name abbreviations. Plus abbreviations for regional states in Australia, Canada, USA and USSR. All ITU Symbols designating countries or geographical areas. Table of allocation of international call sign series. Revised radio regulations on indentification of stations, including formation or call signs. All services listed. BK1271 $4.95

70 YEARS OF RADIO TUBES AND VALVES—by John Stokes "Great, the best book on the history of radio tubes that I've *ever* seen!" raved 73's technical editor. Written by an expert who has been involved in radio since '29, this book will be of special interest to "oldtimers" and will provide those younger hams with a unique sense of the history of their hobby. BK1272 $21.95

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT AMATEUR TELEVISION, (but were afraid to ask)—By Mike Stone WB8QCD. This book is a complete guide to setting up your own amateur radio television station. It contains—A history, what equipment you need, video theory, cameras, recorders, lighting, special effects, sound ATV DXing, mobile FSTV, ATV repeaters, ATV groups, building projects, test equipment, dealer directory, a cumulative index of over 1000 articles on amateur TV and much more. **This is the new, 1982 edition.** From the publishers of *Amateur Television Magazine*. BK1244 $9.95

WORLD PRESS SERVICE FREQUENCIES—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. BK1202 $7.95*

*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. $1.50 for the first book, $1.00 each additional book for U.S. delivery and foreign surface. For foreign airmail $10.00 per book. 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

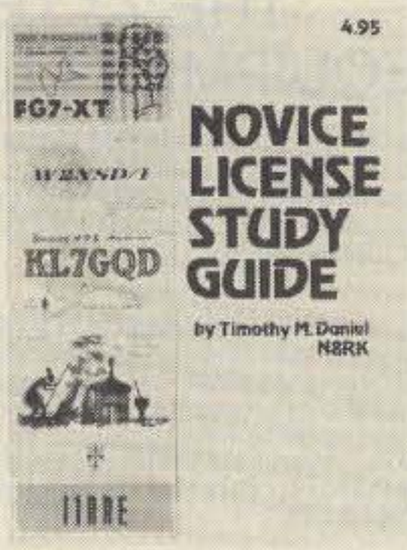
RADIO BOOKSHOP

FOR THE NOVICE

New, updated editions

of our famous novice

license study guide and novice study tapes.



● **NOVICE LICENSE STUDY GUIDE**—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 emphasizes 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. SG7357 $4.95.*

● **NOVICE STUDY TAPES**—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!

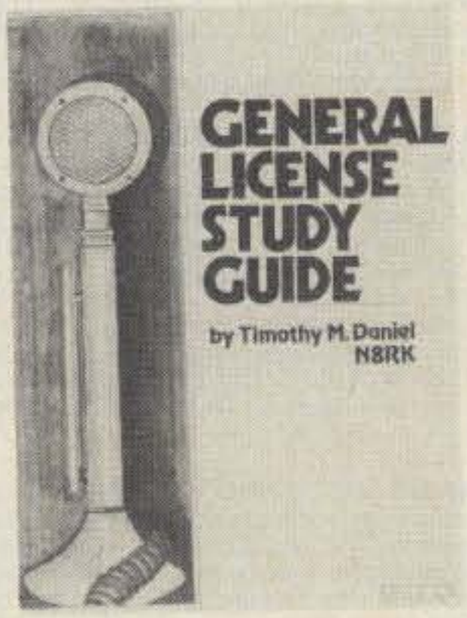
Once the test is behind you, these tapes will go right on being useful, because they are packed with the latest information on setting up your own ham station, and getting on the air.

Thousands of people have discovered how easy learning from cassette can be—order now and enter the fascinating world of ham radio! CT7300 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.

GENERAL LICENSE STUDY GUIDE



GENERAL LICENSE STUDY GUIDE—By Timothy M. Daniel N8RK This is the complete guide to the General License. Learning rather than memorizing is the secret. This is not a question-and-answer guide that will gather dust when the FCC issues a new test. Instead, this book will be a helpful reference, useful long after a ham upgrades to General. Includes up-to-date FCC rules and an application form. Order yours today and talk to the world. SG7358 $6.95

● **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 boxes each hold a full year of *73, Microcomputing or 80 Micro Desktop Computing, inCider.* With your order, request self-sticking labels for any of the following: *73, Microcomputing, 80 Micro, 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*.

For Your Ham Shack 73 Magazine Binders

● 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.**

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."

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!

73300	73 BACK ISSUE—BEFORE JULY 1980	$ 3.00
73350	73 BACK ISSUE JULY 1980 THRU OCT. 1981	$ 3.50
73350P	73 BACK ISSUE NOV. 1981 TO PRESENT	$ 3.50
73005	73 BACK ISSUE—5 YOUR CHOICE	$10.75
73010	73 BACK ISSUE—10 YOUR CHOICE	$16.00
73025	73 BACK ISSUE—25 YOUR CHOICE	$27.00
73125	73 BACK ISSUE—25 OUR CHOICE	$14.00

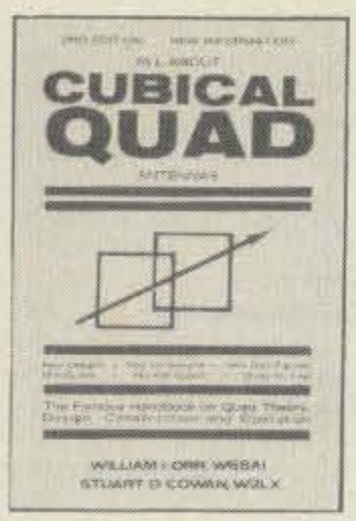
Shipping: Please add $1.00 per magazine. Orders of ten magazines or twenty-five magazines add $7.50 per order.

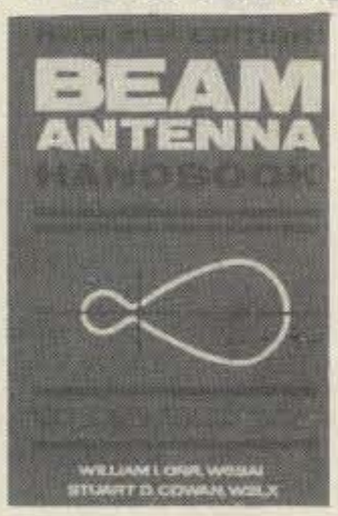
*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. $1.50 for the first book, $1.00 each additional book for U.S. delivery and foreign surface. For foreign airmail $10.00 per book. 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.)

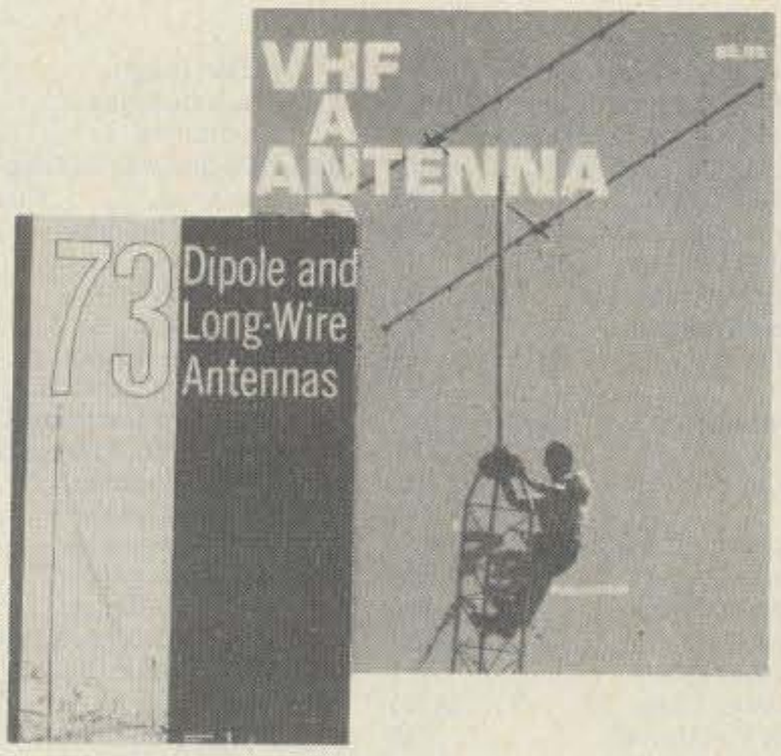
FOR TOLL FREE ORDERING CALL 1-800-258-5473

RADIO BOOKSHOP

ANTENNA BOOKS







VHF ANTENNA HANDBOOK—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. BK7368 $5.95.*

ALL ABOUT CUBICAL QUAD ANTENNAS (2nd edition)—The "Classic" on Quad design, theory, construction, and operation. New 2nd edition contains new feed and matching systems and new data. BK1196 $5.95.*

THE RADIO AMATEUR ANTENNA HANDBOOK—All about wire antennas, beams, tuners, baluns, coax, radials, SWR and towers. Clear and complete information. BK1199 $6.95

SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS—All new data and everything you want to know about low-cost, multi-band antennas, inexpensive beams, "invisible" antennas for hams in "tough" locations. BK1200 $6.95

73 DIPOLE AND LONG-WIRE ANTENNAS—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. BK1016 $5.50.*

BEAM ANTENNA HANDBOOK (New 5th edition)—by William I. Orr & Stuart D. Cowan. Yagi beam theory, construction and operation. Information on wire beams, SWR curves and matching systems. A "must" for serious DXers. BK1197 $5.95.

COOK BOOKS

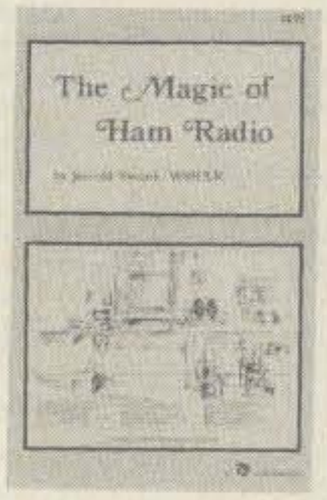
TTL COOKBOOK—by Don Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. BK1063 $9.50.*

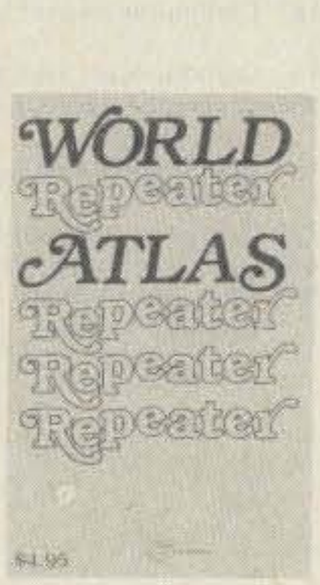
CMOS COOKBOOK—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! BK1011 $10.50.*

TVT COOKBOOK—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. BK1064 $9.95.*

IC OP-AMP COOKBOOK—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 × 8½, softbound. BK1028 $14.95.*

THE WELL EQUIPPED HAM SHACK





HOW TO DEFEND YOURSELF AGAINST RADAR—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! BK1201 $6.95.*

MICROCOMPUTER BOOKS

THE SELECTRIC INTERFACE—by George Young. You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included. BK7388 $12.97

TEXTEDIT—A Complete Word Processing System in kit form—by Irwin Rappaport. *TEXTEDIT* is an inexpensive word processor that you can adapt to suit your needs, from writing form letters to large texts. It is written in modules, so you can load and use only those portions that you need. Included are modules that perform right justification, ASCII upper/lowercase conversion, one-key phrase entering, complete editorial functions, and much more! *TEXTEDIT* is written in TRS-80* Disk BASIC, and the modules are documented in the author's admirably clear tutorial writing style. Not only does Irwin Rappaport explain how to use *TEXTEDIT*; he also explains programming techniques implemented in the system. *TEXTEDIT* is an inexpensive word processor that helps you learn about BASIC programming. It is written for TRS-80 Models I and III with TRSDOS 2.2/2.3 and 32K. *TRS-80 and TRSDOS are trademarks of the Radio Shack Division of Tandy Corporation. BK7387 $9.97

WORLD REPEATER ATLAS—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. BK7315 $2.00

THE MAGIC OF HAM RADIO—by Jerrold Swank W8HXR. Under various callsigns, W8HXR has been heard on the ham bands since 1919. He has watched amateur radio grow from the days of Model A spark coils to an era of microprocessors and satellite communications. Jerry has responded to calls for help from earthquake-striekn Managua and tornado-ravaged Xenia. Antarctica, one of man's loneliest outposts, has been a bit less lonely, thanks to Jerry's tireless phonepatching efforts. Drawing on his own colorful experiences and those of many other hams, Jerry has compiled this word-picture of ham radio during the past six decades. BK7312 $4.95

40 COMPUTER GAMES FROM KILOBAUD MICROCOMPUTING—Forty games in nine different categories. Games for large and small systems, and a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. BK7381 $7.95*

COMPUTER CARNIVAL—by Richard Ramella. Your child can become a crackerjack computerist with the sixty TRS-80 Level II programs in COMPUTER CARNIVAL. This large-type, spiral bound book for beginners is a veritable funhouse of games, graphics, quizzes and puzzles. Written by *80 Micro* columnist Richard Ramella, the programs are challenging enough to ensure continued learning, yet short enough to provide your child with the immediate delight and reward of mastering basic computing skills. And for even greater enjoyment, get the CARNIVAL COMPANION, a 30-minute cassette containing all the programs in the book. Eliminates tiresome typing and lets your child spend more time enjoying the programs. BK7389 $16.97 CC7389 Book and Cassette $24.97

A GUIDE TO HAM RADIO—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. BK7321 $4.95.*

KILOBAUD KLASSROOM—By George Young and Peter Stark. Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. *Kilobaud Klassroom* the popular series first published in *Kilobaud Microcomputing*, combines theory with practice. This is a *practical* course in digital electronics. It starts out with very simple electronics projects, and by the end of the course you'll construct your own working microcomputer! BK7386 $14.95

WORLD RADIO TV HANDBOOK 1983, 26TH EDITION—This book is the bible of international broadcasters, providing the only authoritative source of exact information about broadcasting and TV stations world wide. This 1983 edition is completely revised, giving comprehensive coverage of short, medium and long wave, 560 pages of vital aspects of world listening. BK1184 $16.50

*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. $1.50 for the first book, $1.00 each additional book for U.S. delivery and foreign surface. For foreign airmail $10.00 per book. 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

ADVERTISERS

***Please contact these advertisers directly.**
To receive full information from our advertisers please complete the postage-paid card.

R. S. No.		Page
2	AEA/Advanced Electronic Applications	115
476	AEA/Advanced Electronic Applications	103
262	A to Z Crystal Co.	20
448	Advanced Communications International	59
67	Advanced Computer Controls	69
481	Advanced Computer Controls	100
*	Alaska Microwave Labs	91
20	All Electronics	61
*	Amateur Electronic Supply	53
180	Amateur-Wholesale Electronics	46
243	Amateur-Wholesale Electronics	61
334	Amidon Associates	87, 98
*	Ampersand Electronics	127
169	A. P. Systems	93
213	API Electronics	82
*	Appliance & Equipment	20
71	Applied Invention	65
*	Associated Radio	86
484	Automated Production Equipment Corp.	101
469	BG Carl Electronics	93
11	Barker & Williamson, Inc.	24
305	Barry Electronics	29
*	Blacksburg Group	46
223	Britt's Two-Way	33
226	Buckmaster Publishing	109
255	Buckmaster Publishing	127
*	Butternut Electronics Corp.	82
187	Call Letter Hats	93
14	Communications Concepts, Inc.	87
19	Communications Design	89
462	Communications Electronics Specialties, Inc.	69
15	Communications Specialists	8, 9
222	Computer Applications	91
478	Computer Applications	104
*	*Computer Trader*	130
*	Connect Systems	13
480	Contemporary Electronics	100
*	Crown Micro Products	63, 87
21	Current Development Corp.	65
106	Cushcraft Corp.	15
346	Data Service Co.	98
256	Davilyn Corp.	129
*	Daytapro Electronics, Inc.	89
*	DGM Electronics, Inc.	88
425	Doppler Systems	41
263	EGE, Inc.	59
453	EGE, Inc.	63
146	Electronic Rainbow Industries, Inc.	31
231	Electronic Rainbow Industries, Inc.	115
400	Engineering Consulting Service	130
248	Etco Electronics	109
85	Faxscan, Inc.	107
218	Ferritronics	69
323	Fox-Tango Corp.	38, 90
178	Galaxy Electronics	130
*	Gilco International	24
229	Gizmo Electronics	98
143	GLB Electronics	52
195	Goldsmith Scientific Corp.	89
417	Gotham Antenna	91
*	Grantham College of Engineering	41
352	Grove Enterprises	109
486	Hal Communications	101
31	Hal-Tronix	68
*	Ham Radio Center	5
*	Ham Radio Outlet	3
33	Hamtronics, NY	142, 143
460	Handi-Tek	129
184	High Technology Service Center	61
320	Hoosier Electronics	68
*	*Hot CoCo* Magazine	108
*	ICOM	Cov. II, 73
78	Independent Crystal Supply	129
445	Instant Software Amateur Radio Program	67
487	International DXer's Club of San Diego	100
*	JDL Industries	130
*	Kantronics	21, 47, 82
230	KCS Electronics Corp.	115
*	Kenwood	Cov. IV, 7, 100, 102
*	KLM Electronics	18, 68
204	Lacombe	107
214	A. Lascurain	128
*	Lee-Art, Inc.	101, 129
44	Macrotronics, Inc.	66
45	Madison Electronics	75
46	Maggiore Electronics	49
*	Matt Smith, *73 Magazine*	129
47	MFJ Enterprises	40
233	MFJ Enterprises	61
234	MFJ Enterprises	63
260	MFJ Enterprises	65
48	MHz Electronics	132-141
227	Micro Concepts & Design	20
49	Micro Control Specialties	39
50	Microcraft	89
257	Microfish Software Products	130
51	Microlog Corporation	32
264	Midwest Amateur Radio Supply	25
*	Mirage Communications	77
258	Missouri Radio Center	17
254	National Comm. Group Co.	24
318	National Comm. Group Co.	107
412	Nemal Electronics	127
483	National Microtech, Inc.	101
137	*Nuts & Volts*	129
265	Omar Electronics	83
*	*Orbit* Magazine	65
*	P. C. Electronics	107
*	Palomar Engineers	4
159	Parsec Communications	85
182	Peterson Electronics	130
246	Phillips-Tech Electronics Corp.	129
*	Plymouth Electronics Co.	35
61	Radio Amateur *Callbook*, Inc.	33
397	Radio World	91
454	Radiokit	90
62	Ramsey Electronics	131, 145
*	RCA Service	89
156	RF Electronics	109
171	Ridge Systems Co., Inc.	4
133	Rivendell Associates	128
418	Rolin Distributors	91
150	Royal	127
207	Russ Software Ltd.	127
488	SMR, Inc.	101
259	S & T Electronics	87
65	S-F Amateur Radio Services	90
261	SEI, Inc.	41
253	Scientific Instruments	107
477	*Seychelles Sagal* ZL1BSO	104
500	*73* Books	110-114, 119, 128
	73 Dealer Ad	108
	73 Moving	108
	73 Subscriptions	81, 130
	73 University Microfilms	130
162	Space Electronics	127
*	Spectronics	144
68	Spectrum Communications	79
436	Spectrum International, Inc.	105
173	Spider Antenna	109
245	Sultronics	98
183	Tayco Comm.	129
*	Telex/Hy-Gain	104
*	The Antenna Bank	66
482	Tokyo Hy-Power Labs, Inc.	100
449	The Ham Shack	90
205	The Metheny Corp.	4
104	Trionyx	105
485	Ungar	101
217	Universal Electronics	100
189	Universal Software	129
*	V-J Products, Inc.	41
*	Van Gorden Engineering	33, 87
311	Vanguard Labs	127
90	VoCom Products	59
*	W9INN Antennas	95
302	W-S Engineering	98
79	Wacom Products	90
*	Westcom Corp.	115
80	Western Radio Electronics	127
83	Yaesu Electronics	Cov. III

73

BOOKS, ETC.

To order, complete the 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
73300	73 BACK ISSUE—BEFORE JULY 1980	$ 3.00
73350	73 BACK ISSUE—JULY 1980 THRU OCT 1981	$ 3.50
73350P	73 BACK ISSUE—NOV 1981 TO PRESENT	$ 3.50
73005	73 BACK ISSUE—5 YOUR CHOICE	$10.75
	Add $1.00 per magazine for shipping	
73010	73 BACK ISSUE—10 YOUR CHOICE	$16.00
73025	73 BACK ISSUE—25 YOUR CHOICE	$27.00
73125	73 BACK ISSUE—25 OUR CHOICE	$14.00
	Add $7.50 per order for shipping	
BK1196	ALL ABOUT CUBICAL QUAD ANTENNAS	$ 5.95
BK7384	ANNOTATED BASIC VOL 1	$10.95
BK7385	ANNOTATED BASIC VOL 2	$10.95
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
BK1241	THE COMPLETE SHORTWAVE LISTENER'S HANDBOOK	$ 9.95
BK7308	THE CONTEST COOKBOOK	$ 5.95
BK7381	40 COMPUTER GAMES	$ 7.95
BK1244	EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT AMATEUR TV	$ 9.95
BK7321	A GUIDE TO HAM RADIO	$ 4.95
BK7322	HOBBY COMPUTERS ARE HERE	$ 2.47
BK1201	HOW TO DEFEND YOURSELF AGAINST RADAR	$ 6.95
BK1028	IC OP AMP COOKBOOK	$14.95
BK1230	INTERFERENCE HANDBOOK	$ 8.95
BK7386	KILOBAUD KLASSROOM	$14.95
BK7312	MAGIC OF HAM RADIO	$ 4.95
BK7340	THE NEW HOBBY COMPUTERS	$ 2.47
BK7383	THE NEW WEATHER SATELLITE HANDBOOK	$ 8.95
CT7300	NOVICE THEORY TAPES	$15.95
BK7310	OWNER REPAIR OF RADIO EQUIPMENT	$ 7.95
BK1185	THE PRACTICAL HANDBOOK OF FM REPEATERS	$12.95
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
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
BK1016	73 DIPOLE & LONG WIRE ANTENNAS	$ 5.50
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 LOW COST WIRE ANTENNAS FOR RADIO AMATEURS	$ 6.95
BK7311	SOME OF THE BEST FROM KILOBAUD	$10.95
BK7351	SSB THE MISUNDERSTOOD MODE	$ 5.50
SG7357	STUDY GUIDE—NOVICE CLASS	$ 4.95
SG7358	STUDY GUIDE—GENERAL CLASS	$ 6.95
BK1190	THE TEN METER FM HANDBOOK	$ 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
BK7387	TEXTEDIT—WORD PROCESSING KIT	$9.97
DS7387	TEXTEDIT—DISK	$19.97
BK7348	TOOLS & TECHNIQUES	$ 4.95
BK1063	TTL COOKBOOK	$ 9.50
BK1064	TVT COOKBOOK	$ 9.95
BK7382	UNDERSTANDING & PROGRAMMING MICROCOMPUTERS	$10.95
BK7368	VHF ANTENNA HANDBOOK	$ 5.95
BK1198	VHF HANDBOOK FOR RADIO AMATEURS	$ 6.95
BK1202	WORLD PRESS SERVICE FREQUENCIES	$ 7.95
BK1184	WORLD RADIO TV HANDBOOK	$16.50
BK7315	WORLD REPEATER ATLAS	$ 2.00

SHIPPING AND HANDLING CHARGES: $1.50 for the first book, $1 for each additional book for US delivery and foreign surface. $10 per book for foreign airmail

SATELLITE TELEVISION RECEIVER KITS

Rainbow makes a top-of-the-line Receiver affordable

The Electronic Rainbow Receiver consists of a receiver with an external down-converter that mounts at the antenna, feeds the voltage to the LNA through the coax cable. The 4GHz signal is down converted to 70 MHz and is fed through the RG59/U coax to the receiver.

Rainbow Kits are supplied with simple step by step instructions. All the circuits that you need expensive test equipment to do are pre wired and tested. All printed circuit boards have the outline of each part printed on them.

RECEIVER FEATURES
Built in RF modulator • Detent Tuning-3.7 to 4.2 GHz • Variable Audio-5.5 to 7.5 MHz • Invert Video • Channel Scan • Voltage monitoring • Meter output • Remote Tuning

SPECIFICATIONS:
Single Conversion Image Rejection Downconverter • Threshold 8 db CNR • IF Bandwidth 24MHz • Output IV Audio and Video • IF Frequency 70MHz • Video Bandwidth 4.5MHz • Size 3½"Hx8½"Dx11¼"W

Complete Satellite TV Receiver

KIT #1 — Contains:
- Mainboard • Tuning Board • Down-converter Board • Modulator Board
- All parts needed to complete receiver
- Down Converter built in case.
- Cabinet, attractive black brushed anodized metal with silk screened front and back for a professional look
- 70 MH2 Filter is pre-wired and tested.
- Complete instruction Manual. **$395.00**

KIT #2 — Board Kit Contains:
- Main Board • Tuning Board • Down-converter board • Modulator Board
- Parts List, assembly and alignment manual
- 4GHz local oscillator and 70MHz filter is pre-wired and tested. **$129.00**

Instruction manual. Contains printed circuit board layouts, parts placement, and alignment instructions. **$25.00**

Ask about guaranteed to play

We will accept telephone orders for Visa & Mastercard
No C.O.D. Orders
TO ORDER CALL 317-291-7262
800-428-3500
Complete kit weighs 10 lbs. Please add sufficient postage
6254 LaPas Trail
Indianapolis, Indiana 46268

ELECTRONIC RAINBOW INC ✓231

Check These Prices On Factory Prime Parts
*** AUTHORIZED MAIL ORDER DISTRIBUTORS**
*** MOTOROLA MRO DISTRIBUTOR**

WRITE OR CALL TODAY FOR OUR FREE CATALOG!
"All Parts Fully Guaranteed"

POPULAR MICROWAVE DEVICES —

MRF 901	$2.15	NEC 02135 high gain/ low noise	$3.50
2N6603 (replaces MRF 902)	$9.75	Chip Caps .001 (.05 x .11)	4/$1.00
MRF 911	$2.15		
MBD 101	$ .45	Thermistor 1K Ohm @ 25°C	$ .74
2SC2369	49¢		

LINEAR IC'S —

MC 1590G	$6.85	MC 1733CP	$ .95
MC 1330A1P	$1.65	MC 4558CP1	$ .85
MC 1349P	$1.40	NE 564	$2.50
MC 1350P	$1.20	NE 565	$1.30
MC 1358P	$1.70	LM 301AN	$ .34
MC 1374P	$2.40	LM 307N	$ .45
MC 1458CP1	$ .70	LM 380N	$ .89
MC 1496P	$1.00	LM 1889	$2.45

DYNAMIC RAMS —
4116 16K 200NS — 8 for $11.95

LOW PROFILE SOLDER TYPE IC SOCKETS —
8 pin to 40 pin — 1¢ per pin (20 pin = 20¢)

RESISTORS - 1/4 Watt 5% Carbon Film —
Standard Value - 10 Ohm to 3.3 Meg Ohm
Same Value 1 - 100 — .02 ea.
Same Value 100 - 1000 — 015 ea.
Same Value - 1000 - up — 010 ea.

MISCELLANEOUS —

MV2109	$ .82	Polarized Line Cord	
MV2209	$ .40	5 Foot	$ .42
IN4001, 4004, 4007	10 for $ .99	75 - 300 Ohm Matching Transformer	$ .50

Gardiner Solder 60/40 Rosin Core .032 dia., 1 Lb. Spools $8.10

KCS Electronics Corp.
P.O. Box 33205
Phoenix, Arizona 85067 ✓230
(602) 274-2885
VISA MasterCard COD'S
Special Quantity Pricing. Min. Credit Card Order $15.00. No Min. on COD or Prepaid. Prepaid Orders Add $2.50 Ship., Ins., Handling

---

HOT ROD ANTENNA

Achieve 1 or 2 db gain over ANY ¾ wave two meter telescopic antenna. The AEA model HR-1 Hot Rod™ antenna was designed by Dr. D.K. Reynolds (designer of the IsoPole) to deliver maximum performance for any hand-held transceiver with a BNC fitting.

The factory-tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave.

The Hot Rod antennas can be expected to make the same improvement to hand-held communications that the IsoPole brand antennas have made to base station operations. Why pay more when the best costs less?

Prices and Specifications subject to change without notice or obligation.

ADVANCED ELECTRONIC APPLICATIONS, INC. ✓2
P.O. Box C-2160,
Lynnwood, WA 98036
(206) 775-7373
Telex: 152571 AEA INTL

AEA Brings you the Breakthrough!

RF TRANSISTORS

FRESH STOCK - NOT SURPLUS

P/N	Net/ea.	Matched Pr.	Net/Pr.
MRF412	$18.00	MRF412-2	$39.00
MRF421	27.00	MRF421-2	58.00
MRF450	12.50	MRF450-2	28.00
MRF453	15.00	MRF453-2	33.00
MRF453A	15.00	MRF453A-2	33.00
MRF454	16.50	MRF454-2	36.00
MRF454A	17.00	MRF454A-2	37.00
MRF455	14.00	MRF455-2	31.00
MRF455A	13.50	MRF455A-2	30.00
MRF458	18.00	MRF458-2	39.00
MRF492	20.00	MRF492-2	43.00

PREMIUM MATCHED QUADS AVAILABLE

VHF & UHF TRANSISTORS

Type	Mount	Rating	MHz	Net/ea.
MRF238	(s)	30W	145-175	13.00
MRF240	(s)	40W	145-175	15.00
MRF245	(F)	80W	130-175	27.00
MRF247	(F)	80W	130-175	27.00
MRF492	(F)	70W	27-50	20.00
SD1416	(F)	80W	130-175	30.00
SD1477	(F)	125W	130-175	37.00
SD1441	(F)	150W	130-175	83.50
2N6081	(s)	15W	130-175	7.75
2N6082	(s)	25W	130-175	9.75
2N6083	(s)	30W	130-175	9.75
2N6084	(s)	40W	130-175	13.50
MRF644	(F)	25W	430-470	21.50
MRF646	(F)	45W	430-470	24.50
MRF648	(F)	60W	430-470	33.50

Technical Assistance and cross-reference information on CD, PT, RF, SRF & SD P/N's; Call our Engineering Dept. (619) 744-0728

WE SHIP SAME DAY — C.O.D. or VISA/MC/Am.Ex.
Minimum Order $25.00 — Add $3.50 Shipping
RF Parts Catalog Avail. — OEM & Quantity Discounts
ORDERS ONLY: 800-854-1927

WESTCOM
1320 Grand Ave. San Marcos
California 92069 (619) 744-0728

✓See List of Advertisers on page 114

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

WORLD COMMUNICATIONS YEAR RTTY CONTEST

Contest Periods:
0000 to 0800 GMT June 11
1600 to 2400 GMT June 11
0800 to 1600 GMT June 12

Formerly the VK/ZL/Oceania RTTY DX Contest, the contest is organized and conducted by the Australian National Amateur Radio Teleprinter Society with trophies donated by the secretary of the ITU, Mr. Butler. Entry classes include single-operator, multi-operator, and SWL. Each station may be worked only once per band, but may be worked on another band for further multipliers.

EXCHANGE:

Serial number consisting of RST, zone number, and time in GMT.

SCORING:

As per CARTG Zone Chart, multiplied by the number of countries worked, multiplied by the number of continents worked (6 maximum). After the above calculations, world stations add 100 points for each VK/ZL station worked on 20 meters, 200 points for each on 15 meters, and 300 points for each on 10 meters. Countries count as per the ARRL list of countries, except that each VK, ZL, JA, VE, VO, and W/K district counts as a separate country. Contacts with one's own country count zero points for multipliers.

AWARDS:

Trophies to first-place single- and multi-operator entries on world basis donated by Mr. Butler of the ITU. Trophies to first-place single- and multi-operator entries in VK donated by ANARTS. Trophies will be presented by Mr. Butler at the IREE convention to be held in Sydney between September 5th and 19th. Certificates will be issued for second- and third-place entries on a world basis and for the winner in each country. A certificate of participation signed by Mr. Butler will be issued to all contestants.

ENTRIES:

Logs must show (in this order) date and time (GMT), callsign of station worked, serial number sent and received, points claimed. Logs of multi-operator stations must be signed by all operators, together with a list of their callsigns. Incomplete loggings are not eligible for scoring. Logs must be received by the Contest Committee by August 19th. Address all logs to: W. J. Storer VK2EG, 55 Prince Charles Road, French's Forest 2086, N.S.W., Australia.

Summary sheet must show callsign of station, name of operator(s) and address of same, bands used (a separate log is required for each band), the points claimed for each band, the number of VK/ZL stations worked, total points claimed, and signature(s).

The judges' decision regarding the placings in the contest will be final and no correspondence will be entered into regarding the same. The logs become the property of the Contest Committee on completion of checking.

SUMMER SMIRK PARTY CONTEST

Starts: 0000 GMT June 17
Ends: 2400 GMT June 19

The contest is sponsored by the Six-Meter International Radio Club (SMIRK). No crossband contacts, multi-operators, or partial contacts are allowed. Check logs or dupe sheets are not needed.

EXCHANGE:

SMIRK number and ARRL section, foreign state, province, prefecture, or country. Count ARRL sections in the 48 US states only; KH6 and KL7 count as countries. Washington DC counts as a section, as well. Canadians count as provinces; all others count as states, provinces, prefectures, or countries.

SCORING:

Count 2 points for each SMIRK contact, 1 point for each non-SMIRK QSO. Add QSO points and multiply by number of ARRL sections, foreign states, provinces, and countries worked for final score.

AWARDS:

Trophies for high-score SMIRK in two divisions: US/Canada and foreign. Certificates for high score in each ARRL section and foreign state, province, prefecture, or country.

ENTRIES:

Entries must be submitted on the fall, 1981, edition of the official SMIRK log. Single copies are available for an SASE and photocopies may be used. Send log requests and entries postmarked by July 11th to: Spencer F. Ritchie KC2TX/5, 5122 Sagamore, San Antonio TX 78242.

QSL OF THE MONTH

Who says kids aren't interested in ham radio anymore? This month's winning QSL comes from the Charlotte Latin School club station in Charlotte NC. The school is a private, coeducational institution located on a 92-acre campus on the south side of Charlotte. Bob Olson WD4OHD, director of the school's ham club, said that the card was designed by one of the students, and he added that the club is active and growing. And with all the new members, the book they requested for winning the contest was an obvious choice: *73*'s *Novice License Study Guide*.

If you think your QSL is a winner, put it in an envelope with your choice of a book from *73*'s Radio Bookshop and send it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries which do not use an envelope or do not specify a book will not be considered.

NINE-LAND CW CONTEST

Starts: 1700 GMT June 18
Ends: 1700 GMT June 19

This is really an "everybody works everybody" contest sponsored by the Joliet Amateur Radio Society. The same station may be worked once per band. Operating categories include single operator (1 transmitter), multi-operator (1 transmitter), and multi-operator using portable field conditions with a maximun of two transmitters.

EXCHANGE:

Consecutive serial number beginning with 001 followed by state, province, or DX country.

FREQUENCIES:

1805 and 60 kHz up from lower edge of 80, 40, 20, 15, and 10 meters; Novices use 25 kHz up from lower edge of Novice bands.

SCORING:

Contacts with 9-land stations count 2 QSO points each; others are 1 point each. Multipliers are the number of states, Canadian provinces, and DX countries worked. Count a bonus multiplier for every 20 9-land stations worked.

AWARDS

Certificate to high score in each category in each state, province, and DX country.

ENTRIES:

Dupe sheets are required for over 200 contacts. Logs must be postmarked by July

CORRESPONDENT zone / YOUR zone

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	2	14	10	13	16	18	22	20	25	30	36	37	39	21	22	19	20	17	11	25	29	29	22	22	16	28	25	31	39	35	14	36	25	29	34	39	40	47	44	15
2	14	2	15	8	7	16	16	12	16	23	24	30	30	12	14	16	19	20	19	19	25	31	26	30	28	35	35	40	50	50	25	47	14	21	21	28	33	36	37	6
3	10	15	2	8	11	9	13	14	18	21	28	28	30	26	28	27	29	27	21	32	37	39	32	31	24	37	33	40	43	35	11	32	29	35	35	42	48	50	52	20
4	13	8	8	2	3	8	10	8	12	18	22	25	27	19	21	23	25	26	22	26	33	37	32	34	30	40	38	44	52	44	20	40	21	28	26	33	40	41	44	14
5	15	7	11	3	2	9	9	6	10	17	20	24	25	18	20	22	26	26	24	35	32	38	33	35	31	41	40	45	54	46	22	41	19	27	24	31	38	39	42	13
6	18	16	9	8	9	2	4	7	10	12	19	19	21	27	29	31	34	33	29	34	40	46	40	40	33	46	42	49	47	38	17	32	28	36	30	37	44	43	46	22
7	22	16	13	10	9	4	2	4	6	8	15	15	17	26	29	31	15	36	33	33	40	47	42	44	38	50	46	53	49	40	22	34	26	34	26	33	40	38	44	22
8	20	12	14	8	6	7	4	2	5	11	15	18	19	22	24	27	31	32	30	29	35	42	38	42	37	47	46	51	54	44	24	38	21	30	23	30	38	36	41	13
9	25	16	18	12	10	10	6	5	2	8	10	14	15	23	25	29	33	35	34	29	35	43	41	45	41	50	50	55	52	45	28	38	21	30	23	27	35	32	38	21
10	30	23	21	18	17	12	8	11	8	2	9	7	9	31	33	37	41	43	41	36	42	51	49	52	45	58	52	54	44	37	28	31	28	36	24	29	38	31	38	29
11	36	24	28	22	20	19	15	15	10	9	2	9	7	26	28	33	36	41	43	30	34	42	45	51	52	49	55	49	42	41	37	35	22	29	16	20	28	23	29	27
12	37	30	28	25	24	19	15	18	14	7	9	2	3	35	37	41	45	49	48	39	42	49	53	58	50	52	52	48	37	33	32	27	31	37	34	27	33	27	33	34
13	39	30	30	27	25	21	17	19	15	9	7	3	2	33	35	40	43	48	49	37	39	46	50	56	53	50	52	46	34	34	35	29	29	34	21	24	30	24	30	34
14	21	12	26	19	18	27	26	22	23	31	26	35	33	2	3	6	10	14	18	7	14	21	19	25	27	27	30	32	42	49	34	55	5	10	15	19	21	26	26	6
15	22	14	28	21	20	29	29	24	25	33	28	37	35	3	2	5	9	13	18	6	11	18	17	23	27	25	29	30	39	47	36	54	6	7	15	18	19	25	24	8
16	19	16	17	23	22	31	31	27	29	37	33	41	40	6	5	2	4	8	13	6	10	15	12	18	22	21	24	26	36	42	33	49	10	9	20	21	21	27	25	9
17	20	19	29	26	26	34	35	31	33	41	36	45	43	10	9	4	2	5	12	7	8	12	8	14	19	17	20	22	32	38	32	45	14	10	22	22	20	27	23	12
18	17	20	27	26	26	33	36	32	35	43	41	49	48	14	13	8	5	2	7	12	12	12	6	11	14	15	16	20	30	35	29	40	18	15	27	28	24	31	27	14
19	11	19	21	22	24	29	33	30	34	41	43	48	49	18	18	13	12	7	2	18	19	16	10	10	9	16	15	20	30	32	21	36	23	21	33	34	30	38	33	16
20	25	19	32	26	35	34	33	29	29	26	30	39	37	7	6	6	7	12	18	2	6	14	14	20	26	21	26	25	34	43	39	49	8	3	15	16	15	22	20	12
21	29	25	37	33	32	40	40	35	35	42	34	42	39	14	11	10	8	12	19	6	2	9	11	17	24	16	21	20	28	37	40	43	14	6	18	16	11	19	15	19
22	29	31	39	37	38	47	46	42	43	51	42	49	46	21	18	15	12	12	16	14	9	2	6	10	18	17	13	11	21	29	36	35	22	14	26	22	15	22	16	24
23	22	26	32	32	33	40	42	38	41	49	45	53	50	19	17	12	8	6	10	14	11	6	2	6	13	8	12	11	24	30	31	37	22	16	29	26	21	28	22	20
24	22	30	31	34	35	40	44	42	45	52	51	58	56	25	23	18	14	11	10	20	17	10	6	2	8	6	6	10	20	24	26	30	28	22	35	33	25	32	25	25
25	16	26	24	30	31	33	38	37	41	45	52	50	53	27	27	22	19	14	9	26	24	18	13	8	2	13	9	15	23	30	18	27	32	28	41	40	33	40	33	25
26	28	35	37	40	41	46	50	47	50	50	49	52	50	27	25	21	17	15	16	21	16	7	8	6	13	2	6	5	16	22	31	29	29	21	33	29	21	27	20	29
27	25	35	33	38	40	42	46	46	50	52	55	52	52	30	29	24	20	16	15	24	21	13	12	6	9	6	2	7	15	18	25	25	34	27	40	35	27	32	26	30
28	31	40	40	44	45	49	53	51	55	54	49	48	46	32	30	26	22	20	20	25	20	11	14	10	15	5	7	2	10	17	31	24	34	25	36	30	22	26	19	34
29	39	50	43	52	54	47	43	54	52	44	42	37	37	42	39	36	32	30	30	34	28	21	24	20	23	16	15	10	2	9	15	32	42	33	39	31	24	24	20	14
30	35	50	35	44	46	38	40	44	45	37	41	33	34	49	47	42	38	45	32	43	37	29	30	24	30	22	18	17	9	2	24	7	51	42	47	10	33	32	29	48
31	14	25	11	20	22	17	22	24	28	26	37	32	35	34	36	33	32	29	21	39	40	36	31	26	15	31	25	31	15	24	2	22	39	42	46	53	52	54	51	28
32	36	47	32	40	41	32	34	38	38	31	35	27	29	55	54	49	45	40	36	49	43	35	37	30	27	29	25	24	32	7	22	2	57	48	47	42	38	34	33	50
33	25	14	29	21	19	28	26	21	21	26	22	31	29	5	5	10	14	18	23	8	14	22	22	28	32	29	34	34	42	51	39	57	2	9	10	14	18	22	23	10
34	29	21	35	28	27	36	34	30	30	36	29	37	34	10	7	9	10	15	21	3	6	14	16	22	28	21	27	25	33	42	42	18	9	2	13	17	12	18	16	16
35	34	21	35	26	24	30	26	23	20	24	16	34	21	15	15	20	22	27	33	15	18	26	29	35	41	33	40	36	39	47	46	47	10	13	6	7	15	15	19	20
36	39	28	42	33	31	37	33	30	27	29	20	27	24	19	18	21	22	28	34	16	16	22	26	33	40	29	35	30	31	40	53	42	14	12	7	2	8	8	11	24
37	40	33	48	40	38	44	40	38	35	38	28	33	30	21	19	21	20	24	30	15	11	15	21	25	33	21	27	22	24	33	52	18	18	12	15	8	2	7	5	28
38	47	36	50	41	39	43	38	36	32	31	23	27	24	26	25	27	27	31	38	22	19	22	28	32	40	27	32	26	24	32	56	34	22	18	15	8	7	2	6	32
39	44	37	52	44	42	48	44	41	38	38	29	33	30	26	24	25	23	27	33	20	15	16	22	25	33	20	26	19	20	29	51	33	23	16	19	11	5	6	2	32
40	15	5	20	14	13	22	22	18	21	29	27	34	34	6	8	9	12	14	16	12	19	24	20	25	25	29	30	34	44	48	28	50	10	16	20	24	28	32	32	2

World Communications Year RTTY Contest (CARTG) exchange points table.

CALENDAR

Jun 11–12	ARRL VHF QSO Party
Jun 11–12	World Communications Year RTTY Contest
Jun 17–19	Summer SMIRK Party
Jun 18–19	Nine-Land CW Contest
Jun 25–26	ARRL Field Day
Jul 2–3	Venezuelan Worldwide Contest—SSB
Jul 9–10	IARU Radiosport Championship
Jul 15–17	*A5 Magazine* SSTV DX Contest
Jul 30–31	Venezuelan Worldwide Contest—CW
Aug 6–7	ARRL UHF Contest
Aug 19–21	*A5 Magazine* UHF FSTV DX Contest
Aug 20–21	SARTG Worldwide RTTY Contest
Sep 3	DARC Corona 10-Meter RTTY Contest
Sep 10–11	ARRL VHF QSO Party
Sep 10–11	Cray Valley Radio Society SWL Contest
Oct 8–9	ARRL QSO Party—CW
Oct 9–10	ARRL QSO Party—Phone
Oct 15–16	ARRL Simulated Emergency Test
Oct 22–23	MF Runde SW Activity Weekend
Nov 5–6	ARRL Sweepstakes—CW
Nov 6	DARC Corona 10-Meter RTTY Contest
Nov 19–20	ARRL Sweepstakes—Phone
Dec 3–4	ARRL 160-Meter Contest
Dec 10–11	ARRL 10-Meter Contest

23rd. Enclose a business-sized SASE for results. Send logs, dupe sheets, and summary sheet to: Paula Franke WB9TBU, PO Box 873, Beecher IL 60401.

STATIC SHEET

NEWSLETTER OF THE MONTH

Some club newsletters contain little more than the date and time of the next meeting, late dues notices, and a bimonthly request for more member participation in club events. But the *Static Sheet* stands out from that crowd like 75 wpm in the Novice band.

The *Static Sheet* is the monthly publication of the Des Moines Radio Amateurs Association, and it runs an average of 20 pages each issue. The newsletter, which is about the size of a playbill, is held together with a saddle binding rather than just stapled in one corner, which gives it a true magazine-like appearance. The front cover usually has artwork or photographs, and the masthead is striking against the white background.

But there is more good stuff inside the *Static Sheet*. "Honest John Says" brings the humor of a Don Rickles to the pages of the newsletter. With a sure aim, Honest John throws humorous barbs and one-liners at the members of the club. Other regular features include "DX in the 80s" and "The Last Word," where straight-shooting editor Ron Kinton WB0MBZ turns his thoughts loose.

The *Static Sheet* also has feature articles on local hams and offers the reader voluminous club news in its never-ending effort to keep the members active and informed.

Just as static is composed of many different frequencies mixing together, many voices comprise the *Static Sheet*, and editor Kinton deserves the credit for bringing it all together into a coherent whole.

To enter your club's newsletter in *73's* Newsletter of the Month Contest, send a copy to *73*, Pine Street, Peterborough NH 03458.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

I dedicate this column to all of you, the readers I love to hear from, who have made this column grow over the past six years. I enjoy your comments, suggestions, and questions and shall share some of them forthwith.

A short note from N4AN, whose signature is as illegible as mine, regarding the February, 1983, column and various types of encoded RTTY. He states, "There is some stuff on the air that *no one* will copy except the people it is intended for." I agree. But isn't it fun trying to decipher such undecipherables? At least, in a strange sort of way.

Regards to Bernard P. Ginsberg, M.D. KC6P (ex-WA3WNA), a physician in family practice and gynecology out in Santa Monica. Bernie was a familiar voice on the Baltimore Amateur Radio Club repeater when he lived here in the Baltimore area, and I'm sure he is just as noisy in Los Angeles. Bernie is working on interfacing his Sinclair ZX-81 (AKA Timex 1000) to RTTY. I keep asking, Bernie, but have heard nothing. Will keep the gang posted when I know something.

The 6800 crowd continues to be heard from. You know, I read in most of the computer magazines that the eight-bit processors are dead, especially the 6800. I don't know. Mine is still going strong and judging from the mailbag, so are many of yours. John H. Davison W0ZFN runs his 6800 in a Motorola D1 evaluation board. His homemade systrem runs fine, and he is trying to get his system up on RTTY. Hopefully, some of the stuff printed here will help.

T. Nick Hulbert KG5N of Lubbock, Texas, is another 6800 owner still with us. His SWTP 6800 is waiting for the conclusion of that RTTY program we talked about a while back. It may take a while, and it may be presented for more than one system at one time, but it will be here; just hang in there.

Ditto to Colonel B. J. Smith (USAF-Ret.) W5RYW. The colonel, who signs himself "B. J." (shades of M★A★S★H), is another SWTP 6800 owner trying to interface his computer to his amateur station.

Somewhat more adventurous is Harold B. Blethen WB1HBD. Harold is looking for a dedicated microprocessor to build into a RTTY system, using the James keyboard as an input device. Well, I reviewed the James keyboard in this column many months ago, and except for the fact that it cannot generate two of the ASCII control characters and that the CAPS LOCK key affects many of the symbol keys strangely, this is a good keyboard. In fact, I am typing this column on one, right now.

Another item mentioned here before, the Kilobaud Klassroom single-board computer, may well serve as the heart of your project. This small 6800-based computer is available from Star Kits, PO Box 209, Mt. Kisco NY 10549. Pete Stark K2OAW, the proprietor up there, produces quite a few items of interest for the 6800 crowd, several of which I have yet to see but would like to. Tell him "RTTY Loop" sent you! You're also going to need some kind of video display. My favorite is the GIMIX board, but there are several around these days. Look around, and good luck.

Interfacing computers with radios is always fun, and each camp has its advocates. Another 6800 user, Peter Bennett VE7CEI, passes along his favorite circuit. Peter uses this to interface a 60-mA loop to a TS-820 FSK input, and he also has a suggestion for a transistor-output switching to ground. Fig. 1 shows Peter's two ideas.

Rob Lawson WB4BSZ in Pensacola, Florida, mentions that he has a Color Computer (TRS-80C*) and has been trying to get it onto RTTY. One of Rob's hopes is to use the TRS-80 graphics on the air for some "creative RTTY." You know, this is one area about which little has been written, and now that ASCII is legal over the air, I expect more will show up. I can visualize an adventure-type game which would use back-and-forth transmissions to move through a game. This should be easier than a real-time game like Pac-Man™ or such.

John F. Deane KA1FL from Hanover, Massachusetts, is another Color Computer user. He casts his vote for chip-of-the-year for the 6809. His reasons for the 6809, housed in the CoCo system, include the opinions that the 6809 is a versatile chip, and that the CoCo is an inexpensive, "almost RFI-free" computer with a good keyboard. At least there are real keys! He mentions the built-in interfaces for the RS232C and SS-50 buses, and that the family can use it when the ham is not. Sounds like some convincing arguments for using this system. Along with some of the RTTY interfaces we have mentioned here over the past few months, I think this may well make a fine entry into computerized RTTY.

Another CoCo devotee is Joe Ryan WB5LLM of Florence, Mississippi, who passes along information on his RTTY setup. Joe indicates that his "low-cost" station includes a TRS-80C reading RTTY off an old CV-89A demodulator. This is a tube-type boat anchor of the same vintage as an old Northern unit I once had. He has copied all kinds of RTTY with this setup, using an optoisolator to connect the demodulator to the computer. Well, there's always a way.

Not to be left out, there are users of non-68xx systems who like to get their two cents in now and then. Charles W. Hoppesch KD4JG of Merritt Island, Florida, is one of them. He has been trying to get his TRS-80 Model III up on RTTY. Again, there are several interfaces available with different features for different money. Several have been discussed here in the past few months; drop their makers a line. I am sure that they will be able to provide literature to help you compare. Let me know how things work out.

Bob Workman WA4ZZN, Atlantic Beach, North Carolina, is trying to get onto RTTY with an old Teletype® Model 15 and a Northern Radio Convertor Type 152, Model 2.

* TRS-80C is a registered trademark of Tandy Corporation.

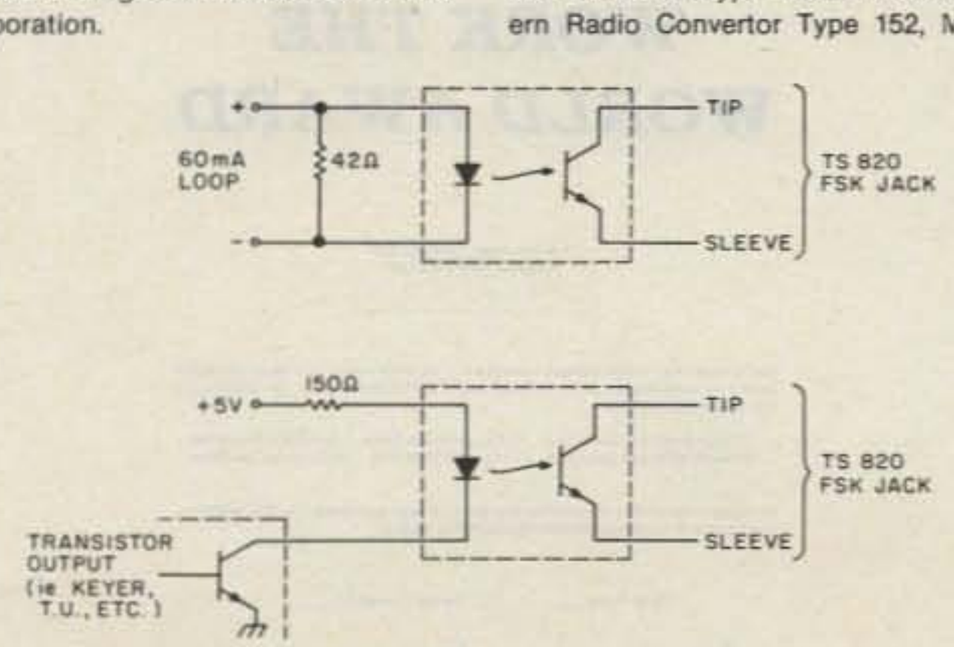


Fig. 1. Optoisolation, VE7CEI style.

This brings back memories of that same old Northern type 107 mentioned above. It was a boat anchor, but it copied RTTY "real good." Bob relates that the filters for mark and space are missing, and he wants to try to substitute for them. My presumption is that you will be able to use mark and space filters similar to the ones used in so many home-brew RTTY systems. For 170-Hz shift RTTY, it really does not matter what two frequencies you use as long as they are separated by 170 Hz. But just for the sake of compatibility, let's use the "standard" tone pair of 2125-Hz mark and 2295-Hz space.

All you need to do to put such a filter together is parallel a coil, typically an 88-mH toroid that can be purchased from many mail-order suppliers, and a capacitor of the appropriate value to resonate at the desired frequency. For 2125 Hz, this is nominally 0.068 uF, and for 2295 Hz, 0.056 uF *plus* a tad. These values are starting ones. Add capacitance a little at a time until the combination resonates at the desired frequency. Use the setup in Fig. 2 to view the moment desired.

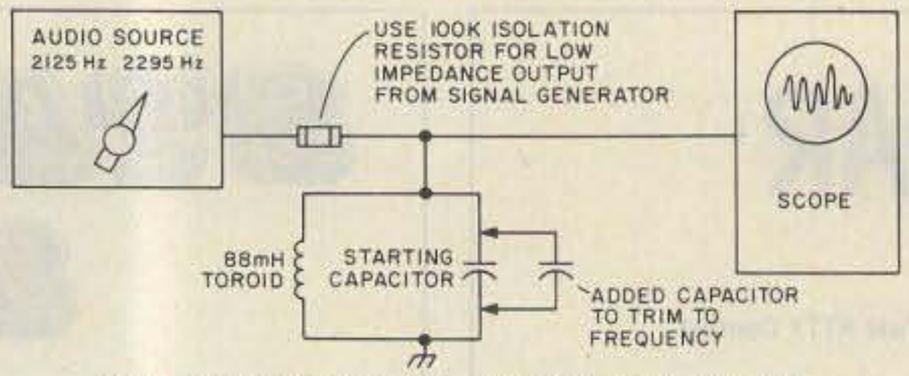


Fig. 2. Tuning a toroid filter.

RTTY Books

Back in the mid-1960s, when I got my first RTTY station on the air, I went to my mentor, Ted Fisher W3EOV, for guidance. After discussing the whys and wherefores of RTTY, Ted copied down a list of numbers and pressed them into my trembling hands. I don't remember how many of those numbers, frequencies in the HF spectrum, panned out, but that was the first list of non-ham RTTY frequencies I ever saw.

From that list, culled by one individual's listening, we have come quite a way: This month, the mail brought several new RTTY frequency books, from two sources we have mentioned before.

The first offering is from Oliver P. Ferrell, whose second edition *Guide to RTTY Frequencies* is being published by Gilfer Associates, Inc. This book, just short of 200 pages, is a storehouse of information about quite a variety of RTTY signals. It begins with a brief but accurate introduction to RTTY, with some general information about various forms of RTTY. There are some pointed remarks which the author terms "Putting Newscasts In Perspective" which I think are worth paraphrasing here.

The RTTY listener looking to latch onto the "hot" news wire can expect that less than ten percent of all RTTY newscasts will be in English and can be copied in North America. Stations transmitting RTTY are not bound by published frequency lists; they can—and do—change frequencies every few months, and newscasts are not sent continuously—that mark signal you tune across now may be sending what you were looking for fifteen minutes or fifteen hours ago.

After these explanations (either cream or fat depending on your point of view) comes a list of over 5000 signals, listed in frequency order. For each listing, information supplied included frequency in kHz, callsign if available, location if known, service (fixed, aeronautical, etc.), mode (shift, speed, orientation), power, and special remarks, Listings are included from 4 to 28 MHz and feature all kinds of transmissions, from press to embassy to weather to traffic.

Following the frequency list is a reverse list ordered by callsign. So, if you hear a call, you can look it up and get the same kind of information as if you looked up the frequency alone. Unfortunately, my review copy was missing one set of pages—the one that ended the frequency list and began the callsign list— so I cannot tell you whether or not the stations that have no call in the frequency list are represented in the callsign list, and if so, how. If I remember, and ever find out, I will let you all know.

A list of Z-codes follows the frequency lists. The Z-codes are the military equivalent of Q-signals and should be familiar to all of you who have ever checked into a MARS net. How well I remember the days of sending ZKE QRU, which roughly translates as "checking into the net (ZKE) with no traffic (QRU)." If you monitor military stations, this list can render what might seem like a meaningless string of three-letter codes into a meaningful string of statements.

After all these listings, an article is included called "Getting to Know Cyrillic." This is an overview of RTTY used by Soviet stations, which employ the Cyrillic alphabet of the Russian language. The basic information presented includes the second- and third-register Cyrillic systems. Unfortunately, I don't think there is enough there to really enable you to make much of what you will receive should you tune in such a station, but it makes for good reading.

Finally, a list of abbreviations used in the listings clarifies any remaining questions you might have about what the book says. All in all, this is a rather complete text. It sells for $9.95 and is available from Gilfer Associates, Inc., PO Box 239, 52 Park Avenue, Park Ridge NJ 07656.

In past columns, we have covered several of the publications from another source, Universal Electronics, Inc., and now we have two more which are described in this issue of *73* under "New Products." Be sure to check them out. See you next month in "RTTY Loop."

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

It is hard to believe the years which have passed since our initial announcement of the famous *73* Awards Portfolio. During this period, we've seen the program grow significantly to become one of the most sought-after challenges facing amateurs today.

Consisting of five domestic incentives and six DX achievement programs, the awards portfolio has captured the interest of almost everyone on the bands, whether a rag-chewer or a big-time contester.

In the paragraphs to follow, I am listing the awards individually. Read through the rules with caution. The requirements are not as easy as one might first imagine. We want our award recipients to realize they had to earn their recognition, and therefore have designed each award to be somewhat of a challenge. Here are the six DX awards.

WORK THE WORLD DX AWARD

To enhance the enjoyment of working DX, the editors of *73* take special pleasure in introducing the most complex and probably the most sought-after award in existence today—the green and black Work the World DX Award.

1. The WTW Award is available to licensed amateurs the world over.

2. To be valid, all contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but applicants will be given recognition for single-band or -mode achievements upon their request. Only DX countries shown on the WTW DX Listing qualify.

3. The Work the World program consists of six continental awards (North American, South American, European, Oceanic, Asian, and African), each of which is a worthy accomplishment on its own. Once application has been made for all six, the ultimate award, the Worked the World DX Award, will be issued automatically without charge. The operator who earns WTW recognition has truly "worked the world."

4. Requirements for the individual continental awards: North American Award—work 13 North American countries; South American Award—work 12 South American countries; European Award—work 12 European countries; Oceanic Award—work 12 Oceanic countries; Asian Award—work 12 Asian countries; African Award—work 12 African countries.

5. To apply for any of these awards, prepare a list of claimed contacts for each continent, listing all callsigns in prefix order. Include date and time in GMT, and the band and mode of operation.

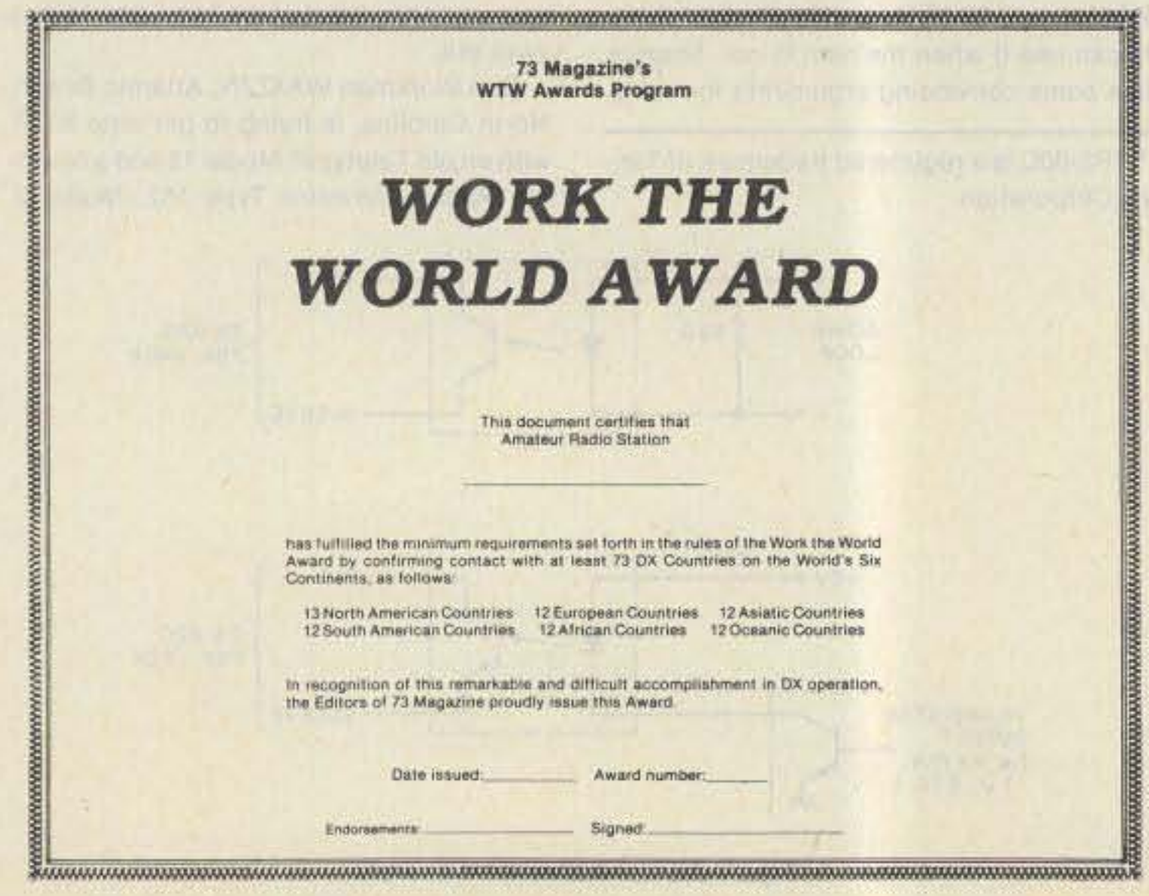
6. If you are submitting the sixth award application, please emphasize this fact to speed processing of your WTW Award.

7. Do not send QSL cards! Have your list(s) verified by two amateurs, a radio club secretary, or by a notary public.

8. Each continental award has an award fee of $4.00 or 20 IRCs.

DX COUNTRY CLUB AWARD

1. Sponsored by the editors of *73*, the *73* DX Country Club Award is available to licensed amateurs throughout the world.


73 Magazine's
WTW Awards Program

WORK THE WORLD AWARD

This document certifies that
Amateur Radio Station

_____

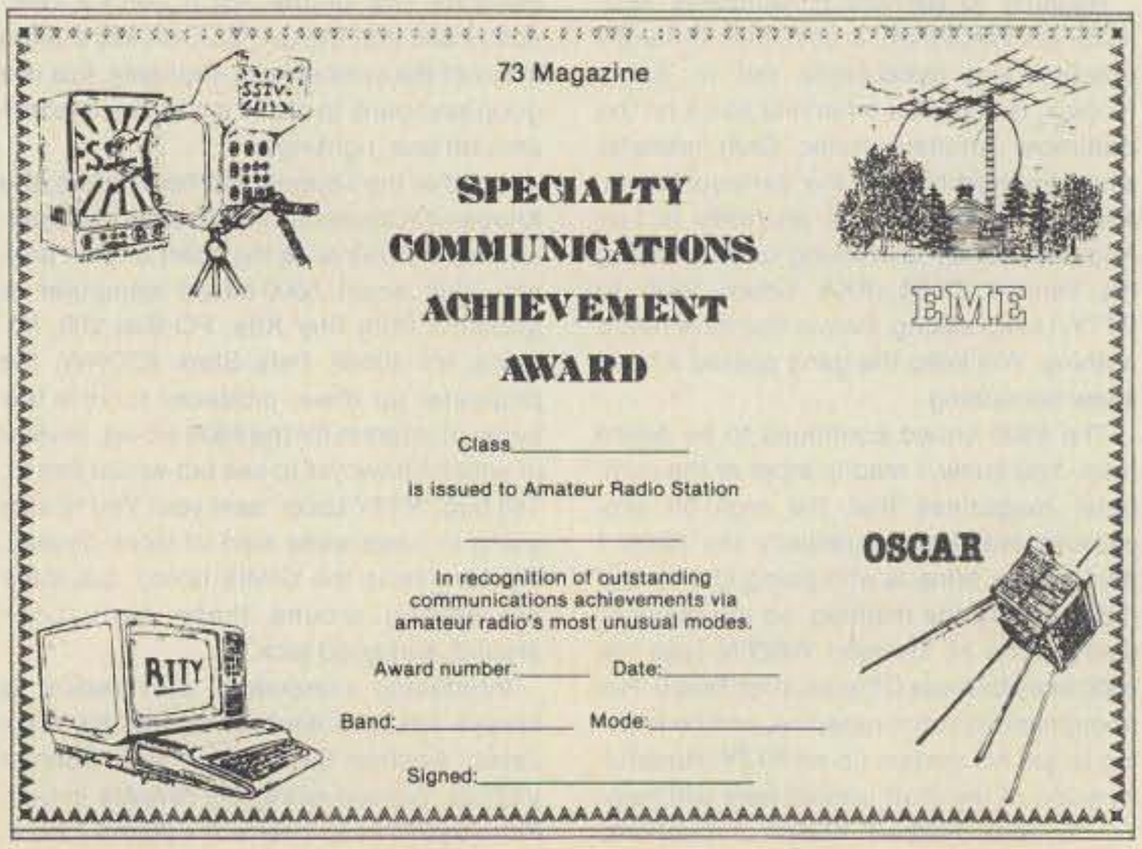
has fulfilled the minimum requirements set forth in the rules of the Work the World Award by confirming contact with at least 73 DX Countries on the World's Six Continents, as follows:

13 North American Countries 12 European Countries 12 Asiatic Countries
12 South American Countries 12 African Countries 12 Oceanic Countries

In recognition of this remarkable and difficult accomplishment in DX operation, the Editors of 73 Magazine proudly issue this Award.

Date issued:_____ Award number:_____

Endorsements:_____ Signed:_____



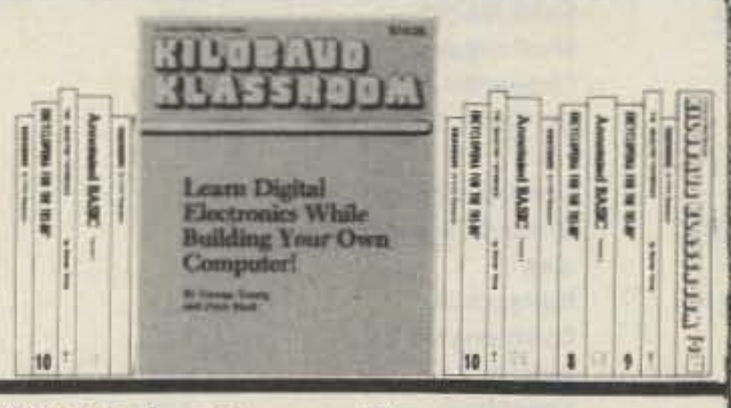
WAYNE GREEN BOOKS

KILOBAUD KLASSROOM

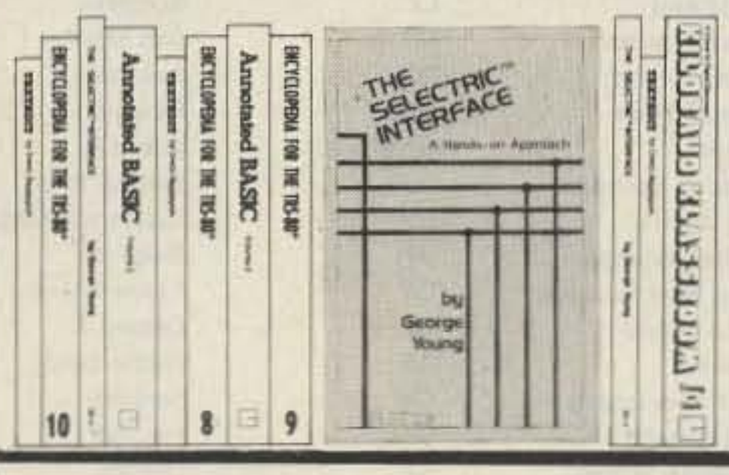
by George Young and Peter Stark

Makes learning electronics fun and easy. First published as a series in *Kilobaud Microcomputing*, the book combines the learning of essential theory with practical, hands-on experience. The course begins with basic electronic projects and culminates in the construction of your own programmable microcomputer. The direct instructional methods of authors Young & Stark make KILOBAUD KLASSROOM a simple way for you to acquire a solid background in digital electronics.

BK7386 (419 pages).....$14.95



THE SELECTRIC INTERFACE by George Young



You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. The SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. The SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With The SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

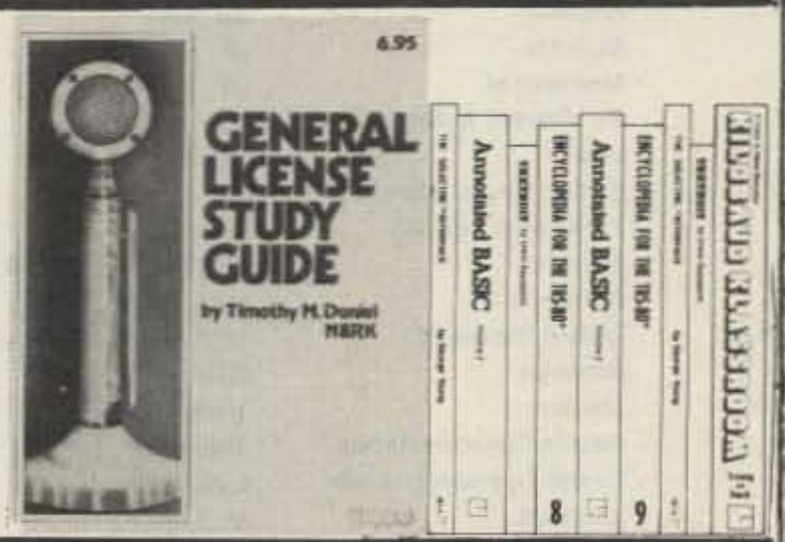
BK7388 (125 pages).....$12.97

GENERAL LICENSE STUDY GUIDE

By Timothy M. Daniel N8RK

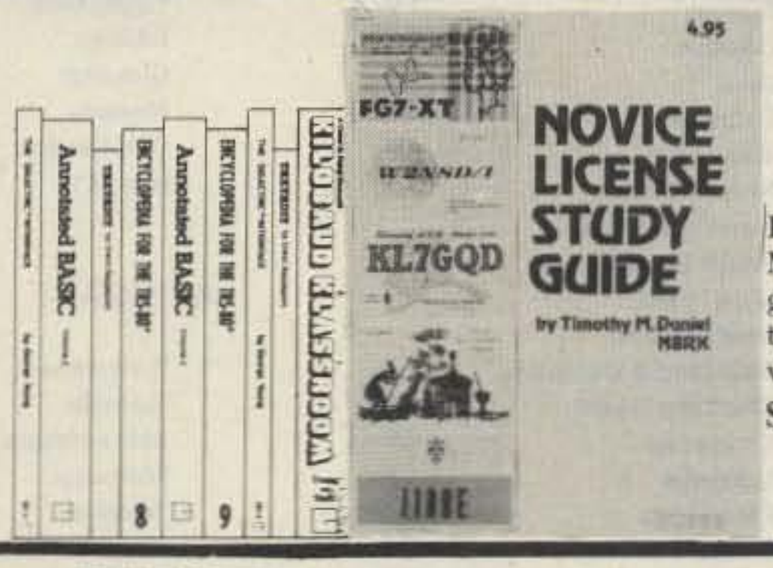
This is the complete guide to the General License. Learning rather than memorizing is the secret. This is not a question-and-answer guide that will gather dust when the FCC issues a new test. Instead, this book will be a helpful reference, useful long after a ham upgrades to General. Includes up-to-date FCC rules and an application form. Order yours today and talk to the world.

SG7358 (87 pages).....$6.95



NOVICE LICENSE STUDY GUIDE

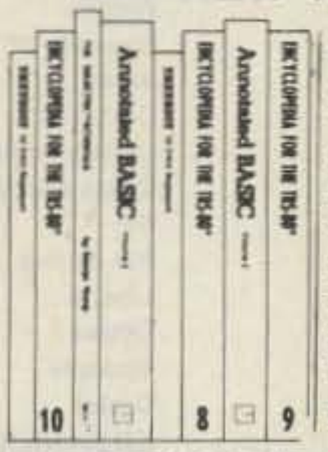
By Timothy M. Daniel N8RK



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 emphasizes 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.

SG7357 (98 pages).....$4.95

THE NEW WEATHER SATELLITE HANDBOOK by Dr. Ralph E. Taggart WB8DQT



Here is the completely updated and revised edition of the best-selling *Weather Satellite Handbook*—containing all the information on the most sophisticated and effective spacecraft now in orbit. Dr. Taggart has written this book to serve both the experienced amateur satellite enthusiast and the newcomer. The book is an introduction to satellite watching, providing all the information required to construct a complete and highly effective ground station. Not just ideas, but solid hardware designs and all the instruction necessary to operate the equipment are included. For the thousands of experimenters who are operating stations, the book details all procedures necessary to modify their 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.

BK7383 (132 pages).....$8.95

FOR TOLL-FREE ORDERING CALL 1-800-258-5473
WAYNE GREEN BOOKS•PETERBOROUGH NH 03458

Itemize your order on a separate piece of paper and mail to Wayne Green Books, Att: Sales, Peterborough, NH 03458. Be sure to include check or detailed credit card information. (Visa, MC or AMEX accepted.) No C.O.D. orders accepted. All orders add $1.50 for the first book, postage and handling; $1.00 each additional book; $10.00 per book foreign air mail. Please allow 4–6 weeks after publication for delivery. Questions regarding your order? Please write to Customer Service at the above address.

WORK THE WORLD DX LISTING

NORTH AMERICA

C6	Bahamas
CO	Cuba
FG	Guadeloupe
FG, FS	Saint Martin
FM	Martinique
FO	Clipperton Is.
FP	St. Pierre & Miquelon
HH	Haiti
HI	Dominican Republic
J3, VP2G	Grenada & dependencies
KC4, KP1	Navassa Is.
KG4	Guantanamo Bay
KL7	Alaska
KP4	Desecheo
KP4	Puerto Rico
KS4, KP3, HK0	Serrana Bank and Roncador Cay
KV, KP2	Virgin Islands
OX, XP	Greenland
PJ6, 8	Saba Is.
VE	Canada
VE1	Sable Is.
VE1	St. Paul Is.
VO	Newfoundland, Labrador
VP2A	Antigua, Barbuda
VP2D	Dominica
VP2E	Anguilla
VP2K	St. Kitts
VP2L	Montserrat
VP2S	St. Vincent & dependencies
VP2V	British Virgin Islands
VP5	Turks and Caicos Islands
VP9	Bermuda
W, K, N, A	United States of America
XE	Mexico
XF4	Revilla Gigedo Islands
ZF	Grand Cayman Islands
6Y	Jamaica
4U	HQ, United Nations
8P	Barbados

SOUTH AMERICA

CE	Chile
CE0A	Easter Is.
CE0X	San Felix
CE0Z	Juan Fernandez
CP	Bolivia
CX	Uruguay
FY	French Guiana
HC	Ecuador
HC8	Galapagos Is.
HK	Colombia
HK0	Bajo Nuevo
HK0	Malpelo Is.
HK0	San Andres & Providencia
HP	Panama
HR	Honduras
HR0	Swan Is.
KZ	Canal Zone
LU	Argentina
OA	Peru
PJ	Netherlands Antilles
PY	Brazil
PY0	Fernando de Noronha
PY0	St. Peter & St. Paul
PY0	Trindade & Martim Vaz Is.
PZ	Surinam
TG	Guatemala
TI	Costa Rica
TI9	Cocos Is.
VP1	Belize
VP8	Falkland Is.
VP8, LU	South Georgia Is.
VP8, LU	South Orkney Is.
VP8, LU	South Sandwich Is.
VP8, LU	South Shetland Is.
VP8W	South Grahamland
YN	Nicaragua
YS	Salvador
YV	Venezuela
YV0	Aves Is.
ZP	Paraguay
8R	Guyana
9Y	Trinidad and Tobago

ASIA

A4X	Oman Is.
A5	Bhutan
A6X	United Arab Emirates
A7X	Qatar
A9X	Bahrain
AP	Pakistan
BV	Taiwan
BY	China
CR9	Macao
EP	Iran
HL, HM	North Korea
HL, HM	South Korea
HS	Thailand
HZ, 7Z	Saudi Arabia
JA-JR	Japan
JR6, KA6	Okinawa (Ryukyu Is.)
JD, KA1	Ogasawara
JT	Mongolia
JY	Jordan
KA	US Military in Japan
OD	Lebanon
S2	Bangladesh
TA	Turkey
UA, UK, UV, UW9-0	Asiatic RSFSR
UD6, UK6C, D, K	Azerbaidzhan
UF6, UK6F, O, Q, V	Georgia
UG6, UK6G	Armenia
UH8, UK8H	Turkmen
UI8, UK8I	Uzbek
UJ8, UK8J, R	Tadzhik
UL7, UK7	Kazakh
UM8, UK8M, N	Kirghiz
VS6	Hong Kong
VS9K	Kamaran Is.
VU	India
VU7	Andaman & Nicobar
VU7	Laccadives
XU	Khmer Republic
XV	Vietnam
XW	Laos People's Dem. Republic
XZ	Burma
YA	Afghanistan
YI	Iraq
YK	Syria
1S	Spratly
4S	Sri Lanka
4W	Yemen
4X, 4Z	Israel
5B4, ZC	Cyprus
7O	People's Dem. Repub-lic of Yemen
8Z4	Neutral Zone
	Saudi Arabia/Iraq
9H	Malta
9H4	Gozo & Comino
9K	Kuwait
9M2	West Malaysia
9M6	North Borneo
9M8	Sarawak
9N	Nepal
9V	Singapore, Abu Ail, Jabal Attair

OCEANIA

A3	Tonga Republic
CR8	Portuguese Timor
C2	Republic of Nauru
DU	Philippines
FK	New Caledonia
FO	French Polynesia
FW	Wallis & Fortuna Islands
H4, VR4	Solomon Islands
JD, KA1	Minami Torishima
JD, 7J1	Okino Torishima
KB, KH1	Baker, Howland, American Phoenix
KC6	Eastern Carolines
KC6	Western Carolines
KG6, KH2	Guam Island
KG6R	Rota
KG6S	Saipan
KG6T	Tinian
KH6	Hawaiian Islands
KH7	Kure Island
KJ, KH3	Johnston Island
KM, KH4	Midway Island
KP6, KH5K	Kingman Reef
KP6, KH5	Palmyra
KS6, KH8	American Samoa
KW, KH9	Wake Island
KX	Marshall Islands
P2	Papua New Guinea
T2, VR8	Tuvalu Island
VK	Australia
VK	Lord Howe Island
VK9	Willis Island
VK9	Christmas Island
VK9	Cocos (Keeling) Island
VK9	Mellish Reef
VK9	Norfolk Island
VK0	Macquarie Island
VR1	British Phoenix Islands
VR1	Gilbert Island
VR1	Ocean Island
VR3	Christmas Island
VR6	Pitcairn Island, Line Is-land, South and Central
VR8	(see T2)
VS5	Brunnei
YB, YC, YD	Borneo
YB, YC, YD	Celebes
YB, YC, YD	Java
YB, YC, YD	Sumatra
YB, YC, YD	West Irian
YJ	New Hebrides
ZK1	North Cook Island
ZK1	South Cook Island
ZK2	Niue Island
ZL	New Zealand
ZL	Auckland & Campbell
ZL	Chatham Island
ZL	Kermadec
ZM7	Tokelaus
3D2	Fiji Islands
5W	Western Samoa

EUROPE

C3	Andorra
CT	Portugal
CT2	Azores
DA-DL	Federal Republic of Germany
DM, DT	German Democratic Republic
EA	Spain
EA6	Balearic Islands
EI	Republic of Ireland
EJ0	Aran Is.
F	France
FC	Corsica
G	England
GD	Isle of Man
GI	Northern Ireland
GJ, GC	Jersey
GM	Scotland
GM	Orkney Islands
GM	Shetland Islands
GU, GC	Guernsey
GW	Wales
HA	Hungary
HB	Switzerland
HB0	Liechtenstein
HV	Vatican
I	Italy
IC	Ischia
IA	Tuscan Archipelago
IS	Sardinia
IT	Sicily
JW	Bear Is.
JW	Svalbard Is.
JX	Jan Mayen
LA	Norway
LX	Luxembourg
LZ	Bulgaria
M1	San Marino
OE	Austria
OH	Finland
OH0	Aland Is.
OJ0	Market Reef
OK	Czechoslovakia
ON	Belgium
OY	Faroe Islands
OZ	Denmark
PA	Netherlands
SM	Sweden
SP	Poland
SV	Greece
SV	Crete
SV	Dodecanese
SV	Mount Athos
TF	Iceland
UA, UK1, 3, 4, 6	European RSFSR
UA1, UK1	Franz Josef Land
UA2, UK2F	Kaliningradsk
UB, UK, UT, UYS	Ukraine
UC2, UK2	White RSFSR
UO5, UK5O	Moldavia
UP2, UK2B, P	Lithuania
UQ2, UK2G, Q	Latvia
UR2, UK2R, T	Estonia
YO	Romania
YU	Yugoslavia
ZA	Albania
ZB	Gibraltar
3A	Monaco
4U	ITU, Geneva
9A	(see M1)

AFRICA

A2	Botswana
C5	Gambia
C9	Mozambique
CN	Morocco
CN2	Tangier
CR3	Guinea Bissau
CT3	Madeira Is.
D2, 3	Angola
D4	Republic of Cape Verde
D6	Comoros
EA8	Canary Islands
EA9	Ceuta and Melilla
EA9	Ifni
EA9	Rio de Oro
EL	Liberia
ET2	Eritrea
ET3	Ethiopia
FB8W	Crozet
FB8X	Kerguelen Is.
FB8Z	Amsterdam & St. Paul
FH	Mayotte
FR	Glorioso Island
FR	Juan de Nova, Europa
FR	Reunion
FR	Tromelin
H5	Bophuthatswana
IG	Lampedusa Island
IH	Pantelleria Island
J2, FL8	Djibouti
S7	Seychelles

DX COUNTRY CLUB

73 Awards Program

Number_____
This certifies that Amateur Radio Station

_____

Has submitted evidence of confirmed contact via Amateur Radio with at least 73 DX Countries in one calendar year.
This station is hereby recognized as a bona fide member of the 73 DX Country Club as a result of this operating achievement.

Signed:_____ Date issued:_____

Band:_____ Mode:_____

Annual Endorsements

73 Magazine
Awards Program

DX CAPITALS OF THE WORLD AWARD

Presented to Amateur Radio Station

_____

In recognition of confirmed contact with the Capital Cities of 50 DX Countries

Award#_____ Date:_____

Endorsements:_____

Signed:_____

2. To be valid, all contacts claimed must be made in a single calendar year (January 1 through December 31), beginning January 1, 1979.

3. This red and maroon award is issued for all phone, all CW, and mixed modes. Should you wish to recognize a single-band or mixed-band accomplishment, merely state your request when submitting your application.

4. To qualify for any of the *73* DX Country Club Awards, a minimum of 73 DX countries must be worked and confirmed from the *73* WTW (Work the World) DX Listing which appears elsewhere in this column. Once again, all contacts must be made in the same calendar year for which application is made.

5. Annual endorsement stickers are available for each succeeding year in which application is made and which shows a minimum of 73 countries worked.

6. To apply, prepare a list of claimed contacts in prefix order. Include each station's callsign, date and time in GMT, mode, and band of operation.

7. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local club secretary, or by a notary public.

8. Award fee is $4.00 or 20 IRCs for each award. Endorsements are granted for a fee of $2.00 or 10 IRCs.

9. For all *73* award applications: Enclose your verified list and award fee(s) to: Bill Gosney KE7C, *73* Awards Editor, 2665 North Busby Road, Oak Harbor, Whidbey Island WA 98277, USA.

SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD CLASS A

A significant number of amateurs throughout the world find their primary interest in the operation and development of specialty-type communications. It is the efforts of these many pioneers in their respective fields which have created many state-of-the-art improvements in technology today. The editors of *73* wish to recognize those amateurs who make positive steps toward expanding the use of their respective mode or type of amateur operation. As a result, in the paragraphs to follow, learn of our latest communications award, dedicated to "communicator specialists." Both Specialty Awards are green and black.

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

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

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

Do not send QSL cards! Have your list verified by two amateurs, a local radio club, or a notary public. Enclose with your application a $4.00 award fee or 20 IRCs.

SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD CLASS A-1

1. Sponsored by the editors of *73*, this award is dedicated to amateurs worldwide who take pride in active participation in the field of specialty communications.

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

3. To qualilfy, applicants must work a minimum of 10 DX countries from the WTW DX Listing. Special recognition will be made for those exceeding the 10-country minimum.

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

5. Do not send QSL cards! Have your list verified by two amateurs, a local club secretary, or a notary public.

6. The award fee is $4.00 or 20 IRCs.

DX CAPITALS OF THE WORLD AWARD

1. Sponsored by the editors of *73*, the blue and black DX Capitals of the World Award is made available to licensed amateurs the world over.

2. To be valid, all claimed contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but special recognition will be given for single-band or -mode accomplishments if requested in the application.

3. To qualify, applicants must work and

DX Decade Award

Whereas: Continued activity on all amateur bands is vital to the preservation of those bands for amateur use; and

Whereas: It is particularly desirable to encourage utilization of the 10 Meter Band; and

Whereas: The applicant has demonstrated the ability to communicate on the 10 Meter Band using channelized AM equipment;

73 Magazine hereby presents this award to station

_____

in recognition of communication with at least 10 foreign countries.

Date:_____ signed:_____
Wayne Green

Certificate #_____

confirm 50 different capital cities of the world. Only capitals of those countries which appear on the WTW DX Listing qualify. Should a country be contacted and its capital city not commnly known, you may list it on your application and the awards editor reserves the right to make a final determination as to its acceptance for award credit.

4. To apply, make a list of contacts made in prefix order. Indicate the station callsign, date and time in GMT, band and mode of operation, name of the capital city, and the DX country.

5. Do not send QSL cards! Have your list of contacts verified by two amateurs, a radio club secretary, or a notary public. The award fee is $4.00 or 20 IRCs.

TEN-METER DX DECADE AWARD

1. Sponsored by the editors of *73*, the black-on-blue Ten-Meter DX Decade Award is available to licensed amateurs worldwide.

2. All contacts must be made on the 10-meter band using only channelized converted Citizen-Band equipment or similar-type commercial units operating a maximum of 15 Watts PEP output. External amplifiers may not be used.

3. To be eligible for this award, all contacts must be made on or after October 1, 1978. Contacts may be claimed for all AM, SSB, CW, or FM. Mixed-mode accomplishments are not valid for this award.

4. To qualify, the applicant must work and confirm at least ten DX countries from the WTW (Work the World) Listing. Endorsements will be given for 25, 50, 75, and 100 countries confirmed.

5. To apply, make a list of contacts claimed, giving the callsign of each station worked in prefix order. Include the date and time in GMT, band, mode, and a brief description of the equipment used in making each contact. Special recognition will be given for QRP mobile achievements.

6. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public. The award fee is $4.00 or 20 IRCs.

******

Now here are the five domestic awards, also being sought after by award seekers the world over. These awards were not meant to be an overnight venture nor were they designed to duplicate any in existence today. Each offers its own degree of difficulty and creates a sense of accomplishment in those who are happy recipients.

WORKED ALL USA AWARD

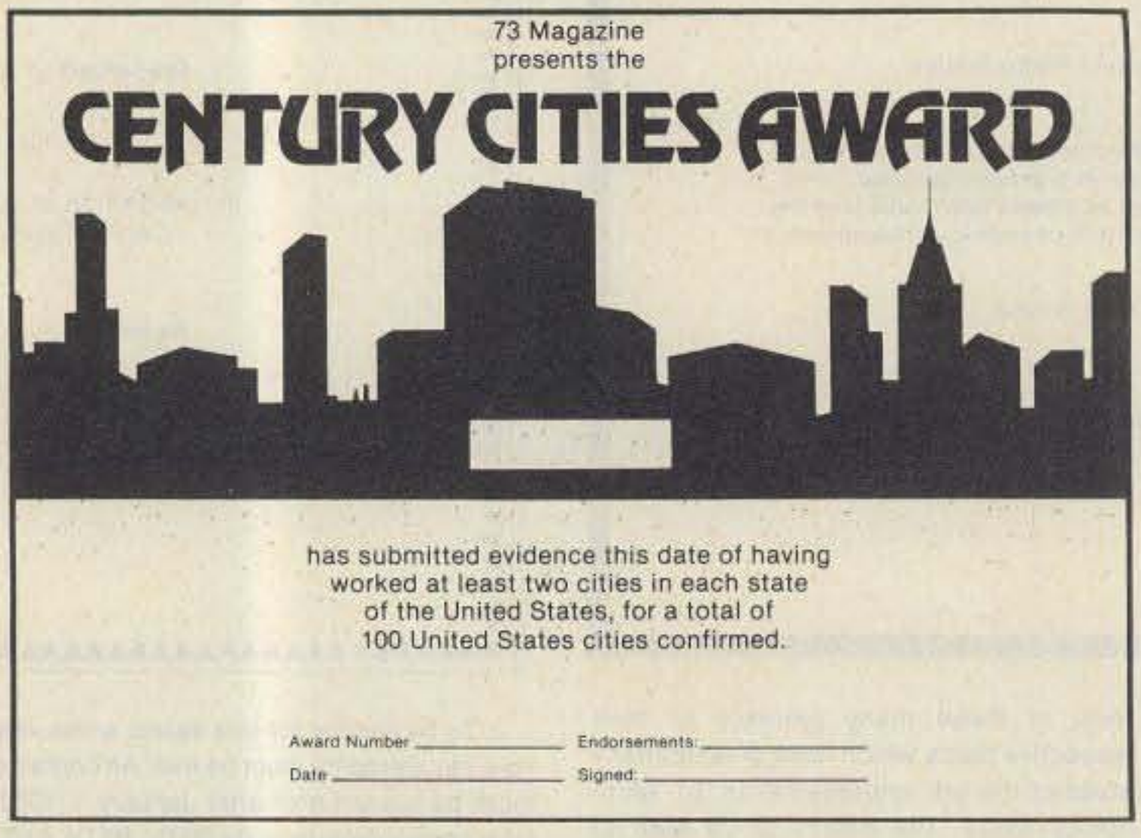
Sponsored by the editors of *73*, the black and maroon Worked All USA Award is available to licensed amateurs throughout the world. To be valid, all contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but single-band and single-mode accomplishments will be recognized.

If you're looking for an award with challenge, this definitely is one. To qualify, applicants must work each of the 50 US states within the same calendar year (January 1 through December 31). Annual endorsements will be awarded applicants who can verify their claim.

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

Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public.

The fee for the basic award is $4.00 or 20 IRCs; endorsements are $2.00 or 10 IRCs.



The Worked All USA Award, with its 12-month limitation, separates the men from the boys. To date, only a few have mastered the 80-meter band, while 10, 15, and 20 have been more popular. Only a few aplicants have mastered all states on 6 meters, and 160 meters has been conquered only once. Does your station have what it takes to Work All USA in a calendar year?

CENTURY CITIES AWARD

Designed as a Dual-Worked-All-USA effort, the editors present this maroon and black Century Cities Award to the most demanding of amateur operators. The applicant who applies for this achievement realizes he has accomplished what is probably the greatest feat available in award programs today.

As with all *73*-sponsored awards (with the exception of the ten-meter incentives), all contacts must be made on or after January 1, 1979, to be valid.

To qualify, the applicant must work and confirm a minimum of two cities or towns in each of the fifty US states, for a total of 100.

To apply, prepare a list of claimed contacts in alphabetical order, by state. As shown below, include the full callsign of the station worked, the date, the band, and the city. Beginning with Alabama, your list will look something like the following: Alabama—W4ZZZ, March 31, 1979, 14 MHz, Decatur; N4XXY, February 1, 1979, 21 MHz, Mobile; Alaska—KL7AB, January 22, 1979, 7 MHz, Anchorage, May 19, 28 MHz, Fairbanks; and so on.

Do not send QSL cards! Have your list of claimed contacts verified by two amateurs, a radio club secretary, or by a notary public. Enclose this list along with your award fee of $4.00 or 20 IRCs.

TEN-METER 10-40 AWARD

What would an awards program be like without a QRP incentive? With 10 meters at an all-time high, the editors of *73* take pride in announcing the Ten-Meter 10-40 Award. Printed in black on blue, and designed specifically for owners of converted Citizens-Band equipment, the 10-40 Award is probably the roughest worked-all-states award program in existence. Ask those who have tried numerous times and failed!

Available to licensed amateurs the world over, the award offers a challenge second to none. To be valid, all contacts must be made on the ten-meter band using only "channelized" Citizens-Band equipment or similar commercial units. Power is limited to 15 Watts PEP output. External amplifiers are prohibited.

All contacts must be made on or after October 1, 1978, on SM, SSB, CW, or FM modes. Mixed-mode contacts NOT valid.

To qualify for this award, the applicant must work and confirm at least forty of the 50 US states. (An endorsement will be issued if all 50 states are worked.)

To apply, make a list of contacts in alphabetical order by US state beginning with Alabama. Include the call of the station worked, the date and time in GMT, the band and mode of operation, and a brief description of the equipment and antenna system utilized.

Do not send QSL cards! Have your list verified by two amateurs, a radio club secretary, or by a notary public. The award fee is $4.00 or 20 IRCs.

THE Q-5 AWARD OF EXCELLENCE

If you frequent the American Novice bands, you will be pleased to hear of an exclusive award for these bands. Sponsored by the editors of *73*, the black and maroon Q-5 Award of Excellence is available to amateurs worldwide who meet the requirements.

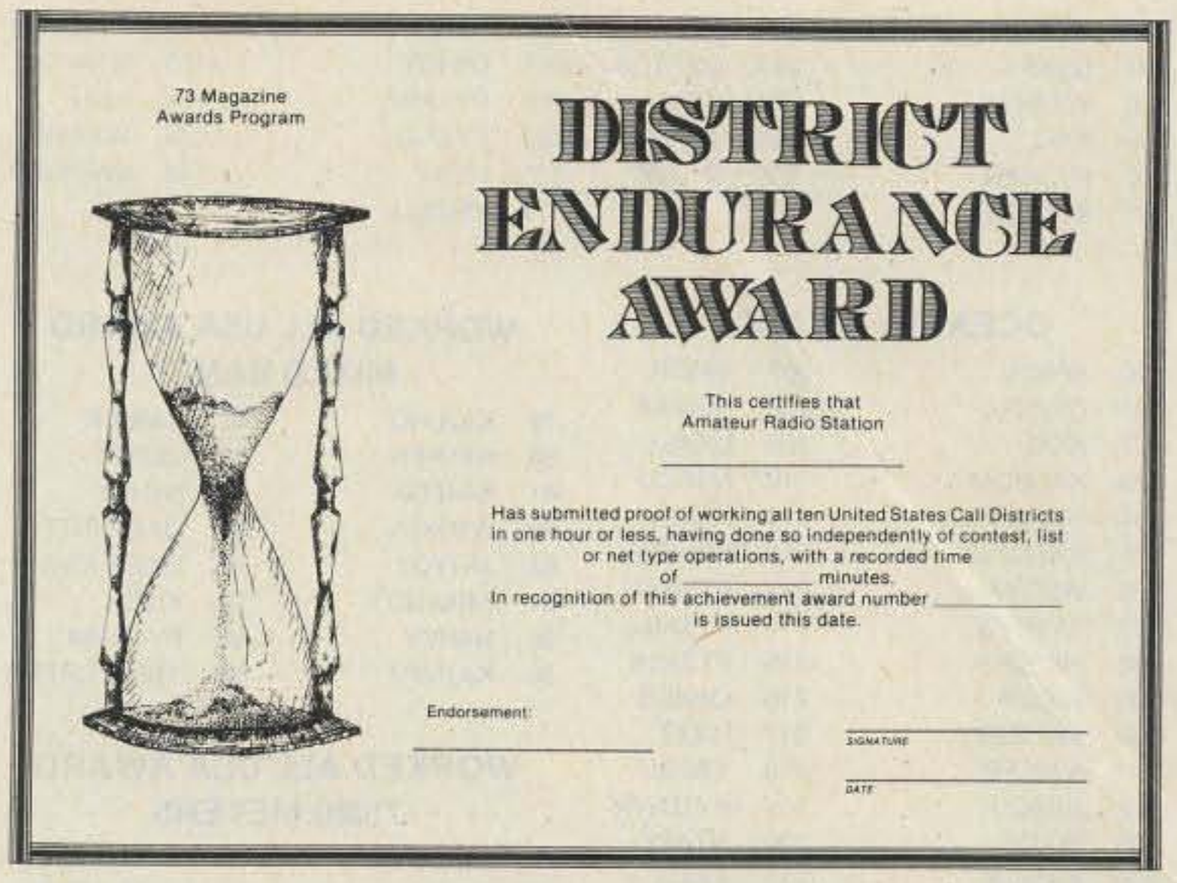
To be valid, all contacts must be made on or after January 1, 1979. All contacts must be made operating the CW mode on those frequencies assigned the American Novice. Applicants are cautioned that power limitations are 250 Watts input. There are no band restrictions, but applicants may request special band endorsement on the award if the request is made at the time of application.

To qualify, applicants must work all ten US call districts and receive no less than a Q-5 report. A valid RST might be 559, 539, 579, etc., while an RST of 449, 349, or 479 would not quaify.

This award is not meant to be an overnight accomplishment. Stations meeting the challenge of these requirements will be proud to display this unique award depiciting the excellence and superiority of the station's transmitted signal.

To apply, prepare a list of claimed contacts, logging each contact in order of the US call district. Include the station callsign, date and time in GMT, the frequency utilized, and, most important, the RST as noted on your confirmation card. Also required is a brief description of the station equipment and antenna system utilized to complete this award.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club



secretary, or a notary public. Enclose with your application the fee of $4.00 or 20 IRCs.

DISTRICT ENDURANCE AWARD

If any of you feel our awards are too soft for you, take a hard look at our next award! This one, in black and maroon, was designed to appear fairly simple at first glance, but it will drive you up the wall with frustration as it is pursued. It is known as the District Endurance Award. You'll need to find yourself an accurate timepiece, as you'll have exactly 60 minutes to work all 10 US call districts! Simple, huh? Best time so far—8 minutes!

Sponsored by the *73* editors, the District Endurance Award is offered to licensed amateurs throughout the world. To be valid, all contacts must be made on or after January 1, 1979. There will be no band or mode restrictions, but if you are fortunate enough to work these requirements on a single band, we will be happy to recognize this feat when processing your award.

One of the most important rules applicable to this award is that all contacts must be made independent of nets or any net-type operation and must not be made while any contest is under way.

To qualify, applicants must work all ten US call districts in one hour or less. The time will commence the moment the first contact is established and end with the time logged for the last district required.

To apply, applicants must prepare a signed declaration that all contacts were independent of net or contest operation. Applications must include a list of stations worked in callsign order by district, the date and time worked in GMT, the band and mode of operation, and the state.

Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public. Accompanying your application should be a $4.00 award fee or 20 IRCs.

*****

For applicants for the awards offered by *73*: I would like to give you some insight on how we process the paperwork. Upon receipt of an application, each award requirement is carefully scrutinized to see that the applicant has met each one to the letter. If approved, an award work sheet is prepared. The original copy of this and applicable award fee is mailed to Peterborough NH for the *73* art department to process. It is there that your award is given a personal touch and later mailed to your door. A copy of the award work sheet is mailed to the applicant to acknowledge receipt of the application. (Should the applicant feel it necessary to follow up, he or she should write a letter to the Assistant Publisher, *73*, Peterborough NH 03458. Writing directly to *73* headquarters will speed things up since the awards editor does not retain your paperwork once the request for issuance is mailed.)

We hope you enjoy the challenges of the *73* Awards Program and will share its rules with your amateur friends. While we hope you all will pursue the objectives these awards have to offer, we also hope you will send any information you might have on other award programs which have never appeared between the covers of this magazine. Looking through my files, I see where we have gone many, many months without duplicating information on a single award. Our files are getting bare, however, and it is the input of readers that keeps the image of this column original and creative. If your club has an award it sponsors, why not share it with our thousands of readers?

OHIO WINE WEEK

The Wireless Institute of Northern Ohio (WINO) will be on the air with a special-events station to commemorate Ohio Wine Week on Saturday, June 11, and again on Sunday, June 12. On Saturday evening we will be operating between 7 and 11 pm EDST (2300Z May 10 to 0300 May 11), on 3900 MHz and 7235 MHz. On Sunday afternoon we will be on between 11 am and 4 pm EDST (1500Z to 2000Z) on 7235 MHz and 21360 MHz. The station will be located at an actual winery in Madison, Ohio, using the call K@8O, and a special QSL certificate will be available from: Scott Farnham K@8O, 7126 Andover Drive, Mentor OH 44060, for a legal-sized SASE and an additional 40¢ (in postage or coin).

NAS MEMPHIS ARMED FORCES DAY

In recognition of the 34th annual Armed Forces Day celebration, amateur radio station W4ODR, located aboard Naval Air Station Memphis, Millington TN, will be operating on Saturday, May 21, from 1400Z to 2200Z. Plans call for operation on 7.230 (± 10 kHz), 14.280 (± 10 kHz), and 21.370 (± 10 kHz). The CW frequency will be 21.145. 146.52 will be the 2m frequency. It is hoped that operation will be continuous on all bands, but check all frequencies to be sure. Special certificates and QSL cards will be available to those who work W4ODR. QSL to amateur radio station W4ODR, PO Box 54278, Millington TN 38054.

MICHIGAN TORNADOES

The Macomb Emergency Communication Association will operate special-event station KA8KTV in commemoration of Michigan tornado season from 1300Z June 11, till 2100Z June 12. They will be on 20-meter RTTY (14.080–14.090), on 2-meter FM (146.07/.67), and on the upper General-class phone portion of 15, 40, and 80 meters as propagation allows. QSL with a certificate-sized addressed envelope to: KA8KTV, Box 291, Utica MI 48087. No return postage needed.

WORK THE BETHLEHEMS

W1FHP and the Hen House Gang will operate on 10, 15, and 40 meters from Bethlehem, Connecticut, The Christmas Town, Field-Day weekend, June 25 and 26, 1983. They also will operate July 9 from Bethlehem, New York and July 16 from Bethlehem, Pennsylvania. Awards will be available for working four Bethlehems from around the world. Send log information and a 20¢ stamp to Robert O'Neil W1FHP, Hard Hill Road, Bethlehem CT 06751.

NATIONAL HOLLERIN' CONTEST

Cape Fear ARS, Spivey's Corner, North Carolina, will operate WB4YZF from 1300-2100Z, June 18, from the 15th Annual National Hollerin' Contest. Frequency—phone, 7.235. Certificate available. For details, contact: Lee Brown N4DTB, 462 Shoreline Drive, Fayetteville NC 28301.

JAMBOREE IN THE HILLS

Special-event station W8QZ will be on the air during the Jamboree in the Hills on July 15-17, 1983. Operators from the Northern Panhandle Radio Club of Wheeling, West Virginia, will be on 7.280 and 14.280, ± 5 kHz, and a special QSL certificate will be offered to all stations worked. To receive the certificate, send an SASE to: Joe McCready WB8CTC, 111 Chase Ave., Bridgeport OH 43912. The event is being sponsored by broadcast station WWVA of Wheeling WV.

73 AWARD WINNERS

NORTH AMERICAN AWARD

269	WA2FYW	283	WA7GCS
270	KI2G	284	WB4GRC
271	OE2SXL	285	KC8RH
272	HK5CKH	286	N5ACU
273	W2GVX	287	DK4SY
274	KA6QPL	288	HI3VAK
275	KA5IUK	289	WA9MTP
276	I@AOF	290	N1APE
277	KB8CU	291	YB2BLI
278	KA@IAR	292	I1ZXT
279	OZ5EDR	293	OZ1ACB
280	W2-6893	294	PY2AJK
281	K8IU	295	PY6ABZ
282	W4CKD		

SOUTH AMERICAN AWARD

237	PT9OK	251	I@AOF
238	OE2SXL	252	K4KYI
239	KI2G	253	KA5IUK
240	KA2IAL	254	W4CKD
241	KA6QPL	255	K8IU
242	W2GVX	256	I5HOR
243	PY1EWN	257	HI3VAK
244	HK5CKH	258	DK4SY
245	OE2-207181	259	DA2LI
246	KA1CLV	260	KC8RH
247	N9CQB	261	PY2RAN
248	KA2LHO	262	PY6ABZ
249	KA@IAR	263	I1ZXT
250	KB8CU	264	DFH-1000742
265	YB2BLI	267	WA9MTP
266	N1APE	268	4W-16260

EUROPEAN AWARD

314	PT9OK	325	I@AOF
315	OE2SXL	326	KB8CU
316	KI2G	327	KA@IAR
317	KA3FUR	328	KA2LHO
318	G2VF	329	N9CQB
319	PY1DEA	330	W2-6893
320	HK5CKH	331	K8IU
321	K9IML	332	KK2Y
322	W2GVX	333	JM1IFB
323	KA6QPL	334	W4CKD
324	KA5IUK	335	WA2KDC
336	DA2LI	343	HI3VAK
337	WB4GRC	344	I5HOR
338	OZ1ACB	345	N2BFG
339	VE5ADO	346	N1APE
340	KC8RH	347	YB2BLI
341	N5ACU	348	I1ZXT
342	DK4SY	349	PY6ABZ

ASIAN AWARD

184	KI2G	190	WB3BVL
185	PT9OK	191	W8UMP
186	OE2SXL	192	KB8CU
187	KA6QPL	193	I@AOF
188	W2GVX	194	PY1DWM
189	K9IML	195	I5HOR

196	HI3VAK	202	PY2AJK	166	HI3VAK	172	PY1DWM
197	DK4SY	203	OZ1ACB	167	DK4SY	173	N1APE
198	W2-6893	204	I1ZXT	168	PY6ABZ	174	K8IU
199	K8IU	205	YB2BLI	169	PY2AJK	175	W2-6893
200	PY2RAN	206	N1APE	170	I1ZXT	176	4W-16260
201	PY6ABZ			171	YB2BLI		

OCEANIA AWARD

190	8P6OV	207	I5HOR
191	OE2SXL	208	HI3VAK
192	KI2G	209	DK4SY
193	KA5BQM	210	N5ACU
194	HI3AMF	211	KC8RH
195	KA6QPL	212	W2-6893
196	W2GVX	213	PY2RAN
197	JA1NVG	214	PY6ABZ
198	HK5CKH	215	PY2AJK
199	K9LJP	216	OH6CS
200	4W-16260	217	I1ZXT
201	KA0IAR	218	YB2BLI
202	KB8CU	219	PY1DWM
203	I0AOF	220	N1APE
204	KA5IUK	221	K8IU
205	ZL2LQ	222	W9CC
206	JR6GSE		

WORK THE WORLD AWARD

154	OE2SXL	160	OE2-207181
155	KI2G	161	HI3AMF
156	N4AKO	162	KB8CU
157	KA6QPL	163	I0AOF
158	W2GVX	164	I5HOR
159	K9IML	165	PY2RAN

WORKED ALL USA AWARD MIXED BAND

79	KA2LHO	87	KA9JKK
80	KA1HFN	88	VE7EIK
81	KA4EOX	89	N4HPX
82	WB9KUV	90	I0AOF (RTTY)
83	JA1VDJ	91	I0AOF (CW)
84	KB4AUD	92	KI2G
85	N4HVV	93	PY1DWM
86	KA7MPJ	94	YB2BLI (RTTY)

WORKED ALL USA AWARD 75/80 METERS

7	WA0RVK	11	K9LJP
8	N4QH	12	KI4Y
9	W4PCK	13	KQ7Y
10	WB2ZEL		

WORKED ALL USA AWARD 40 METERS

1	WA2SRM	5	N5AHZ
2	N8AZD	6	N4QH
3	WD4DBJ	7	KA1DNB
4	WD0BOS	8	K4NRR

WORKED ALL USA AWARD 10 METERS

6	VE1BWP	9	KA9HVV
7	N4QH	10	VE2FOH
8	N5CSW		

WORKED ALL USA AWARD 30 METERS

1 K3WGA (first award issued on the new 10-MHz WARC band.)

DX CAPITALS OF THE WORLD

29	VE3JPJ	33	JA1VDJ
30	HI3AMF	34	SV1MO
31	W2-6893	35	K12G
32	I8HZT	36	FM7WD

73 SSB DX COUNTRY CLUB

118	DJ9ZB (1980)	126	I8HZT
119	DJ9ZB (1981)	127	IK1AOD
120	DL5LV	128	KA2CDE
121	HK5CKH	129	DE1ULF
122	KA6QPL	130	OZ1ACB
123	OE1-111080	131	OH6CS
124	DE0DXM	132	I2JIN
125	DA2LI	133	KI2G

73 MIXED-MODE DX COUNTRY CLUB

22	WB5LBR	26	W2GVX
23	WD6EEQ	27	W9CC
24	NL7J	28	JH7VHZ
25	KA0MMD		

73 CW DX COUNTRY CLUB

20	PY2BTR	23	PT2ACZ
21	DF5UT	24	KK4Y
22	OZ5EDR	25	PY2FK

SPECIALTY COMMUNICATIONS CLASS A

1 WA6VGS (OSCAR)
2 KE7C (RTTY)
3 YB2BLI (RTTY)

SPECIALTY COMMUNICATIONS CLASS A-1

22	I1ZXT	25	IW1PED
23	IW3QIO	26	YB2BLI
24	W4CKD	27	FM7WO

10-METER DX DECADE AWARD

9	WB8LSV	12	KA3FUU
10	WB9WFZ	13	W2-6893
11	W8AKS/6		

CENTURY CITIES AWARD

39	K9LJP	42	PY2DBU
40	KA9LYH	43	KX5U
41	HC2RG	44	WA8BIJ

Q5 AWARD OF EXCELLENCE

107	KA9LYH	111	VE6CNV
108	N8CYS	112	KA2LHO
109	WB9UIA	113	KA0IAR
110	NS4J	114	KA6OGC

LETTERS

NERVES

I enjoyed your editorial in the March, 1983, issue of *73*. I had difficulty with code because of a nerve condition, not a memory problem. As a result, I was excluded from ham radio. I have been a microwave technician for 30 years and am a 1963 graduate of RCA Institutes, NYC. I always resented being excluded from a wonderful hobby because of a stupid rule. I wish there were more understanding people like you in the field.

Thomas Costigan
East Setauket NY

One is enough.—Wayne.

RETURN TO THE FOLD

Back in 1942, as a marine radio operator in the Navy Department, I operated CW circuits at speeds in excess of 50 wpm. On one occasion, I was timed over a three-minute period at 64 wpm, with a total of four mistakes. At the close of WWII, I lost all interest in radio and did not regain it until a group of CBers asked me to teach them the code. Now they all have their ham tickets, and I am a 62-year-old Novice, having received my license in January, 1980. I thoroughly enjoy the Novice bands because I can always find some poor struggling soul to lend a hand to in learning how to communicate. Because of this I will not upgrade my license until I join the ranks of the annuitants. Even then I will look for that Novice needing my assistance. I relate this to you in order to set the stage for what is really on my mind. Wayne, I am with you 100% on the no-code license. I totally disagree with the ARRL in their approach to this, and since they refuse to print anything but the silliest of objections to the code, I decided to let my membership die with the February, 1983, issue of *QST*. Lo and behold, on page 65, there with his bare face hanging out was W2NSD/1! Are they beginning to see the light, Wayne? Or did you and Carl sneak that one in one them? By golly, I may renew my membership if that keeps up!

Bill Haddad WD9HXH
Whiting IN

Surprised me, too.—Wayne.

SOGGY VIDEO

During the recent storms, two pieces of electronic equipment went into the "Mighty Blue Pacific," and both were saved. The first was my Icom IC-2AT hand-held. It slipped off my belt and was inundated with salt water before I could retrieve it. The key to saving it and a $5,000 Sony BVU-110 broadcast video recorder that got caught by a misguided wave the next day was to get it, while still wet, into a deionized water ultrasonic cleaner. In the case of the BVU-110, the machine was dissassembled and pressure cleaned, after which it was dried at 130 degrees for 36 hours. I then replaced all rubber, including belts, drives, etc. It has been in service for a month with no problems.

The HT was handled in a similar way, washing out all corrosive salt water before the salt began to dry and start its corrosive process. After 36 hours of drying, the transmitter and tone pad functioned properly, but the receiver would only emit toilet noises. After a quick consultation on the phone with Icom America, it was decided to send the unit for repair via the dealer it was purchased from. I dropped the unit at Ham Radio Outlet/Van Nuys on the Tuesday following the incident and had it back within 7 days, operating to perfection and at a very reasonable price. The sevice rendered by both HRO and Icom deserves acclaim. It's rare in this day and age to be satisfied the first time out. So, with thanks to the folks at HRO and to Mr. Tom Snelling at Icom, this letter is made possible.

Bill Pasternak WA6ITF
Saugus CA

DEATH THROES

I've been going to a local ham club's meetings for two months now. Unfortunately, the ham club does not. And then, guess what? Well, first they can't get quorums. Without quorums, there are no elections, nor can there be a vote on new membership applications (like mine). Second, without member attendance, there are no project proposals or programs. Then there are the somewhat outspoken, non-attending former members (including charter members) who apparently say, "The club is dead and the officers should stop keeping it artificially alive," or something to that effect, as reported by the club paper (the editor does a super job).

Well, I'm afraid that the club is about to die and the few attending members (mostly officers) are discussing solvency (ironically, they need a quorum to do so). Whether or not the club will formally dissolve is speculation, because one officer has pseudo-formally resigned (again, need a quorum). And I cannot hold it against him for doing so.

I wonder if nobody attends meetings for fear of being elected to office, or is it because nothing happens (except gab) when they do go? After all, it seems rather ludicrous to have a formal meeting to just gab when you can do it at your rig.

Perhaps the elimination of about 75 percent of the formalities, like the need for officers or structured meetings or running a treasury, would improve the situation. So that way, if the group does want to do something, they can "pass the hat" to finance it. Then, if nobody wants to do anything (or very many), nothing is lost and "members" could have a gab session without being put in an office position (the horrible dread).

Oh well, it looks like my two ventures to the meetings will be a loss. I'll just bet there are many, many "clubs" in the very same sinking boat.

Duane Grotophorst KA9HKL
Sauk City WI

Duane, you're right. Clubs should be for fun, with virtually no business meetings. There should be classes on code, theory, talks about DX, repeaters, show and tell of RTTY, slow scan, computers, packet radio, discussions of the articles in the latest magazines, club participation in contests such as Field Day, DX contests, sweepstakes contests, and so on. Get rid of the turkeys who try to conduct business meetings and replace 'em with a hot-to-trot program chairman. Bring in active local hams to talk, manufacturers, dealers, have QSL card showings, home-built gear shows, flea markets, auctions, and get some action going there.—Wayne.

OOPS

This letter is in response to one I wrote which you published in your magazine in March, 1983.

In the previous letter, I mentioned two operators who were on CB, supposedly running ham gear. Since this letter has been published, I have received many comments about it.

First, let me state that I never should have written about it or at least should never have mentioned the club calls I thought they were using. I admit that I should not have written the names they were using, although when I was a CB operator (not always legal), it was almost always common practice to say you were

somewhere other than where you were and be called by something other than your own call.

Secondly, I never meant to give the impression that the Mercury Sideband Club members were all illegal operators with no brains.

It seems as if I really struck a wrong note here in the area and I apologize for all the mess.

I still feel, however, that if there are any amateur radio operators who are in the club and are operating illegally, they should reconsider their actions. It would seem that their ham licenses are really of no importance to them if they don't.

Wayne, it seems that you and I are two of a kind, always out of step with everyone else. Guess that makes America what it is—a place where you can disagree and still be free.

So, in closing, once again I state my apologies to the many good operators in this area who are members of the Mercury Sideband Club and wish for them continued success in furthering the improvement of CB radio.

Wayne, thanks again for your help.

Jerry Rogers KA8PTL
Monroe OH

Oh, baloney. I'll bet you were right the first time. Don't be so wishy-washy.—Wayne.

GUAM GROANS

In your January issue, you said, "DX is out there, where are you?" I would like to reply to part of that question from a possible DX point of view. I am over 7,000 miles from Kansas so I think I may be a DX station, but I have two problems. I work the Novice bands on 10 and 15 because I am a Technician and the nearest FCC examination point is 3,000 miles from here. The FCC sure doesn't come to us. I also work CW because I sincerely enjoy it.

That was problem number one. Problem number two is that I have a California "6" call because of my address. Wayne, I have answered CQ DX calls from all over the states, most with a 559 or better signal, and I often get, "I was calling DX; do you know what DX is?" I was even interrrupted once while in QSO with a VK station by a K6 that wanted to make a DX contact with VK-land. That's all fine, and no problem, but when I went back to him with N6HSC/KH2, he said he wasn't interested in California. My standard reply is "73 from Guam" and then I ignore the commotion as they realize they blew it.

I suppose most Novices have drawers full of KH2/KG6 QSLs, but I sure don't have any quanity of their cards. I can work JAs and VKs anytime I want and, when the bands open, cause a pileup in Europe, but I can't get a KA to come back to me unless I pretend I'm in California and drop the /KH2. At least one KA6/DU2 shares my frustration. I would like to get Guam in a few more Novice logs. I average one contact in the states for each five hours of operation and that's ridiculous. I know you guys can hear me when the band is open. Please inform your readers that there are stateside calls all over the world operating portable something or other, and most would welcome a call. Almost 100 percent of my QSLs say "Thanks for my first Guam contact."

Wayne, we're out here trying, but probably not for much longer. I, for one, will go back to my JAs and VKs and say to hell with the stateside guys.

Preston Allen N6HSC/KH2
Agana, Guam

Those DX snots don't know how to fill out a QSL anyway.—Wayne.

FREE TAPE

The Wichita Amateur Radio Club invited Dick Abraham, corporate engineer for Multimedia Cablevision, the Wichita cable franchise, to speak before our group at our December 1, 1982, meeting. Dick did a lot of homework and made an excellent presentation.

We recorded his presentation and will be happy to make a copy available to anyone who would like a copy. To obtain one, mail a C-90 cassette and an SASE to me. We have bulk duplicating equipment and will be able to get copies out immediately. Any request without a C-90, SASE, or both will be thrown away.

I don't believe Dick's presentation has any real "news" value; however, it would be helpful to those who are having trouble with their local cable operators and especially helpful to those whose communities will soon be building cable systems.

The Wichita cable system is not tight. There are leaks on 145.25 MHz all over town. But Dick has promised to fix those that exist, at least to the letter of the law and better than that if he can. All we have to do is notify him of their existence. Amateurs in Wichita don't like having to coexist with cable but realize they have a much better situation than most. At least our local cable operator has made helpful overtures.

Dick Houser WD0ENU
PO Box 1402
Wichita KS 67201

SCHOLARSHIPS

The Atlanta Radio Club announces that three cash ($500) competitive scholarships will be awarded to graduating high school seniors who will enter an accredited college or university in the fall of 1983. Recipients must be duly licensed amateur radio operators at the time of application. The scholarships are awarded on the basis of both scholastic attainment and outstanding efforts as amateur radio operators.

This is the fifth consecutive year in which the Atlanta Radio Club has been able to award scholarships to deserving amateurs.

For additional information and application forms, write to: Phil Latta W4GTS, Secretary, Atlanta Radio Club Scholarship Committee, 259 Weatherstone Parkway, Marietta GA 30067.

Completed applications along with the required high school transcripts must be postmarked not later than July 31, 1983.

Atlanta Radio Club, Inc.
Atlanta GA

BEACON

On January 5, 1983, I put KA1YE/B on the air from Oakdale CT. The beacon is running 2 Watts output to a vertical antenna on 28.284 MHz. The beacon operates 24 hours a day and provides a consistent signal source for checking out 10-meter propagation. At this time, the ID is on FSK, but it will changed to an all-CW format soon. I am also putting beacons on 6 and 2 meters, hopefully by May 1, 1983.

I would like to receive some reception reports from US and Canadian amateurs, especially this summer during the sporadic-E (short-skip) season. Any unusual propagation noted would also be of interest. Reception reports can be sent to my 1983 *Callbook* address, or foreign reports can be sent to the W1-land bureau, c/o my call.

So far, the only reports I have received from US amateurs have come after I requested them to listen specifically for the beacon. Many amateurs, even those who are consistently on 10 meters, do not seem to be aware of the extensive DX beacon system on from 28.200 to 28.300 MHz. In the last 2 months, I have logged over 30 DX countries, in all continents except Asia, on the beacons. Many times I have heard the beacons S7-9, only to hear some stateside station say, "Gee, 10 meters was great when it was open." Give a listen down there. Ten meters is open much more than most hams realize. Let's use the band. See all of you on ten.

W. Keith Hibbert KA1YE
Niantic CT

RAVE REVIEW

I want to commend you and your staff for the excellent product reviews. I find them superior to those of the other ham magazines.

Frank Vogel WB5PMU
Cherokee IA

You are very perceptive.—Wayne.

FCC

NO-CODE COMMENT EXTENSION

The FCC has extended the deadline for comments on the no-code license by 60 days, giving hams until June 28 to file their suggestions.

In February, the Commission released a Notice of Proposed Rulemaking setting forth two alternatives for a theory-only amateur license which would offer VHF privileges similar to those for the present Technician license. When the notice was released, the comment deadline was dated April 29, with reply comments due one month later.

The extension came in response to a March request by the ARRL which argued that the League's members needed more time to discuss the issue and that members' responses would not be considered until the April 21 and 22 Board of Directors meetings.

In its statement, the FCC said, "We concur...that a no-code amateur radio license is a core issue for the amateur community. Since we want the input from amateur radio operators to reflect thorough and dispassionate consideration, we will grant the requested extension of time."

HAM HELP

Wanted: the manual, or a copy of it, for the Clegg Thor RF 6-meter rig and the Heath GR-81. I will pay postage and copying costs.

R. L. Lyon N8BQV
2425 W. Bennington Rd.
Owosso MI 48867

I am in desperate need of a schematic for the Brimstone 144 transceiver made by Satan Electronics. I will reimburse any expenses.

Phil Taylor KA9LAA
517 Hendricks
Berne IN 46711

CORRECTIONS

Although the tunable Pocket Weatheradio used in "Put 2 Meters in Your Shirt Pocket" (March, 1983, p. 46) is no longer available from Radio Shack, the crystal-controlled Weatheradio (RS no. 12-151) will work even better. It draws only 10 mA, needs no squelch, and modification is simple.

Remove the 16-MHz weather crystal and replace it with a 2-meter transmit crystal approximately 455 kHz above or below the intended receive frequency. If a standard transmit frequency does not fall exactly 455 kHz above or below the intended receive frequency, the i-f detector transformers can be shifted at least 50 kHz and there is also an internal trimmer capacitor and variable inductor to shift the crystal frequency. The two-meter crystal can be either 12- or 18-MHz fundamental. The crystal I use is from an Icom 22A and has an 18-MHz fundamental. Add a 5-pF capacitor across the 2 rf amplifier inductors and spread or compress it to achieve maximum sensitivity.

Lester Kolb K3PJG
Lebanon OR

An error appeared in the schematic for "QRM Eliminator for Computer CW," which was part of the Circuits feature on page 105 of the April, 1983, issue. The junction of C2 and C3 on U1 should be grounded.

Avery L. Jenkins WB8JLG
***73* Staff**

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

ARRL. What would happen to a *Relay* League based upon Morse-code-trained operators if automation was permitted to set in and allow messages to be sent without these operators? The whole concept struck at the heart of the League. Well, here we are 33 years later and the ARRL has every reason to be very proud of itself. They have managed to fight off modern communications techniques for over three decades, keeping us in the medieval days.

Is it any wonder that people working in the communications field look on hams as hangers-on from the long-gone past of radio? We've been left so far behind current technology that it is going to take us years to catch up. Our communications systems are so irrelevant and wasteful of people that no one really takes us very seriously. Oh, they would like to get the radio spectrum we've managed to hold onto over the years. Every shortwave channel is worth many millions of dollars when used for an efficient communications system.

So please don't do the old Captain Queeg bit and try to get anyone to seriously think that hams are ever going to use Morse code for anything but a monument to our resistance to progress and our insistence on wasting billions of dollars in radio channels for little more than entertainment. I suppose that we do agree that it is entertaining to sweat out a CW contact with someone a few hundred miles away, managing to get his name, location, rig model, type of antenna, and a brief on the weather as the reward for fifteen minutes or so invested. It must be fun or we wouldn't see so many hams devoting the declining years of their lives to this.

I'll agree that using the good old Morse code can be fun, but it isn't anything I can take seriously as a means of communications, and it hasn't been for years. I don't think anything can happen that will put us back into the spark days. Heck, it's getting difficult to come up with an old Ford coil these days. Old-timers will fondly remember those little wooden boxes we used to hook to number 6 dry cells and generate tens of thousands of volts. They came from the good old Model T cars and were everywhere... for a while. You could hear 'em for a mile on *any* radio.

It may be time for us to stop looking at the past and take a more serious look around at where the commercial firms are with their communications in the 1980s and see if we can at least catch up. The time was when amateur radio was ahead of the commercials, not lagging them by 50 years. We have plenty of ICs to work with and the support of a growing number of ham-oriented firms to help us get going with high-speed digital communications.

We may want to continue our traffic nets as they are... much like keeping antique cars running and preserving Williamsburg or New Hampshire's Strawbery Banke. But this shouldn't stop us from developing some high-speed error-correcting traffic systems. One automated system with two ops sitting back drinking coffee should be able to handle more traffic than all of the Morse code nets in the country combined. If emergencies come, we're going to need modern services, not relics of the 1939s.

VIVA THE CODE!

One of our readers has come up with what appears to be a wonderful idea. He noted the strong support of the code for amateur licenses by a large part of the brethren and suggests that if this really is a necessary skill, amateurs should be re-tested at regular intervals to be sure that they have not lost their skill. I'm recommending that as a first-rate idea.

If anyone agrees with the majority of ARRL members that Morse code really is a necessary skill, let's see a petition to the FCC asking that every ham be re-examined every two or three years to make sure that he or she has not slipped in code skills. Or would every year be better? It sure doesn't take long to get rusty at the code, right? And I don't think you want anyone wasting our time on our valuable ham bands who managed to sneak through without knowing the code or who has gotten rusty.

You know, since there is such general agreement on the importance of code, perhaps we should start to take it seriously and stop being so namby-pamby about it. Is there really any reason why we shouldn't require everyone to move up a step in code with each re-examination? That would move all the Novices and Techs, who virtually don't know the code at all. At five words per minute you really don't have to have any code-handling skills... the skill comes in at 13 per, not at five. Okay, so let's make sure that we really do require the skills the majority agrees we should have... put our skills where our mouths are, so to write. Techs would then have to demonstrate an honest skill... 13 words per minute the second time down. And the third time they would be expected to show that they can copy at 20 wpm. I really don't see where anything less is honest or fair... if we are in agreement on the importance of code.

Well, you are saying (yes, I hear you), this just means that everyone can memorize the Bash tape translations, the way so many have been doing in recent months, and not even have to really learn the code. No, I'm willing to put the facilities of *73* at the disposal of the FCC... and at our cost, which is a heck of a lot less than they're paying right now... and turn out computer-generated Morse-code tapes, complete with an exam grading chart geared to each tape. That's a cinch. We'll just put about a hundred different on-the-air-type contacts on a disk and have a computer pick at random a call, name, QTH, rig, and so on for each tape, complete with an individual printout of the tape. No problem for us at all. We can grind out dozens of such tapes a day, each one entirely different, and the cost will be miniscule. If you agree that we really should get cracking with this code business in earnest, I'll get a bid in to the FCC to supply the tapes for them or for any clubs which give the exams, if we go that route.

Just think, if we stop pussy-footing around about the code and make sure that every ham has this skill, every one of us will be able to copy 20 wpm! The code is an absolute snap for me, always has been, so I'm 110% in favor of getting rid of all the old fogies who are too lazy to keep up this skill, one which a high percentage of you agree is important. And any Techs who are too busy gabbing on two meters to take off the few hours it takes to learn the code won't be missed... right?

I don't know why we should give people two years to increase their code speed when it takes just a few hours of work. Why not stop coddling the lazy and make it so you can get your Novice ticket at 5 wpm, then one year later you will have to have passed your 13 per, and a year after that 20 per. It makes a lot of sense to me, and I don't think you'll find anyone at the ARRL opposing the code.

Should we tighten up that schedule a bit? Giving new hams a year to increase their code speed will only tend to encourage them to put off practicing until the last minute. So why not make the last minute closer to the first minute and not have them fretting and fussing for eleven months and 28 days before starting to practice.

I haven't seen any recent figures on this, but I do know that a good friend of mine in New York has been teaching people the code from scratch at 20 wpm in one weekend. But let's agree that some people are a bit slower and might take a couple of weekends, and some might even have other things to do for one or two weekends which would keep them from practicing. Would a month do it? Certainly anyone seriously interested in his ham ticket can find a few hours in a month to get his code speed up.

You know, one of the saddest days in amateur radio was when the FCC under George Sterling, a ham and chairman of the FCC, forced us to have the Novice class license. The ARRL fought it tooth and nail and hated it, and still, as far as I know, doesn't really think of Novices and Techs as real hams. When I came into amateur radio, the first test was at 13 words per minute. That meant that you darned well had to really know the code and be able to copy it as a skill, not just by memorizing the characters and translating each one as heard as one does at five words per minute. *That* really isn't a code skill at all.

So let's petition the FCC to dump the 5-wpm test and start right out the way we used to at 13 wpm. *That* really proves some code skill. And then a month later, 20 wpm. That way we'll get all those darned CBers off our bands and stop all of the stupid pileups on DX, jamming on repeaters, bad language, and so on.

You know, most of the commercial CW circuits used to perk along at 35 words per minute. It probably takes a few weeks of practice to go from 20 to 35, but I'm not sure that is too much to ask any ham who is serious about this hobby. Let's have some letters on this. Should we go on up to 35 wpm for everyone... allowing perhaps six months to get there? Or is that too long? I'm 60 years old and as anyone will tell you, my brain is obviously going soft, but I'm sure I can get right on up to 35 per in a few weeks if we all agree on it. And you can bet that if I have to do that, I'm going to make sure that everyone else who comes along later isn't going to have to do any less, even if it kills the hobby.

So let's get together and put the no-code wishy-washies where they belong... on CB. And if they want to work DX, let 'em go on the 27-MHz HF band with the rest of the CW illiterates.

WHAT ARE YOU READING?

The results of a recent poll of the amateur radio community showed some interesting patterns. They're not really surprising, if you stop and think about it, but amid the flurry of claims and baloney flying around, it is nice to see what the surveys show is really going on.

To achieve a statistically valid survey, one can poll as little as a few hundred people, as you know if you've ever had to sit through a course on statistical analysis. That was not one of the more interesting courses I had to live through in college, but at least the experience did help to clear away the mystique of that field for me. In the *73* survey, we received responses from 5,720 hams, which is an overkill of about ten times that actually needed for dependable results.

Since we like to be sure that the content of *73* is right down the middle of the alley, so to speak, one of the questions had to do with how this content is perceived by hams with a comparison of how the content of the other ham magazines is perceived. Here's the result:

Mag	Too Complex	Just Right	Too Simple
73	6.1%	86.6%	7.3%
QST	24.9%	62.6%	12.5%
HR	32.6%	57.6%	9.8%
CQ	7.3%	57.3%	35.4%

Okay... what does that tell us? Looking first at the "too complex" column, we see that two of the ham magazines are turning off readers by making them feel stupid. Mind you, the material covered is not much more complex than is covered in *73*, it's just that the editors are not making the material easy enough to understand. It's the writing that makes it complex, not the material covered.

We hams, like anyone else, tend to be turned off if we are unable to understand what we are trying to read. And we also get bent out of shape if we think we are being catered to with condescending copy, which brings us to the "too simple" column. Isn't it curious that *73* did the best on both the "too simple" and "too complex"? No, not all that curious when you remember that our editors know what you want and see to it that the articles are neither condescending nor too esoteric in technical language.

Remembering that we're trying to be all things to all hams, there is no way to really get to 100% on "just right." There are always going to be newcomers trying to learn about what is going on who need to have plenty of hand-holding, so material must be made reasonably simple. Then there are the scientists who want to keep up with the state of the art and who will never admit even to themselves that anything is too complex. I'm not sure that anything much over 85% is ever going to be attainable, considering the wide variety of ham interests.

The perception of interest of articles obviously will reflect in an interest, or lack of it, in spending the money for a ham magazine. This brought about the next obvious question on the survey... asking which ham magazine, if any, the respondent had dropped during the past year. Almost one quarter of those surveyed had dropped at least one ham magazine subscription, so the degree of interest of a magazine does turn out to be a most significant factor. Further, the dropping of subscriptions is unsurprisingly parallel to the perception the magazines are giving of their relevance to the ham reader.

The magazine dropped by the highest percentage of those surveyed was *Ham Radio*, with an 11% loss. This is consistent with the 32.6% "too complex" perception of the magazine. *QST*'s loss was second, running 9% and reflecting, one would suppose, the 24.8% "too complex" as well as the 12.5% "too simple"... and despite all of the pressure to "support the League, right or wrong." *CQ* fared better with only a 7% drop,

Ampersand
electronics

Offers outstanding mail-order values in:
computer peripherals & accessories
scope probes & test leads
RS-232 cables

6065 Mission Gorge Rd. #66

San Diego, CA 92120

Write for our FREE FALL SALE FLYER of HAM & computer goodies!!!

MILITARY SURPLUS
HANDI-TALKIES WANTED
Super high prices. Any quantity, any condition.
RT-976/PRC-75 RT-976A/PRC-75
RT-865D/PRC-66 UHF-225 to 400 MH
SPACE ELECTRONICS
Call Ray, K2BBC, or Jack, WA2KTX
Call collect: 201-440-8787 ✓162

NEMAL ELECTRONICS
COAXIAL CABLE SALE

This Month's Specials — Same Day Shipping

RG8U-20 ft., PL-259 ea. end $4.95
RG214U dbl silver shield, 50 ohm ..... $1.35/ft.
100 ft. RG8U with PL-259 on each end $19.95
BELDEN Coax in 100 ft. rolls
RG58U #9201 ..... $11.95
Grounding strap, heavy duty tubular braid
3/16 in. tinned copper ..... 10¢/ft.
3/8 in. tinned copper ..... 30¢/ft.

POLYETHYLENE DIELECTRIC

RG213 noncontaminating 95% sheild mil spec.	36¢/ft.
RG174/U mil spec. 96% shield	10¢/ft.
RG11U 96% shield, 75-ohm mil spec	25¢/ft.
RG8U 96% shield, mil spec	$27.95/100 ft. or 31¢/ft.
RG6A/U double shield, 75-ohm	25¢/ft.
RG58AU stranded mil spec	12¢/ft.
RG58 mil spec. 96% shield	11¢/ft

LOW LOSS FOAM DIELECTRIC

RG8X 95% shield (black, white or gray)	$14.95/100 ft. 17¢/ft.
RG8U 80% shield	18¢/ft.
RG58U 80% shield	07¢/ft.
RG58U 95% shield	10¢/ft.
RG59U 100% foil shield, TV type	$7/100 ft. 10¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214)	31¢/ft.
Rotor Cable 8-con. 2-18 ga, 6-22 ga	19¢/ft.

CONNECTORS MADE IN USA

Amphenol PI-259	79¢
PL-259 push-on adapter shell	10/$3.89
PL-259 & SO-239	10/$5.89
Double Male Connector	$1.79
PL-258 Double Female Connector	98¢
1 ft. patch cord w/RCA type plugs each end	3/$1.00
Reducer UG-175 or 176	10/$1.99
UG-255 (PL-259 to BNC)	$3.50
Elbow (M359)	$1.79
F59A (TV type)	10/$2.15
UG 21D/U Amphenol Type N Male for RG8	$3.00
BNC UG88C/U, male	$1.25
3/16 inch Mike Plug for Collins etc	$1.25
UG273 BNC to PL-259	$3.00

FREE CATALOG
COD add $1.50—FLA. Res. add 5% Sales Tax

Connectors—shipping 10% add'l, 2.50 minimum ✓412

Orders under $30.00 add $2.00
Cable—shipping $3.00 1st 100 ft. $2.00 each add'l 100 ft.
1327 NE 119th Street, Dept. RLO, No. Miami, FL 33161 Call (305) 661-5534

Custom Mailing Lists on Labels!
Amateur Radio Operator NAMES
Custom lists compiled to your specifications —**Geographic by ZIP** and/or **State; by Age** or **Birthdate;** by **Licence Issue** or **Expiration Date**—on labels of your choice.
Total List: 411,000 Price: $25/Thousand
Call **203: 438-3433** for more information
Buckmaster Publishing ✓255
70 Florida Hill Rd., Ridgefield, CT 06877

SYNTHESIZED
SIGNAL GENERATOR

MADE IN USA

MODEL SG100D $349.95 plus shipping

• Covers 100 to 185 MHz in 1 kHz steps with thumbwheel dial • Accuracy 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • Spurs and noise at least 60 dB below carrier • RF output adjustable from 5-500 mV at 50 ohms • Operates on 12 Vdc @ 1/2 Amp • Available for immediate delivery • $349.95 plus shipping • Add-on Accessories available to extend freq. range, add infinite resolution, voice and sub-audible tones, AM, precision 120 dB calibrated attenuator • Call for details • Dealers wanted worldwide.

VANGUARD LABS ✓311
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (212) 468-2720

AMATEUR RADIO
SOFTWARE
FOR VIC AND 64

THE DIPOLE ANTENNA & ANTENNA FORMULAS.....$8.95
THREE ELEMENT YAGI & ANTENNA FORMULAS.....$8.95
*BASIC & MORE ELECTRONIC FORMULAS.....$8.95

*MORSE CODE TUTOR.....$8.95
GIVES YOU PRACTICE AND TESTS YOU FROM 5-20 WPM. WITH TOTALLY RANDOM FIVE CHARACTER CODE GROUPS.

AMATEUR RADIO DATA SYSTEM.....$14.95
RECORD CALLSIGN, NAME, CITY, STATE, CONTACT #, DATE, TIME, FREQ. ON EACH CONTACT. 50 CONTACTS PER FILE, UNLIMITED NUMBER OF FILES. REQUIRES A MINIMUM OF 3K ADDITIONAL MEMORY.

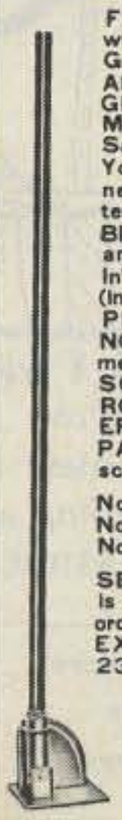
*MULTI-FILE.....$24.95
SIMILAR TO ABOVE PROGRAM, BUT 8 UNTITLED LINES ALLOW ANY TYPE FILE TO BE PROCESSED. 100 ITEMS PER FILE MAY BE STORED WITH ADEQUATE MEMORY AND ALLOWS USE OF CASSETTE, DISK AND PRINTER.

* INDICATES PROGRAM NOW AVAILABLE IN 64 VERSION.

ALL PROGRAMS AVAILABLE ON DISK—ADD $3.00
VIRGINIA RESIDENTS ADD 4%, WE PAY POSTAGE.
SEND CASH, CHECK OR MONEY ORDER TO:

RUSS SOFTWARE LTD.
P.O. BOX 378 NORTHWEST STATION
CHESAPEAKE, VA. 23322 ✓207
(804) 421-3914

ALL BAND TRAP VERTICAL ANTENNAS!



FULL 1/4th WAVE - All Bands! Automatic Selection with proven HI-Q Traps. 3 Models-ALL self supporting Ground or roof mount. HEAVY Double wall seamless Aluminum lower section - HI STRENGTH FIBERGLASS TUBING OVER -ALL. NO WOBBLY, LUMPY TRAPS - NO UNSIGHTLY CLAMPS needed Same size all the way up 1 1/4" - Traps hidden inside. You can use it in a 1 ft. sq. Backyard! Neighbors will never know this is a HI-Power ALL Direction DX Antenna. FOR APARTMENTS, ROW HOUSES, MOBILE HOMES - CONDOS etc. where minimum space and neat appearence is MANDATORY! Instant "Drive In" ground mount (included). Use with or without radials (included) (All angle roof mount - Extra) COMPLETELY PRETUNED - NO ADJUSTMENTS NEEDED EVER! NO TUNER NEEDED Over All Bands (except 80 meter - 400 KC) SWR 1-1 to 2-1 at Band edges, Stnd, SO239 connecter - 50 ohm for any length RG58U - RG8U feedline. Matches ALL MAKES TRANSCIEVERS. 2000 Watt PEP, input power. Shipped - PREPAID IN USA. Assembles in 10 min. using only screwdriver. WEATHERPROOF!

No.-AVT80-10 — 5 Band — 25'6" — $179.95
No.- AVT40-10 — 4 Band — 18'9" — $129.95
No.- AVT20-10 — 3 Band — 11'4" — $99.95

SEND FULL PRICE FOR PP DEL IN USA (Canada is $10.00 extra for postage, clerical, Customs etc.) or order using VISA, MASTER CARD or AMERICAN EXPRESS. Give Number and Ex. date. Ph 1-308-236-5333 9AM-6PM weekdays. We ship in 2-3 days. Prices will increase, so order NOW AND SAVE. All Antennas Guaranteed for 1 year - 10 day money back trial, if returned in new condition. Free Inf.

WESTERN ELECTRONICS ✓80
Dept. A7-6 Kearney Nebr. 68847

CONTACT-80...

RTTY your TRS-80 with CONTACT 80 MARK II for 1983!

TRS-80, MOD III INTERFACE (included with system) gives keyboard STATION CONTROL and connects with the TTY TU of your choice.
(No other equipment needed for CW operation)

Cassette & Disk Features:
- BAUDOT, ASCII & MORSE...
- CW RX speed AUTOSYNC & unique FIST-FIXER...
- TRI-SPLIT screen (user sets HIS way)...
- "Unlimited" STORED MSG. sizes...
- Automatic DYNAMIC BUFFER ALLOCATION...
- Live HARDCOPY plus other Line-printing...
- AUTO-ID, TIME/DATED transmissions...
- On screen "OSCILLSCOPE", CLOCK, COUNTERS...
- Unique EDITOR, CLOCKED-KEYING, NAME-LINE...
- AUTO-DIDDLE, K/B ROLLOVER, REPEATING KEYS...
- Fast CASSETTE I/O and many other features...

Additional Disk Features:
- Two-way message SELCALL. A "PERSONAL MSO"...
- AUTO-MONitor frequency activity to disk...
- SAVE, LOAD, KILL & DIR plus other I/O...

INTRODUCTORY SPECIAL

DISK VERSION	$199.00
CASSETTE VERSION	$179.00
CASSETTE, later upgrade to DISK	$20.00

Guaranteed-Include Amateur CALLSIGN-POST PAID

ROYAL
407 Conkle Road ✓150
Hampton, GA 30228 Telephone: (404) 946-9314

✓See List of Advertisers on page 114

largely resulting, one would suppose, from the 35.4% "too simple" perception. *73* came out with only a 4% subscription loss, which might be considered as a minimum which is possible when you remember that there are going to be reader losses due to many factors other than magazine quality. There will always be non-renewals resulting from readers being out of work (which seems to have been a minimum for hams in this recession) or suffering from some personal disaster...such as getting married. We'll always lose a few.

What does this mean to you, the reader? Well, it means that we're giving you what you seem to like best in an article/column mix. Mind you, we're wide open for any ideas on change. *73* has changed substantially down through the last 23 years it has been published and will continue to do so. Older readers will remember back when the magazine first started and pushed the heck out of sideband. Then, when the so-called incentive licensing proposal was put before the FCC, we fought that, feeling that it would stop the growth of amateur radio and hurt the industry. Alas, we were right in that, even if powerless to stop the League at the time. Now we all have to live with the disastrous results of those black days...including the new management of the League.

Next we plugged for solid state while the other magazines were still pushing tube circuits, and then we pioneered FM and repeaters, at first a very lonely and controversial position. Our record is good for keeping you really up to date on new technologies and encouraging the building of ham gear.

Advertisers should find the results of the survey of particular interest, too. There is always the question of where it is best to invest in ads in order to reach the active, buying ham. The large number of retired hams getting *QST* has always made that magazine seem like a good deal for ads...after all, look at how many readers there are! It turns out there is a big difference between the buying interest of retired old-timers and active younger hams. Would you believe that surveys of *QST* readers have shown that about one-third of the subscribers don't even look into the welter of ads in the back of the magazine at all? Their equipment budgets are zilch, so why bother?

Speaking of ham buying, the recent survery showed very clearly the impact of the recession. The 5,720 hams surveyed said that they averaged about $567 each spent during the last year. When asked what they had budgeted for ham gear purchases for this year, they estimated an average of $640. This is the first time in several years that hams have said that they intended to go out and buy a lot more gear than they had in the previous year.

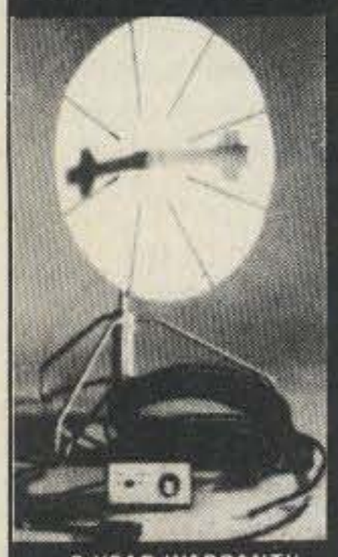
What are they going to buy? Unless the *73* readers are exaggerating, there are going to be a lot of low-band rigs sold this year...about 32,000 just to the *73* readers alone. The second product in mind for the readers is a new HF antenna...please make note KLM, Cushcraft, et al. Surprisingly, perhaps the third most wanted new item is a microcomputer, with an estimated 22,800 budgeted for purchase. That comes down to around $1M a month in computers just for the *73* readers, so we may be looking at a substantial rise in interest in RTTY and other computer-related communications.

At least 20,000 HTs are in the budget for this year and, with any encouragement from repeater groups, I'll bet that could be doubled.

By the time you add up what the approximately 150,000 readers of *73* tell us they are going to spend, it comes to around $7,5000,000 per month. Who says the ham business is dead? With that kind of market... and growing... I think we'll be seeing more and more small firms getting into the business to get a piece of the action.

QUALITY MICROWAVE TV SYSTEMS

2.1 to 2.6 GHz Ant.
34 db Gain or Greater



COMPLETE SYSTEMS:
Parabolic Dish Style (as pictured) $ 99.95
Commercial Rod Style (39" overall length) $109.95
COMPONENTS:
Down Converters (both types) $ 34.95
Power Supplies (12V to 16V) $ 24.95
Data Info (Plans) $ 9.95
REPAIRS:
Down Converters $ 19.95
(all types - includes parts, labor, freight)

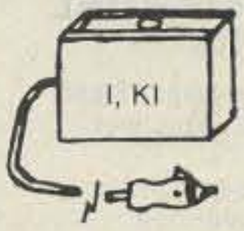
Phillips-Tech Electronics
P.O. Box 34772
Phoenix, AZ 85067
(602) 265-8255 ✓246

2 YEAR WARRANTY
PARTS & LABOR

COD'S · MasterCard · VISA

Special Quantity Pricing
Dealers Wanted

GO MOBILE WITH YOUR H.T.!

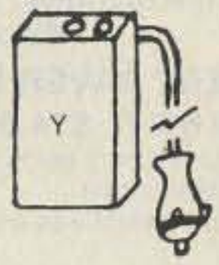


Model I—Icom IC-2A/T, Etc.
Model K-1 for TR-2500
—slides on bottom of radio

Guaranteed!

Model K—TR-2400;
—powered thru battery plug
Model N—FT-208R
Model T—Simple mod for Tempo

NOW FOR FT-208R & TR-2500



Model Y—FT-207R,
—fits into battery compartment

A unique battery eliminator HANDI-TEK Regulator allows constant hand-held operation from auto DC or base supply with no nicad drain and WITHOUT RADIO MODIFICATION! $24.95 PPD in USA. CA add $1.50 Sales Tax.
✓460

HANDI-TEK
P.O. BOX 2205, LA PUENTE, CA 91746

COLLINS RECEIVERS

R-390/URR

0.5 to 32 MHz in 32 bands. AM, CW, Tone FSK through use of BFO. IF selectivity 100 Hz to 16 kHz. Impedance 600 ohms. Power input 110/220 VAC, 50/60 Hz, single phase. Dimensions 12½ × 19 × 6½ inches. Weight 75 lbs. Used, good working condition. Includes partial manual reproduction.

$285

R-392/URR

0.5 to 32 MHz in 32 bands. AM and CW. Bandwidth 2, 4, and 8 kHz. B+ and Filament voltages 24 VDC. Power input 24 VDC @ 3 Amps. Dimensions 14 × 12 × 11½ inches. Weight 52 lbs. Used, good working condition. Includes partial manual reproduction.

$235

Prices F.O.B. North Hollywood.
Allow for shipping.
Write for *free* 56-page catalog

MasterCard · VISA

Davilyn Corporation
13406 Saticoy Street
North Hollywood, CA 91605
(213) 787-3334
✓256

CB TO TEN METER CONVERSION KITS

10 METER FM—Limiter discriminator board with specific instructions to fit over 80 different AM & SSB chassis

SSB-AM KITS—Now in stock kits for most CB models—23 or 40 channels

NEW & USED—FM—SSB—AM converted C.B.'s in stock

ANEXTER MARK ANTENNAS—You saw them at Dayton. Now in stock the HW-3 three band helewhip that covers 10—15—20 meters with no traps

FREE CATALOG—Write or call today

INDEPENDENT
CRYSTAL SUPPLY COMPANY

141 Rt. 6A, Box 183
Sandwich, Ma. 02563-0183
(617) 888-4302

✓78

CABLE CONVERTER SALE

MAGNAVOX FV-25 - 26 CHANNEL WITH REMOTE CONTROL - VHF-MIDBAND-SUPERBAND - REG $59.95 - NOW **$49.95**

JERROLD JSX-3DIC - 36 CHANNEL WITH IN BAND GATED SYNC DECODER - REG $209.95 - NOW **$149.95**

JERROLD SB-3 - IN BAND GATED GATED SYNC DECODER - USE WITH ANY CONVERTER WITH OUTPUT ON CHANNEL 3 - REG $149.95 - NOW **$99.95**

UHF BLOCK CONVERTER - CONVERTS MIDBAND AND SUPERBAND TO UHF - REG $39.95 - NOW **$26.95**

SEND $1.00 (REFUNDABLE) FOR CATALOG

ADD $4.25 SHIPPING/HANDLING FOR EACH UNIT ORDERED

NYS ADD SALES TAX -C.O.D.'S OK

24 HOUR ORDER LINE
(607) 962-7313

ORDER DIRECT FROM -

TAYCO COMMUNICATIONS
R3-146A NARROWS CREEK ROAD
CORNING, NEW YORK 14830

✓183

CALL LETTERS OR 73 LOGO BELT BUCKLE

Navajo call-letter belt buckle. Hand crafted. Inlaid call-letters of blue torquoise, rust coral, white abalone, ironwood brown, or mother of pearl. The lightning bolts are yellow. Size: Med. 2.6" × 3.6" oval. Large: 3" × 4" oval. Style: Ladies or mens. The mens attaches to the left side, and the ladies to the right side of the belt.

Send: Call-name-and address.
Color of call-letters (or 73 logo).
Style: Ladies or mens.
$48.50 check or M/O for medium.
$61.50 check or M/O for large.

To: **LEE-ART, INC.**
112 n. Main Street
Shamrock, Texas 79079

We pay U.S. postage. (Foreign-add $2.50/item).
Money-back guarantee. Allow 4-6 weeks delivery.

Have an Apple?

Want to work RTTY?

Know about Super-Ratt?

You should.

Call or write for details.

UNIVERSAL SOFTWARE SYSTEMS, INC.
9 SHIELDS LANE · RIDGEFIELD, CT 06877
(203) 438-3117 ✓189

THE BEST PLACE To Look For New & Used Equipment Buy-Sell-Trade

Our 4th Year

NUTS & VOLTS MAGAZINE

PO BOX 1111-G • PLACENTIA, CA 92670
(714) 632-7721 ✓137

JOIN THOUSANDS OF READERS NATIONWIDE, EVERY MONTH

U.S.A. SUBSCRIPTIONS
$ 7.00 - 1 YR. 3RD CLASS MAIL
$12.50 - 1 YR. 1ST CLASS MAIL
$25.00 - LIFETIME - 3RD CLASS

VISA · With Free Classified Ad · MasterCard

SALE! SALE! SALE! SALE!

HAM *save!* GEAR

USED EQUIPMENT
TESTED BY 73 STAFF
OTHERWISE LIKE NEW

Icom 451A Transceiver	$692.00
Icom PS 15 Power Supply	$121.50
Icom 560 Transceiver	$395.00
Icom 290H Transceiver	$427.50
Icom 490A Transceiver	$506.00
Icom 4AT HT	$211.50
Icom 3AT HT	$211.50
Yaesu FT408R 2m Transceiver	$396.00
Yaesu FT208R HT	$260.00
Robot Research Model 400	$315.00

Check or Money Order

Contact: (603) 924-9471
MATT SMITH
73 MAGAZINE
PINE STREET
PETERBOROUGH NH
03458

✓See List of Advertisers on page 114

RTTY
FOR THE
VIC 20
SIMPLE AND INEXPENSIVE FULL-FEATURED RTTY

- BAUDOT And ASCII, All Common Speeds
- CW ID With Your Call Pre-Programmed
- Transmit/Receive (PTT) Control
- Use With Any Terminal Unit - Simple Hookup Instructions Supplied
- Highly Readable Screen Formatting

8K VERSION Also has 10 Message Buffers, Automatic CQ, Start and End Messages, Status Display, many other Features

RTTY3K (req. 3K memory expansion) $19.95
RTTY8K (req. 8K memory expansion) $24.95
both versions supplied on cassette

Send Check or Money Order To:
MICROFISH SOFTWARE PRODUCTS
P.O. Box 920342 ✓257
Norcross, Georgia 30092

NEW
BASIC PROGRAM MANUAL FOR AMATEURS

Programs Design: Antennas, Op-amps, Smith-charts, R.F. Coils, Pads, Filters, Striplines, Microwave and more.

All FOR $9.95 (INCLUDES SHIPPING AND HANDLING)

ATTENTION YAESU FT-207R OWNERS

AUTOMATIC SCAN MODULE

15 minutes to install; scan re-starts when carrier drops off; busy switch controls automatic scan on-off; includes module and instructions.
Model AS-1 $25.00

NEW! **BATTERY SAVER KIT**
Model BS-1 $14.95

- No more dead batteries due to memory backup
- 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 216 DEPT. H
✓400 BREA, CALIFORNIA 92621

Subscription Problem?

73 Magazine does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

Please send a description of the problem and your most recent address label to:

73 Amateur Radio's Technical Journal
Subscription Dept.
PO Box 931
Farmingdale, NY 11737

Thank you and enjoy your subscription.

SATURN V

MICROWAVE TV ANTENNA
FACTORY DIRECT
SPECIAL SALE:
$125.00 plus shipping.
Calif. residents add 6% tax.

TOP SELLING ANTENNA
FACTORY DIRECT
WARRANTY SERVICE

Sorry - No Visa or MasterCharge This Sale

To Order Call (916) 454-2190

JDL INDUSTRIES
4558 Auburn Blvd.
Sacramento, CA 95841

BUY! SELL! TRADE!
COMPUTER & HAM EQUIPMENT
COMPUTER® TRADER
ANNUAL SUBSCRIPTION $10.00
Low Ad Rates — Mailed Monthly
Foreign Subscriptions - $25.00 Year
FREE 50 Word Classified Ad with Subscription Order
COMPUTER TRADER®
Chet Lambert, W4WDR
1704 Sam Drive • Birmingham, AL 35235
(205) 854-0271
Please include your Name, Address, Call Sign or Phone Number

this publication is available in microform

University Microfilms International

300 North Zeeb Road
Dept. P.R.
Ann Arbor, MI 48106
U.S.A.

18 Bedford Row
Dept. P.R.
London, WC1R 4EJ
England

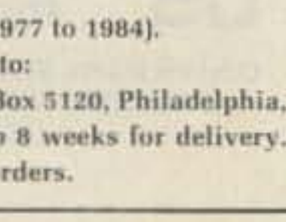
QUALITY MICROWAVE TV SYSTEMS
Complete Systems From $69.95
1.9 to 2.5 GHz Antennas
Galaxy Electronics ✓178
6007 N. 61st Ave.
Glendale, Az.
85301
(602) 247-1151
COD's
Dealers Wanted
VISA
MasterCard

RELIABLE MICROWAVE TV ANTENNAS
2.1 to 2.6 GHz Frequency Range
34db System Gain (or Greater)

Complete System (as pictured)	$119.95
Down Converter Probe Style (Assembled and Tested)	$ 49.95
Power Supply (12V to 16V DC+) (Assembled and Tested)	$ 39.95

PETERSON ELECTRONICS
4558 Auburn Blvd.
Sacramento, CA 95841
(916) 486-9071 ✓182
C.O.D.'s
SPECIAL QUANTITY PRICING
Dealers Wanted
MasterCard VISA
1 YEAR WARRANTY PARTS & LABOR

PRESERVE 73 WITH



BINDERS & FILE CASES.

Keep your issues of *73 Magazine* handy and protected in handsome and durable library file boxes or binders. Both styles are bound in red leatherette with the magazine logo stamped in gold.

File boxes: each file box holds 12 issues, with spines visible for easy reference.
$5.95 each, 3 for $17.00, 6 for $30.00
Binders: each binder holds 12 issues and opens flat for easy reading.
$7.50 each, 3 for $21.75, 6 for $42.00
(USA postage paid. Foreign orders must include $2.50 per item.)
Please state years desired (1977 to 1984).
Send check or money order to:
Jesse Jones Box Corp., P.O. Box 5120, Philadelphia, PA 19141; please allow 6 to 8 weeks for delivery.
Sorry, no C.O.D. or phone orders.

See List of Advertisers on page 114

FACIT 4555 SERIAL PAGE PRINTER

The Facit 4555 alphanumerical serial printer is complete. Equipped with RS232C Interface, printing mechanism, control electronics, drive electronics, power supply and character generator. The adaptation electronics can be modified in four versions:Bit-parallel data transfer, CCITT (EIA, RS232C) for bit-serial data transfer and the current loop (TTY) interface also for bit serial data transfer. The Facit 4555 prints on ordinary paper and is adjustable for different paper widths and formats, 9.5" paper width with 66 lines per page or DIN A4 with 70 lines per page.

SPECIFICATIONS

Print speed	up to 60ch.s.	Char. spacing	2.54mm/1/10" 80ch/line 1.55mm/0.06" 132ch/line
Printing mode	Incremental.		
Max. # of ch/line	80 alt. 132.	Char. Code	ECMA-6 7-bit coded char. set
Matrix	7 X 5 dot matrix.	Char. Set	63 Char. various national versions.
Char. Size Height	2.7mm/1/8"		
Char. Size Width	1.3mm/0.05" 132ch/line 2.1mm/0.083" 80ch/line	Feed mechanism	Sprocket feed.

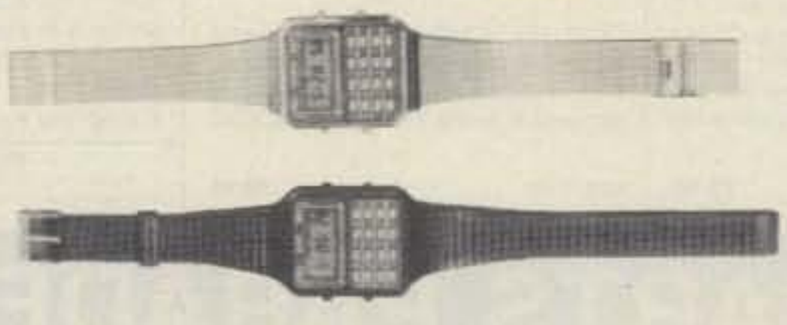
THESE UNITS WERE PULLED OUT OF SERVICE IN GOOD WORKING CONDITION. WE CHECK EACH UNIT ON A RADIO SHACK TRS-80 COLOR COMPUTER.

PRINTER ONLY $129.99

Printer with linecord, box of paper, inter-connect cable for TRS-80 COLOR COMPUTER. $149.99

GENEVA CALCULATOR WATCH

This attractive watch has the following modes:
Normal Time Setting,
Calendar Setting,
Daily Alarm Time Setting,
Weekly Alarm Time Setting,
Chronograph,
Calculator.



Featured in Black Plastic $24.99 or Featured in Stainless Steel $29.99

SILICON DIODES

MR751	100vdc	6Amps	10/$5.00	100/$38.00
MR510	1000vdc	3Amps	10/$3.75	100/$24.00
HEP170	1000vdc	2Amps	20/$2.00	100/$15.00
1N3209	100vdc	15Amps	$2.00	10/ $15.00
BYX21/200	200vdc	25Amps	$2.00	10/ $15.00
1N2138A	600vdc	60Amps	$5.00	10/ $40.00
DS85-04C	400vdc	80Amps	$10.00	10/ $80.00
1N3269	600vdc	160Amps	$15.00	10/$120.00
275Z41	300vdc	250Amps	$20.00	10/$175.00
7-5754	300vdc	400Amps	$30.00	10/$250.00
RCD-15	15KVDC	20ma.	$3.00	10/ $20.00
SMFR20K	20KVDC	20ma.	$4.00	10/ $30.00
1N4148	signal		30/$1.00	100/ $3.00

FAIRCHILD 4116 16K DYNAMIC RAMS 200ns. Part # 16K75

25 For $25.00 or 100 For $90.00 or 1000 For $750.00

HEWLETT PACKARD MICROWAVE DIODES

1N5711	(5082-2800)	Schottky Barrier Diodes	$1.00 or 10 for $ 8.50
1N5712	(5082-2810)	" " "	$1.50 or 10 for $10.00
1N6263	(HSCH-1001)	" " "	$ .75 or 10 for $ 5.00
5082-2835		" " "	$1.50 or 10 for $10.00
5082-2805	Quad Matched	" " " per set	$5.00 or 10 for $40.00

FEED THRU SOLDER RF CAPACTORS

470pf +-20%

5/$1.00 or 100/$15.00 or 1000/$100.00

1000pf/.001uf +-10%

4/$1.00 or 100/$20.00 or 1000/$150.00

E PROMS

2708 1024x1	$2.00 each
2716 2048x8	$4.00 each
27L32/25L32	$10.00 each

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min	F=2GHz	dB 2.4 Typ.	MAG	F=2GHz	dB 12 Typ.	$5.30
	F=3GHz	dB 3.4 Typ.		F=3GHz	dB 9 Typ.	
	F=4GHz	dB 4.3 Typ.		F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacturers, and described in the RF Data Book.

5pf	10pf	18pf	30pf	43pf	100pf	200pf	1 to 10pcs. $1.00 ea
5.1pf	12pf	22pf	32pf	51pf	110pf	220pf	11 to 50pcs. $ .90 ea
6.8pf	13pf	25pf	33pf	60pf	120pf	470pf	51 up pcs. $ .80 ea
7pf	14pf	27pf	34pf	80pf	130pf	500pf	
8.2pf	15pf	27.5pf	40pf	82pf	140pf	1000pf	

NIPPON ELECTRIC COMPANY TUNNEL DIODES

		MODEL 1S2199	1S2200 $7.50
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ratio (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE $45.00

MOTOROLA RF DATA BOOK

Listsall Motorola RF Transistors / RF Power Amplifiers, Varactor Diodes and much much more.

PRICE $7.50

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

RF TRANSISTORS, MICROWAVE DIODES

PART	PRICE
1S2199	$ 7.50
1S2200	7.50
2N1561	25.00
2N1562	25.00
2N2857	1.55
2N2857JAN	2.55
2N2876	11.00
2N2947	18.35
2N2948	15.50
2N2949	3.90
2N2950	4.60
2N3375	8.00
2N3553	1.57
2N3632	13.80
2N3818	5.00
2N3866	1.30
2N3924	3.35
2N3927	17.75
2N3950	25.00
2N4072	1.80
2N4127	21.00
2N4427	1.30
2N4428	1.85
2N4957	3.45
2N4958	2.90
2N4959	2.30
2N5090	13.90
2N5108	4.00
2N5109	1.70
2N5160	3.45
2N5177	21.62
2N5179	1.00
2N5583	4.00
2N5589	8.65
2N5590	10.35
2N5591	13.80
2N5635	10.95
2N5637	15.50
2N5641	9.20
2N5642	10.95
2N5643	15.50
2N5645	13.80
2N5646	20.70
2N5691	18.00
2N5764	27.00
2N5836	5.45
2N5842	8.00
2N5849	20.00
2N5913	3.25
2N5922	10.00
2N5923	25.00
2N5941	23.00
2N5942	40.00
2N5944	9.20
2N5945	11.50
2N5946	19.00
2N6080	9.20
2N6081	10.35
2N6082	11.50
2N6083	$ 13.25
2N6084	15.00
2N6094 /M9622	11.00
2N6095 /M9623	12.00
2N6096 /M9624	15.50
2N6097	17.25
2N6136	21.85
2N6166	40.25
2N6201	50.00
2N6459	18.00
2N6603	12.00
2N6680	80.00
2SC756A	7.50
2SC781	2.80
2SC1018	1.00
2SC1042	12.00
2SC1070	2.50
2SC1239	2.50
2SC1251	12.00
2SC1306	2.90
2SC1307	5.50
2SC1760	1.50
2SC1970	2.50
2SC2166	5.50
8B1087 (M.A.)	25.00
A50-12	20.00
A283B	5.00
ALD4200N (AVANTEK)	395.00
AM123	97.35
AM688	100.00
BB105B	.52
BD4/4JFBD4 (G.E.)	10.00
BFQ85	1.50
BFR90	1.30
BFR91	1.65
BFW92	1.50
BFX89	1.00
BFY90	1.00
BGY54	25.00
BGY55	25.00
BGY74	25.00
BGY75	25.00
BL161	10.00
BLX67	11.00
BLY568CF	25.00
BLY87	13.00
BLY88	14.00
BLY89	15.00
BLY90	20.00
BLY351	10.00
C4005	20.00
CA402 (TRW)	25.00
CA405 (TRW)	25.00
CA612B (TRW)	25.00
CA2100 (TRW)	25.00
CA2113 (TRW)	25.00
CA2200 (TRW)	25.00
CA2213 (TRW)	25.00
CA2418 (TRW)	25.00
CA2612 (TRW)	$ 25.00
CA2674 (TRW)	25.00
CA2881-1 (TRW)	25.00
CA4101 (TRW)	25.00
CA4201 (TRW)	25.00
CA4600 (TRW)	25.00
CD1889	20.00
CD2545	20.00
CMD514AB	20.00
D4959	10.00
D4987M	20.00
D5147D	10.00
D5506	10.00
D5827AM	20.00
DMD6022	30.00
DMS-2A-250	40.00
HEP76	4.95
HEPS3002	11.30
HEPS3003	30.00
HEPS3005	10.00
HEPS3006	19.90
HEPS3007	25.00
HEPS3010	11.34
HTEF2204 H.P.	112.00
5082-0112 H.P.	14.20
5082-0253 H.P.	105.00
5082-0320 H.P.	58.00
5082-0386 H.P.	POR
5082-0401 H.P.	POR
5082-0438 H.P.	POR
5082-1028 H.P.	POR
5082-2711 H.P.	23.15
5082-3080 H.P.	2.00
5082-3188 H.P.	1.00
5082-6459 H.P.	POR
5082-8323 H.P.	POR
35826E H.P.	POR
35831E H.P.	29.99
35853E H.P.	71.50
35854E H.P.	75.00
HPA0241 H.P.	75.60
HXTR3101 H.P.	7.00
HXTR3102 H.P.	8.75
HXTR6101/2N6617 H.P.	55.00
HXTR6104 H.P.	68.00
HXTR6105 H.P.	31.00
HXTR6106 H.P.	33.00
QSCH1995 H.P.	POR
JO2000 TRW	10.00
JO2001 TRW	25.00
JO4045 TRW	25.00
K3A	10.00
MA450A	10.00
MA41487	POR
MA41765	POR
MA43589	POR
MA43636	POR
MA47044	POR
MA47651	25.50

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MHz electronics

GaAs, TUNNEL DIODES, ETC.

PART	PRICE	PART	PRICE	PART	PRICE
MA47100	$ 3.05	MRF503	$ 6.00	PT4186B	$ POR
MA47202	30.80	MRF504	7.00	PT4209	POR
MA47771	POR	MRF509	5.00	PT4209C	POR
MA47852	POR	MRF511	8.65	PT4566	POR
MA49558	POR	MRF605	20.00	PT4570	POR
MB4021	POR	MRF629	3.47	PT4571	POR
MBD101	1.00	MRF644	23.00	PT4571A	POR
MDO513	POR	MRF816	15.00	PT4577	POR
MHW1171	42.50	MRF823	20.00	PT4590	POR
MHW1182	48.60	MRF901	3.00	PT4612	POR
MHW4171	49.35	MRF8004	2.10	PT4628	POR
MHW4172	51.90	MS261F	POR	PT4640	POR
MHW4342	68.75	MT4150 Fair.	POR	PT4642	POR
MLP102	25.00	MT5126 Fair.	POR	PT5632	POR
MM1500	32.32	MT5481 Fair.	POR	PT5749	POR
MM1550	POR	MT5482 Fair.	POR	PT6612	POR
MM1552	50.00	MT5483 Fair.	POR	PT6626	POR
MM1553	50.00	MT5596 Fair.	POR	PT6709	POR
MM1614	10.00	MT5764 Fair.	POR	PT6720	POR
MM2608	5.00	MT8762 Fair.	POR	PT8510	POR
MM3375A	11.50	MV109	.77	PT8524	POR
MM4429	10.00	MV1401	8.75	PT8609	POR
MM8000	1.15	MV1624	1.42	PT8633	POR
MM8006	2.30	MV1805	15.00	PT8639	POR
MO277L	POR	MV1808	10.00	PT8659	POR
MO283L	POR	MV1817B	10.00	PT8679	POR
MO3757	POR	MV1863B	10.00	PT8708	POR
MP102	POR	MV1864A	10.00	PT8709	POR
MPN3202	10.00	MV1864B	10.00	PT8727	POR
MPN3401	.52	MV1864D	10.00	PT8731	POR
MPN3412	1.00	MV1868D	10.00	PT8742	POR
MPSU31	1.01	MV2101	.90	PT8787	POR
MRA2023-1.5 TRW	42.50	MV2111	.90	PT9790	41.70
MRF212/208	16.10	MV2115	1.55	PT31962	POR
MRF223	13.25	MV2201	.53	PT31963	POR
MRF224	15.50	MV2203	.53	PT31983	POR
MRF237	3.15	MV2209	2.00	PTX6680	POR
MRF238	12.65	MV2215	2.00	RAY-3	24.99
MRF243	25.00	MWA110	7.45	40081	POR
MRF245	34.50	MWA120	7.80	40281	POR
MRF247	34.50	MWA130	8.25	40282	POR
MRF304	43.45	MWA210	7.80	40290	POR
MRF315	23.00	MWA220	8.25	RF110	25.00
MRF420	20.00	MWA230	8.65	SCA3522	POR
MRF421	36.80	MWA310	8.25	SCA3523	POR
MRF422	41.40	MWA320	8.65	SD1065	POR
MRF427	16.10	MWA330	9.50	SS43	POR
MRF428	46.00	NEC57835	5.30	TP1014	POR
MRF450/A	13.80	ON382	5.00	TP1028	POR
MRF453/A	17.25	PPT515-20-3	POR	TRW-3	POR
MRF454/A	19.90	PRT8637	POR	UTO504 Avantek	70.00
MRF455/A	16.00	PSCQ2-160	POR	UTO511 Avantek	75.00
MRF458	19.90	PT3190	POR	V15	4.00
MRF463	25.00	PT3194	POR	V33B	4.00
MRF472	1.00	PT3195	POR	V100B	4.00
MRF475	2.90	PT3537	POR	VAB801EC	25.00
MRF477	11.50	PT4166E	POR	VAB804EC	25.00
MRF502	1.04	PT4176D	POR	VAS21AN20	25.00

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

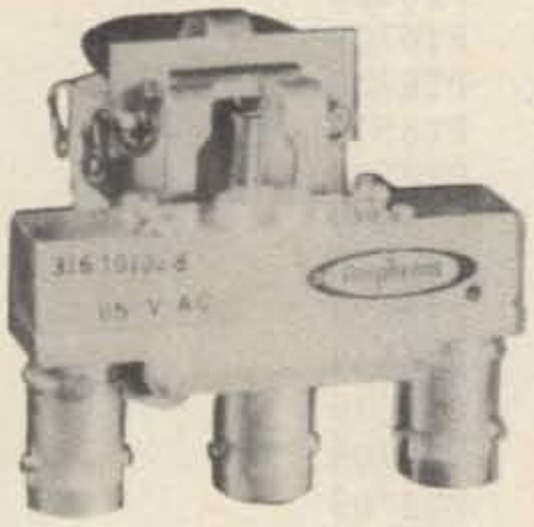
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

COAXIAL RELAY SWITCHES SPDT

Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.

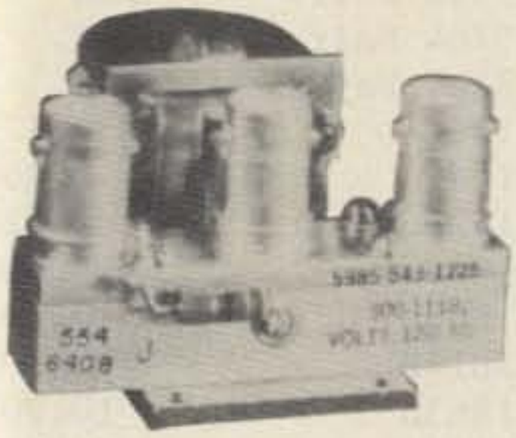
Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99



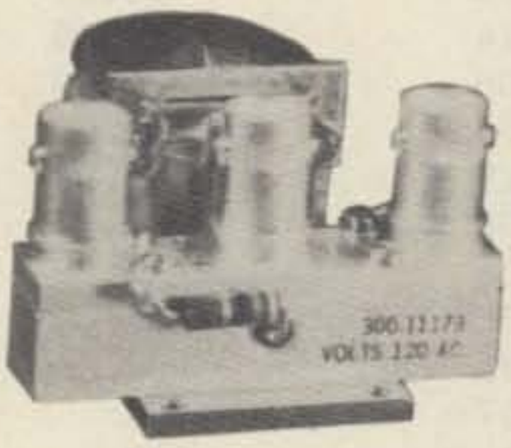
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99



BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00

$8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1DB72 PRICE EACH $5.00	5vdc turn on	120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Digisig, Inc. Model ECS-215 PRICE EACH $7.50	5vdc turn on	240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Grigsby/Barton Model GB7400 PRICE EACH $7.50	5vdc turn on	240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

MHz electronics

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

Toll Free Number
800-528-0180
(For orders only)

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.)
$2.00

TOUCH TONE PAD

This pad contains all the electronics to produce standard touch-tone tones. New with data.

$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.

$19.99 or 10/$149.99

INTEGRATED CIRCUIT.

		1 to 10	11up
MC1372P	Color TV Video Modulator Circuit.	$ 4.42	$2.95
MC1358P	IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator.	5.00	4.00
MC1350P	IF Amplifier	1.50	1.25
MC1330A1P	Low Level Video Detector	1.50	1.15
MC1310P	FM Stereo Demodulator	4.29	3.30
MC1496P	Balanced Modulator/Demodulator	1.50	1.25
LM565N	Phase Locked Loop	2.50	2.00
LM380N14	2Watt Audio Power Amplifier	1.56	1.25
LM1889N	TV Video Modulator	5.00	4.00
NE564N	Phase Locked Loop	10.00	8.00
NE561N	Phase Locked Loop	10.00	8.00

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.

Features:
1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MHz electronics

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

Toll Free Number
800-528-0180
(For orders only)
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

		$POR
SK110	Socket	
SK300A	Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J	$520.00
SK400	Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A	260.00
SK406	Chimney For 4-250A,400A,400C,4PR400A	74.00
SK416	Chimney For 3-400Z	36.00
SK500	Socket For 4-1000A/4PR1000A/B	390.00
SK600	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	51.00
SK602	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	73.00
SK606	Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ	11.00
SK607	Socket For 4CX600J,JA	60.00
SK610	Socket For 4CX600J,JA	60.00
SK620	Socket For 4CX600J,JA	66.00
SK626	Chimney For 4CX600J,JA	10.00
SK630	Socket For 4CX600J,JA	66.00
SK636B	Chimney For 4CX600J,JA	34.00
SK640	Socket For 4CX600J,JA	36.00
SK646	Chimney For 4CX600J,JA	71.00
SK700	Socket For 4CX300A,Y,4CX125C,F	225.00
SK711A	Socket For 4CX300A,Y,4CX125C,F	225.00
SK740	Socket For 4CX300A,Y,4CX125C,F	86.00
SK770	Socket For 4CX300A,Y,4CX125C,F	86.00
SK800A	Socket For 4CX1000A,4CX1500B	225.00
SK806	Chimney For 4CX1000A,4CX1500B	40.00
SK810	Socket For 4CX1000A,4CX1500B	225.00
SK900	Socket For 4X500A	300.00
SK906	Chimney For 4X500A	57.00
SK1420	Socket For 5CX3000A	650.00
SK1490	Socket For 4CV8000A	585.00

JOHNSON TUBE SOCKETS AND CHIMNEYS

124-111/SK606	Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ	$ 10.00
122-0275-001	Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A	(pair)15.00
124-0113-00	Capacitor Ring	15.00
124-116/SK630A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
124-115-2/SK620A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
	813 Tube Socket	20.00

TUBE CAPS (Plate)

HR1, 4	$11.00
HR2,3, 6 & 7	13.00
HR5, 8	14.00
HR9	17.00
HR10	20.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_o), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2E26	$ 5.69	KT88	$ 20.00	6562/6974A	$ 50.00
2K28	100.00	DX362	50.00	6832	22.00
2X1000A	300.00	DX415	50.00	6883/8032A/8552	7.00
3B22	19.75	572B/T160L	49.00	6897	110.00
3B28/866A	7.50	592/3-200A3	144.00	6907A	75.00
3-500Z	102.00	807	7.50	6939	15.00
3-1000Z	400.00	811	10.00	7094	125.00
3CX1000A/8283	428.00	811A	15.00	7117	17.00
3CX1500A7/887	533.00	812A	35.00	7211	60.00
3X2500A3	200.00	813	50.00	7289/3CX100A5	34.00
3CX3000A7	490.00	829B	38.00	7360	11.00
4-65A/8165	45.00	832A	28.00	7377	67.00
4-125A/4D21	58.00	4624	310.00	7408	4.00
4-250A/5D22	75.00	4662	80.00	7650	250.00
4-400A/8432	90.00	4665	585.00	7695	8.00
4-400C/6775	95.00	5675/A	25.00	7843	58.00
4-1000A/8166	300.00	5721	200.00	7854	83.00
4B32	22.00	5768	85.00	7868	5.00
4E27A/5-125B	155.00	5836	100.00	7894	12.00
4CS250R	146.00	5837	100.00	8072	65.00
4X150A/7034	30.00	5861/EC55	110.00	8117A	130.00
4X150D/7035	40.00	5876A	25.00	8121	60.00
4X150G/8172	100.00	5881/6L6W	6.00	8122	100.00
4X250B	30.00	5893	45.00	8236	30.00
4CX250B/7203	45.00	5894/A	50.00	8295/PL172	506.00
4CX250F/G/8621	55.00	5894/B	60.00	8462	100.00
4CX250K/8245	100.00	5946	258.00	8505A	73.50
4CX250R/7580W	69.00	6080	10.00	8533W	92.00
4CX300A/8167	140.00	6083/AX9909	89.00	8560/A	65.00
4CX350A/8321	83.00	6098/6AK6	14.00	8560AS	90.00
4CX350F/J/8904	95.00	6115/A	110.00	8608	34.00
4X500A	282.00	6146	7.00	8637	38.00
4CX600J/8809	607.00	6146A	7.50	8643	100.00
4CW800F	625.00	6146B/8298A	8.50	8647	123.00
4CX1000A/8168	340.00	6146W	14.00	8737/5894B	60.00
4CX1500B/8660	397.00	6156	66.00	8873	260.00
4CX5000A/8170	932.00	6159	15.00	8874	260.00
4CX10000D/8171	990.00	6161	233.00	8875	260.00
4CX15000A/8281	1260.00	6291	125.00	8877	533.00
4PR60A	100.00	6293	12.00	8908	12.00
4PR60B/8252	175.00	6360	5.00	8930/651Z	71.00
4PR400A/8188	192.00	6524	53.00	8950	12.00
5CX1500A	569.00	6550	10.00		
6BK4C	6.00	6JM6	6.00	6LQ6 (Sylvania)	7.50
6DQ5	5.00	6JN6	6.00	6LU8	6.00
6FW5	6.00	6JS6B	6.00	6LX6	6.00
6GE5	6.00	6KG6/EL505	6.00	6ME6	6.00
6GJ5	6.00	6KM6	6.00	12BY7A	4.00
6HS5	6.00	6KN6	6.00	12JB6A	6.00
6JB5/6HE5	6.00	6LF6	6.00	6KD6	6.00
6JB6A	6.00	6LQ6 (GE)	6.00	6JT6A	6.00
				6KD6	6.00

NOTICE ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE !!!
TUBES MAY EITHER BE NEW OR SURPLUS CONDITION !!!

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

"FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO, Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

****

CRYSTAL FILTERS

NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

****

CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
	BFB455L	455KHz	3.50
	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
	CFR455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB	8.00
	CFU455B	455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB	2.90
	CFU455C	455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB	2.90
	CFU455G	455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB	2.90
	CFU455H	455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB	2.90
	CFU455I	455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB	2.90
	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
	CFW455H	455KHz +-3KHz at 6dB , +-9KHz at 40dB	2.90
	SFB455D	455KHz	2.50
	SFD455D	455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz	5.00
	SFE10.7MA	10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB	2.50
	SFE10.7MS	10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB	2.50
	SFG10.7MA	10.7MHz	10.00
NIPPON	LF-B4/CFU455I	455KHz +-1KHz	2.90
	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
TOKIN	CF455A/BFU455K	455KHz +-2KHz	5.00
MATSUSHIRA	EFC-L455K	455KHz	7.00

****

SPECTRA PHYSICS INC, Model 088 HeNe LASER TUBES

POWER OUTPUT 1.6MW. BEAM DIA. .75MM BEAM DIR. 2.7MR 8KV STARTING VOLTAGE DC
68K OHM 1WATT BALLAST 1000VDC +-100VDC At 3.7MA $59.99

ROTRON MUFFIN FANS Model MARK4/MU2A1

115 VAC 14WATTS 50/60CPS IMPEDENCE PROTECTED-F 88CFM at 50CPS
105CFM at 60CPS THESE ARE NEW $ 7.99

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

HEWLETT PACKARD SIGNAL GENERATORS

606A	50KHz to 65MHz in 6 bands +-1%,Output level adjustable 0.1uV to 3V into 50 ohms.Built-in crystal calibrator.400 -1000Hz modulation.	$ 650.00
606B	Same as above but has frequency control feature to allow operation with HP 8708A Synchronizer.	$1100.00
608C	10MHz to 480MHz,0-1uV-1V into 50 ohms,AM,CW,or pulse modulation, calibrated attenuator.	$ 500.00
608D/ TS510	10MHz to 420MHz, 0.1uV-0.5V into 50 ohms,+-0.5% accuracy, built-in crystal calibrator, AM-CW or pulse output.	$ 375.00
608E	Improved version of popular 608C.Up to 1V output.Improved stability,low residual FM.	$1450.00
608F	10MHz to 455MHz in 5 bands +-1% frequency accuracy with built-in crystal calibrator.Can be used with HP 8708A Synchronizer. Output continuously adjustable from .1uV to .5V into 50 ohms.	$1100.00
612A	450-1230MHz ,0.1uV-0.5V into 50 ohms,calibrated output.	$ 750.00
614A	900-2100MHz with many features including calibrated output and all modulation characteristics.	$ 500.00
616A/ TS403	Direct reading and direct control from 1.8 to 4.2GHz. The H.P.616A features +-1.5dB calibrated output accuracy from -3127dBm to -dBm.The output is directly calibrated in microvolts and dBm with continuous monitoring. Simple operation frequency diad accuracy is +-1% and stability exceeds 0.005%-/ C change in ambient temperature. Calibrated attenuator is within +-1.5dB over entire output band. 50 ohm impedance unit has internal pulse modulation with rep rate variable from 40 Hz to 4KHz,variable pulsewidth(1 to 10usec)and variable pulse delay(3 to 300usec).External modulating inputs increas versatility.	$ 375.00
616B	Same as above but later model.	$ 600.00
618B	3.8 to 7.6GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 600.00
618C	Same as above but later model.	$2200.00
620A	7 to 11GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 750.00
620B	Same as above but later model.	$2200.00
626A	10 to 15GHz,10mw output power with calibrated output and pulse-square wave or FM modulation.	$4200.00
8708A	Synchronizer used with 606B,608F.The synchronizer is a phase-lock frequency stabilizer which provides crystal-oscillator frequency stability to 430MHz in the 608F signal generator.Phase locking eliminates microphonics and drift resulting in excellent frequency stability.The 8708A includes a vernier which can tune the reference oscillator over a range of +-0.25% permitting frequency settability to 2 parts in 10 to the seventh.Provides a very stable signal that satisfies many critical applications. (With HP 606B or 608F) (Without)	 $ 350.00 $ 450.00
EMC-10	ELECTROMETRICS EMC-10 RFI/EMI RECEIVER Low frequency analyzer covering 20Hz to 50KHz frequency range.Extendable to 500 KHz in wideband mode.	$2500.00
NF-105F	Empire Devices Field Intensity Meter. Has NF-105/TA,NF-105/TX,NF-105/T1,NF-105/T2,NF-105/T3. Covers 14KHz to 1000MHz.	$2100.00

ALL EQUIPMENT CARRY A 30 DAY GUARANTEE.

EQUIPMENT IS NOT CALIBRATED.

ORDERING INSTRUCTIONS

DEFECTIVE MATERIAL: All claims for defective material must be made within sixty (60) days after receipt of parcel. All claims must include the defective material (for testing purposes), our invoice number, and the date of purchase. All returns must be packed properly or it will void all warranties.

DELIVERY: Orders are normally shipped within 48 hours after receipt of customer's order. If a part has to be backordered the customer is notified. Our normal shipping method is via First Class Mail or UPS depending on size and weight of the package. On test equipment it is by Air only, FOB shipping point.

FOREIGN ORDERS: All foreign orders must be prepaid with cashier's check or money order made out in U.S. Funds. We are sorry but C.O.D. is not available to foreign countries and Letters of Credit are not an acceptable form of payment either. Further information is available on request.

HOURS: Monday thru Saturday: 8:30 a.m. to 5:00 p.m.

INSURANCE: Please include 25¢ for each additional $100.00 over $100.00, United Parcel only.

ORDER FORMS: New order forms are included with each order for your convenience. Additional forms are available on request.

POSTAGE: Minimum shipping and handling in the US, Canada, and Mexico is $2.50 all other countries is $5.00. On foreign orders include 20% shipping and handling.

PREPAID ORDERS: Order must be accompanied by a check.

PRICES: Prices are subject to change without notice.

RESTOCK CHARGE: If parts are returned to MHZ Electronics due to customer error, customer will be held responsible for all extra fees, will be charged a 15% restocking fee, with the remainder in credit only. All returns must have approval.

SALES TAX: Arizona must add 5% sales tax, unless a signed Arizona resale tax card is currently on file with MHZ Electronics. All orders placed by persons outside of Arizona, but delivered to persons in Arizona are subject to the 5% sales tax.

SHORTAGE OR DAMAGE: All claims for shortages or damages must be made within 5 days after receipt of parcel. Claims must include our invoice number and the date of purchase. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY
NO INFORMATION WILL BE GIVEN. 1-800-528-0180.

TERMS: DOMESTIC: Prepaid, C.O.D. or Credit Card
FOREIGN: Prepaid only, U.S. Funds—money order or cashier's check only.

C.O.D.: Acceptable by telephone or mail. Payment from customer will be by cash, money order or cashier's check. We are sorry but we cannot accept personal checks for C.O.D.'s.

CONFIRMING ORDERS: We would prefer that confirming orders not be sent after a telephone order has been placed. If company policy necessitates a confirming order, please mark "CONFIRMING" boldly on the order. If problems or duplicate shipments occur due to an order which is not properly marked, customers will be held responsible for any charges incurred, plus a 15% restock charge on returned parts.

CREDIT CARDS: WE ACCEPT MASTERCARD VISA AND AMERICAN EXPRESS.

DATA SHEETS: When we have data sheets in stock on devices we do supply them with the order.

MHz electronics

✓48

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

(602) 242-3037
(602) 242-8916
2111 W. CAMELBACK ROAD
PHOENIX, ARIZONA 85015

Toll Free Number
800-528-0180
(For orders only)

See List of Advertisers on page 114

NEW LOW-NOISE PREAMPS

New low-noise microwave transistors make preamps in the 0.9 to 1.0 dB noise figure range possible without the fragility and power supply problems of gas-fet's. Units furnished wired and tuned to ham band. Can be easily retuned to nearby freq.

Models LNA( ), P30, and P432 shown

Model	Tunable Freq Range	Noise Figure	Gain	Price
LNA 28	20-40	0.9 dB	20 dB	$39.95
LNA 50	40-70	0.9 dB	20 dB	$39.95
LNA 144	120-180	1.0 dB	18 dB	$39.95
LNA 220	180-250	1.0 dB	17 dB	$39.95
LNA 432	380-470	1.0 dB	18 dB	$44.95

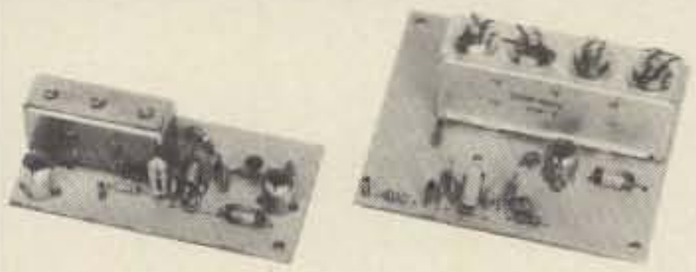
ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $14.95
- P30C, VHF Kit with case $20.95
- P30W, VHF Wired/Tested $29.95
- P432K, UHF Kit less case $18.95
- P432C, UHF Kit with case $24.95
- P432W, UHF Wired/Tested $33.95

P432 also available in broadband version to cover 20-650 MHz without tuning. Same price as P432; add "B" to model #.

HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier similar to the LNA series and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Noise figure = 1 to 1.2 dB. Gain = 12 to 15 dB.

Model	Tuning Range	Price
HRA-144	143-150 MHz	$49.95
HRA-220	213-233 MHz	$49.95
HRA-432	420-450 MHz	$59.95

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

	Antenna Input Range	Receiver Output
VHF MODELS	28-32	144-148
	50-52	28-30
Kit $44.95	50-54	144-148
Less Case $39.95	144-146	28-30
Wired $59.95	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	144-148	50-54
	220-222	28-30
	220-224	144-148
	222-226	144-148
	220-224	50-54
	222-224	28-30
UHF MODELS	432-434	28-30
	435-437	28-30
Kit $54.95	432-436	144-148
Less Case $49.95	432-436	50-54
Wired $74.95	439.25	61.25

SCANNER CONVERTERS Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $79.95.

SPECIAL FREQUENCY CONVERTERS made to custom order $119.95. Call for details.

SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – **ONLY $159.95**
complete with controls, heatsink, etc.
10 Watts, 5 Channels, for 6M, 2M, or 220

Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $59.95

REPEAT OF A SELLOUT!

While supply lasts, get $59.95 cabinet kit free when you buy an FM-5 Transceiver kit. Where else can you get a complete transceiver for only $159.95?

TRANSMIT CONVERTERS

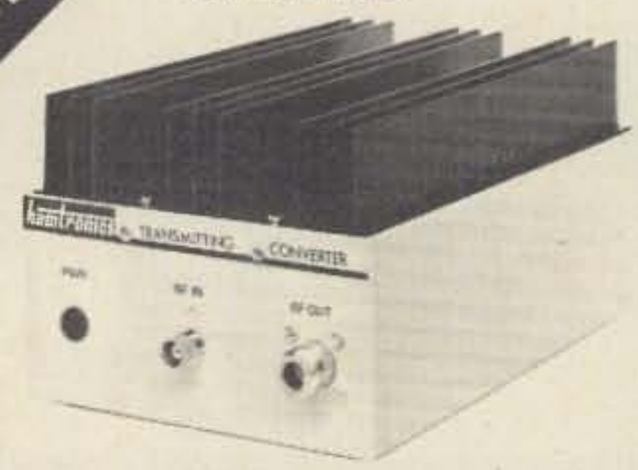
For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 watts output.

	Exciter Input Range	Antenna Output
For VHF,	28-30	144-146
Model XV2	28-29	145-146
Kit $79.95	28-30	50-52
Wired $119.95	27-27.4	144-144.4
(Specify band)	28-30	220-222
	50-54	220-224
	144-146	50-52
	50-54	144-148
	144-146	28-30
For UHF,	28-30	432-434
Model XV4	28-30	435-437
Kit $99.95	50-54	432-436
Wired $149.95	61.25	439.25
	144-148	432-436*

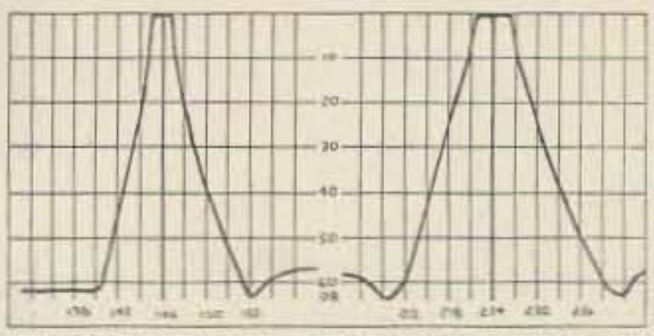
*Add $35 for 2M input

FREE OFFER

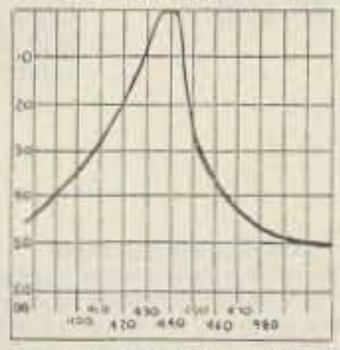
For limited time, buy a transmit converter above with 40-45W PA ($129.95) and get $39.95 cabinet FREE.



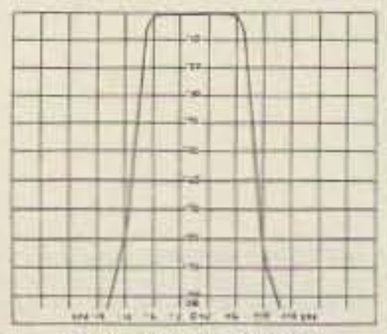
LOOK AT THESE ATTRACTIVE CURVES!



R144 & R220 Front Ends, HRA 144/220, & HRF-144/220

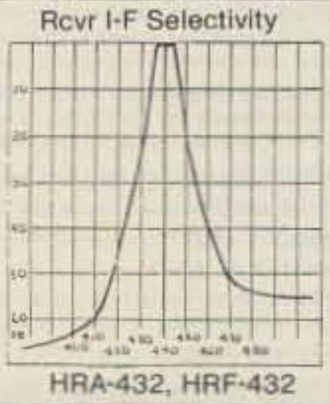


R451 Receiver Front End



Rcvr I-F Selectivity

Typical Selectivity Curves of Receivers and Helical Resonators.



HRA-432, HRF-432

- **Call or Write for FREE CATALOG**
  (Send $1.00 or 4 IRC'c 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-W MOUL RD. ● HILTON NY 14468
Phone: 716-392-9430

AT LAST — A REPEATER YOU CAN AFFORD!

For years, Hamtronics ® Modules have been used by individual hams and manufacturers to make repeaters. Now, in the Hamtronics tradition of top quality and superb value, we are proud to offer a complete repeater package.

JUST LOOK AT THESE PRICES!

Band	Kit	Wired/Tested
6M,2M,220	$595	$745
440	$645	$795

Both kit and wired units are complete with all parts, modules, hardware, and crystals.

CALL OR WRITE FOR COMPLETE DETAILS.

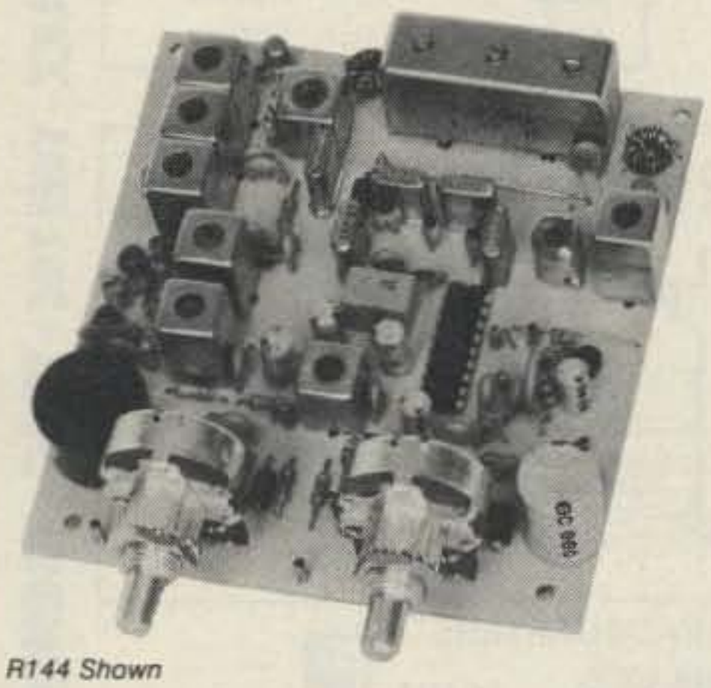
Also available for remote site linking/crossband & 10M.

FEATURES:

- SENSITIVITY SECOND TO NONE; TYPICALLY 0.15 uV ON VHF, 0.3 uV ON UHF.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE CRYSTAL FILTER & CERAMIC FILTER FOR GREATER THAN 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS. SEE R144, R220, AND R451 SPECS IN RECEIVER AD BELOW.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY-TUNE TRANSMITTER; UP TO 20 WATTS OUT.

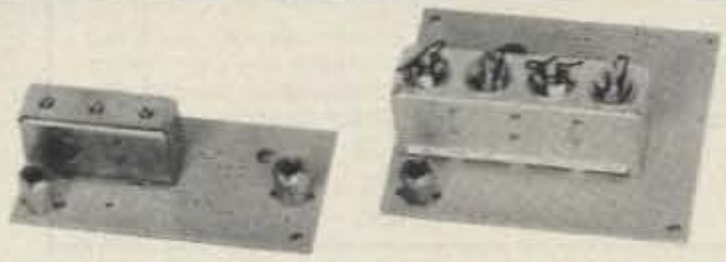
HIGH QUALITY MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.

INTRODUCING — NEW 1983 RECEIVERS



R144 Shown

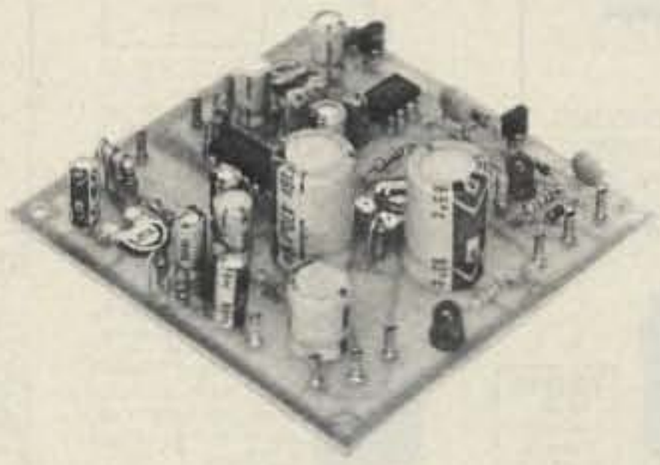
- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity (curves at left). AFC incl., xtal oven avail. Kit only $119.95
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $119.95.
- **R76 FM RCVR** for 10M, 6M, 2M, 220, or commercial bands. As above, but w/o AFC or hel. res. Kits only $109.95.
  Also avail w/4 pole filter, only $94.95/ kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft band or ham bands. Only $84.95
- **R110 UHF AM RECEIVER** for UHF uses, including special 259 MHz model to hear SPACE SHUTTLE. Kit $94.95



- **HELICAL RESONATOR FILTERS** available separately on pcb w/connectors.

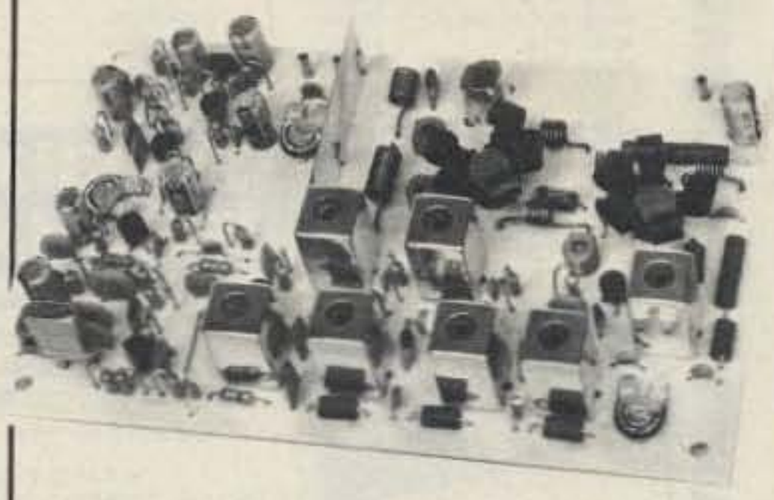
  HRF-144 for 143-150 MHz $34.95
  HRF-220 for 213-233 MHz $34.95
  HRF-432 for 420-450 MHz $44.95

  (See selectivity curves at left.)



- **COR KITS** With audio mixer and speaker amplifier. Only $29.95.
- **CWID KITS** 158 bits, field programmable, clean audio. Only $59.95.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $89.95.
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $89.95. Requires DTMF Module.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Only $18.00

TRANSMITTERS AND ACCESSORIES



- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous. Kits only $59.95

- **T451 UHF FM EXCITER** 2 to 3 Watts on 450 ham band or adjacent. Kits only $69.95.
- **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.

hamtronics® ↙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 master charge

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.

↙See List of Advertisers on page 114

DEALER DIRECTORY

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego. 827-5732 (Reno NV).

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.**

Sacramento CA

TOWERS—galvanized steel stack/crankup and accessories. Northern California factory direct to you. **California Antenna Systems, 6020 Windy Ridge Road, Shingle Springs CA 95682, 677-9540.**

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.**

New Castle DE

Factory Authorized Dealer! Yaesu, ICOM, Ten-Tec, KDK, Azden, AEA, Kantronics, Santec. Full Line of Accessories. No Sales Tax in Delaware. One mile off I-95. **Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720, 328-7728.**

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.**

Bloomington IL

ROHN TOWERS—Large stock plus all UNARCO ROHN items available for fast drop shipments. Wholesale prices to all users. Also wholesale distributor for Antenna Specialists, Regency, and Hy-Gain. **Hill Radio, 2503 C.E. Road Box 1405, Bloomington IL 61701, 663-2141**

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 47803, 238-1456.**

Littleton MA

The Reliable Ham Store Serving N.E. Full line of ICOM & Kenwood. Yaesu HTs, Drake, Daiwa, B&W accessories. Curtis & Trac keyers. Larsen, Hustler, Telex/Hy-Gain products. Mirage amps., Astron P.S., Alpha Delta protectors, ARRL & Kantronics instruction aids. Whistler radar detectors. Full line of coax fittings. **TEL-COM Electronic Communications, 675 Great Rd. (Rt. 119), Littleton MA 01460, 486-3400/3040.**

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 MI 48104, 668-8696.**

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.**

Buffalo NY
WESTERN NEW YORK

Niagara Frontier's only full stocking Amateur dealer. Also Shortwave, CB, Scanners, Marine, Commercial. Operating displays featuring Kenwood and others. Towers, Antennas, Sales and Service. **DX Communications, 3214 Transit Road, West Seneca NY, 668-8873.**

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, 736-0184.**

Columbus OH

The biggest and best Ham Store in the midwest featuring quality Kenwood products with working displays. We sell only the best. Authorized Kenwood Service. **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, AEA, Vibroplex, Hamkey, Amphenol, Sony, B&W, Coax-Seal, Cover Craft, J.W. Miller/Daiwa, ARRL, Ameco, Shure. **LaRue Electronics, 1112 Grandview St., Scranton PA 18509, 343-2124.**

Mountaintop PA
WILKES-BARRE AREA

VHF/UHF Equipment & Supplies—From HTs to kW Amplifiers, Transverters, Connectors, VHF/UHF/Microwave Linear Amplifiers, GaAs-FET Preamps, OSCAR Equipment, Low Noise Preamps, Antennas, Power Supplies. From: Lunar, Microwave Modules, UHF Units/Parabolic, ARCOS, Astron, F9FT-Tonna, Tama, Den-Tron, KLM, Mirage, Santec, Tokyo Hy-Power, Amphenol. Two Stamps for catalog. **The VHF SHOP, Dept. S, RD 4, Box 349, Mountaintop PA 18707, 868-6565.**

Dallas TX

IBM PC/Apple aftermarket products; hobbyists' electronics project kits: $50.00 complete modem kit, subscription/satellite TV decoder kits, EPROM programmer/duplicator, popular memory IC testers, data sheets, application notes, and more than 6000 parts in stock. Semiconductors, discretes, video products, tools . . . Please write for your free literature/catalog. **Independent Electronics, 6415-06 Airline Rd., Dallas TX 75205.**

Baltimore/Washington

Avantek transistors, amplifiers, oscillators and LNAs. Coaxial cable and connectors. Blonder Tongue dealer with Microwave laboratory. **Applied Specialties, Inc., 10101G Bacon Drive, Beltsville, Maryland 20705. Wash. 595-5393, Balt. 792-2211. 7:30 a.m. to 6:00 p.m. Monday thru Friday.**

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 Aug. '83 issue must be in our hands by June 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	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14A	14A	14	7A	7	14	14	21	21A	21A	21A
AUSTRALIA	14A	14	14	14B	7B	7B	7	7	7B	7B	14	14A
CANAL ZONE	14A	14	14	14	7	7	14	14	14	14A	21	21
ENGLAND	14	7	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	14A	14	14	14B	7B	7B	7	14	14	14	14	14A
INDIA	14	14	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7	14	14	14	14
MEXICO	14	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
PUERTO RICO	14	14	7	7	7	7	7A	14	14	14	14	14
SOUTH AFRICA	7B	7B	7B	7B	7A	14	14	21	21	21	14	14B
U.S.S.R.	14	7A	7A	7	7	7A	14	14	14	14	14A	14
WEST COAST	21	14A	14	7	7	7	7A	14	14	14A	21	21

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14A	14A	14	7A	7	7A	14	21	21A	21A	21A
AUSTRALIA	14A	14A	14	14	7B	7B	7	7	7B	7B	14	21
CANAL ZONE	14A	14A	14	14	7	7	14	14	14	21	21	21
ENGLAND	14	7	7	7	7	7	7	14	14	14	14	14
HAWAII	14A	14	14	14	7A	7	7	14	14	14	14	14A
INDIA	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7	7	14	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	14	7B	7B	7B	7B	14B	14	14	14
PUERTO RICO	21	14A	14	14	7	7	14	14	14	14A	21	21
SOUTH AFRICA	7B	7B	7B	7B	7B	14B	14	14	14	14A	14	14B
U.S.S.R.	14B	7A	7A	7	7	7B	7B	14B	14	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14A	14A	14	7A	7	7	14	21	21A	21A	21A
AUSTRALIA	21A	21A	21	21	14	7	7	7	7B	7B	14A	21
CANAL ZONE	14A	14A	14	14	7	7	7	14	14	21	21	21
ENGLAND	14	7	7	7	7	7	7	14B	14	14	14	14
HAWAII	21A	21	21	14A	14	14	7A	14	14	14	14A	21
INDIA	14	14	14	14	7B	7B	7B	14B	14	14	14	14
JAPAN	14A	14	14	14	14B	14B	7	7	14	14	14	14A
MEXICO	14	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14A	14	14	14	14B	7	7	14	14	14	14
PUERTO RICO	21	14A	14	14	7	7	7A	14	14	14A	21	21
SOUTH AFRICA	7B	7B	7B	7B	7B	7B	14B	14	14	14A	14	14B
U.S.S.R.	14B	7	7	7	7	7B	7B	14B	14	14	14	14
EAST COAST	21	14A	14	7	7	7	7A	14	14	14A	21	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F/G	2 G/G	3 G/G	4 G/G
5 F/G	6 F/G	7 F/G	8 F/G	9 F/G	10 F/G*	11 P/F*
12 F/F*	13 F/F	14 P/F	15 F/F	16 P/F	17 F/G	18 G/G
19 G/G	20 F/G	21 F/F	22 F/G	23 F/G	24 G/G	25 G/G
26 G/G	27 F/G	28 F/G	29 G/G	30 G/G		

New

INTRODUCING . . .
THE FT-980 CAT SYSTEM ! ! !

Join the computer revolution in Amateur Radio with the Computer Aided Transceiver . . . the new FT-980 from Yaesu Electronics!

8-Bit microprocessor for greater operating flexibility.

High-voltage, all solid state transmitter PA for excellent linearity.

Keyboard entry of frequencies into any of twelve independent VFO/memory registers.

Amateur band transmit plus general coverage receive capability.

Full CW break-in with quiet solid state switching.

CW Spot switch on front panel.

Digital frequency display with resolution to 10 Hz. Digital readerboard-type coarse frequency sub-display.

Keyboard entry of sub-bands for Novice, General, or Advanced Class operators. Separate sub-bands may be programmed on each memory.

Up/Down scanning plus instant ±5 kHz/step QSY from front panel.

SSB/CW/AM/FSK/FM operation built in. CW and AM Wide/Narrow selection using optional filters.

Wide dynamic range and noise floor maintenance provided by husky front end design and IF filter gain balancing.

10 Hz synthesizer steps. Quick frequency change via keyboard or scanning controls.

IF Notch filter at 455 kHz for interference rejection.

- Audio Peak Filter for narrow band CW signal enhancement.
- RX Audio Tone Control for signal laundering in AF line.
- Variable IF Bandwidth and IF Shift using cascaded filters.
- Memory storage of both frequency and operating mode.
- Pushbutton Memory Check feature for verification of memory frequencies without actually changing operating frequency in use.
- Pushbutton Offset Check feature for verification of memory-to-VFO frequency difference.
- Variable Pulse Width Noise Blanker.
- IF Monitor with front panel volume control.
- RF Speech Processor.
- Dual metering of Vcc, Ic, ALC, Compression, Discriminator Center, Relative PO, and SWR (Calibrated).
- Selectable AGC: Slow/Fast/Off.
- Separate RX-only antenna jack.
- Three FSK shifts built in.
- Optional Electronic Keyer Module.
- Optimization of audio passband for mode in use, for preservation of noise figure with changing bandwidth.
- Computer interface optional module available mid-1983, for remote transceiver control from personal computer terminal.

For a detailed brochure covering the FT-980 CAT System, call or write your Authorized Yaesu Dealer.

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU
The radio.

0183
✓83

YAESU ELECTRONICS CORPORATION, 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007
YAESU CINCINNATI SERVICE CENTER, 9070 Gold Park Drive, Hamilton, OH 45011 ● (513) 874-3100

FM "Dual-Bander."

NEW

2 m & 70 cm in single compact package, LCD, 25 W, optional voice synthesizer.

TW-4000A

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

TW-4000A FEATURES:

- **2 m and 70 cm FM in a Compact Package**
  Covers the 2 m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).
- **Large, Easy-to-Read LCD Display**
  A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.
- **25 Watts RF Power on 2 m/70 cm.**
  Hi/Lo power switch.
- **Optional "Voice Synthesizer Unit"**
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Front Panel Illumination**
- **10 Memories with Offset Recall and Lithium Battery Backup**
  Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band operation.
- **Programmable Memory Scan**
  Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band Scan in Selected 1-MHz Segments**
  Scans within the chosen 1-MHz segment (ie., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority Watch Function**
  Unit switches to memory 1 for 1 second each 10 seconds, to monitor the activity on the priority channel.
- **Common Channel Scan**
  Memory 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
- **Dual Digital VFO's**
  Selectable 5-kHz or 10-kHz for 2 m, and 5-kHz or 25-kHz for 70 cm. Depress "UP" or "DOWN" key on the front panel for band change in 1-MHz steps.
- **16-Key Autopatch UP/DOWN Microphone (Supplied)**
- **Repeater Reverse Switch**
- **High Performance Receiver/Transmitter**
  GaAs FET RF amplifiers on both 2 m and 70 cm, high performance MCF's in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Rugged Die-cast Chassis**
- **Optional Two-Frequency CTCSS Encoder**
  Easily mounted inside the radio, allows DIP switch programming of two different tone frequencies, for 2 m and 70 cm.
- **"BEEPER" sounds through speaker.**
- **Easy-to-Install mobile mount**

TW-4000A accessories:

- **VS-1 Voice Synthesizer**
- **TU-4C Two-Frequency Programmable CTCSS Encoder**
- **KPS-7A Fixed station power supply**
- **SP-40 Compact mobile speaker**

Subject to FCC approval

More information on the TW-4000A and TS-780 is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

...pacesetter in amateur radio

All mode "Dual-Bander"

TS-780

2 m & 70 cm all mode, dual digital VFO's, 10 memories, scan, IF shift...

TS-780 FEATURES:

- USB, LSB, CW, FM all mode, covering the 2 m band (144.000-148.000 MHz) and the middle 70 cm band (430.000-440.000 MHz). UP/DOWN band switch.
- Dual digital VFO's with normal/tight drag switch. VFO steps in 20-Hz, 200-Hz, 5-kHz, or 12.5-kHz, plus "FM CH" channelized tuning. Split (cross) frequency operation possible. F. LOCK switch provided.
- 10 memories include band and frequency data, backed up by internal batteries (not supplied). Battery life exceeds one year. Memories 9 and 10 for priority instant recall.
- Band scan, with selectable 0.5, 1, 3, 5, and 10-MHz scan bandwidth.
- Memory scan selectable for all memories, or 2 m or 70 cm only.
- IF shift circuit rejects adjacent interference.
- High sensitivity and wide dynamic range • 7-digit fluorescent tube digital display • 10 watt RF output • 2 m ±600-kHz TX offset switch with reverse switch • Tone switch for optional TU-4C two frequency tone encoder unit • VOX and semi break-in CW built-in • FM center-tune meter • Noise blanker for SSB, CW.

Subject to FCC approval