40 A Speedy Spinner Mod
— 5,000,000 Hz per minute. W2RZJ

42 A Variable Bandpass Active Filter
— extremely simple design. W3KBM

44 What About an Active Antenna?
— here’s a look at one. W5JJ

56 Help for the Hearing-Impaired
— don’t miss another call. W4VRY

58 Try a Bi-Loop Antenna
— gets you coming and going. W7CJB

60 Simple RTTY IDer
— uses five ICs. G3MEJ

62 Tales of Speech Processing
— including a practical design. WA4JHS

68 PTT For Ten-Tec’s Linear
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74 Disaster Preparedness
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78 Comfort Mods for the Mark II
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118 Who Needs SSB?
— using your FT-101 on 10m AM. KBJS

120 12 Volts, 5 Amps, 3 Terminals
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124 Tricky QSK
— a treat for CW. Blasco

126 Make Life Easier
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128 The Heath/Kenwood Connection
— RIT for the 104. W8SGI

132 An 8-Element, All-Driven Vertical Beam
— super array for DX. W1DBM

146 CW with a Nordic Flair
— new life for the Viking I. K2VJ

150 House Hunting for Hams
— caveat emptor. WB9URA
Historically, Amateur Radio operators have made important contributions to the art and science of communications. Once again Amateur Radio assumes leadership in advanced communications technology. You have the privilege of being one of the first to include a Narrow Band Voice Modulation (NBVM) system in your station. The VBC Model 3000 is the system that you have been hearing about for a year and have read about recently in QST and the 1979 ARRL Handbook. It is the world's first such system.

The VBC Model 3000 provides full audio level compression and expansion... complete intelligibility in only 1300 Hz bandwidth. It permits you to take full advantage of other stations' RF speech clippers and processors... similar to the amplitude compression and expansion used for many years in telephone and satellite communications. The Model 3000 is for mobile and fixed station use and requires no modifications to your existing equipment. It is completely self contained, including its own audio amplifier. The unit automatically switches into transmit mode when microphone is keyed or voice operation is used. It connects just after the microphone on transmit and just prior to the speaker on receive. In addition to its basic function of operating in a narrow bandwidth, the Model 3000 also increases the performance of your station in the following ways:

- Reduces adjacent channel interference
- Increases signal to noise ratio
- Increases communications range

Some of its outstanding features include:

- High quality narrow band speech
- Self contained transmit/receive adapter
- Built in audio amplifier
- 5 active filters with a total of 52 poles
- Rugged dependable hybrid IC technology
- Low power consumption

Receive only features, such as sharp voice and CW filtering and amplitude expansion, provide improved reception without requiring a unit at the transmitting station.

For the more advanced experimenter the Model 3000 is available in a circuit board configuration for building into your present transceiver.

Henry Radio is ready to offer technical assistance and advice on the use and servicing of the Model 3000 and will help introduce new owners to others operating NBVM units. Get in on the ground floor... order yours now.

Price: VBC Model 3000 $349.00
Circuit board configuration $275.00

For more detailed information please call or write. The Model 3000 will be available from most Tempo dealers throughout the U.S. and abroad.
**THE WILSON GIVE-A-WAY**

Wilson Electronics announces a factory authorized rebate program. Here's how it works:

Purchase a TT-45 and a System Three at the same time and Wilson will give you a factory 5% rebate from the price you paid for the package. You can use this to pay for the concrete to install it, or buy the XYL a little something to keep her happy! Or...we will give you, at no charge, a M-27, the best 7 element, 2M beam available today! The choice is yours to make!

Just send Wilson the receipt of your purchase from your dealer, showing your cost, and let us know what you want — 5% cash, or a M-27. But hurry! This offer starts April 1, expires midnight, April 30, 1979, and receipt must be mailed before June 1, 1979.

Don't wait! See your nearest dealer to take advantage of this great Give-A-Way!

**SPECIFICATIONS**

**TT-45 TOWER**
- Maximum height: 45'
- 800 lbs. winch with padlock feature
- 2800 lb. raising cable
- 272 sq. ft. surface area
- Maximum mast diameter: 2 1/2”
- Turn radius: 15’ 9”
- Coordinate support arms: RBRF-10, SBRF-10, CBFR-10.

The TT-45 is a freestanding tower. Ideal for installations where guys cannot be used. If the tower is not being supported against the house, the proper base fixture accessory must be selected.

**SY 3 TRI-BAND ANTENNA**

<table>
<thead>
<tr>
<th>Band MHz</th>
<th>440-450 MHz</th>
<th>Legal limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>9.5 dB</td>
<td>12 dB</td>
</tr>
<tr>
<td>SWR</td>
<td>1.1:1</td>
<td>1.1:1</td>
</tr>
<tr>
<td>Impedance</td>
<td>10 ohms</td>
<td>50 ohms</td>
</tr>
<tr>
<td>Length</td>
<td>3'</td>
<td>5'</td>
</tr>
</tbody>
</table>

**M-27 7 ELEMENT 2M BEAM**

<table>
<thead>
<tr>
<th>Band MHz</th>
<th>144-148 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>11 dB</td>
</tr>
<tr>
<td>SWR</td>
<td>1.1:1</td>
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<tr>
<td>Impedance</td>
<td>50 ohms</td>
</tr>
<tr>
<td>Number of elements</td>
<td>7</td>
</tr>
<tr>
<td>Longest element</td>
<td>40”</td>
</tr>
</tbody>
</table>

**WV-1 SPECTIFICATIONS**:
- Input impedance: 50 ohms
- Power handling capability: Legal limit
- Two High-Q traps with large diameter coils
- Low angle radiation omnidirectional performance
- Taper swaged aluminum tubing
- Automatic band switching
- Master bracket furnished
- SWR: 1.1:1 on all bands
- 1 1/2” O.D. heavy wall aluminum tubing
- Does not require guying
- Overall length: 19’ 8”

See what just some of the many satisfied Hams say about the Wilson Antennas.

---

**ACT NOW!**

Buy the WV-1 and Wilson will treat you to the Radial Kit... FREE of charge!
which page do you read?

On page 6 of the March issue of *Ham Radio Horizons* (also reprinted in *HR*), an editorial discounted the grooms and doom reports about WARC, saying G8.Ders "apparently get their information from the Wizard of OZ—or some other equally unlikely source." On page 11 of the same magazine, a wizard tells us in the lead item of Newsline that broadcast Interests are threatening us atWARC. Some schizophrenia there?

There was no specific mention of anyone in the editorial, just a few straw men set up and toppled. Since I've written about WARC recently, I tried to identify any possible references to my writing, but failed. Like the League, I feel optimistic and agree with them that the ITU can't kill amateur radio. It is unthinkable and I am not thinking it. I do regret that something positive wasn't done just to make sure, particularly in the face of the massive losses amateur radio has suffered in recent years—and I consider the loss of 239,000 MHz of satellite microwave ham allocations a massive loss. *Ham Radio Horizons* knows all about this loss and just ignored it.

They also know about the meetings in the next few weeks between the African and Latin American lessor-developed countries (LDCs), which are for the express purpose of shooting down the US position at WARC. These are the countries which may well swing the tide at WARC ... and they are not friends of amateur radio.

But are these things which won't have much of an impact on us, even if the worst happens, for many years, so why get all exercised over something we will no longer have much control? For the next few years, we are going to be in the middle of a sunspot maximum... DX will be good... the VHFs will be hopping... and we will have more exciting new modes coming along than most of us can handle.

If amateur radio really gets clobbered at WARC, perhaps we can use the years before our country agrees to the new allocations to do some of the lobbying for amateur radio in the LDCs that we should have done in the last year... and perhaps turn things around. We sure need a worldwide lobbying effort to bring the value of amateur radio to smaller countries out in the open. I'm optimistic.

1979 HAM INDUSTRY CONFERENCE

With our fourth annual ham industry conference in Aspen, new records were set. For instance, I think that this was the fourth year in a row that our confirmed reservations on either Rocky Mountain or Aspen Airlines were met with a slight smile and a shrug of the shoulders when we came to their departure desk at Denver.

Hertz and Avis were up to the situation... no cars available for us to drive to Aspen. National really was geared for this... they had one car available, but with a $250 charge if we dropped it at Aspen... take it or leave it. We grumbled a whole lot, but we took it.

The four of us, Sherry Smythe, Chuck Martin WA1KPS of Tufts Electronics, Eric Williams WA1HON, and I drove over the mountains some 200 miles to Aspen. The road was icy most of the way, but we still made good time, after what is becoming a ritual dinner at Holly West in Denver before our annual drive to Aspen. Chuck played bluegrass on his guitar through much of the trip and we all sang as we went over the mountain passes.

The snow in Aspen was superb, as usual.

On the first evening, we had our worst meal of the week... a cheese fondue at Guido’s Swiss Inn. Ugh. It sort of discouraged much of the shop talk that usually accompanies our meals in Aspen. But the next night we did much better at the Copper Kettle. It was there that we had our first coincidence.

I had just finished handing out some brochures from an advertising agency in New York which was pitching ham businesses to use a ham-run agency. We were all sitting around reading the brochures when the...
It's a compact, up to 200 watts PEP input, all solid-state HF transceiver with such standard features as built-in digital readout, IF shift, new PLL technology ...and requires no tuning!

FEAT U R E S:
• All solid-state with wideband RF amplifier stages. No final dipping or loading, no transmit drive peaking, and no receive preselector tuning! Just dial your frequency and operate!
• Five bands, plus WWV. Transmits and receives on 80/75, 40, 20, 15, and all of 10 meters...and receives WWV on 15 MHz.
• 200 watts PEP (160 watts DC) input on 80-15 meters, 160 watts PEP (140 watts DC) input on 10 meters. LSB, USB, and CW.
• Digital frequency display (standard). 100-Hz resolution. Six digits. Special green fluorescent tubes eliminate viewing fatigue. Analog subdial, too, for backup display.
• IF shift (passband tuning), to remove adjacent-frequency interference and sideband splatter.
• Advanced PLL circuit, which eliminates need for heterodyne crystal element for each band. PLL lock frequency, CAL marker signal, and counter clock circuit use single reference frequency crystal. Simplifies circuitry, improves overall stability. Also improves transmit and receive spurious characteristics.
• Attractive, compact design. Measures only 3½" high X 9¼" wide X 13½" long, and weighs only 4.9 kg (11.7 lbs). A perfect size for convenient mobile operation and rugged enough for either mobile or portable use. Also has all the desired features for optimum ham-shack operation at home.
• Noise blanker. You'll wonder where the ignition noise went.

Exciting and perfect for car or ham shack use! But, there's more to say about the TS-120S! This unique all solid-state HF, SSB/CW transceiver produces a hefty signal and also offers a lot of other great features in a very attractive, compact package.

NEW!

STILL AVAILABLE...
K E N W O O D T S - 5 2 0 S
TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT/COMPTON, CA 90220
CES '79

CES: three letters with a lot of meaning to the American economy. These letters stand for the Consumer Electronics Show, a twice-yearly gathering of all those who manufacture and sell the myriad of electronic and electronic-related products which wind up in your home and mine. During the summer, the city of Chicago plays host to this gathering, but come January, it's Las Vegas where the action is.

Residing in southern California has certain advantages. Other than writing for this magazine, I earn my keep from consumer electronics, and a show like this is one I do not want to miss. Las Vegas being but a 45-minute flight or five-hour drive, I try to be in attendance when such events take place. Mother Nature being kind and keeping 1-15 open made the decision to drive an easy one. Armed with my 35mm camera, extra film and batteries, a Clegg FM-27B, and a Midland 13-509, I aimed the nose of my Ford Maverick northeast along California Highway 14. Destination: the Hilton Convention Center in Las Vegas.

Two pieces of advice to anyone planning to attend a trade show such as this. First, get a good night's sleep before going. Second, buy the most comfortable pair of shoes your budget will allow. Also, if like me you intend to photograph things, get the lightest camera and strobe you can find.

The CES is the place where everyone who is anyone shows everything. There are televisions, radios of every description, VCRs, home computers, and even amateur radio gear. That's right, amateur radio. Ham gear seems to be playing a more and more significant role in this show each year. In the past, it had been CB which had cornered the personal communications aspect of CES, with amateur radio ranking a distant last. This year, however, perhaps due to the teetering condition of the CB industry in relation to its past performance, amateur radio and related products were right up there with the rest. Wilson had their entire amateur product line on display, as did a number of others such as Pace, Lunar Electronics, and Sujiitsu-Ten. In the peripheral department, there were such standbys as Antenna Specialists, Hy-Gain, Hustler, and a new entry to the amateur market well known to CB enthusiasts: Avanti. In fact, Avanti! has come into the amateur market with a most-advanced line of fixed station and mobile antennas, including a gain antenna for two meter mobile operation which requires no holes in the vehicle and no external wiring. You simply glue it to the window and plug it into your radio. They have a similar one for 10 meter enthusiasts, as well as a diversity beam which permits you to adjust polarization from your shack. All in all, a very interesting arrival in the amateur marketplace.

You could easily tell the hams at the show. There was no need to look for badges—very few were visible. The hams were the ones playing with radios like the new ND1 or Pace or Midland entries. They were to be found examining handhelds and antennas at the various booths. No one knows how many of the 86,000 attendees were amateurs, but there sure were a lot of them and they were not hard to spot. Hustler, Midland, Pace, and the rest. These are all names familiar to those of us who are involved in the amateur radio game. I'll tell you one thing, though. It was nice to see them giving the amateur service the kind of exposure it needs in a place where so many could see it. CES was great. Amateur radio's representation was about 1%, I guess, but that was good. Better than ever!

THE WHATEVER HAPPENED TO HIM DEPARTMENT

Richard B. Cooper. Now, that name should ring a bell with you. No? How soon we forget. Last year a man calling himself Richard B. Cooper and professing to be an attorney startled the amateur community with such announcements as a lawsuit against the ARRL and his intentions to "grab" at least half of the current amateur spectrum for expanded CB. "Rick," as he called himself, was really making a name for himself. Then suddenly he just vanished from sight! It became impossible to contact either Cooper or his "legal firm" he claimed to own: the Communications Attorney Service. Where has he gone? Your guess is as good as mine. What has happened to him over the last year or so is really what is of interest.

It seems that amateurs were not the only ones interested in Rick Cooper and his Communications Attorney Service. Rick was making a lot of claims back then as to the power and scope of his organization, its goals, and its membership. Eventually the matter drew the attention of the Office of the Attorney General of the State of California. An investigation by the Attorney General's office led to a formal civil complaint against Cooper, CAS, and Does 1 through 20, inclusive. The complaint, case #0233123, was filed in March of 1978 in the
Novice, QRP, 200 w, deluxe — good, better, best — $299, $369, $399, $699, $869, $899, $1069. TEN-TEC has them all. A choice of seven HF transceiver models — a choice of power levels — a choice of operating features (and accessories) for beginner or old timer. Best of all, there’s a wide choice of prices to fit every amateur budget.

TEN-TEC “OMNI” TRANSCEIVERS — REALLY CHOICE.
Top of the line. Deluxe in every respect. Deserving of a place in the finest of operating positions. All solid-state 100% duty cycle 200-watt final amp.; 8-bands (160-10 m plus convertible 10 MHz and “Aux” band positions); broadband design for no tune-up; built-in VOX and PTT; built-in Squelch; 4-position CW-SSB filter and 8-pole crystal filter with separate mode switch to permit using all filters in all modes; 2-speed break-in; 2-range offset tuning; optimized sensitivity from 2 µV on 160 m to 0.3 µV on 10 m; greater dynamic range (typically better than 90 dB) plus PIN diode switched 18 dB attenuator, WWV at 10 MHz; front panel control of linear/antenna bandswitching, phone patch jacks; “timed” crystal calibrator (on “A” model only); zero-beat switch; SWR bridge; adjustable ALC and sidetone; dual speakers; plug-in boards; “damshell” aluminum case with black vinyl covering plus warm dark metal front panel; full shielding; optimum size for convenient operation: 5½” h x 14¼” w x 14” d. Model 545 OMNI-A with analog dial, only $899, Model 546 OMNI-D with six 0.43” LED digital readouts, $1069. Model 645 keyer, $85, Model 243 Remote VFO, $139, Model 248 Noise Blanker, $49, Model 252MO AC Power Supply, $119.

TEN-TEC “ARGONAUT” TRANSCEIVER — QRP CHOICE.
The challenge and excitement of working the world on 5 watts. And every feature you need: all solid-state, 5 bands (80-10 m), full amateur band coverage SSB/CW; sensitivity less than 0.5 µV; offset tuning; 4-pole IF crystal filter, 2.5 kHz bandwidth; analog dial; vernier tuning; automatic sideband selection, built-in speaker, 5-watt input to broadband push-pull final amplifier; PTT; full CW break-in; adjustable sidetone volume and pitch; built-in SWR bridge, TVI filter, plug-in boards; small and light weight enough to go anywhere (4½” h x 13” w x 7” d and 6 lbs.). World beating price, too: Model 509 only $369; Model 210 AC Power Supply just $34.

TEN-TEC 540/544 TRANSCEIVERS — POWER CHOICE. 200 watts from the bottom of 80 m to the top of 10 m — SSB or CW. No compromise from the leader in solid-state HF technology. Instant band change without tune-up; sensitivity 0.3 µV; offset tuning; 8-pole crystal-lattice filter, WWV at 10 & 15 MHz; push-pull solid-state final amp.; 100% duty cycle, adjustable ALC with LED indicator, built-in SWR bridge, PTT; full CW break-in; adjustable sidetone pitch and vol.; zero-beat switch in Model 544. Choose the value leading Model 540 with analog dial and built-in 25 kHz pulsed calibrator for just $699 or the Model 544 with six 0.43” LED digital readouts for $869. Model 240 160M converter, $110, Model 262M AC Power Supply with VOX, $145, Model 252M AC supply only, $119.

TEN-TEC CW TRANSCEIVERS — BUDGET CHOICE.
The “Century 21” series. Unique. Modern technology with old-fashioned value. Fine performance, reliability, and simplicity of operation, all at low cost. Win raves from novices and confirmed brass pounders alike. All solid-state, 5 bands (80-10 m) full amateur band coverage, receive CW and SSB, transmit CW; sensitivity 1 µV or less; offset tuning; 3-position selectivity (2.5 kHz, 1 kHz, 500 Hz), 70 w input to push-pull Class C final amp.; broadbanded for no tune-up or resonating; full break-in; adjustable side-tone level; built-in AC power supply. Choose Model 570 with analog dial for only $299; Model 574 has a 5 LED digital readouts for only $399.

The choice is all yours when you choose TEN-TEC HF transceivers; see your nearest dealer or write for full details.

WIDEST CHOICE IN HF TRANSCEIVERS: TEN-TEC
Superior Court of the State of California for the County of Los Angeles. It asked that the court issue an injunction against Cooper and his CAS on five specific violations of both the civil and business/professions code of the state of California, and further requested that the court exact monetary penalties on each count of each violation.

Cooper was served the necessary documentation and at that point dropped out of sight. Nothing has been heard from him since. According to Assistant State Attorney General Herschel T. Elkins, who has been handling the Cooper/CAS matter, Cooper lost the case by default. Shortly, a hearing will be held to set the penalties in this case. Collecting them may be another matter. Cooper, as elusive as a fox, has disappeared without a trace. If you happen to know of Rick's whereabouts, you might drop a note to Mr. Elkins or to me. A lot of us would like to know what ever happened to Rick Cooper.

220—A LATE-BREAKING DEVELOPMENT

The 220-MHz Spectrum Management Association of Southern California (220-SMA) has filed a formal petition for reconsideration on FCC docket 20271, the document recently issued by the Commission relative to US WARC preparations in which maritime is made the prime user of the spectrum between 216 and 225 MHz.

In its appeal, 220-SMA states its belief that representatives of the amateur service have not been given their chance under the structure of administrative procedures to properly comment on the proposed sharing with the maritime mobile radio service. 220-SMA goes on record as opposing the suggested reallocation and suggesting an allocation within the 880-MHz spectrum be considered as an alternative, in that such spectrum would be available worldwide since it has little or no utilization at this time. Implementation of a maritime mobile service in that spectrum would not displace any established activity and would have little environmental impact throughout the entire world.

The petition was prepared by 220-SMA advisor Henry R. Von Neumann K6PUW at the direction of 220-SMA President Larry Mohler WA6DOD, and was derived from input obtained at a joint meeting of 220-SMA, 2mASMA, ARRL Director Holladay, and other VHF spectrum users. VRAC’s local representative and the Southern California Repeater Remote-Base Association both declined to attend or take part in the initial planning on this matter, but did ask to be kept informed as matters progressed. However, 2mASMA, along with other local special-interest groups, is expected to endorse the petition, and 220-SMA is requesting that letters of support from coordinators, coordination councils, and individual amateurs be sent to the Commission as soon as possible. Those writing on the subject should refer to 220-SMA petition number 790120, submitted January 22, 1979. It’s felt that enough support from the general amateur community might well force the Commission to give this petition serious consideration and perhaps reopen commentary on the matter.

CAN AND WILL THE ARRL SAVE 220?

"220 CB is dead and the ARRL slew it." With that statement, the League tried to take full credit for saving 220 MHz from the onslaught of "10-4" when stories of what killed it, not the ARRL. If true, it makes a lot more sense, and I tend to believe it. Let's look at the present situation and the ARRL's power in relation to it.

First, we must assume that there were other forces which really devastated the 220 Class E CB idea. Class E was being pushed by but one entity, the EIA. For the EIA, this was a good move from an economic standpoint. It's a fact that it costs less to manufacture a radio for a lower frequency than for a higher one. This holds true even with today's advanced linear IC technology and mass production. So, if you were running an organization which represented the vast majority of those manufacturing two-way radio equipment, what would you do? You would look around at all spectrum and forge a viable attack to gain some more. When studies of available spectrum were made some years back, the 220-MHz
OMNI HAS IT ALL. All the advantages and capabilities, all the new
conveniences and new levels of performance you need, whatever your
HF operating specialty. All built-in, ready to use.

ALL SOLID-STATE. All the advantages of total solid-state from the
pioneer of HF solid-state technology. Reliable, cool, stable — from
receiver front-end to transmitter final.

ALL HF BANDS. From 160 through 10 meters (and all the crystals) plus
convertible 10 MHz and "AUX" band positions for possible future needs.

ALL BROADBAND. Band changing without tuneup — without danger
to the final amp.

ALL READOUTS. Choose OMNI-A for analog dial (1 kHz markings) or
OMNI-D for six 0.43" LED digits (100 Hz readability.)

ALL VOX AND PTT FACILITIES built-in, 3 VOX controls plus PTT
control at front and rear jacks for external PTT switch.

ALL SQUELCH NEEDS for tuning and monitoring are built-in.

ALL FILTERS INCLUDED: 4-postion CW/SSB filter (150 Hz
bandwidth with 3 selectable skirt contours) plus 8-poile Crystal filter (2.4
kHz bandwidth, 1.8 shape factor.)

ALL MODE SWITCH puts all filters to work in any mode.

ALL BREAK-IN: Instant or delayed receiver muting to fit any band
condition or mobile operation.

ALL VERSATILE OFFSET TUNING; dual ranges, ±5 kHz range for
off-frequency DX or ±0.5 kHz range for fine tuning.

ALL SENSITIVE RECEIVER; from 2 µV on 160 m to 0.3 µV on 10 m
(10 dB S+N-N) for ideal balance between dynamic range and sensitivity.

ALL OVERLOADS HANDLED; dynamic range typically exceeds 90
dB and PIN diode switched 18 dB attenuator also included for extra
overload protection.

ALL LINEAR/ANTENNA BANDSWITCHING FROM FRONT
PANEL; auxiliary bandswitch terminals on back panel for external relays
or circuits are controlled simultaneously by the OMNI bandswitch.

ALL INTERFACE JACKS FOR PHONE PATCH; access to speaker
and microphone signals.

ALL LEVEL ADJUSTABLE ALC; set output from low power to full,
retain low distortion at desired drive to power amp.

ALL SIDETONE ADJUSTMENTS; pitch and volume.

ALL POWERFUL. ALL-WARRANTED FINAL AMPLIFIER. 200
watts input to final. Proven design with full warranty for first year and
pro-rata warranty for additional 5 years.

ALL 100% DUTY CYCLE. For RTTY, SSTV or sustained hard usage.

ALL-MODE POWER: basic 12 VDC for easy mobile use, external
supplies for 117/220 VAC operation.

ALL FRONT PANEL MICROPHONE AND PHONE JACKS.
Convenient.

PLUS ALL THE OTHER HANDY BUILT-INS: "Timed" 25 kHz
crystal calibrator in OMNI-A with automatic 5-10 sec. "on" time for easy
2-hand dial skirt adjustment... Zero-Beat switch for placing your signal
exactly on CW listening frequencies... SWR bridge switches "S" meter
to read SWR each time you transmit for continuous antenna monitor-
ing... Separate receive antenna capability... Dual speakers for greater
sound at lower distortion... Plug-in circuit boards for fast, easy field
service.

ALL-FUNCTIONAL STYLING. "Clamshell" aluminum case clad in
textured black vinyl with complementary nonreflective warm dark metal
front panel and extruded aluminum bezel and ball. Convenient controls.
Complete shielding. And easier-to-use size: 5¾"h x4¾"w x 14½d.

AND ALL THE OPTIONS: Model 645 Keyer, Model 243 Remote VFO,
Model 248 Noise Blanker, Model 252MO AC Power Supply.

Model 545 OMNI-A $899 Model 546 OMNI-D $1069

Experience the all-encompassing HF world of OMNI. See your TEN-TEC
dealer or write for all the details.
After reading "Diodes of the Dead" (73, Jan., 1979), I have diagnosed Mr. Dunn's problem. By using high-quality audio tape (Armpex "Grand Master" or Maxell UD35-90), I had absolutely no problem "calling up" two dead aunts and some guy calling himself "Macaroni." Also, I found by using a slightly larger antenna (10'12), Alpha Centauri comes in "Q573.

Jerry Robinson III N4KJ
Asheville NC

With only one element remaining to complete my Extra class ticket, I just had the misfortune to "close encounter" the brand new exam.

My advice: If you're not a mathematician, you'd better take a crash course before you attempt the test. It is a brutal mother.

This new Extra class series (dated 9/79) features a central core of 20-or-so questions, each one attached to a schematic. You'll be asked to compute complex reactivities, impedances, resonant frequencies, or missing component values at some arbitrary point in the circuit. No formulas are provided, and most of the values you'll be asked to compute are not related directly to any of the mistakes in any of the existing study guides.

The non-mathematical questions, by the way, are extremely esoteric and obscure. There is material on IC junctions, remote base regulations, 5 or 6 questions on SSTV and ATV, and other trivia from the fine print of the regs.

My punch is that the FCC found itself rapidly running out of 1x2 call signs and decided to plug the small conduit that lets new Extras through. They plugged it good and tight! Be warned: It is not impossible—but you will need lots of math, and we all will need new, competent study guides—like pronto.

Incidentally, this exam itself is atrociously edited—with numerous typographical mistakes, misspelled words, and my copy even had the wrong element class printed on the cover! The word "ADVANCED" had been pasted over with a sticker that said "EXTRA." My confidence in Uncle's competence was not enhanced.

By the way, felias and gals, if you haven't yet listened to the "secret" pseudo-ham band that runs from 27.5 to 28 MHz (above CB and below 10 CW), you're missing some of the funniest (or most infuriating) SWLing of your life!

A recent spot check produced these gems:

1. A spiritualist in Houston who gives psychic readings and conducts on-air meditation classes every Sunday.

2. A cross-country SSB QSO between two chaps, one running a TS-820, the other a Yaesu FT-101, shooting the breeze about how they're progressing toward their NOVICE tickets!

3. Someone conducting very graphic, on-the-air sexual counselling.

4. A slow-scan TV signal!

5. Many, many individuals who indicated that they also hold amateur licenses and operate (legally) on other bands.

This latter finding is the most surprising of all. Maybe it's the anarchist spirit having a go—or simple boredom with the routine and formula for ID's beyond me why an op who can handle 20 wpm takes his business down there. But turn up your ears and check it out for yourself. There are.

On the foreign stations who are using "secret band" to sked relatives in this country, I try to imagine these relatively easy, hassle-free regulars taking place in the licensed amateur service, where the DX station would immediately be pounced upon by the prick-eared wolf pack, and all hopes of a relaxed rag chew would vanish. I do begin to understand what may be driving even licensed hams to this virgin frontier!

Could it be a radio revolution in one making? Or the prelude to a determined FCC crackdown? Only time will tell. In the meantime, something is definitely happening at one of our borders. It behoves us to listen and evaluate the phenomenon.

Name and address withheld by request

VOYAGING

The JPL Amateur Radio Club, through its club station W6VIO (Voyager In Outerspace), will repeat its performance during the Viking landings on the planet Mars by holding commemorative contacts during the forthcoming (actually, now in progress) Voyager mission to the planet Jupiter.

The spacecraft Voyagers I and II are currently engaged in the first observational phases of their mission of exploration of the planets Jupiter and Saturn.

Among the data being returned will be pictures of the disc of Jupiter at various distances showing details of its rings. It is not planned to see with any terrestrial telescope of known configuration.

On slow-scan TV, these and other pictures will be sent out for amateurs to see throughout the world.

According to Dick Piety K6SVP, the project coordinator, the first contacts will have been made March 11, 1979. This coincides with the encounter phase of the first of the Voyagers to arrive near Jupiter. A second encounter period for Voyager II will bring on more amateur contacts July 6-15.

The following frequencies will be used plus or minus QRM: CW—30 kHz above bottom band; and 80 through 10 meters. SSTV—3545, 7220, 14325, 21340, 28680. Novice—3730, 7130, 21130, 28130. SSB—3930, 7230, 14285, 21340, 28680. OSCAR—250 meters and 220-MHz transmissions are planned as well.

As presently set up, the plans call for heavier operations on weekends and between the hours of 4:00 pm and 7:00 pm PST (0000 to 0300 Zulu).

The JPL Amateur Radio Club regrets that it does not have a special commemorative call sign, such as the N6V used calling the Viking mission. However, W6VIO will issue a special QSL card for the Voyager commemorative. An SASE is requested from U.S. stations. DX stations may QSL via their QSL bureaus.

Norman L. Chalfin K6PGX
Pasadena CA

It would almost be worth buying occasional copies of 73 to see if this letter changes an approach or otherwise gets published under "Letters"—but the odds are against it. Recently there was a debate at the UN between representatives of Vietnam and Cambodia. A TV commentary stressed that through each side called the other liars, it was on a higher, diplomatic, and less corrosive level than a previous controversy when "Khomeini" pounded the table with it. What has this to do with 73?

Many years ago, almost when you first started 73, I regularly purchased copies and think I've them prescribed for a year or so. However, the vitriol dripping from your pen so turned me off that I stopped reading it. Recently, a ham whom I regularly work towied 73, so I bought two sets prescribed for a year or so. However, the vitriol dripping from your pen so turned me off that I stopped reading it. Recently, a ham whom I regularly work towied 73, so I bought two sets.

Even granting that the ARRL could do a better job for ham radio, that it tends to pigeonhole ideas of others, that it is biased against women, and that it is dictatorial in many ways, is it possible that a more affable indictment in publishing their shortcomings would present your ideas in a more acceptable way to your readership and (if a miracle occurred) to the ARRL?


Although doing some necessary home brewing in 1923 (call 2AST) and some since, I am primarily a CW user. Making a PC board, etc., frightens me off, but I am able to make repairs to my two transceivers which are solid state. My wpm is somewhere between 25 and 100 wpm, except for one or two schedules per week on SSB with old-timers who have large-
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MULTIPLIERS ARE AS FOLLOWS:

- COUNTS 3 POINTS, NON-MEMBER TERMINAL, INC.
- RP AMATEUR RADIO CLUB AMATEURS AND IS SPONSORED BY
- X 1.5: 5 TO 25 WATTS — X 2.0; 1 TO 5 TIMES POWER MULTIPLIER.
- PROVINCE/COUNTRY, POWER INPUT.
- QRP NUMBER.
- EXCHANGE:

Members — RS(T), STATE/PROVINCE/COUNTRY, QRP NUMBER.
Non-members — RS(T), STATE/PROVINCE/COUNTRY, POWER INPUT.

FREQUENCIES:
- CW—1810, 3560, 7060, 14060, 21060, 28060, 50380.
- SSB—1810, 3985, 7265, 14285, 21385, 28885, 50385.
- Novice—3710, 7110, 21110, 28110.
- All frequencies ± 5 kHz.

ENTRIES:
- Send full log data, including full name, address, and bands used. Indicate equipment, antennas, and power used. Include a #10 SASE for results. Logs must be received by April 30, 1979, to qualify. Send logs to: E. V. Sandy Blaize WSTW, 417 Ridgewood Drive, Metairie LA 70001.
- Certificates will be awarded to the highest scoring station in each state/province/country, and places depending on activity. One certificate for the station showing three "skip" contacts using the lowest power.

BERMUDA AMATEUR RADIO CONTEST

Starts: 0001 GMT April 21
Ends: 2400 GMT April 22
Sponsored by the Radio Society of Bermuda. Operate no more than 36 hours of the 48-hour contest period. Off periods to be clearly logged and each period to be of not less than 3 consecutive hours.

All stations shall be single operator only and must be operated from their own private residence or property. Each station may be worked only once per band regardless of mode. Use all bands 80 to 10 meters, but no crossband or crossmode contacts permitted.

EXCHANGES:
- All stations exchange RS(T) and following: UK—county, US—state, VE—province, BERMUDA—parish, West Germany—DOK #.
- US and VE stations must exchange reports with UK, West German, and Bermuda stations only. UK and West German stations must exchange reports with US, VE, and Bermuda only.

SCORING:

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</table>

| Ontario | VE3KK*  | 53  | 8     | 424   | DX    |
| Japan   | JE2MDE  | 1   | 1     | 1     |       |

*County or section winner
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STATE ZIP

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Reader Service — see page 195
Each QSO = 5 points. Multiplier for all stations outside Bermuda is the total number of VP9s worked on each band. The same VP9 can be worked on all bands. For Bermuda stations, it is the total number of states, provinces, counties, and DOKs worked on each band.

AWARDS:
Top scorer in each state, province, county, and DOK area in West Germany shall receive a certificate. Trophy to top scorer in VE, US, UK, and West Germany. Round-trip air transportation plus accommodation will be provided to overseas winners to enable them to receive their awards.

ENTRIES:
All dates and times in GMT. All contestants to check for duplicates and to compute their own scores. Sign a statement that all rules and regulations have been observed. Each page must be clearly marked, on one side only, call, name, and address, and must be received by the contest committee before June 30. Send entries to: PO Box 275, Hamilton 5, Bermuda.

Note: Please submit a log if you operate in the contest. This

---

### Results

#### 1978 DELAWARE QSO PARTY RESULTS

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<thead>
<tr>
<th>State</th>
<th>Station</th>
<th>Score</th>
<th>QSOs</th>
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<td>N3ND**</td>
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<td>N3AJA</td>
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### Delaware Scores
- Denotes county winner
- Denotes high score for Delaware

### Out-of-State Scores

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<td>11193</td>
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<tr>
<td>WA3QLS/3</td>
<td>11033</td>
</tr>
<tr>
<td>Sussex</td>
<td>52096</td>
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<tr>
<td>WB3IXC/3</td>
<td>40442</td>
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<tr>
<td>WB3KYL/3</td>
<td>22743</td>
</tr>
<tr>
<td>K3JL</td>
<td>2016</td>
</tr>
</tbody>
</table>

#### Results

PUBLICATIONS CONTEST RESULTS

Results of the Amateur Radio News Service 1978 Publications Contest have just been released by judges Norm Monroe K4FRY, Vivian Douglas WA2PUP, and Dan Dolan K4RN.

Submissions for this contest were divided by publisher and size into two groups. Group I consisted of club papers: (la). less than 100 copies; (lb). 100-199 copies; (lc). 200-299 copies; (ld). 300-399 copies; (le). 400 or more copies. Group II contained multi-club papers: (lf). less than 1000 copies; (lg). 1000 or more copies.

The club presidents of the winning entries will receive certificates to be presented to their groups. All editors will be receiving the judges' comments by personal letter. Congratulations to the following:

Group I:


Third prize: Red Rose Repeater Association (Newsletter), Lancaster PA 17601. Martin Bloomberg WA3MHP, Editor.


Group II:


ARE YOU ON FREQUENCY?

BE ON FREQUENCY WITH DSI

MODEL 3600A .5PPM 17° - 37°C
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<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency Range</th>
<th>Accuracy Over Temperature</th>
<th>Number of Readouts</th>
<th>Power Requirements</th>
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<tr>
<td>3700</td>
<td>50Hz - 700MHz</td>
<td>Proportional Oven 2 PPM 0° - 40°C</td>
<td>8 .5 inch</td>
<td>115 VAC or 8.2 - 14.5VDC</td>
</tr>
<tr>
<td>3600A</td>
<td>50Hz - 600MHz</td>
<td>Oven .5 PPM 17° - 37°C</td>
<td>8 .5 inch</td>
<td>115VAC or 8.2 - 14.5VDC</td>
</tr>
<tr>
<td>3550W</td>
<td>50Hz - 550GHz</td>
<td>1 PPM 65° - 85°F</td>
<td>8 .5 inch</td>
<td>115VAC or 8.2 - 14.5VDC</td>
</tr>
</tbody>
</table>

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DX PROFILE
This month's DX Profile is on Bob Geary 5Z4NH of Thika, Kenya, East Africa. The following is a letter from Bob describing his background and his life in Kenya:

"I first became interested in amateur radio in 1946 when I helped Larry W8VPA carry his BC-610 up the stairs. I have not recovered either my sanity or my back since then. I was first licensed in 1957 as K22LE and became interested in VHF as a member of the VHF Institute in New York City. I managed to work a VO1 from Brooklyn without the aid of a repeater, but I didn't realize that it was much of a feat until later.

"I arrived in Kenya in 1965 to take up the job of teaching chemistry in the Kenya schools. The courses here are the same as you would find in an American high school or junior college.

"Due to some very bad misinformation from a 'know-it-all' type who told me that I would not be able to get a license here in Kenya, I was off the air until 1972. Upon learning the true facts, I was readily and graciously issued a license by the Kenya authorities. It is interesting to note that an American can easily obtain operating permission here in Kenya, but that the reverse does not hold true for someone from Kenya trying to obtain operating permission in the US.

"The people of Kenya come from a civilization and culture which is several centuries old. They are very gracious and kind to outsiders. In all my years here in Kenya, I have met only one Kenyan who was not a desirable person. The weather here is more pleasant than that of either Florida or southern California. In the highlands, the temperature ranges from 65 °F in the evening up to about 85 °F during the day. The rains, which come in two seasons, are heavy at times, but are warm and without strong winds. The sun shines better than nine hours a day during the dry seasons, and it is easy to develop a nice tan in only a short time. The coastal area is a bit warmer, but it is some 5,000 feet lower in altitude.

"The numerous recreation opportunities include golfing, boating, mountain climbing, camping, and, of course, the popular photo-safaris. Kenya is not only a great place to visit, but a perfect place to live as well. About the only inconvenience is having to wait until the giraffes pass before I can get to the school building some mornings. Being mute, the giraffe has few outlets for his anger; since they can kill a lion with one kick, I allow them plenty of clearance.

"Being in almost the center of the world's land masses, Kenya is a perfect amateur radio QTH. California, New Zealand, Chile, Japan, Alaska, and Antarctica are all almost equidistant from Nairobi. The elevation of 5,000 to 7,000 feet gives a perfect 360-degree downhill shot to the entire world. The low winds and easy availability of free bamboo make Kenya perfect for quad antennas. I have made better than 13,000 contacts in 250 countries without any special DX effort.

"Kenya 'Field Day' activities are functional, in that we supply communications for the annual East Africa Safari Race. The Radio Society of Kenya sets up a control station in Nairobi and dispatches members to some rather distant locations to set up and operate under horrible conditions. One year I drove 42 miles on a muddy road, set up the rig and contacted the control station, only to be informed that the race had been rerouted due to floods. I then repacked the gear and drove back to Nairobi, checked in, and was dispatched to another location, fortunately on the tarmac, but still wet and rainy. The volunteer stations are the only means of communication between the race organizers and the cars out on the course.

"Unlike field days in other areas of the world, you do not get to select your site. You are given a map reference and must hunt for your spot—and then try to get up some type of wire antenna for 40 and 80. Due to distances and conditions, verticals will not provide good results. A dipole is required for any degree of reliability.

"Usually, you do not get much chance to see any of the race activity because the cars come out of the bush, skid around a curve, slide to a stop, check in, and then roar off back around another curve into the bush again. Then there is the problem of crowd control. Little kids press around wanting to see what you are doing and are constantly in the way. Fortunately, the police, with a little judicious application of a switch from a nearby bush, usually can control the situation. The real kicker is when someone hears your call and..."
DRAKE ACCESSORIES
add a new dimension to your present gear...

Drake WH-7
Directional RF Wattmeter

Drake 7077
Dynamic Desk Microphone

Drake "Dry" Dummy Loads

**Model 1514 Drake WH-7**
- 1.8-30 MHz coverage
- Through-line, versatile, lab accuracy, low cost
- Removable coupler for remote metering
- Includes four calibrated scales: three for RF power from QRP to high power (0-20, 0-200 and 0-2000 W full scale) and one for direct reading
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- Power: 2000 W continuous
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- Wt: 3 lbs (1.4 kg)

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- Features both VOX and PTT operation without modification
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- Includes coil cord and plug wired for direct Installation to the Drake TR-7
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**Model 1515 Drake "Dry" Dummy Loads**
- 1000 watts for 30 seconds, with derating curve to 5 minutes
- Built-In PL-259 coax connector for direct connection to rear of transceiver or transmitter-no jumper coax necessary
- VSWR of 1.5:1 max. 0-30 MHz 1.5 max. 30-160 MHz
- Ideal as bench test device for amateur or commercial HF and VHF gear.
- Small size fits conveniently in any field service tool box. 6.7 x 2.08" (17.0 x 5.3 cm)
- Wt: 11 oz (310 g)

**Model 1550 Drake DL-300**
- 300 watts for 30 seconds, with derating curve to 5 minutes
- Built-In PL-259 coax connector for direct connection to rear of transceiver or transmitter-no jumper coax necessary
- VSWR of 1.1:1 max. 0-30 MHz 1.5 max. 30-160 MHz
- Ideal as bench test device for amateur or commercial HF and VHF gear.
- Small size fits conveniently in any field service tool box. 6.7 x 2.08" (17.0 x 5.3 cm)
- Wt: 11 oz (310 g)

**Model 1551 Drake DL-1000**
- 1000 watts for 30 seconds, with derating curve to 5 minutes
- Features both VOX and PTT operation
- High Impedance
- Includes coil cord and plug wired for direct installation to the Drake TR-7
- VSWR of 1.5:1 max. 0-30 MHz 1.5 max. 30-160 MHz
- Size: 14 x 3.6" (35.6 x 9.1 cm)
- Wt: 2 lbs (910 g)

**Model 1552 Drake DL-300**
- 300 watts for 30 seconds, with derating curve to 5 minutes
- Built-In PL-259 coax connector for direct connection to rear of transceiver or transmitter-no jumper coax necessary
- VSWR of 1.1:1 max. 0-30 MHz 1.5 max. 30-160 MHz
- Ideal as bench test device for amateur or commercial HF and VHF gear.
- Small size fits conveniently in any field service tool box. 6.7 x 2.08" (17.0 x 5.3 cm)
- Wt: 11 oz (310 g)

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tries to get a DX contact when you are having a rough time just hearing the control station.

"In normal times, I enjoy giving DX contacts, especially to the JA boys. They are good operators and are very good in standing by when you are working someone. If you express any note of complaint about a station, there will be a burst of Japanese on the frequency and the trouble immediately disappears for good. I can't understand the words but the meaning is clear.

"Stateside operators are usually well mannered in pile-ups, but there are a few who never seem to get the word. Fortunately, they are few in number and it is simple to make a list of their calls and ignore them. Another method is to give them a report to get rid of them and then forget to log their calls. I have worked one station five times in this manner and he still doesn't understand (until now) why he's never in the log.

"The great benefit of amateur radio is the really nice people I have met, especially on the Afrikaner and Clinker nets. I've made numerous contacts with these fellows over the past seven years and enjoyed every minute. To make a list of the guys who have offered to give any help needed would require several pages of fine print. I once asked for a copy of FCC Form 610 and received a copy from five different guys. These responses make life enjoyable.

"I would like to see an award given for the best QSL manager and I would like to nominate my manager, W2PPG, for the first one. I don't understand why these guys volunteer their services, but from the DX station's point of view it is greatly appreciated. I am a lot more likely to stay in and give a report to everyone who is calling when I know I won't have to miss a week of operating time filling out QSL cards. These guys are the unsung heroes of DXing.

"Well, that about covers everything from over here in Kenya. My best 73 to everyone, and if anyone needs Kenya, look for 5Z4NH any day between 21.300 and 21.355 MHz."

**DX NOTEBOOK**

**Isle of Man GD/GT**

DF7FH reports a planned DXpedition to the Isle of Man in July, 1979, to celebrate the 1,000th anniversary of the Isle of Man's parliament. During the first week of July, every station will be allowed to use the special GT prefix. They plan to operate from July 1st to July 15th on all SSB/CW bands. Operators include DF7FH, DK5FJ, DJ3BG, and YLs DF9ZG and DF92H. QSLs go to the individual operators.

**Aves Island YV9AA**

The Venezuela Amateur Radio Club is planning a DXpedition from April 7th to the 14th. Intended CW/SSB frequencies are 3525/3775, 7025/7085, 14025/14195, 21025/21295, 26025/28495-595. These are transmitting frequencies; listening frequencies have yet to be announced.

**Heard Island VK9**

Several of the VK9/ZL DXers have been gazing fondly toward Heard Island, and indications are that something may firm up before the year is out. Word has been passed that landing permission has been granted, transportation is on line, and even the callsign, VK9HI, has been issued. The last Heard Island activity was VK9HM back in the dark ages of 1970.

**Christmas Island VR3AH**

The following letter from WB4PRU gives some information and operating habits for those needing VR3AH:

"I am the QSL manager for VR3AH. I would like to pass along some skeds and..."

---

*DXpedition QTH on the Isle of Man for the June/July operation by DF7FH, DK5FJ, DF9ZG, DF92H, DC1FP, and DJ3BG.*
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Touch Tone® Microphone or Remoting Kit CK28 with ICOM IC-280 Purchase!

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The SCR1000—simply the finest repeater available on the market—absolutely TOP QUALITY throughout... and often compared to (lesser featured) units selling for 2-3 times the price! This is a 30 Wt unit, with a very sensitive & selective receiver. Included is a built-in AC Supply, NEW Expanded Memory CW IDer, full metering and lighted stat's indicators/control push-buttons, crystals, local mic, etc.

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We are proud to announce that the SCR1000 is now
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Parts 21, 89, 91, and 93!

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<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>RF Output</td>
<td>30 Watts typ. Infinite VSWR proof</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.3uV/20dB Q, 0dB @ 6.5kHz, 150dB @ 50kHz</td>
</tr>
<tr>
<td>Selectivity</td>
<td>600kHz @ 25kHz</td>
</tr>
<tr>
<td>Includes</td>
<td>8 Pole Xtal Filt, Sharper 10 Pole Filt. Available.</td>
</tr>
<tr>
<td>FEATURES</td>
<td>All basic autopatch functions</td>
</tr>
<tr>
<td>Front Panel Controls</td>
<td>for timers &amp; AF levels.</td>
</tr>
<tr>
<td>Lighted push-buttons for control/test functions &amp; status indicators.</td>
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<tr>
<td>State of the Art CMOS control logic &amp; timers—No Relay problems!</td>
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<tr>
<td>Exclusive Spec Comm MOS/FET/Ic Carrier Diode rcr. front-end reduces ‘dense’ &amp; IM problems!</td>
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<td>Built-in AC Supply winstant bty. switcher for emergency pwr. (+Trickle Chgr.)</td>
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<td>Supplied with ±.0005% Int.’lational precision Xtals, local m/c. &amp; FL-6 Preselector.</td>
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<td>Built-in CW IDer—Low current, 250 bit PROM Memory! Adjustable speed, pitch, time, etc.</td>
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<tr>
<td>Jacks Provided for Remote Control, Auto-Patch, DC out, AF In/Out, COR Switch, etc.</td>
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<tr>
<td>True FM—For Rpt. Audio so good, “It sounds like direct!?”</td>
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  - Ex. audio quality! Fast squelch $125.00, xtal. 8 Pole Filt. (Highly recommended) $15.00

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- 6 HI-O Resonators with FET preamp.
- Provides tremendous rejection of ‘out-of-band’ signals with the usual loss! Can often be used instead of large, expensive cavity filters.
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- Gain: apx. 10 dB
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- Puts out a tone ‘deep’ on rptr. xmr. apx. 1 sec after rcrd. signal drops — thus allowing time for breakers.
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- Adjustable time delay and tone duration.
- For use with CTC100 and ID102/250.
- $20.95 (Add $18.00 for Inst. & chk out in SCR1000).

**CTC100/COR/Timer/Control Board**

- Complete COR circuitry.
- Carrier ‘Hang’ & TO Timers.
- Remote xmr., inhibit/reset control.
- Provision for panel control switches & lamps.
- 100% Solid State CMOS logic.
- Many other features.$35.00

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- Adjustable ID tone, speed, level, timing cycle.
- 4 Input AF Mixer & Local Mic amp.
- COR input & xmr. hold circuits.
- CMOS logic, PROM memory—256 bits/ch.
- Up to 4 different ID channels! Many other features. Programmed $65.00 (1 chan.) Add $5.00 ea.  
  - Local Mic. $18.95

**FL-6**

- RF Output: 5-25 Wt.; 2, 6, & 12 Chan.; 2M & 220 MHz.

**SCT 110 BOARD**

- 7 or 10 Wts. Output 100% Duty Cycle!
- Infinite VSWR proof.
- True FM for exc. audio quality.
- New Design—specifically for continuous rptr. service.
- Very low in "white noise".
- Spurious—70 dB.
- With 0.005% Xtal.$135.00
- BA 10 30 Wt. Amp board & Heat Sink. 3 sec. LPF & rel. pwr. sensor. $59.95

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- SCT110 mounted in shielded housing.
- Same as used on SCR1000.
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- Control Board. TTC100 Touchtone!
- 3 digit ON. 3 digit OFF. control of a single repeater function. Or, 2 functions ON (2 digits each) with 1 digit (each) OFF.
- Can be used to pull in a relay, trigger logic, etc.
- Typically used for Rptr. ON/OFF, HILO Pwr., P.L. ON/OFF, Patch inhibit/Reset, etc.
- Stable, anti-failling design. 55. Limit on access.  
  - $95.00 ($125.00 inst. & chkd. out in SCR1000).
- For Audio Function(s)—Add a "Partial TTC" Board $42.00

Write or call for further info.

*(Ship/lHandl. — $3.75 PA residents add 6% tax)*
Over the last several months, we have been investigating the components of a solid-state RTTY "stunt box," in hopes of putting together some kind of test equipment to send "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG." Along the way, it has occurred to me that even a simple identifier would be nice, like a "DE WA3AJR" or something. Hopefully, by the end of this month's column, we will be able to put something concrete together.

To date, we have covered interfacing to a loop (January, 1979), matrix encoding (February, 1979), and the UART with its associated circuits (March, 1979). If you are not familiar with these concepts, I suggest you check back to the indicated issues of 73. If all is OK, plow on!

Let's start with the matrix. Assume space for encoding fifteen characters, with a switch to select which character is to be sent. You would have something like Fig. 1. Now, besides being expensive, fifteen-position switches are hard to turn using TTL voltage levels. So what we will use is the electronic version of a fifteen-position switch, a 74154 data distributor, shown in Fig. 2. By grounding both the enable and data input lines, the output selected in binary will go low. Now all we need do is provide the binary code to the input and watch the data select. By the way, before you get all huffy, I know that there are really sixteen outputs from this chip, but we will need the last one later. The binary code input can be provided by a binary counter chip, such as the 7493. The beginnings of a system can be seen in Fig. 4, where the counter sequences the data distributor, which subsequently selects the matrix element.

"OK, smarty," I hear you say, "where do we get the pulse to trigger the counter?" From the UART, naturally! Reviewing the inputs and outputs of the UART, one finds a pulse on pin 22 which goes high when it's all right to load a new character. Sounds useful, no? Just as useful, we shall see, is a signal output which signifies completion of transmission of the current character.

Enough of the preliminaries. Let's throw in some more gates to control all this logic and come up with something like the suggested circuit in Fig. 5. It's not too hard to dissect this rather formidable circuit if you start at one side and proceed through It, gate by gate. On the right we have a push-button, used to start things off, which is suitably debounced and conditioned into the negative pulse needed to start the UART off. This pulse is passed through two gates on the way to the UART: an OR gate which will accept either the push-button or UART signal to trigger the UART, and an AND gate used to turn the whole thing off at completion of the message. As soon as the UART starts sending the character presented by the matrix, an "OK TO LOAD" signal appears on pin 22. This is sent to the counter, advancing one count, and presenting the next character to the UART. When transmission of the current character is completed, an "OK TO SEND" pulse appears on pin 24 and is used to trigger the UART to send the next character. When the last character in the matrix is sent, the next advancement of the counter selects the sixteenth line (I told you I would get around to it!) and grounds it. By using that line as one input of an AND gate and the "send" signal as the other, one can block the "send" by providing a logic "0" to the other input of the AND gate. That is, with a logic "1", as will be provided when the last character is not selected, the output of the AND gate will follow the input. A logic "0" on one input of an AND gate inhibits any output from the gate. Fig. 6 demonstrates this for the disbelievers in the crowd.

If one wished to send just a test, say "RYRYRYRY", quite a bit of simplification could be envisioned. Only two rows of a matrix would be needed, and a simple flip-flop could select the row in use. Further, a "start" and "stop" control could be integrated with one more bounceless push-button. Fig. 7 offers some suggestions along that line.

Expanding the data to more than fifteen characters is also possible, but is a bit more complicated. Fig. 8 is one possible solution. Here we have used an additional 74154 as a true data distributor which selects which bank of matrices gets selected. For now, this shall remain food for thought.

Are you all ready for the...
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1st RTTY Video Generator

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RVD-1005
Improved RTTY Video Generator

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1974

1975
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High-performance RTTY Demodulator

1976

1977

1978
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1979

AND NOW...

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The FIRST Automatic Send-Receive Electronic Terminal for Baudot, ASCII, and MORSE
- Type and edit your message while receiving
- 200 line storage
- Non-volatile and programmable HERE-IS
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To the many readers who have written in questions and requests for personal and points. By the time this is published, I should be essentially caught up. That means that if you have written me and enclosed a self-addressed stamped envelope prior to the month's date, you should have received a reply. I discovered my two wonderful kids going through Daddy's desk and "sorting mail." I don't think it was anything, but if you have not received a reply, it is possible.

That SASE bit is not just for me, by the way, but is common courtesy whenever you write any author whose work you enjoy and from whom you desire a personal answer. That should go for not only articles you read here, but even those in (shudder) other magazines.

Next month, we will get to some of those burning questions you'll need. To complete our second year of RTTY Loop. When we pick it up again, in June, we will add the second half of the program covered last year, sending RTTY to a microcomputer. Again, while the program will be written for one specific microprocessor, I hope to present it well enough so that it may be adapted to other popular systems.
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ORDER YOURS TODAY DIRECTLY FROM CLEGG!

Send your check or money order for $295 and we will pay domestic UPS. Or order yours on your VISA or Master Charge card and we'll add the few dollars for shipping to your credit card charges.
New Products

HAL'S NEW DS3100 ASR
HAL Communications Corporation has announced a new electronic RTTY terminal—the DS3100 ASR. The new terminal features full buffering of both received and transmitted data, thus permitting preparation of transmit text while receiving, as well as storage of up to 150 lines of received text and 50 lines of text to be transmitted. The new terminal also features a new screen format with 24 characters per line to show all the new screen format with 24 well as storage of up to 150 data modes (ASCII, Baudot, and Morse), allows use of continuous, line, or word transmitting modes, and has synchronous Idle, unshift on space, and word wrap-around. Both the electrical and mechanical features of the terminal have been completely redesigned to use a Z80 microprocessor and plug-in circuit boards, and to allow easy service. A front-face legend has been added to the keyboards to fully label all control functions of the terminal and simplify operation. The keyboard and new streamlined cabinet are color-coordinated in a new two-tone castle tan and chocolate brown finish.

The terminal weighs 45 pounds and can be connected for use with 120 or 240 V ac, 50- or 60-Hz power mains. The cost is $1995.00, including shipping within the United States; deliveries of the first units will start before May 1, 1979. For further information, contact HAL Communications Corporation, Box 365, Urbana IL 61801, (217) 367-7373.

HAL's DS3100 ASR electronic RTTY terminal.

NEW CUSHCRAFT ANTENNAS
Cushcraft has introduced two new high-performance VHF/UHF mobile antennas. They feature 3-dB gain with 58-wavelength stainless steel whips and precise frequency adjustment with a fingertip collar. There are tri-band and magnetic-mount models which have been tested to speeds in excess of 90 mph. The antenna packages include 18' of RG-58/U cable with connectors, plus a high-performance protective pads. The VHF models cover 144-174 MHz, including the 2 meter FM subband. The UHF model covers 220-225 MHz. For further information, write Cushcraft Corporation, PO Box 4680, Manchester NH 03108. Reader Service number C67.

COMPUTER-GENERATED BEARING CHARTS
How accurately are you pointing your beam? Until recently, I thought I was doing a pretty good job of pointing mine. Oh, sure, I was using one of those standard charts centered on the nearest big city (Boston in my case), but I always figured that was close enough. Now, I've changed my mind, thanks to the superb selection of beam-heading charts offered by Bill Johnston N5KR.

For more than a dozen years, Bill has been supplying hams with the real McCoy: Great Circle charts to Cushcraft for the exact QTH you specify. No more guesswork...no more trying to make do with a chart centered hundreds of miles from your QTH. The amazing thing is that Bill can send you his basic chart for just $1.00. What do you get for a buck? The basic chart gives you beam headings from your QTH to 600 cities, countries, and islands around the world. The listings are evenly split between DX and domestic locations. The chart also shows the distance to the other QTH in both miles and kilometers, as well as the beam heading the other fellow should be using to maximize his signal to you. All this for $1.00!

I compared Bill Johnston's $1.00 chart to another I'd seen advertised for $4.95. The $4.95 chart was the loser by a wide margin. It listed only 332 different locations, and if you don't live near one of 51 American population centers, you're out of luck, because the charts are not customized to your QTH. Bill Johnston has recently expanded his offerings, which now include enlarged DX and US beam heading charts, OSCAR/RS acquisition charts, geosynchronous satellite pointing charts, computer-generated code-practice groups, and even a computer-drawn Great Circle map centered on your
readout to update your receiver; this is it. Shortwave listening becomes a pleasure, since you can quickly go back to a station or find a new reception. The unit has an internal switching system which enables you to correct for a difference in $i$-frequency of plus or minus 4 kHz, if your $i$ is off a little from 455 kHz, you can make corrections after installation. Calibration is simple, as all you have to do is tune into a WWV or local broadcast station and adjust the switches. The calibration holds permanently.

The Dial Spotter is not a totally new design. It has been used in a slightly different configuration as the Navigator Mate, which is used by boaters for frequency readout on their portable RDF/ADF receivers. The unit weighs 6 lbs., measures 10 7/8" x 2 3/8" x 11", and comes with ac, 4- or 5-digit readout, black anodized finish, and several options. Also included is an excellent instruction manual.

For further information, write the Gemini Instrument Co., Box 205, Larchmont NY 10538. Reader Service number G27.

Wells R. Chapin W8GI
Kingsley MI

FIRST HAM RADIO WITH AMPLITUDE-COMPARESSED SPEECH

Stoner has just introduced the first amateur radio receiver to employ amplitude-compressed speech. Officially called the Model PRO-10, it has been dubbed "The Black Widow" by those who have seen and heard it operating on the 10 meter band.

The impressive performance of the radio is the result of a tiny integrated circuit from Signetics. The "chip" contains the equivalent of a six-foot rack of tube-type telephone-circuit speech-processing equipment.

Amplitude compressing involves logarithmic speech compression and expansion with no audible distortion. Part of the IC compresses the speech to raise the average modulation and then "talk power". The other half of the Signetics "chip" is used to expand the voice on receive. The company stresses that both the incoming and outgoing signal are enhanced significantly even when the PRO-10 communicates with conventional SSB radios. A technical paper on amplitude-compressed speech is available from STONER upon request.

The PRO-10 is described by the company as a "platform" for high-technology SSB concepts. It operates on 10 meters. The SSB, IAM/CW transmitter features 100 Watts minimum power output over the entire band. The receiver has a sensitivity of 0.5 microvolts for a 15 dB S/N ratio. A built-in six-digit frequency counter, which reads ± 100 Hz, features jumbo 0.5"-high LEDs.

The PRO-10 also features state-of-the-art electronic tuning (fast or slow) from either the panel or the microphone. A PLL (phase locked loop) tunes the radio in 1-kHz steps, while a vfo provides continuous tuning (1 kHz per turn) between steps. A built-in memory stores the last frequency used when the radio is turned off. Break-in CW operation is provided by carrier offset (60 Watts power output).

Another feature of the PRO-10 is the inclusion of amplitude modulation (AM). Noting the popularity of converted CB radios on 10 meters, Stoner incorporated a provision for this mode by employing a dual-bandwidth (2.5- and 5.0-kHz) crystal filter. The carrier output is 25 Watts. The operating mode (U, L, or A) is indicated by an LED to the right of the frequency display.

The PRO-10 measures 9" W, 8" D, and 3.25" H, an ideal mobile configuration. The power required is 13.6 V dc at 5 Ampere average current.

Stoner—The Sideband People, John Hancock Building, Mercer Island WA 98040, (206) 222-9464. Reader Service number S85.

NEW "BEACAT" 211 SCANNER HAS 18 PROGRAMMABLE CHANNELS

A new, crystal-less scanner radio with 18 channels which can be programmed with push-button ease has been announced by Electra Company. Named the "Bearcat 211," the new radio also features direct channel access which allows the user to manually select channels directly, without the need to step through other channels. In the radio's automatic scan mode, the 18 channels can be scanned at either 5 or 15 channels per second, permitting closer monitoring of desired frequencies. Also included is a patented selective scan delay which permits a 2-second delay to be programmed for any channel, allowing reply calls on the same channel to be picked up.

The new Bearcat 211 scanner radio also features a built-in digital clock function utilizing the radio's bright-red LED digital display. The high accuracy clock shows hours, minutes, and seconds. Another feature built into the new radio is automatic squelch. This feature allows the convenience of selecting a factory pre-tuned squelch level eliminating the need for manual squelch-level adjustment.

Thousands of frequencies in six bands are covered by the new Bearcat 211. Included are public safety, marine, government, transportation, and amateur communications. In the radio's "search" mode, the radio will seek out active frequencies between the limits selected by the user. Electra Company's patented Track Tuning is used to provide optimum reception across wide frequency bands. Complete details on the new Bearcat 211 scanner are available from Bearcat scanner suppliers or by writing to Electra Company, PO Box 29243, Cumberland IN 46229. Reader Service number E40.

Continued on page 32
Contests

from page 15

is the only indication of amateur Interest the Bermuda Dept. of Tourism has.

COUNTY HUNTERS SSB CONTEST

Contest Periods:
0001 GMT Saturday, April 21 to 0800 GMT Sunday, April 22
1200 GMT Saturday, April 21 to 0800 GMT Sunday, April 22
1200 GMT Sunday, April 22 to 2400 GMT Sunday, April 22

Please note the two-hour rest periods.

This is the 8th annual contest sponsored by the Mobile Amateur Radio Awards Club, Inc. Mobile stations may be worked each time they change counties or bands, but, if worked again from the same county on a different band, count for point credit only. Mobile stations contacted on a county line count as one contact but two multipliers. Portable stations will be considered fixed stations. Fixed stations may be worked by other fixed stations only once during the contest regardless of bands. Repeat contacts between fixed stations on other bands are not permitted. Fixed stations may be worked by mobile stations each time they change counties or bands. Repeat contacts between mobile stations are permitted provided they are on a different band or in a different county.

EXCHANGE:

Signal report, county, and state (country for DX). Mixed mode contacts are permitted provided that one station is on SSB. (Mobiles, please keep an ear for CW county hunters calling!)

FREQUENCIES:
3920-3940, 7220-7240, 14275-14295, 21375-21395, 28575-28595. Look for mobiles on 15 meters on even numbered hours.

Please note: Again, this year there will be a "mobile window" of 10 kHz on the following frequencies:
3925-35, 7225-35, 14285-90. Mobiles will be in this 10-kHz segment and fixed stations are asked to refrain from calling "CQ Contest" in this segment. After working mobile stations in the "window," fixed stations are requested to tune and work other mobile stations or QSY to the outer edges of the suggested frequency bands for work other fixed stations in the contest. This will allow the mobile running lower power a chance to be heard and worked in the contest.

Scoring:

Contact with a fixed/portable US or Canadian station = 1 point. Contact with DX stations (including KL7 & KH6) = 5 points. Contact with mobile stations = 10 points. The total number of US counties plus Canadian stations worked; take credit for a county only the first time it is worked. A Canadian station counts each time it is worked. Final total number of QSO points times total number of different counties and VE stations worked.

ENTRY:

Logs should show date/time in which station worked, report exchanged, county, state, band, claimed points (1, 5, or 10), and each new multiplier number. Official log sheets and summaries are filed. Final tally is SASE or SAE and appropriate IRCs from John Ferguson WQWQS, 3820 Stonewall Ct., Independence MO 64055. Submit all entries to the same address no later than June 1 to be eligible for awards; DX should use air mail.

AWARDS:

Plaques to highest scoring fixed US or VE, DX, mobile, and 2nd mobile; certificates to top 10 fixed and mobile stations in US and VE and to the highest scoring DX in each country. Only one station per county is eligible for these awards, but multi-op certificates may be issued if merited. A station may enter as both fixed and mobile, but separate scores are required.

WORKED ALL SOUTH EAST AWARD (WASE)

This award is offered by the Southeast Amateur Radio Club of Atlanta. An eligible certificate is available to all amateur radio operators who QSO with at least three members of the club on any band below six meters. Members of the club operate on 28.70 MHz every Wednesday evening starting at 0130 GMT. The club also meets on 28.70 MHz at 0130 GMT each Sunday evening for ‘catch up’ with members across the country. To get your WASE certificate, send an SASE along with the call signs of three club members and the date of each QSO to: WASO, d/o WD8KIS, 2196 South Overlook Road, Cleveland Heights OH 44106.

Looking West

from page 8

Amateur band had little to no activity to speak of, depending upon where you lived. Remember that it's been but two short years since 220 started to come into its own—as a result of two hurricane lands.

Having one was the severe overcrowded conditions which developed on the two meter band in localities such as southern California, New York, metro Chicago, and a few others. Amateurs wanted to get away from these conditions and started to look elsewhere. Many migrated to 450, but in some places, especially southern California, that band, too, was very crowded. Starting first in southern California, amateurs began to look at 220 as an alternative.

This was the spur to the second happening. Recognizing that amateurs were giving 220 notice, a number of manufacturers began to produce equipment for the band which was popularly-priced. Just as Heath was credited with "making" six meters years ago, companies such as Midland, Clegg, Wilson, and Cobra will go down in the amateur annals as the pioneers of 220.

By the time the 220 Class E proposal came to fruition, amateur operation had begun to entrench itself on that band. And by the time the FCC announced that the proposal was no longer viable, we had run out of 220 repeater pairs in southern California. Even if the proposal had gone through, it would have been all but impossible to implement here.

There was one fly in the ointment, though. 220 CB might have been approved had not our neighbors taken issue with the idea. They had witnessed the 27-MHz mess and did not want an expanded version of it. Maybe, had the US been able to guarantee that it would have been a totally-structured, heavily-policed service, it should have passed, but even the most bureaucratic of bureaucrats would have thought twice about that one. So, much to the dismay of many manufacturers who had hoped that 220 would be a needed shot in the arm for the teetering CB Industry, 220 Class E died. If the ARRL had sold nary a word, or even if they had supported the idea, it probably would have died the same death.

There is a difference between the Class E CB proposal and the current US WARC proposal pushing maritime mobile. Unlike CB, maritime will be looked at as a structured and policed service. Moreover, this is not a proposal for a given nation, but rather for the entire world. Now, when you "lose one," as happened with Class E CB, you do not go out and get eggs, as they used to say. The FCC "lost" in the Class E fiasco, so they are not about to take that chance again unless they thought they had a viable proposal. This means that they would at least expect support from throughout the region. I believe that the ARRL will be looked upon as no more than a rambunctious neighbor in the entire region. They are just not that powerful. It would be nice if they were, but such is not the case. If they had taken the initiative years back and invested in a professional lobbyist rather than a new office building, they might have developed the necessary structure to fight such transgressions as these. In fact, had the ARRL developed an effective lobby in Washington, we would not now be facing crisis after crisis.

There is another important factor. The ARRL just does not have the overall support of our VHF community. The world of VHF communication is fascinating and fast-moving—especially that of VHF/UHF relay technology. Yet the ARRL has always been slow to react to the needs of that segment of the amateur society. In most cases, they have acted "after the fact." I seem to remember that half of the national number of repeaters had been coordinated along a 2 meter band before the ARRL got around to endorsing one. What is called the ARRL Band Plan for "2" is, in actuality, the Modified Texas Plan. Later, after the ARRL recognized that inserted tertiaries worked better than right-side-up ones, the Southern California Band Plan suddenly became incorporated in the ARRL Plan. At one recent ARRL acquisition was the band plan for the 144.5-145.5-MHz subband. This is actually the NARC or Northwest Amateur Relay Council Band Plan; it was not dreamed up by the ARRL. There is nothing original in the ARRL 2 Meter Band Plan. It consists only of what they have borrowed from others and attached their almighty name to.

If the ARRL were the true VHF/UHF leaders, they would have developed band plans for all spectral activity long before they did. They didn't, and to date they have not come up with anything.
of this lack of Board initiative, some of those who have served on the VRAC have felt that they have had enough and have left. Can you blame them? Put yourself in the position of being an advisor to their Board on matters with which the Board was a bit unfamiliar. You were selected because of your knowledge of VHF/UHFC communication and were told to advise the Board on such matters. The committee itself exists because the Board knows little about the topic. If they were experts in it, why would they have you on the advisory board in the first place? By forming such committees, the ARRL Board admits its knowledge deficient in such areas.

So, you research something. Let's say it's a band plan for six meters. You present it to your fellow committee members and they agree. Your chairman then forwards this committee recommendation to the Board for their consideration, where it is formally pigeonholed. Eventually you give up and do one of two things. You protest and quit, or you become a good little boy and bow down to status as a committee member while doing as little as you can. Frankly, I can't blame anyone who does either under the circumstances. However, there is so much potential in both the VRAC and the VUAC that it's a shame to see all this talent wasted. It can be changed, and here is one way:

First, both the VRAC and the VUAC must be taken out from under the Board of Directors' thumb. Members of both committees should not be appointed through Newtoning, but rather should be elected on a Division basis as are Division Directors. It would then be the people rather than the bureaucrats speaking. Within this executive committee, an election process should be held to determine a chairman and a liaison officer. Decisions of such committees should then be presented to the ARRL membership and voted upon by the members as to whether such should or should not be implemented. The Board should keep its nose out of it, since by creating such committees, the ARRL is only giving them the carrot to entice them not at all adept at these matters in the first place. Once the roadblock caused by the Board of Directors is eliminated, the VRAC, the VUAC, and other expert League committees should be formed and help guide amateur radio directly.

The big question is: "Can it ever happen?" It's a simple question, one that would dilute the Board of Directors authority. I doubt that the current regime in Newtoning would buy it. Therefore, the real answer is a long-term one. It means voting into power individuals whose views are the same as yours. It means evolutionary change, and, unfortunately, we in VHF/UHF just don't seem to have the time to accomplish things without pain.

As in the past, things keep going with or without the ARRL. They will continue to take credit for what we accomplish and will keep on accomplishing with or without them. If we survive WARC, VHF and UHF will continue to grow and prosper. New ideas will continue to pour forth. If the ARRL is not managed properly, it was pulling out of any further involvement in this part of amateur radio, it would not matter one iota. That's what makes the whole thing so sad.

COORDINATION: THE BEST METHOD YET

Gary Pearce WA9NSO is the Illinois Repeater Council's coordinator. According to Gary, there's been quite a bit of discussion of just what we are doing, but it was not until recently that I had the pleasure of meeting him and finding out first-hand how the IRC faced an almost overwhelming problem and was able to conquer it. Here is the story, as Gary explained it to me over lunch in San Diego.

About a year ago, the IRC suddenly found itself out of places to put repeaters. There were always far more requests for spectrum than there was space available. Eventually there was no more, even with co-channeling and similar measures. At this point, the idea was born in the IRC that it was time that it became an advisory rather than an administrative group. A new local repeater licensing authority took root, which I term "advice and consent coordination."

According to Gary, someone came to him with the idea these days for a metro-area repeater. The two does not get an exact assignment. Rather, he is given an accurate listing of all area activity and told to go forth and find himself a home which will cause minimal interference to himself and all existing activity. The rationale is that nobody wants to be interfered with, and the new repeater will seek a home which satisfies this criterion. This concept takes the responsibility for minimizing and/or eliminating interference on places it squarely upon the shoulders of the new system owner. In such cases, the IRC operates on an advisory level. If all goes well, it gives final consent to the system's establishment and operation.

After listening to Gary, I took the initiative and developed a similar plan for this area, which I presented to the 2mAưa Technical Committee. The Committee decided to give it a try. Some new forms to utilize the concept were developed and included in the coordination information packet which is sent to every new repeater applicant. The results have been amazing.

2mAịa administers a very large area, one of the largest in the nation. It is impossible for a committee meeting in LA to know every bit of control and activity in this geographic area. At least half a dozen coordinations have been made using this system to date, and not one has faltered. In the past, at least two out of every six have—especially from the overcrowded LA-San Diego rf corridor which for years has been the crux of our problem. It's no longer simply a matter of requesting a channel pair. You must go out and find one upon which you can survive, and in this no-man's-land, that's not an easy thing to do. VHF/UHF and SCRA. I'm happy to report that the League should have the support of the majority of the VHF/UHF community.

According to Gary, there are two origins to the VHF/UHF leaders of tomorrow. If the ARRL Board of Directors would let them. They are the VHF Repeater Advisory Committee (VRA) and the VHF/UHF Advisory Committee. However, they do seem continually stifled by the bureaucratic attitudes of the ARRL Board of Directors. Eventually, because...
reason why you should know about HFI and its people. Many of them are transitionists, in the process of leaving CB and becoming amateurs. One of the avowed new goals of HFI is to educate the CBer of today so that he/she can be a good amateur of tomorrow. Then, too, 100,000-plus hobby radio operators make up a big chunk of today’s personal communicators and, just as the US could no longer fail to recognize the existence of mainland China, we in radio cannot bury our heads in the hope that HFIs will all just go away. The fact is that what is termed illegal radio operation between channel 40 CB and the low end of 10 meters is growing at a phenomenal rate; another goal of the new HFIs is to try to curtail this.

Like most other amateurs, for years I have been noisier in expressing my indignation at any illegal operation. A year ago, if you had asked me who all those bad guys were, I would have said that they were all members of HFI. The fact is that I said that many times and to many people. One day I said it to another amateur, who simply giggled a bit. He called me back later to offer LW a chance to meet with the president of HFI and judge for himself. The meeting was arranged according to certain ground rules I set down. I was still feeling indignant. There were two things. First, it would have to be a no-holds-barred interview, in which I could ask anything I darn well pleased. The second condition was that I be permitted to tape-record the interview so that later on no one could deny that what was printed had been said. This was agreed to, and early last spring I drove to Riverside and met with Norm Muller and his wife Jeannie at their home (which also serves as HF head-quarters).

We spent a rather enjoyable afternoon just “rapping” with one another, breaking now and then to change a tape or get another can of cola. I had come with the typical “ham with a chip on his shoulder” attitude well entrenched, and I was ready to do battle. The war has never developed. There was an instant rapport, and it turned out to be one of the most educational afternoons I have ever spent. More in future columns.

THE JOE MERDLER REVISITED DEPARTMENT

On Tuesday, January 9th, I received the following news release from Joe Merdler N6AHU: “On January 9th, 1979, Scott Lookholder WB6LHB pled guilty to three counts of violating section 1464 of Title 18, U.S. Code, for obscene and abusive language as a misdemeanor. Maximum penalties are up to 1 year in prison and up to a $5,000 fine on each count. Sentencing is set for February 6th, 1979.”

Looking West will have more on this in the future. However, we do have a rather interesting sidelight to report now. As a result of the text of Joe’s San Diego speech last December, he has been reunited with a relative he never knew existed. Joe tells the story this way:

He was in QSO on 20 meters with AA6A discussing DX when a breacher was heard. The breaching station turned out to be K8AQA in Saginaw, Michigan. K8AQA asked N6AHU: “Would you believe my name is Merdler, too?” It turned out to be Robert Merdler, and, in the course of the QSO, the two realized that they were indeed cousins. On that happy note, we will end this month’s Looking West.

The DOC has announced the following changes to agreements with other countries. Add Mexico to the third-party traffic list. Negotiations are under way for third-party agreements with Australia, Haiti, Jamaica, and Malta.

DIRECTLY TO Gary Kohltaia,
USAFS-K Box 194, APO San Francisco 96271.

Recollective licensing arrangements have been made with Austria, Barbados, Bermuda, Costa Rica, Honduras, India, Indonesia, New Zealand, the Philippines, Sweden, and the United Kingdom.

On the banned countries list, the Viet Nam exceptions XV5AA, XV5AB, and XV5AC have been eliminated.

The DOC is negotiating reciprocal licensing arrangements with Haiti, Italy, Liberia, and Spain.

Lists in copies of the CARF publication, The Canadian Amateur, should be amended to conform.

DX

from page 18

recommended operating habits. I keep a sked with Doug every Sunday he is available on 28031 kHz at 20002. When he has the time, Doug will hang around and work a few stations after our sked. Doug’s general operating times are from 0500 to 0800, on all bands 1 through 160. I have handled all QSLs since June 1, 1978. Prior contacts should go to K2BT.

There was a very active pirate using Doug’s call, so unfortunately some cards are being bounced back. Best 73, Greg WB4PRU.”

Palmyra Island

This summer, one of the better-heeled newcomers to the DX fraternity plan to depart from California for a four-month tour aboard his yacht Wildfire. Planned stops are Hilo, Palmyra, and Christmas Island. He is definitely planning the Palmyra stop, and says if the weather permits, he will take a swing by Kingman Reef. This looks to be mainly a CW-type operation, since the operator is new to ham radio and has a CW background from the Navy. He is planning to devote much of his operating time to the Novice bands.

Chad TT8

F6FFQ is in Chad and has been signing TT8 in the 14105 area. It is hoped that he can soon be persuaded to brave the storms above 14200.

Djibouti J28AY

WB8ENI passes along the following information on J28AY: Marc plans to QRT sometime in July of 1979, when he will return to France as FEETO. Beginning in July, all cards should be sent to FEETO’s CBA. In the meantime, they can still be sent to the Djibouti CBA. Marc prefers CW because his English is somewhat fragmentary. Look for him on 10, 15, and 20.

Korea HL9TG

Gary writes that he will be in Korea until January, 1980, and plans to be active on SSB and CW, 6 through 80. Contacts after March, 1974, go to WA7NTF, 6419 158th Street CT East, Puyallup WA 98371 or directly to Gary Kohltaia, USAFS-K Box 194, APO San Francisco 96271.

Afghanistan/Pakistan

O2CRH will be traveling to Afghanistan and Pakistan and is optimistic about reaching YA operating permission. He will be in Pakistan from March 15th to May 30th and plans to sign AP2LJ. QSL to WA8AGJ.

Spratly 1S1B

The late word had the group departing Brunei on March 28th and landing March 30th. The plan is to operate until more than 30,000 QSOs have been logged. VK2BLK and ZL1ADI from the Mellish operation will be along, and the boat will be the same one used at Mellish.

Dodecanese Islands SV

Those needing the Dodecanese should be interested in the following letter from SV1G in Athens:

“Please inform the readers of 73 Magazine that I and my wife will be touring the Dodecanese Islands from July 1st to August 15th. There will be many difficulties, as not all the islands have transportation. Since some are without roads, we will not have a car either. We will operate all bands, but will concentrate on twenty meters at

14205 and 14285 kHz. QSL to Anastasios Panos, 48 Voltairou Street, Athens 411, Greece.”

SV1G also noted that he no longer holds office in RAAG at the awards department, so letters addressed to PO Box 564 in Athens will no longer be answered. Anastasios also mentioned possible SY Mt. Athos activity in 1980.

China

Rumor has it that at least two American amateurs have applied and received preliminary approval for operation inside The People’s Republic. It has long been felt by some that the first legitimate operation from China would be by Chinese nationals, but who can tell? Work ’em if you hear ’em, and worry later.

Comoros D68AD

As an accommodation to those working toward 5BDXCC, Robin maintains regular skeds on 1804 kHz from 0230Z and on 3504 kHz from 0300Z.

Sao Tomé S9

Angelo D4CBS will have been on Sao Tomé for an extended visit which began in March. Although he holds a license and will be taking his rig with him, informal inquiries as to the status of amateur radio have

30
gone unanswered. Hopefully, by now you will be hearing Angelo from S9.

Pitcairn Island VR6

Things should pick up from Pitcairn on April 19th, when the Yankee Trader puts in on its latest around-the-world journey. Aboard will be K5UC, N1DX, and K5BJ, who has been issued the call VR6RJ. The idea will be to put VR6 on bands and modes not usually available. Planned are RTTY, CW, 40, and 80. Other RTTY stops will be CE0Z, 3D2, KJ6B (K58), and BO6. W9PAH will handle QSLs.

NOVICE CORNER

Although in the early stages of working DXCC it shouldn’t be necessary to make schedules in order to work a new one, there may be instances when you want to ensure a contact with a certain station.

The best way to do this is to write to the station’s QSL manager requesting possible schedule times and frequencies. Most QSL managers keep regular schedules with the stations they represent in order to pass logs or verify contacts. Often, the DX station will either show up early or else hang around afterward and hand out a few reports.

Remember, these QSL managers have plenty of work just keeping up with their own QSL demands, so be sure to include an SASE with any correspondence. It never hurts to include paper as well. When schedule time comes, just let the QSL manager know you are on frequency and then stand by until all traffic has been passed. Then you can make a contact and the QSL manager will already have you in the log.

Just remember to be patient and follow Instructions, and you’ll usually be able to add a new one to your log.

HEARD ON THE BAND

457EA runs a Tuesday, Thursday, Sunday sked for the deserving DXer on 14247 kHz at 2300Z, with TRBA at 80 meters.

TRBA is shooting for 2000 QSOs per month with those deserving DXers in need of a TR contact. Look for him around 14222 after 2000Z.

Those new 8L2 prefixes are the old VP2L St. Lucia stations signing their newly-gained independence-type calls.

There are still two active operaters on Johnston Island. KH3AA, the on-air radio technician for the installation there, is on generally once a week, and KJ6BJ can be found around 14056 kHz from 0000Z to 0300Z. KH3AA is reported to also be on the island and trying to upgrade.

The New Jersey DX Club has been supplying some needed manpower in an effort to reduce the backlog at 4JU1UN. They are having some success, but it never seems to be enough when you are among those in the waiting line.

Congratulations to new ARRL DX Advisory Committee members K5YY, K7LAY, and W05R. They join holdovers W2XN, N6RJ, WB8EUN, K9AM, W3N2, N4MM, and Chairman W1OT. Any complaints or bouquets you have concerning RFI should be directed to these deserving ones.

Box 88 is slow but sure. K41IF, who handles the QG Magazine program, recently received six pounds of cards and applications from Moscow. The applications included 93 for WPX, 27 for CQ-DX, and 17 for WAS. The round trip for these applications from Moscow averages 18 to 24 months. While we are on the subject, CO recently raised the fee for the WAZ certificate from $1 to $2. Therefore they will never run out of new countries. Look for the Marshall Islands, the Palau Islands, and Micronesia to obtain some form of independence by 1981.

Congratulations to WA8MOA, recent recipient of the first “Michigan DX Plaque,” for his efforts in the Mellow Reef operation.

The FCC recently raided the W472 licensed by John in Porter, Oklahoma, and seized some 440 illegal CB linearized values at $200,000. According to a story released by the AP, these amateurs cause TVI.

The January/February issue of Oceans magazine has an interesting article on Canton Island, the Auckland Islands, and Palau. Check your library for a copy.

W6KPC just put up a 12-element 20-meter beam on top of a Sky Needle at the top of a 100’ tower.

The International Island DX Net meets every Friday at 0300Z on 14280 kHz. The net is operated by the Whibdsey Island DX Club. Write W7BFK for more information.

Maurice Caplan, who gave out many new country contacts as V5SMC from Brunei, has retired from the DX wars and returned to England. K4VVA says no Descheo activity until the ARRL decides on its country status.

Some big bets are being made among the south Florida DXers as to who will be the first to earn 5BWAZ. The winner will be entitled to use “The Big Florida Pizza” on his QSL card.

The Delta DX Association will send a computer-driven heading card to any DX station free for the asking. Write to Box 73, Metairie LA 70004.

Sometimes a letter to Box 88 will shake out some long-need cards. Two years ago, K6DT wrote complaints about some overdue QSLs for contacts back in 1972. Now, two years later, the cards have finally come through. Where Box 88 is concerned, it just takes a lot of patience and sometimes a little prodding.

Word comes through that E. R. “Robble” Robson 5Z4ERR, formerly VQ4ERR, became a silversilencer during December.

Chod Harris W8BCO is in the process of setting up a permanent contest-type QTH in Montserrat, where he holds the call VP2MA. The station setup will include a five-element quad for 10/15/20 and a two-element quad for forty. He will have three complete operating stations. Chod was with the group which ran 7.4 megapoints from 5LCA in the recent DX contest. In the meantime, between contests, he plans operation from VP1, P2, 8R, FR, HB0, 3A, and other European spots.

China recently ended their economic aid to Albania, and there seems to be a slow shifting of the Albanian axis toward the west. This opens up future possibilities of a true ZA operation by some visiting Europeans.

Don’t discard your old Callbooks. Many of our DX friends wrote us unable to find a US or foreign Callbooks. Send your old discarded Callbooks to WA4JQS, and Tony will mail them overseas at his expense. He will also advise you of the recipient.

The Long Island DX Association is looking for associate editors. Contact W21YX if you are interested in helping out and getting your own book.

Speak of the Devil, or at least a new country, SM3VE and SM4CNN advise that they have received a license and will activate ZA5A on all bands including OSCAR and 436 MHz the last week in June and first week in July.

There is really no excuse for not having worked KV4. Dick KV4A ran off nearly 50,000 QSOs during 1978. That’s better than 100 a day.

The ARRL is petitioning the FCC for Novice privileges in the 220-MHz band. They have also asked for standard FM emission in the 52.0 to 52.5 MHz band.

The February QST carried a feature article on "Incons". These are devices which combine inductance and capacitance into one component. The ARRL is issuing a news release on this and is canvassing the House and Senate Subcommittee on Communications. The feeling is that Incons are helpful in reducing RFI.

TT0KP has been showing on twenty recently. He is reported to be a police officer there in Chaco, Parana.

Total US amateur licenses as of December 1, 1978, numbered 353,162. This breaks down to 61,000 Novices, 68,000 Techns, 118,000 Generals, 82,000 Advanceds, and 22,000 Extras. The gain for November was 325, and the 12-month gain was 26,404.

Contesters will be happy to note that KB1MK has filed a petition to KB1QWH, asking an amendment of part 97 so that contacts of one minute or less will not require an amateur station to identify the station it has contacted. This might work against the contestant, since many contest-type DX stations go several minutes without identifying themselves, and the only time you hear their call is when the US station gives it.

QSL INFORMATION

601FG to G. D'Aurella, Via Antonio Fozzagaza 87, 00137 Rome.

7XAN to Hermann Samson, Tamborine 2, D-5501 Osburg, W. Germany.

8P6EZ to W1RED

SL1SLC to WA0CAE

9XSL to SM5IB

A6XW to W1RED

A6XJA to Box 2535, Dubai

CE0AE to WA3HUP

D68AD to G3RWU

DA2QE to Robert Chilcote, USAFSB Box 15, APO NY 09742

EA8OL to EA80U

F6FFQT8 to SP 85215-BM, France

FB8UX to F6FLZ

FB8DDV to WA4JQ5

FPDD1 to VE1DI

FR7BU to FE6ON

FW6AC to F6BXW

GTAVO to DK5FJ

GT5CO to DK5FJ

GT5CID to DJ3BJ

GT5MR to DC1FP

H5FXT to PO Box 137, Lynden, Ontario, Canada L0R 1T0

H0DE to H55DEE to K8LUG

HH2Q CW to WA4ORT, SSB to K4UTE

HL9TG to Gary Kohlta, USAFSK K Box 194, APO SF 96271

HL5WIE to WB8BMS

HS1AB to WH9J

HS1W to Box 155, Bangkok

J2AY to Marc Bourc, Ancienne Poste, Chantiers-Le-Bourg, 17610 Chaniac, France

J16G to 8Y5IZ

K1COOPJ to W8EAB

K23DX to 225 West Coyote Drive, Carson City NV 89701

S79WV to Box 491, Maho

T6AH to Box 821, Umtata

TT0KP to F9KP

Thanks for much of the preceding information goes to the West Coast DX Bulletin, the Long Island DX Association Newsletter, and WorldRadio Magazine.
The versatility of a microprocessor is exemplified in the icom IC-280 4 MHz + FM mobile radio for two meters. Referred to as the "removable" radio, the IC-280 actually comes assembled for immediate operation as one box. However, the same radio may be separated by removing the head, connecting the optional remote cable to each unit, and mounting the head in a small place where almost no other radio will mount. "Remotability" is not the only reason to have an IC-280. The microprocessor covers all 4 MHz of the two meter band, plus some at both ends in 15- or 5-kHz steps which are selected by the user or the processor. In addition, there are three memory channels which can store any frequency which can be programmed on the dial. This allows the set to act as an "eyes-on-the-road" radio for safety. The modular 10-Watt output stage has plenty of power to drive the most popular amplifiers to full output, and the continuous display of frequency in either the transmit, receive, or memory position makes the IC-280 the best FM radio icom has come up with yet. For further information, contact Icom East, Inc., 3331 Towerwood Dr., Dallas TX 75234, or Icom West, Inc., 13256 Northrup Way, Suite 3, Bellevue WA 98005. Reader Service number 11.

**New Products**

**MOS- AND CMOS-SAFE INSERTION TOOL WITH PIN STRAIGHTENER**

OK's new model MOS-1416 Dip insertion tool inserts both 14- and 16-pin IC packages into sockets or predrilled boards.

**STRAIGHTEN PINS**

**PICK-UP**

**INSERT**

OK's new insertion tool.

**THE IC-280**

Total conductivity reduces static electricity. A ground strap may be easily attached for highly-sensitive MOS and CMOS ICs. Durable chrome-plated ABS construction features precision parts for long life and easy one-hand operation. The tool's narrow profile permits it to work on densely spaced patterns, while its unique insertion mechanism assures accuracy as well as excellent "feel." Finally, the tool includes a remarkable pin straightener built into the handle. Simply insert the IC, rock it on the straightening saddle, and push down on the tool. An automatic ejector delivers the IC ready to be placed in the insertion end for installation in your board or socket. The MOS-1416 is available at your local electronics distributor or directly from OK Machine and Tool Corporation, 3455 Conner Street, Bronx NY 10475. Reader Service number 05.

**HUSTLER ANNOUNCES NEW TRIBAND BEAM FIXED-STATE ANTENNA**

Hustler has announced the new Model 3-TBA triband beam antenna. The amateur beam antenna covers the 10-15-20 meter bands. The longest overall element length is 23' 10", and the antenna is designed and tuned for a 24-DB front-to-back ratio. Its unique design permits the elements to be much shorter than other beams on the market today. The boom length is fourteen feet, and the antenna provides better than 8-DB gain. The 3-TBA easily handles power inputs of 1 kilowatt, and is easily matched to 50-Ohm cable.

Conceived of 100% heavy anodized aluminum with stainless steel hardware, its weight is only 36 lbs. The all-new Hi-Q trap design uses twelve-gauge aluminum wire, requires no capacitors, and, once tuned at the factory, is permanently weather-sealed for years of reliable operation. This antenna is sure to be a favorite of those operators entering DX contests.

For further information on this or other Hustler antenna products, write: Sales Department, New-Tronics Corporation, 15800 Commerce Park Drive, Brookpark OH 44142. Reader Service number N2.

**READERS REVIEW THE WILSON MARK II HT**

Have you been looking for a small, lightweight, hand-held two meter unit? I had been looking for about a year, but could not decide which brand to buy. Then, on July 4, 1978, I heard a QSO in progress on 146.52 between John Shean N9TV and Charlie Dalton WDIAGK. John said that he had bought a Wilson Mark II and had worked Indianapolis directly with it early that morning. He had climbed his tower to work Indy, which is about 100 miles north of here. I was with my family at my parents' house. Supper was finished. It was too early to light fireworks, so I broke into John's QSO on my Tempo FM and asked if I could come to see his Mark II. Three days later, I ordered my Mark II from John AA9B, sales manager at Spectronics. It was shipped the same day. I have bought several rigis from Spectronics, and I find them to be excellent people with whom to do business.

The Mark II is small enough to carry in your shirt pocket with about half of it sticking out. It comes with crystals for 146.52 installed in channel A. It has six crystal channels, A through F. There are separate receive and transmit crystals for each channel. Rejection of adjacent channel signals is excellent. The receive crystals must be netted along with the transmit crystals. There is a warning in the manual to avoid high rf fields, since they may cause damage to the receiver. The Mark II should not be used in close proximity to a base station antenna or closer than twenty Inches from another unit. Transmission without the antenna can cause damage to the transmitter. My 25B high is repeater is here at my house running 100 Watts out, but it hasn't hurt the HT yet. My Mark II does an admirable job in this high-rf environment. The adjacent channel rejection it has is amazing, and you must do a good job of netting the receive crystals to get full performance. The Mark II uses a small 10.8-volt nicad battery pack rated at 500 mAh. The current drain is 15 mA squelched and 100 mA at full audio output. The current drain on transmit is 500 mA with 2.5 Watts out. The Mark IV draws 800 mA with 4.0 Watts out. The manual says the battery life is 8 hours with 5% transmit, 5% receive, and 90% stand-by duty cycle. The battery is easily replaced. The unit is housed in a Lexan case.

Looking at the manual, the only difference I see between the Mark II and the Mark IV is the driver transistor, with the Mark IV having a higher gain driver. Both units have an MRF.
ALL NEW
FT-101ZD
HIGH-PERFORMANCE HF TRANSCEIVER

Today's technology, backed by a proud tradition, is yours to enjoy in the all-new FT-101ZD transceiver from YAESU. A host of new features are teamed with the FT-101 heritage to bring you a top-dollar value. See your dealer today for a "hands on" demonstration of the performance-packed FT-101ZD.

Diecast front panel, plus heavy duty case
- Built-in, fully adjustable, VOX circuitry
- Built-in RF speech processor for more "talk power" when you need it
- Built-in, threshold adjustable, noise blanker
- Equipped for SSb and CW operation. Choice of wide or narrow bandwidth for CW (with optional CW filter installed)
- Continuously variable IF bandwidth: 300 Hz to 2.4 KHz

TRANSMITTER
- PA Input Power: 180 watts DC
- Carrier Suppression: Better than 40 dB
- Unwanted Sideband Suppression: Better than 40 dB @ 1000 Hz, 14 MHz
- Spurious Radiation: Better than 40 dB below rated output
- Third Order Distortion Products: Better than -31 dB
- Transmitter Frequency Response: 300-2700 Hz (-6 dB)
- Stability: Less than 300 Hz in first 30 minutes after 10 min. warmup; less than 100 Hz after 30 minutes over any 30 min., period
- Negative Feedback: 6 dB @ 14 MHz
- Antenna Output Impedance: 50-75 ohms, unbalanced

GENERAL
- Frequency Coverage:
  - Amateur bands from 1.8-29.9 MHz, plus WWV/JJY (receive only)
- Operating Modes: LSB, USB, CW
- Power Requirements: 100/110/117/200/220/234 volts AC, 50/60 Hz; 13.5 volts DC (with optional DC-DC converter)
- Power Consumption: 127V: 75 VA receive (65 VA HEATER OFF)
  - 285 VA transmit; DC 13.5V: 5.5 amps receive
  - (1.1 amps HEATER OFF), 21 amps transmit
- Size: 345 (W) x 157 (H) x 326 (D) mm
- Weight: Approximately 15 kg.
- COMPATIBLE WITH FT-901DM ACCESSORIES

RECEIVER
- Sensitivity: 0.25 uV for S/N 10 dB
- Selectivity: 2.4 KHz at 6 dB down, 4.0 KHz at 60 dB down (1.66 shape factor); Continuously variable between 300 and 2400 Hz (-6 dB); CW (with optional CW filter installed): 600 Hz at 6 dB down, 1.2 KHz at 60 dB down (2.1 shape factor)
- Image Rejection: Better than 60 dB (160-15 meters); Better than 50 dB (10 meters)
- IF Rejection: Better than 70 dB (160, 80, 20-10 m); Better than 60 dB (40 m)
- Audio Output Impedance: 4-16 ohms
- Audio Output Power: 3 watts @10% THD (into 4 ohms)

Yaesu The radio.

YAESU ELECTRONICS CORP., 15954 Downey Ave., Paramount, CA 90723 • (213) 633-4007
YAESU ELECTRONICS Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246
237 or SD 1127 output transistor. I have noticed a rise in the final amplifier temperature after several minutes of transmitting. This is normal. I have also noticed a rise in the temperature of the audio output final after several minutes at full volume, which is also to be expected. It should be possible to use some form of switchable power output.

The accessories shown in the manual for the Mark series of HTs include a desk-type battery charger, a wall charger, a cigarette lighter type 12 V dc charger, a speaker-mike, leather case, battery pack, and Digitran or Chomerics key pad. The Mark series uses the same kind of crystals as the other Wilson units. I put crystals from my Tempo FMH in mine with no trouble. Some of the channels I bought for crystals would not adjust to frequency properly, so I replaced the load capacitors to 33 pF. Caution must be used when you have the unit out of its case or else some of the small wires will come loose from the PCB board. I single board housed both the transmitter and receiver, and a small auxiliary board houses some of the crystals.

The unit weighs only 16 ounces including the battery pack, and an excellent manual comes with it. It is checked out at the factory and the specifications sheet is included in the shipping box—something you don't find very often these days.

I would like to thank John AA9B for the excellent service from Spertronics, as well as N9TV for the demonstration that got me to buy my Mark II. Most thanks, though, go to Wilson for producing such a fine unit, the answer to my HT dreams.

How It Works

The Wilson Mark series of HTs are dual-conversion FM units with a single circuit board containing both the transmitter and receiver. An independent microphone element is installed just below the speaker. There is a connector for an external microphone. Incoming signal passes through a low-pass filter and bandpass filter to the rf amplifier, where it is amplified and passed through "selectivity elements" to the first mixer. The first oscillator uses an HC-25/U fundamental crystal with individual trimmers for setting each receive crystal frequency. The crystal frequency is given by the equation Crystal Frequency = (Channel Frequency - 10.7)/9.

The first oscillator signal is coupled to the source lead of the first mixer, where it is mixed with the incoming rf from the rf amplifier. The output of the first mixer is tuned to the difference frequency on 10.7 MHz, and a 0.1-MHz 10.7-MHz signal goes through a monolithic crystal filter to the first IF amplifier. "The crystal filter provides a flat-topped, extremely steep-slope characteristic curve for superior image rejection." The signal from the second oscillator running at 10,245 MHz is coupled to the second mixer, where it is heterodyned with the incoming rf signal to produce the difference frequency, or 455 kHz. The 455-KHz signal goes through a ceramic filter to improve adjacent channel selectivity and to provide spurious rejection to hiss 455-KHz signal is coupled through the second IF chain which consists of four transistors followed by a limiter. The output of the limiter is then fed to the discriminator filter. The audio output of the discriminator is fed to the audio amplifiers. It has a noise-operated squelch.

The transmitter uses ten transistors and two diodes. The microphone audio is amplified, modulated, and fed to the phase modulator. A deviation control is provided. Output from the oscillator is phase-modulated and multiplied in the driver by a factor of 2. Then the signal goes through the driver to the final amplifier. The output signal is passed through a couple of filtering stages to the antenna.

Bob Miller
NBRM
Louisville KY

Since I was introduced to 2 meter FM in 1968, I have wanted a Motorola HT-220 handi-talkie. Unfortunately, the price of even a used HT-220 was always out of my reach, so I moved around with a variety of radios and eventually ended up with a battered HT-200. Now, understand that the HT-200 was a good HT in its day (1964), but it is big and heavy and limited in channel capacity (a maximum of 2). What had always attracted me to the HT-220 was its small size, lightweight, and professional appearance.

Wilson Comes Through

Over the years, I have watched as various companies have produced versions of 2 meter HTs. I have found that none of them even came close to duplicating the HT-220. Sure, they had the technical performance, but they were as big as HT-200 and just didn't look like I thought they should. Then it happened. Wilson ran their first ad for their Mark II and Mark IV mini HTs. They sure looked like an HT-220, and that price! $299.95. How could they sell it for that? Being the skeptic that I am, I figured that the ad was a first-class con job, but having been a year ahead of engineering and that if Wilson ever delivered, the price would probably be up by 50%. A quick call to Wilson confirmed my suspicion. They said first HT they had was in "3 to 4 months." Oh, well, I promptly forgot about it—but every month those full-page ads in 73 kept reminding me that Wilson was still there. So I finally gave in, and the HT-200 discriminator uses a ceramic-type transformer and requires no alignment. The receive crystals are in the 14-MHz range and are multiple direct-to-Fm circuits in the oscillator. Each crystal has individual trimmers for precise adjustment. The total squelch drain of the receiver is 15 mA, which allows many hours on one battery.

The transmitter oscillator uses crystals in the 12-MHz range. Again, individual trimmers are provided to permit exact frequency adjustment. A phase-locked loop is used with mike audio provided by a 2-stage amplifier. A speech clipper is used to prevent over-modulation; full modulation is obtained even during a few inches of away from the Mark II. Conventional transistor multipliers get the signal up to 2 meters, and a Motorola MRF 237 is used in the final stage. Incidentally, the Mark IV uses the same final as the Mark II. According to the schematic, the only difference in the two units is the driver transistor. The Mark II uses a 2SC741 and the Mark IV uses an MRF51. Presumably, one could replace the driver transistor, retune, and have a 4-Watt unit for less than the price differential between the Mark II and Mark IV. Maybe there is more to it than that, as I have found that 2.5 Watts is more than enough power anyway.

A solid-state T/R switch is used, and there is absolutely no noise when going from transmit to receive or back. My old HT-200 has an annoying squelch tail under the same conditions, so this characteristic of the Mark II is very welcome.

Construction

The overall construction of the Mark II is very compact, but servicing should be no problem since all the components are easily accessible. The unit is built around a double PCB and uses very conventional parts—there are no custom micro circuits or even ICs. In view of this, I can't help but wonder why it took so long for Wilson to produce a miniature HT. I have noticed that the overall design on the Mark II is very good; the controls are easy to reach, and the layout is well thought out. The power switch is on the front and there is a HI-LO power switch on the bottom of the case. The WILSON Mark II in the low-power position (1 Watt), since the main electronics is only noticeable in fringe areas. Low power reduces the drain on the battery by a fair amount and allows extended operating. Incidentally, the battery is a sealed, single-piece unit small enough to allow a second one to be carried in your pocket.

Receiver Description

The receiver is a double-conversion superhet with a MOSFET rf and a J-FET mixer. The first i-f is at 10.7 MHz. A 2-pole crystal filter is used for good selectivity and secondary image performance. The signal is downconverted to 455 kHz, passed through a sharp ceramic filter, and then limited. The discriminator uses a ceramic-type transformer and requires no alignment. The receive crystals are in the 14-MHz range and are multiple direct-to-Fm circuits in the oscillator. Each crystal has individual trimmers for precise adjustment. The total squelch drain of the receiver is 15 mA, which allows many hours on one battery.

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Ham Help

I would like very much to use my Radio Shack TRS-80 Level II 16K home computer, along with an interface to send and receive CW on my Yaesu FT-101E transceiver. However, to this date I have been unsuccessful in removing the bright flashes which appear on the video display when transmitting on any ham band.

One might be inclined to think that the transceiver is entirely to blame for the RFI on the video display, but I must add that the FT-101E does not cause any TVI with my home TV when it is operated in the same place as my video display or any other location in the home.

The video display furnished with the TRS-80 has a "hot chassis," i.e., the chassis or internal system ground is returned to the 120-volt neutral through the power cord. Such a video display might be called an ac/dc power supply by some; the home TV has a conventional power supply. Perhaps the conventional power supply is less likely to have interference from a transmitter.

To this date, I have tried isolation transformers, power line filters, many combinations of bypass capacitors, grounding to the same ground on the FT-101E, ferrite toroid filters, and every combination of any or all of these, and none has removed the flashes on the video display. I would like very much to hear from anyone who has solved the flashing in the video display.

John F. German W5BBH
807 South Rosenberg Drive
Bryan TX 77801

The long-dormant Royal Order of Hootoils has been rechartered, and its members are again burning the midnight oil on 6 meters throughout the Southwest. I am the new custodian, and I'm attempting to contact all amateurs who were members of the original order. Original Owls may reactivate by submitting to me their name, call, mailing address, and ROHO number, along with a one-time gift of $5.00, so that I who do not wish to reactivate are invited to send the information so that they may be included in the ROHO directory. A fact sheet on membership requirements is available for an SASE.

Don Abell WB5SND
6821 West Ave.
San Antonio TX 78213

I would like to modulate the Viking Adventurer transmitter for AM phone (ten meter). I would appreciate any information from anyone who has used this setup. Would an ECO-720 modulator work?

Dennis Hennigan WAIHOG
RFD 2
Pittsfield MO 64967

Can anyone assist me in obtaining a tube for an antique Westinghouse regenerative receiver, an Aerioila Sr., type RF, number 359564, made circa 1910-1920? The tube is a WD-11, Aeriotron, style 319553. The tube base is 4-prong, and has a 1/2 volt filament and 22-volt B+. The receiver is a wooden box, with a wooden chassis, rheostat, tickler, and tuning coil arrangement designed to tune 300-500 meters. I will gladly pay a reasonable price and postage for an original replacement, and welcome any advice on what to do with this nostalgic old doorstop.

Jerry Cohen W6DCJG
2568 Dysart Road
University Hts OH 44118

I am looking for an antenna which is efficient and effective, directional, and will fit in a 50 x 100 foot lot. Any designs, brochures, or ideas for an antenna, common or unique, would be appreciated very much.

Dennis Duckworth WB2SVR
109 Gilroy Avenue
Uniondale NY 11553

What Do You Do With An HT, Anyway?

Like many people who have been on 2 meter FM for a while, I am way past the excitement of 100-mile HT-to-repeater contacts and have discovered that intelligent use of the HT can really enhance many situations. My wife has happened to have an amateur license, and we use HTs to keep in touch when we go shopping. The Mark II is small and light enough to fit in her purse, and we can go our separate ways in shopping malls and still easily rendezvous by a quick call on the HT. It's also great for garage sales. I wait in the car listening to FM stereo, and if she spots anything interesting Inside (like a KWM-2 for $50.00), I can run in and survey the merchandise. As a matter of fact, she's even so attached to the Mark II that I never get to use it and am back to using my old HT-200. Wilson Electronics Corporation, PO Box 19000, Las Vegas NV 89119; (702)-739-1931. Reader Service number W2.

Fred Studenberg W4CK
Cedar Rapids IA

I need a manual or schematic for a "Moniscope" made by American Electronics Enterprises, Inc., of Long Beach CA. I also need a manual and a plate transformer for a Gonset GSB-101 power amplifier. I will be happy to pay postage both ways for the manual so that I could make copies of them.

Neil Preston WB4QOW
7024 Bales
Kansas City MO 64132

I would like to copy or purchase the manual and/or schematic for the Lafayette HE-35 six meter transceiver.

N. W. Zimmerman W7MAF
1815-17th Ave. So.
Great Falls MT 59405

I would like to put in a little request for a used model PLF 6-160 meter allband preamp (for receiver use only). I would also like to find a used 1978 U. S. Callbook at a reasonable price.

Paul Tremblay
8 Western St.
Biddgewater ME 04005

I am looking for stations (including DX ones) for the International Chessplayers Net. The net meets at 2100Z, Sundays, on 14.340. No membership is required.

Rick Wentworth WB9ZJW
100 St. Mary's Blvd.
Green Bay WI 54301

I have a 2 meter power amplifier, the Amcomm 2M2. I would like to use the amplifier for SSB. I would like any information on the required modifications? I have written Amcomm and gotten no results.

P. H. Schuyffel FE3JPP
8 Criggview Dr.
West Hill, Ontario
Canada M1E 4T9

I need a photocopy of an article which appeared in the 1959 Radio Handbook, about a 500-Watt "deluxe" transmitter which used a 7094 in the final.

A. McGinnis WA2DQT
55 Patton St.
Iselin NJ 08830

I would like to thank the readers who helped me out in my quest for a miniature variable capacitor for the marble bridge construction project. The letters are still coming in.

Walter Kimmel KB0CB
6033 Delafield Avenue
New York NY 10471

I have a Hallicrafters SBT 22 CW-AM-SSB transceiver. It's a military rig, fully solid-state and crystal-controlled. I need any information I can get, such as a schematic and operations manual.

Bill Mellema N3WM
13229 Old Hanover Road
Retslerstown MD 21136

I would appreciate it if anyone who has used Poly Paks' 92UC5177 and 92UC5226 (or any other circuit) to convert telephone touchtones to rotary pulses would please contact me.

Judah Schwartz KA2CES
941 45th St.
Brooklyn NY 11219

Our ham radio club desperately needs a photonic tube, the Cotron CE 1, or its equivalent, for an old Bell & Howell 16mm movie projector. It is no longer furnished by the projector manufacturer.

A. H. Russell WB4MAW
Tamiami Amateur Radio Club
2528 Bayshore Road
Nokomis FL 32355

I have an Avanti Moon Raker IV 11mb beam, which I would like to convert to 10m. I have written to Avanti and received no results. I would like to know if anyone has converted a Moon Raker, and how I could convert mine.

Cecil R. Trail KA7ACT
Box 486
Asoin WA 99402

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Social Events

MUSKEGON MI  MAR 30-31
The Muskegon Area Amateur Radio Council is sponsoring the ARRL Great Lakes Division Convention and Hamfest at the Muskegon Community College in Muskegon, Michigan, on March 30-31, 1979. This event will feature manufacturers' exhibits, technical forums, and a large swap shop. Ample parking and dining facilities are available. Friday evening at the Muskegon Ramada Inn, there will be a "Ham Hospitality" with libation courtesy of the MAARC and a Wouf Hog initiation. For additional information, contact MAARC, PO Box 691, Muskegon MI 49443, or H. Riekels WAGGVK, (618)-722-1378.

WORCESTER MA  MAR 31
The WPI Wireless Association will sponsor its first annual Spring Flea Market on Saturday, March 31, 1979, from 9:00 am to 4:00 pm, at the WPI campus in Worcester, Massachussets. For more information, write WPI Wireless Association, Box 2393, Worcester Polytechnic Institute, Worcester MA 01609.

ST. LOUIS MO  MAR 31
Mayor Conway of St. Louis has proclaimed March 31st as Amateur Radio Day, and, in conjunction with this, the Gateway Amateur Radio Association is sponsoring a hamfest which promises to be a good one. Hamfest hours are 8:00 am to 6:00 pm at the H. J. Cervantes Convention Center. Scheduled events include: Wayne Green on microcomputers, an antenna forum by Hy-Gain, an FM and repeater forum by Motorola and VHF engineering, FCC Q & A, a station-design forum by Drake, a low-cost transceiving forum by Atlas, a linear amplifier forum by ETO, a DX forum featuring the Navassa group and N9MM, a revolutionary method of learning Morse code, and an OSCAR forum. There will be special meetings for teenage hams, Ten-Ten members, Breakfast Clubbers, SWOT members, YLRL members, and others. Activities for YLs include a fashion show, a cosmetic display, and a tour of St. Louis. Talk-in on 34.94, 37.9/71, and 52. Admission is $3.00. For further information, please contact Bob Hell K9EID, PO Box 68, Marietta IL 62257, or phone (618)-295-3000.

COLUMBUS GA  MAR 31-APR 1
The Columbus Amateur Radio Club will hold its first annual hamfest from March 31-April 1, 1979, at the Columbus Municipal Auditorium, US 27 & 280, Columbus, Georgia. Donation is $1.00 at the door. There will be plenty of free parking and overnight free RV space. Exhibitors and flea market will be inside, with a free flea market outside. Talk-in on 28/88. For advance registration and details, write Bob Glasgow N4BGN, 1503 Laryad Drive, Columbus GA 31907, (404)-561-7746.

PHILADELPHIA PA  APR 1
The Penn Wireless Association will hold its Tradefest '79 from 8:00 am to 4:00 pm at the National Guard Armory, Southampton Road at Roosevelt Blvd. (Rt. 1), 1/2 mile south of turnpike exit 28. General admission is $2.00. Setup is at 7:00 am. Sellers may rent a 6' x 8' space for $3.00; you must bring your own table. Some tables are available for $1.00, and a minimum number of parking connections is available for $2.00. There will be refreshments, displays, and a rest area. Talk-in on 146.37/97 and 146.52. For more information, contact Chuck Miller ADX, (215)-943-3973.

PAINESVILLE OH  APR 1
The 1979 Lake County Hamfest will be held on Sunday, April 1, 1979, from 8:00 am to 4:00 pm at the Lake County Armory, 1289 Mentor Ave., Painesville, Ohio. The hamfest is all-day, all-ticket, all-day. Tickets are available for a $2.00 donation. There will be refreshments, women's activities (ham and non-ham), commercial exhibits, and a flea market. Ticket and Flea market rental will be provided. Prizes include a Wilson Mark II, a Bird wattmeter, and a Drake tone™ mike. Talk-in on 502.52 and 147.81/21. There is easy access to the hamfest via I-90 and Rte. 2.

TOWSON MD  APR 1
The Greater Baltimore Hamboree will be held on Sunday, April 1, 1979, beginning at 8:00 am, at Calvert Hall College, Goucher Blvd. and LaSale Road, Towson, Maryland. The college is located south of Exit 28, Beltway ( interstate 695). There will be food, prizes, and a giant flea market. Admission is $3.00. There will be tables available inside the gym and the cafeteria. For information and table reservations, contact: Gerald Malseed W3WVC at Calvert Hall College, 8102 La-Salle Road, Towson MD 21204, or call (301)-825-4266.

NATCHES MS  APR 1
The Old Natchez ARC Hamfest will be held on Sunday, April 1, 1979, at the Natchez Convention Center, Natchez, Mississippi. The event will be indoors and air-conditioned. There will be free admission to the swap tables. Talk-in on 146.31/91 and 146.52. For information, write ONARC, 1226 Magnolia Avenue, Natchez MS 39120.

WELLESLEY MA  APR 1
The Wellesley Amateur Radio Society will hold its annual auction on Saturday, April 7, 1979, beginning at 11:00 am at the Wellesley High School.
IC-701, Your Synthesized Passport

Enter the exciting world of HF DX with ICOM’s outstanding, fully synthesized IC-701. Globe-spanning QSO’s are as easy as hook-up and tune-in. Complete installation requires only a good 50 Ohm antenna and an AC power plug-in. Your IC-701 comes with everything else you need for beginning DX transmissions, including the matching IC-701PS external speaker and power supply, the fine SM-2 base microphone, and even two built-in VFO’s.

Turn on the power, and the world’s at your single fingertip. The IC-701 lets you scan all the Amateur HF bands from 160M to 10M (plus some MARS coverage above and below some of the Ham bands) with one finger. No more fooling around with two or more tuning knobs, and no complicated retuning when you QSY.

When talking on your IC-701, you get a 200 watt PEP input signal whose punch is significantly increased by the high quality built-in RF speech processor. This makes your 200 watts sound like so much more that we recommend you leave the speech processor on all the time.

For adding on frequency memory and remote frequency control, the IC-701’s synthesizer is completely compatible with ICOM’s RM2 remote computer controller: and with ICOM’s optional EX1 extension, you can operate with the RM2 and a linear amplifier at the same time.

Nothing else matches the value and ease of the IC-701. Plunge into the excitement of HF DX now, and get the whole HF world with ICOM’s IC-701 LSI system.
Wellesley, Massachusetts. The cafe on Rich Street, Wellesley, Massachusetts. The door will open at 10:00 am. Talk-in on 940 kHz, 63/03, 04/64, and 52. For more information, contact Kevin P. Kelly WA1YHV, 7 Lawnwood Place, Charlestown MA 02129.

COLUMBIA MO APR 7
The Columbia Hamfest will be held on Saturday, April 7, 1979, from 7:00 am to 4:00 pm at the Cosmo Recreation Center, Columbia, Missouri. There will be a large flea market, forums, and a buffet supper on Friday, April 6, 1979, at the Heritage House. Tickets are $4 for $5.00 in advance and $5.00 at the door. Food and camping and hotel/motel accommodations will be available. There will be bingo and a special program for the ladies. FCC exams will be administered by the FCC, Advanced, General, and Technician Class licensees. Mail completed form 610 to License Examinations, Central Missouri Radio Association, PO Box 283, Columbia, Missouri 65201. Saturday, April 7, 1979, will be a variety of major and minor prizes including a Kenwood TS-520S and a Wilson Mark II. Talk-in on 3963 kHz, 146.16/146.76 and 223.34/224.04. For ticket information, send check or money order, plus an SASE, to John Malinak W0DAA, PO Box 283, Columbia MO 65201.

ROCHESTER MN APR 7
The Rochester Amateur Radio Club and the Rochester Repeater Society will hold their Rochester Amateur Radio Day on Saturday, April 7, 1979, at St. John's School Gymnasium, 400 W. Center St., Rochester, Minnesota. Doors will open at 8:30 am. There will be a large indoor flea market for radio and electronic items, prize raffles, refreshments, and plenty of free parking. Talk-in on 146.22/82. For further information, contact RARCO KOTS, 2514 N.W. 4th Ave., Rochester MN 55901.

ST. CLAIR SHORES MI APR 8
The South Eastern Michigan Amateur Radio Association will hold its twenty-first annual hamfest on April 8, 1979, from 8:00 am to 3:00 pm at South Lake High School, 21700 E. Nine Mile Road at Mack Ave. St. Clair Shores, Michigan. For additional information, contact Mark C. Wille WB9RDA, Secretary, 171 Mermweather Road, Grosse Pointe Farms MI 48236.

MADISON WI APR 8
The Madison Area Repeater Association, Inc., will hold its seventh annual Madison Swapfest on Sunday, April 8, 1979, at Crabtree Valley Mall, US 70 West, Raleigh, North Carolina. General Admission is $3.00 with activities beginning at 9:00 am. There will be a covered flea market and many prizes which include a Kenwood TS-520S or Icom 211 (your choice), a kilowatt Legal Limit power supply, a three-element Yagi beam, and a CDE rotator. FCC Amateur exams will be administered at 9:00 am sharp. Talk-in on 146.04/146.64 WRAOE and 145.28/145.88 WRAAOE. For additional information, details, or reservations, write RARS Hamfest, PO Box 17124, Raleigh NC 27609.

NEWINGTON CT APR 22
The Pioneer Valley Repeater Association will hold its flea market and auction on Sunday, April 22, 1979, from 10:00 am to 5:00 pm at Newington High School. Food, refreshments, and parking, with over-night camping available. Hotel accommodations are also available within walking distance of the Swapfest. There will be door prizes, an all-you-can-eat pancake breakfast, and a Bar-B-Q lunch, as well as free movies throughout the day. Admission is $1.50 in advance and $2.00 at the door. Tables are $3.00 in advance and $3.50 at the door. Children twelve and under are admitted free. Talk-in on WR9ABT, 146.16/76. For reservations or information, write MA R.A.A., PO Box 3404, Madison WI 53704.

WEYMOUTH MA APR 21
The South Shore Repeater Association will hold its hamfest on Saturday, April 7, 1979, at Central Junior High School on Broad Street, Weymouth, Massachusetts. The doors will open and check-in will be at 9:00 am. There will be refreshments and participation. Participants will open to the general public at 12:00 noon. The club will share 10% of the sales. Please bring all items with call and description. There will be refreshments and door prizes available. Talk-in on 147.90/30 and 52. For more details, write South Shore Repeater Association, Box 71, Hull, Massachusetts 02045.

KANSAS CITY MO APR 21-22
The P.H.D. Amateur Radio Association, Inc., of Liberty, Missouri, will sponsor the tenth annual Northwest Missouri Hamfest on Saturday and Sunday, April 21-22, 1979, from 11:00 am to 5:30 pm on Saturday, and from 10:00 am to 5:00 pm on Sunday, at the Kansas City Trade Mart. The Trade Mart is located at the Kansas City Downtown Airport, with easy access to all area interstate highways, with unlimited parking adjacent to the 45,000 sq. feet of exhibition space. Display booths are available at a minimal cost of $15 for a single and $25 for a double. For further information, contact L. Charles Miller WA9OKU, 7000 Northeast 120th Street, Kansas City MO 64166, (816)-781-7313.

RALEIGH NC APR 22
The Raleigh Amateur Radio Society will hold its seventh annual hamfest on April 22, 1979, at Crabtree Valley Mall, US 70 West, Raleigh, North Carolina. General Admission is $3.00 with activities beginning at 9:00 am. There will be covered flea market and many prizes which include a Kenwood TS-520S or Icom 211 (your choice), a kilowatt Legal Limit power supply, a three-element Yagi beam, and a CDE rotator. FCC Amateur exams will be administered at 9:00 am sharp. Talk-in on 146.04/146.64 WRAOE and 145.28/145.88 WRAAOE. For additional information, details, or reservations, write RARS Hamfest, PO Box 17124, Raleigh NC 27609.
Radio Association will hold its annual hamfest on May 4-5, 1979, at the Louisiana State Fairgrounds. Pre-registration is $3.00; $4.00 at the door. This is an ARRL sanctioned hamfest.

**NEENAH WI MAY 5**

The 3-F Amateur Radio Club will hold its annual swapfest on Saturday, May 5, from 8:00 am to 3:00 pm, at the Neenah Labor Temple, 157 S. Green Bay Road, Neenah, Wisconsin, just off Highway 41 at the Highway 41/94 exit. Facilities include a large parking area and a large indoor swap area with a free auction at the end of the day. Food and beverage will be available. Advance admissions are $1.50 and $2.00 at the door. For reservations, write to Mark Michel W9OP, 339 Naymut Street, Menasha WI 54952.

**LOGANSPORT IN MAY 6**

The Cass County Amateur Radio Club will hold its second annual hamfest on Sunday, May 6, 1979, from 8:00 am to 4:00 pm at the 4-H fairgrounds, Logansport, Indiana. Go north of Logansport on Highway 25, turn right at Road 100, and follow the QSLs! Admission is $1.50 in advance and $2.00 at the gate. Outside set up is free and undercover set up is $1.00. Bring your own tables. There will be overnight camping, refreshments, ladies' bingo, and door prizes. Talk-in on 146.52 and Logansport repeater 147.78/18. For information, write Dave Rothermel KD9All, RFD 4 Box 146G, Logansport IN 46947.

**DEKALB IL MAY 8**

The Kishwaukee Radio Club and the Dekalb County Amateur Repeater Club will hold their 21st annual indoor/outdoor hamfest on Sunday, May 6, 1979, from 8:00 am to 3:00 pm at the Notre Dame School, 3 miles south of Dekalb between highway 23 and South 1st St. on Gurier Rd., Dekalb, Illinois. Tickets are $1.50 in advance, $2.00 at the door. Indoor tables are available or you may bring your own. The outdoor setup is free. Talk-in on 146.13/73 and 94. For tickets and directions, send an SASE to Howard Quinns, K9KW, Box 349, Sycamore IL 60178.

**WARNIMINTON PA MAY 6**

The Warnimont Amateur Radio Club will hold its 36th annual “Ham-Mart” flea market and auction on Sunday, May 6, 1979, from 8:00 am until 4:00 pm. At the William Tennent Intermediate High School, Street Road (Route 132), two miles east of York Road (Route 263), Warminter, Bucks County, Pennsylvania. A registration fee of $1.00 per car includes one ticket for door prizes. The parking fee is $2.00 additional. Indoor tables are available for $3.00 each. Talk-in on 146.16/76 and 146.52. For further information, please write Horace Bart KE7KT, 38 Hickory Lane, Doylestown PA 18901, or phone (215)-345-6816.

**FRESNO CA MAY 11-13**

The 37th annual Fresno Hamfest will be held on May 11-13, 1979, at the Sheraton Inn, Clinton and Highway 99, Fresno, California. The program includes technical talks, swap tables and flea market, transmitter hunt on 2 meters, QSL contest, ARRL CD appointees meeting, ARRL-FCC forum, commercial exhibits, prizes, eyeball QSOs, prime rib banquet, and more. Full registration and eligibility for pre-registration prize, send in $17 before April 27, 1979; it’s $19 and no pre-registration prize after that date. Talk-in on 146/1464. For more information, contact the Fresno Amateur Radio Club, Inc., PO Box 783, Dept. HF, Fresno CA 93712.

**DEERFIELD NH MAY 12**

The Hosstraders Net will hold its 6th annual tailgate swapfest on Saturday, May 12, 1979, at the Deerfield Fairgrounds, Deerfield, Hampshire County, New Hampshire. There will be covered buildings, in case of rain. Admission is $1.00, with no commission or percentage. Commercial dealers are welcome at the same price. Extra revenues will benefit the Boston Burns Unit of the Shriners’ Hospital for Crippled Children. Last year we donated over $100.00. Talk-in on 146.52 and 146.40-147.00. For more information, send an SASE to Joe DeMaso K1RQO, Star Route, Box 56, Bucksport ME 04416; or Norm Black WA1VUL, PO Box 32, Cornish ME 04020. For more information, the Hosstraders Net on Sundays at 4:00 pm on 3940 Khz.

**VANCOUVER WA MAY 12-13**

The Fort Vancouver Hamfair will be held on Saturday and Sunday, May 12-13, 1979, at Clark County Fairgrounds, Vancouver, Washington. Registration is $4.00 per person which includes a drawing ticket. Tickets are also available at the door. Activities will include contests, seminars, commercial and ham radio displays, family events, and a large ham radio flea market. Many prizes will be awarded with the grand prize being an icom IC-701 HF transceiver and power supply. The fairground facilities include trailer parking and parking. A catered buffet dinner is scheduled for Saturday night with musical entertainment included. Price of the dinner ticket is $5.00 for adults. For registration, contact Ken Weiss W7DYZ, Registration Chairman, 606 Miami Court, Vancouver WA 98664.

**DAYTONA BEACH FL MAY 12-13**

The Daytona Beach Amateur Radio Association, Inc., will hold its first hamfest on May 12-13, 1979, at the International Surflodge, Daytona Beach, Florida. For Mom and the kids, there is the “drive-on” ocean beach, and shopping in the seaside plaza. Advance registration is $3.00 per family and $3.50 at the door. For more details, contact Funfest chairman David Russer W4ZT, 1725 Hope Drive, Ormond Beach FL 32074.

**SALINE MI MAY 13**

The ARROW Repeater Association will hold its annual Swap and Shop on Sunday, May 13, 1979, at the Saline, Michigan, fairgrounds. Admission, including parking on the fairgrounds, is $1.50 in advance and $2.00 at the door. There will be food, prizes, and a covered area for trunk sales, as well as indoor tables. Because of Mother’s Day, wives will be given free admission. Talk-in on 146.37/97, 223.18/224.78, and 448.5/443.5 MHz. For additional details, write ARROW, PO Box 1572, Ann Arbor MI 48106, or call George Raub ADBX at (313)-485-3562.

**BENSENVILLE IL MAY 19**

The Radio Amateur Megacycle Society will hold its Holmdel and Antenna Measuring Contest on Saturday, May 19, 1979, starting at 10:00 am on the grounds of the Flick-Reedy Corporation, 1530 N. Wondale and York Roads, Bensenville, Illinois. Equipment will be available to measure the gain and swr of 2 meter, 1.25 meter, and 70 cm antennas. Equipment for higher frequencies will be brought if advance request is made. Prizes will be awarded for the highest-gain antenna in each category. Refreshments will also be served. For further details, including directions, write Joe LeKossal WB9GOJ, 2558 N. McVicker Ave., Chicago IL 60639. Please enclose an SASE.

**CADILLAC MI MAY 19**

The Wexawake ARA will hold its 19th annual swap and shop on Saturday, May 19, 1979, from 9:00 am until 4:00 pm at the National Guard Armory, 415 Haynes Street, Cadillac, Michigan. There will be free parking and lunches available. Talk-in on 146.37/97. For more information, contact Robert Bednarick W8DRZL, Publicity Director, Wexawake ARA, Cadillac MI 49601.

**DURHAM NC MAY 19-20**

The Durham F.M. Association will hold the 114th hamfest on Saturday and Sunday, May 19-20, 1979, at the South Square Mall, Durham, North Carolina. Plenty of prizes, exhibits, and programs will be offered, and the XYLs can enjoy shopping. Ladies’ bingo will be held on Sunday. Free tailgating spaces, under a covered, drive-in-and-sell flea market, come with a one-time $1.00 garage sale registration ticket, with vendors and dealers included. Electrical power will be available. Harmonics and unlicensed XYLs are free. Talk-in on 147.825-225, 146.34-94, 224.34-3.94. For more information, write DFMA, Box 8651, Durham NC 27707.

**BIRMINGHAM AL MAY 19-20**

The Birmingham Amateur Radio Club will hold Birmingham hamfest ’79 and the Alabama State Convention on May 19-20, 1979, at the Birmingham-Jefferson Civic Center Exhibition Hall, Birmingham, Alabama. There will be many of last year’s exhibitors, including most major manufacturers and distributors. There will also be a huge indoor flea market, lots of exhibits, space, meetings, forums, activities, and plenty of free parking. Plans are being made to again offer on-site FCC exams on Saturday morning. Prizes will feature at least three complete HF stations, several VHF rigs, and a home video tape recorder system. The Saturday night banquet will feature the nationally known comedian and Grand Ole Opry member Jerry Clower. Many other door prizes will be available in advance, by mail, while they last. For more information, write Birmingham ’79, PO Box 603, Birmingham AL 35201.

**WEBSTER MA MAY 20**

The Eastern Connecticut Amateur Radio Club will sponsor an electronics flea market from 9:00 am until 6:00 pm, with an auction at 1:00 pm, on May 20, 1979, at Point Breeze Restaurant, Webster, Massachusetts. It will be held rain or shine. For more information Continued on page 156
A Speedy Spinner Mod

— 5,000,000 Hz per minute

Knobify your rig with a minimum of effort.

After purchasing a Kenwood 820 and a Kenwood TS-700A last year, I discovered that something was missing on these two superb rigs. They needed spinner knobs so that I could QSY rapidly across the bands. So I developed a knob that can be affixed to just about any type of receiver or transceiver with a minimum of effort.

To build your own knob, refer to the labeled parts shown in Photo A.

Step 1. Place no. 2 over no. 1 and no. 3 over no. 2. Use a rivet tool or a punch on the no. 1 stem to flange it. After the stem has mushroomed, place a drop of 30-weight oil or white lube around it to ease rotation. After that, use emery paper on the base of no. 1 so that the epoxy has a good surface to adhere to.

Step 2. Epoxy no. 4 to no. 5 and let it set 10 minutes. Press no. 5 into no. 6, and then epoxy no. 7 into no. 6 and no. 8 on top of no. 6. This completes the knob.

Step 3. Take the completed top portion and lubricate the stem, no. 4 (white lube), and press it into the bottom section. The knob is now ready for mounting.

Step 4. Before mounting, make sure that both the knob surface and the rig surface are clean of oil and grease. Apply epoxy on the outer edge of the big knob and let it set for at least one hour. Then QSY rapidly across the ramps.

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Photo A. Parts and their order for knob assembly.

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Photo B. Spinner knob on the TS-700A.

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Parts List

- 5-minute epoxy
- E Z heavy-duty snap fastener, no. 751
- Prims halo buttons, 212-24 9/16"
- Prims halo buttons, 212-30 3/4"

|$1.59
|2.00
|.70
|.70
NEW MFJ-962 1.5 KW Versa Tuner III

For $159.95 you can run up to 1.5 KW PEP and match everything from 1.8 thru 30 MHz: coax, balanced line, random wire. Built-in balun. SWR, dual range forward and reflected power meter. Flexible six position antenna switch. Outstanding value.

MFJ-961 1.5 KW VERSA TUNER III has balun, six position antenna switch. Matches coax, balanced line, random wire, from 1.8 to 30 MHz.

The NEW MFJ-962 1.5 KW Versa Tuner III lets you run up to 1.5 KW PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

This gives you maximum power transfer to your antenna for solid OSO's and attenuates harmonics to reduce TVI and out-of-band emission.

An accurate meter gives SWR, forward, reflected power in 2 ranges (2000 and 200 watts).

A flexible six position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.

A new all metal, low profile cabinet gives you RFI protection, rigid construction, and sleek styling. Black finish. Black front panel has reverse lettering. 5x1x14 inches. A flip down wire stand tilts tuner for easy viewing.

Efficient, encapsulated 4:1 ferite balun. 500 pf, 6000 volt capacitors, 12 position inductor. Ceramic rotary switch. 2% meter.

Built-in quality. Every single unit is tested for performance and inspected for quality. Solid American construction, quality components. One year limited warranty.


After a truly side by side comparison, you'll be convinced that its value, quality and features make it a truly outstanding value.

Why not visit your dealer today? If no dealer is available order direct from MFJ.

6 position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.

$159.95

The MFJ-961 1.5 KW Versa Tuner III gives you a flexible six position antenna switch. It lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.

Run 1.5 KW PEP. Match any feedline from 1.8 to 30 MHz: coax, balanced line, random wire.

Gives maximum power transfer. Harmonic attenuation reduces TVI, out of band emissions.

Black all metal cabinet. Black front panel has reverse lettering. Flip down wire stand tilts tuner. 5x1x14 inches.

Encapsulated 4:1 ferite balun. 500 pf, 6000 volt capacitors, 12 position inductor, ceramic switches. SO-239s, ceramic feedthrough. One year limited warranty.

Every single unit is tested for performance and inspected for quality. Solid American construction, quality components.

For your nearest MFJ dealer, call toll-free 800-647-1800. Visit your dealer and compare. You'll find real value.

Why not see the NEW MFJ-962 1.5 KW Versa Tuner III at your dealer's today? If no dealer is available order direct from MFJ.

FOR YOUR NEAREST DEALER OR FOR ORDERS

CALL TOLL-FREE 800-647-1800

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

Order today. Money back if not delighted. One year limited warranty. Add $8.00 shipping/handling.

For technical information, order/repair status, in Mississippi, outside continental USA, call 801-323-5869.

Order By Mail or Call TOLL FREE 800-647-1800 and Charge It On

MFJ ENTERPRISES, INC.

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A Variable Bandpass Active Filter

— extremely simple design

Clean up those sine waves!

Allan S. Joffe W3KBM
1005 Twining Road
Dresher PA 19025

The op amp configured to produce an "active filter" is of general interest to the present-day ham for several reasons. His activities span a greater range of technology, op amps are rather inexpensive, and the final filter is a small unit that usually does a big job in a simple manner.

The bandpass type is rather useful for voice, CW, or RTTY modes, but the usual versions suffer from the lack of a didele pot to vary the bandwidth without substantially affecting the design center frequency.

Fig. 1 shows a familiar bandpass filter without the variable bandwidth element. Fig. 2 shows the same circuitry with adjustable bandwidth and values for a center frequency of about 800 Hz. Using 5% value components, the measured peak frequency worked out to be 820 Hz with the variable pot turned fully clockwise. This position is the broad position of the filter. With the pot turned fully counterclockwise (the sharp position of the filter), there is a slight shift of the center frequency to 865 Hz, but to the ear this is not detectable.

In the broad position of the filter, the bandwidth at the 3 dB downpoints is a measured 718 Hz. The bandwidth at the 10 dB downpoints is 1890 Hz. In the sharp position, the bandwidth at the 3 dB downpoints is 275 Hz and 800 Hz at the 10 dB downpoints of the response curve. Naturally, as the pot is rotated, you can generate a series of bandwidths between these maximum and minimum limits.

With a plus and minus nine-volt supply for the 741 op amp, the available output swing is about five volts rms. There is a difference in the input sensitivity between the sharp and broad positions of the bandwidth control pot. In the sharp position, it takes about 1.2 volts in to produce the five volts out. In the broad position, this input voltage rises to about 2.7 volts.

The filter demands an input resistance of no more than 22k Ohms from the input terminal to ground, especially when the bandwidth control is set to the sharp position. If this condition is not met, the filter will oscillate, a fact that may come in handy. To illustrate, set the bandwidth pot to the maximum sharp position without any input termination. A scope on the output will show a sine wave with clipped peaks. If you slowly back off the bandwidth control, the clipped peaks will go away, leaving you with a rather nice clean sine wave that also has excellent frequency stability. The frequency of this oscillation will be close to 77% of the center frequency of the filter.

Fig. 1. Fixed bandwidth.

Fig. 2. Variable bandwidth.
The best buy on the market today!

VHF Engineering

HIGH QUALITY POWER SUPPLIES

15, 25 and 30 amp regulated power supplies with fold back current limiting, over voltage and transient protection. Also, output voltage and current meters. You might find a cheaper power supply, but you can't find one as well built with top quality components. Other power supplies with lighter weight transformers and components are no match for the VHF Engineering power supplies.

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V Reader Service—see page 195
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ly dropped A-1. Just within the past year, I decided to go for DXCC and have over 110 confirmed with 40-plus more hopefully en route.

Wish you would change the term of your "Never Say Die." Then I probably would drop another ham magazine in favor of 73.

John H. Pitman W1LY
Quechee VT

CARPING

I have read your magazine for a number of years and do enjoy it. However, I am disturbed at your continual carping at the ARRL, not because the ARRL does not merit considerable criticism, but because at no time have you offered us a suitable alternative. Most organizations such as the ARRL do become inflexible and self-protective. However, challenging them directly as you do merely increases their tendency to insulation and isolation.

You have the means and, I assume, the staff necessary to develop an organization that might effectively represent the ham radio community. I can visualize an organization, not unlike the National Rifle Association, that could be a potent lobby.

Perhaps rather than indulging in ineffective criticism of the ARRL, you could invest some of your tremendous energy in the development of a real alternative organization, functioning solely in the interests of amateur radio.

Edward M. Schneider, M.D.
AA6O
Woodland Hills CA

Well, Edward, you've raised some points that perhaps should be discussed. I am often asked why I don't start a second national amateur radio organization and some answers are called for.

The question can be approached better by dividing it into parts. First, why I haven't started one in the past. Second, why I don't start one now. Some of the past history has been covered in a recent editorial. Beyond that, without going into the depressing details, I can honestly say that there has been no time when I had either the money or the time needed to get something going.

That brings us up to the present. Why not get an organization started now to do all of the things which the ARRL should be doing but isn't? My feeling is this... since the trend for future amateur radio rests upon what frequencies we end up with after WARC this fall, and since little can be done to influence that event at this late hour, perhaps it's best to wait and see what we have left, if anything, to work on.

The organization which I have in mind would be constructed quite differently from the League. It would be based primarily on a local foundation, with very little power in the national organization. We might call it the Institute of Amateur Radio, But perhaps better would be an International Amateur Radio League (IARL). This would be more in keeping with the goals of the organization.

I've changed to some national organizations which were set up in this way and which function much better than the ARRL as a result.

I see the thrust of the IARL as being on three fronts, all of a lobbying nature. Firstly, there would be a lobby in Washington which would make the FCC aware of the rule changes which are important to us. This lobby would push to get these rules accepted, using pressures on the FCC and Congress for this end. I still have the concept of a year or so future meetings of the IARL chapters where rule changes would be proposed, discussed, and voted on. This would be almost identical to the system used by the ITU.

Secondly, I see a need for a lobby on a national level. This would be on the order of "Hobby Lobby," for those of you with longer memories. This "lobby" would organize material on amateur radio for newspapers, magazines, television, radio, etc. The main purpose of this effort would be to make amateurs known, and the lobby would be Splendidally aroused by the whole country. It would also help interest more people in amateur radio, which wouldn't hurt.

Finally, an even more important in the long run would be international lobbying for amateur radio. This effort would introduce amateur radio into smaller countries and build up a world appreciation for the value of amateur radio. This could reflect to our advantage at future ITU meetings. An international lobby would work with the national ham groups in foreign countries to improve amateur frequency allocations in the future.

Being realistic about the cost of the three lobbying efforts is tremendous costs of offices, experienced people, travel, telephone, newsletters, etc., we're looking to a minimum cost of $750,000 per year. That comes to $22 per licensed U.S. ham, which certainly seems reasonable. But by the time you take into consideration the 50% of the hams who are resistant to paying for such a service plus the costs of collecting the needed funds, issuing membership cards, keeping records, sending invoices, statements, etc., you're looking at more like $10 per amateur. It's a formidable administrative job.

Most of us have come to equate the service of a national organization with observable benefits such as contests and certificates. I suspect that the IARL would have to run a full set of contests just to establish visibility. While I personally am a contest fan, you've noticed that I've kept 73 pretty much out of the contest business, feeling that we have enough contests already. Would the IARL have to run VHF contests, a national contest, an international contest, and perhaps a satellite contest?

Let's see, what else does the ARRL do besides run contests and publish? I think that about covers it. If the IARL runs contests, lobbies on three levels, and publishes, it should be a viable organization. We have some serious questions that need answering. For instance, do you prefer a membership which is tied in flexibly to a subscription to the magazine? Keeping separate records is a lot more expensive than doing both together, so a combination IARL membership and subscription to 73 would be cheaper. On the other hand, there might be some amateurs who would prefer not to support an organization devoted to promoting amateur radio and yet want to read the magazine. Let me know what you think of this.

Another question is one of officers. Would you prefer to have a national election which would select the president of the ARRL, or would you go with the ARRL system where the directors select the president and manager? The ARRL system is quite parallel to that in the Soviet Union where the Politburo elects the president and party chairman.

It is tempting to set up a new organization with controls which would make it either difficult or impossible to lose control. This was the system that Hiram Percy Maxim used when he set up the ARRL. The problem with that system was that it resulted in a good deal of infighting and disagreement within the League as people struggled for control...a control that was almost impossible to upset. I'd prefer to avoid this pitfall. What's your thought on this?

For that matter, are there any clubs which feel that the idea of setting up lobbies on three levels is good enough for them to align with? They would thus become a local chapter of the IARL. It seems such an organization be desirable.

I admit that I should have come up with this plan years ago and should have organized my business and personal life so as to implement it...but I didn't get to be too late for such an idea, are you with it or against it? And how about that $10? That's consistent with what other national organizations charge, by the way. Please advise.—Wayne.

NO WINNERS?

After having read your editorial in the December issue, "Never Say Die" seemed to me to be an inappropriate title. Your comments on WARC read as if Wayne Green as well as the ARRL intimately so to lose control. Statements like "Having been an avid ham for some 40 years, I'll sure hate to lose it. It's been a big part of my life and..." brings to mind "glory and doom" in capital letters. So if you insist on using "Never Say Die," at least make it mean something—especially now. Make those 40 years of experience count. You're in a position to do so.

Since, like yourself, no one has asked for my opinion, I too feel free to comment. Just as an amateur station is more than a collection of radio gear, so ham radio itself is more than just a hobby. How much more is a matter of record and, in spite of what we as individuals feel, that...it maintains a large file on ham radio as a public service. Hams may not be unknown to the general public, but they're not a household word, either. If ham radio is on the way out, the American public deserves to know what it's losing. That in...
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Reader Service — see page 195
includes RACES, MARS, and 73 Magazine. Now is as good a time as any to take an objective look at the whole amateur scene. We can't do it—we're too prejudiced. Someone has to pull ham radio out from under its rock and put it in the spotlight for a few minutes. If the amateur service goes, then commercial and military frequencies may not be sacro-
sanct either, and Americans may need more than the Citizens Radio Service can o-
fer sometime in the near future.

The WARC '79 conference has been getting about as much attention as me. I don't know about you, but I've been around long enough to remember the last time in the near future.

Citizens Radio Service can take its amateur service goes, the spotlight for a few minutes. If much national publicity as my nation either, and Americans agree with my proposal or not?

buck. Most of us don't qualify

If it's on its way down, it might as well go down swinging.

A project of this magnitude takes time, a lot of research, a lot of leg work, a lot of convincing, a lot of good old-fashioned salesmanship, and a lot of hubris. I'm not going to qualify in any of the above areas. Maybe Wayne Green does. Does 40 years of experience agree with my proposal or not?

Nobody has to convince a ham on the value of his hobby—convince the ones who have never heard of it. Amateur radio needs, and perhaps even deserves, national support. But it's hard to get any indication of American apathy, then we need a lot more than a few local newspaper articles once in a while. All of us seem to re-
quire a constant reminder of our past, our present, and our future. My proposal is just a shot in the arm.

If amateur radio is no solution to third-world problems, then neither is its demise. If the African nations get the frequencies they want, can they use them as efficiently as others could? Will it take years for their equipment to become a reality?

Lee Hughes WA2VPH Moravia NY

SUCH IS LIFE

Having decided to try my hand at color film and print processing, the meaning of working a "good" timer into the budget, I dug out the July '76 issue of 73 with the WTHCI story, "Dependable Timer—For darkroom, repeater, etc." In the same issue is Al Plavcan's schematic for the low priced frequency counter, and this, of course, invited grafting parts of his circuit onto to that of the timer to give not only a pro-
grammable timer but also a standard 0.99 second timer for monitoring the time in the various solutions with digital readout, the one that I have.

I am busily hunting sources, prices, etc., for the few chips needed and expect to wind up with a precise unit at a cost far below that of anything I've ever seen as a "normal" darkroom timer.

This prompts me to suggest that you cast about among your many contacts to see if you could stir up a circuit for a home-brew color analyst circuit. The prices asked for such as these are beyond the affordable range of the casual photo nut, and I just bet that a reliable circuit can be put together by a brother ham!

What is needed most sorely is a means of determining the subtractive filtration needed to accommodate the color negative, taking into account the particular characteristics of the print paper. This latter information is printed on each package of paper, at least by Eastman, and surely by all of the others.

I sincerely appreciate the inclusion of "other than radio" items; this is what makes 73 my favorite source.

All of my issues are carefully maintained, readily accessible, not torn or bent out of shape. I value them as a constant source of reference.

My ham subscriptions are now limited to just two. I finally dropped the old traditional one, for two reasons: 1. Greater mileage obtained from the other two in the amount of usable material. 2. I grew to re-
sent the rather lofty attitude assumed on the few occasions wherein I wrote to ask for clarification of a few technical points.

Apparently I had "sinned" some years earlier when I took occasion to express my thoughts about the seeming lack of proper support for the efforts of Ted Cohen and his "TV/Hi-Fi Task Force." I felt that if there was any specific area wherein the League should show real leadership in the way of aggressive action, this was it. Ted was about the problem extremely realistically and scientifically and laid the foundation for easing one of the most urgent problems of these times, the matter of im-
proving our color broadcast system. He con-
strued solid-state entertainment equipment which invited interference from the cleanest of transmitters.

I was quick to indulge in color TV until I could find a set which would be both deaf and blind to my Swan 500. A local dealer was kind enough to let me test a few major brands, and to me on my transceiver running normal input on 80 through 10 meters on CW, phone, and slow scan. Each TV was 100% solid state. I found that of them all, at that time, three years ago only the Sony stood up to the test, even though the TV was separated from the transceiver by only 12 feet and was only about 10 feet from the television and 4BTV antenna. On the basis of these tests, I bought the Sony color TV, and the Hi-Fi AM/FM stereo 8-track. To this date there has never been the slightest trace of pickup from my ham rig on either of the units in any of their functions.

I sorely wish my neighbors all owned Sony. I get into one of the higher advertised brands even when they have the power plug pulled from the recep-
tacle! Naturally, they cannot be convinced that the fault lies in their own apparatus. Such is life.

Lee Clough WSGOV Waco TX

SAM HARRIS

No, Sam Harris wasn't born with a beard. He grew it in 1944 when he was employed by Brush Development Co. (sometimes called Brush Bedevil-
ment Co.) on Perkins Avenue in Cleaveland, Ohio.

My former wife, Mary, who worked in the same department on the third floor, told me that he trimmed it with tin snips. At the same time, I worked on the first floor.

I understand that Sam's real name was East, and that he ac-
quired the name Harris from the family who raised him. From his call letters, he was probably first licensed in 1939.

About the end of WW II, Sam bought a duplex house at 1311-1313 Lakeland Avenue in Lakewood, Ohio. Mary (WS8R 1938-58, K4UTB 1958-66) and I visited Sam at his home in the 1311 side about Thanksgiving, 1943. Sam was deeply involved with two meters at the time, us-
ing mostly military surplus SCR 522 equipment also. Helen had bought him a National NC 2-4C, a low-band receiver he used mostly as an I with the SCR 522 receivers as front ends.

Sam's shack was a finished attic room I had used as a playroom as a small boy twenty years earlier. I had a single ham radio in that house when I was 7½ years of age. A playmate of that time, Buss Rhoades, who lived in the 1313 side, also later became a ham, if my informa-
tion is correct.

In the later forties, I lost contact with Sam except for chance meetings at hamfests. By that time, he had moved from Burton, Ohio, and became well known on seventy-five.

It appears that I lost contact with Sam about the time that Wayne became well acquaint-
ed with him.

James B. Bamberg K4UFB

Charlotte NC

THE TAY NET

I would like to inform you of a new net made up specifically of operators 19 years old and younger. It's called the TAY Net, which stands for Teen and Younger Net.

The net control is myself, KA4AQZ, who meets on 28.635 at 2200 UTC every Tuesday evening. An Informal bit of rag-chewing usually can be had a half hour before the net on the same frequency.

In age, by the way, is 13 years, and my QTH is Independence MO.

Please, no OM check-ins, unless you have something of interest to our age group. All hams and children of hams are invited to join in the conversa-
tion, provided you are 19 or less or have something of interest to that age group.

I would very much appreciate it you would print this into the activity. Thank you.

Brin Moffet KA4AQZ Independence MO

KISS

The dc-to-dc converter described in "Try a Little KISS," January, 1979, is not as reliable as described. The circuit shown in Fig. 1, page 59, would put 12 volts at terminals C-D if any of several components fail: 1. If the zener fails open, it will let R1 saturate Q1 and the output will be at 12 volts at C-D will be about 12 volts.

2. If R1 shorts, the zener will probably blow before a 10- or 15-Ampere car fuse. Again, 12 volts will appear at C-D.

3. A collector-to-emitter short on Q1 directly applies 12 volts to C-D.

Possible explanations for the report error results ("...the output voltage will rise a few tenths of a volt...") are: a) Terminals A-B were con-

ected to the 12-volt source with very small wire which pro-
duced current limiting; or b) the 12-volt source was soft and did not provide a constant 12 volts
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Reader Service—see page 195
input. Was the input voltage at A-B monitored during the tests?

An electronic "crowbar," i.e., an SCR across C-D, could be added to the circuit to short-circuit C-D in the event the voltage at C-D exceeds the desired output. To prevent damage to the converter, a properly-sized fuse should be inserted in series between A and the transistor, or between the emitter of Q1 and the crowbar. Such a crowbar could be used with a simple zener-resistor regulator.

No circuit is completely component-fail-proof! Use high-quality conservatively-rated components in any critical application.

J. T. Hancock WB8DRF
Jackson MI

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I would like everyone to be aware of the fine service one of your advertisers, VHF Engineering, is providing.

I have an old HT 144-B which died. After a prolonged attempt to fix it myself (with expert help), I gave up and sent it to VHF Engineering. They returned it in roughly 2 weeks, several days before Christmas. They didn’t just fix the unit, however. They gave me a replacement piece of hardware which I had lost, and they also replaced all of the point-to-point wiring (the HT 144-B was a kit, making it look much more professional. All of this was done for the fixed nominal labor fee alone. The parts were supplied free.

I think that this kind of exceptional service should not go unnoticed.

David Rabin WB8PSD
Wilmette IL

While I work many stations on CW, I of course prefer to work other "CW machines" when using this unit, as the bandwidth is less than 100%, just as specified in the printed page. However, CW is, as a rule, 85-95% readable if the sender is using an electronic bug and down to 15-25% readable if the sender is hand-pumping with an understandable swing. A typical bug error would be "6E" instead of "the" on the screen caused by improper spacing between the "t" and the "h." If it happens once, you can plan on getting through the QSO because this is particular operator’s habit! In any case, I strongly recommend systems like this; it is really fun and in my case has totally rekindled CW interest.

The reason I am writing is to suggest that a particular frequency be used as a worldwide and preferably bandwise CW-machining calling frequency. If we could settle for some kind of reasonable standard, perhaps we could more easily get together. If speed is kept to a reasonable digit, non-machine-users could hear what we are saying. Thus I suggest the following frequency: XX 069 (for XX, insert 14, 3.5 or whatever). For initial speed, I suggest 20 wpm. This would provide studious code-learners with a readily available standard code speed to practice on, and it’s slow enough that it is coped easily enough by ear. 069 is an easy number to remember, for various reasons, and doesn’t appear to be any net frequency or the like. Please advise if you know differently.

Now hear this, all you machinists out there: The frequency is XX 069 and the speed is twenty. CU on ur favorite band!

Ken C. Barroll W7OP
Seattle WA

A BELIEVER
I just got home from school and found my copy of 73 had arrived today. As usual, an excellent magazine! I was reading your editorial and have a few comments on the parts on page 190. "What about the code?" At first, when I saw your constant advertising for your code tapes throughout your editorial, I thought that was a little nutty for. But then I began to think. On Monday of this week (Jan. 8), I went and passed my General after upgrading from Technician. Over the summer, I purchased an ARL code kit with two tapes and all that. I also had one of your 13 wpm tapes. I listened to the ARL tape, then yours. I thought that I would use the ARRL tape since it was easier to copy. Every once in a while I’d put your tape in the recorder just to try it, but I always gave up. I went to the exam, then it hit me like a hammer! Your tapes are the ones to use. They are sent at the FCC standard and the ARL tapes are spaced at about 10 wpm. Luckily, I passed, but it would have been a hell of a lot easier if I had stuck with your tapes! It may just be me, but I think the percentage of failures would be about half of what they are now if tapes offered for practice were like yours! I’m a believer! I am a student in high school (10th grade) and have little time to mess with studying for ham exams with school exams to worry about. I feel that I could have upgraded with less practice and worry with your tapes.

Keith Arnold NB4QR
Columbus OH

CONGRATULATIONS
I made it through my Extra the second time I took it. I feel I can honestly say that your study guide for this class was a major factor in my success. Even if one is not interested in getting the Extra, the book makes an excellent reference source. I’ve always been a poor student, so this book was fun and the learning process painless! I find that now I understand the material as opposed to merely knowing facts and information. Congratulations on a master-piece! There were places where I felt you were prolix and/or pedantic, but, on the whole, this book should be hailed as a classic of the study guide genre.

Thank you for helping me achieve my license.

Bob Wanderer WB2MCC
Pompton Lakes NJ

PEANUT BUTTER
Just a note to compliment you on your fine magazines, 73 and Kilobaud. I know them must be good because the first postal employee who handles them must tear open the wrappers and all the others down the line must read them during lunch or coffee breaks. So far I have not found peanut butter under the pages, but the way the pages look, I would not be surprised. Too bad you cannot entice these people into their own personal subscriptions! I am sure the problem is not unique to me, and if others can save me the issues as I do, we appreciate good copies for the bookstore.

One last note on Kilobaud. For years I have been throwing away those super 1st subscription offers only to finally knuckle under last month to a trial copy. What a super computer magazine! If I could afford it, I would purchase all your back issues of Kilobaud.

Keep it up—you’ve got the only magazines on the market with so much content it takes a month to read.

Roger Syvertsen K9VOD
Brainerd MN

COMM SPEC
I am writing to let you know that one of the advertisers in 73 Magazine, namely Communications Specialists, is a fantastic firm to do business with.

When I had a problem with an ME-3, I shipped it back to them on a Monday. The following Monday, a repaired unit was waiving for me when I arrived home. Two months later, a different problem arose; again it was shipped back to them with a letter explaining what was wrong. One week later, a brand new ME-3 arrived with a notation that it was replaced under the warranty. There was no hassle or lengthy correspondence.

Organizations such as theirs and 73 Magazine, who is particular about the advertising that is accepted, deserve all of the praise that can be given to them. Communications Specialists and 73 Magazine are the rate very highly on my list. I have been a subscriber of 73 since you published your fourth issue.

Julius Countess K2YD
Smithtown NY

Ham Help
I need a service manual and schematic for a Polara model KS-5799-L2 video monitor.

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713 Marlowe Road
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A hearing-impaired member of my family couldn't hear the telephone in some rooms of the house. Sometimes, when I called home, the phone wasn't answered even though I knew that someone was in the house. The major problem turned out to be that the bell was not clearly audible in the room that was used extensively for reading and sometimes for TV. A solution that was acceptable to all was to flash a light when the phone rang. In this case we chose to turn off the circuit that the reading light, hi-fi, and TV were on. It also incidentally turns off the vacuum cleaner in that room, and nobody could hear the phone when that was running. The circuit for the device is shown in Fig. 1.

This device was constructed in one evening out of spare parts as follows: an old power transformer was selected for T, and the high-voltage winding was used for the phone line side. Since the ring frequency is around 25 Hz on most systems, this winding should be rated at a minimum of 200 V ac. The 115-volt winding is then used as the secondary of the transformer. (An audio plate-to-grid transformer could be used the same way if you're old enough to have one of those in the junk box.) An audio generator was then hooked to the high-voltage winding through the capacitor C, and several values were tried to get a maximum 25-Hz voltage across the secondary. In my case, 1.3 µF did the trick, but this value will be different for every transformer.

Relay A is a sensitive dc Reed relay that was removed from a computer board. A 12-volt 5 k-Ohm relay should work well, but the higher the resistance of the coil, the less load it will put on the ring voltage. Resistor R also serves to raise this impedance, and also helps filter the dc produced by the diode. I would suggest starting with about 2.7 k Ohms for R. I used an oscilloscope across a 100-Ohm resistor to measure the current drawn from the line at 25 Hz, and the ratio of voltage to current for my version of the circuit came to 10,000 Ohms. That should be light enough loading not to upset the telephone company. The capacitor keeps you from drawing any dc current.

The contacts on the sensitive relay, A, should not be used to interrupt much current, so it is shown switching a 115 V ac power relay that actually handles the heavy current. I installed the circuit in a box adjacent to the circuit breaker box, and ran two small-gauge wires to the nearest telephone line junction. Now when the phone rings, most of the circuits in the living room go off with each ring and it is not possible for anyone in the room to be unaware of the ringing. The freedom of movement granted to a deaf person expecting a call is well worth the minor inconvenience of occasionally having the lights flash for a few seconds.

See the light?

Note: Telephone company regulations vary regarding attachment of external devices to telephone lines. You should check with your local telephone company offices before using the equipment described in this article.—Ed.

Fig. 1. See text for procedure for finding C, T, R, and A.
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ANTENNAS • ROTORS • TOWERS

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<thead>
<tr>
<th>CUSHCRAFT</th>
<th>ALLIANCE</th>
<th>List</th>
<th>CDE</th>
<th>List</th>
<th>ROHN TOWERS</th>
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<tr>
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<td>SY-1</td>
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<td>WILSON</td>
<td>TH3MK III</td>
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<td>SY-2</td>
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<td>ALLIANCE</td>
<td>TH5JR</td>
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<td>WV-1</td>
<td>79.95</td>
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<td>CDE</td>
<td>18 AVT/WB</td>
<td>99.95</td>
<td>WR1000 ROTOR</td>
<td>469.00</td>
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<td></td>
<td>18HT</td>
<td>299.95</td>
<td>WR500 ROTOR</td>
<td>149.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See us at Dayton!

Give us a try before you buy • Call Jim Titus Toll Free and ask him to quote your requirements from this ad

a Division of TREVOSO ELECTRONICS, INC/ 4033 Brownsville Road, Trevose, PA 19047

FREE UPS SHIPPING ON PREPAID ORDERS

TOLL FREE QUOTES 800-523-8998
Try a Bi-Loop Antenna
—gets you coming and going

Two loops are better than one.

W. W. Davey W7CJB
Rt. 1, Box 121
Charlo MT 59824

This antenna design has performed as well as a 3-element beam on 144 MHz and better than a 2-element full-size yagi on 14 MHz. The idea for this design came from the antenna described by ZF1MA in the December, 1976, issue of 73. The bi-loop configuration needs to be more or less exact to get the best performance.

Having used single loops in the past and noted their ability to reduce man-made noise, I decided to try for more gain—and still keep the closed loop design. My first experiment was on 144 MHz. It took me a whole ten minutes to nail some 3/4" x 3/4" sticks together and tack a test antenna in place. The antenna was compared with a 3-element yagi on the Lookout Pass repeater, 80 miles distant. The Clegg FM-28 S-meter readings were slightly higher with the bi-loop. Results were repeatable, so it was decided to try the 14-MHz configuration between a couple of poles. In nearly all cases, there was an improvement in signal strength of 1 to 2 S-units over my full-size 2-element yagi. With some signals coming from high angles, there was no difference in signal strength. With low-angle DX signals, though, there was a definite improvement over the yagi. The polarization was vertical.

The normal impedance of a single loop is slightly over 100 Ohms, so when two such loops are fed in parallel, the impedance comes close to a good match for 70- or 52-Ohm cable. This impedance will vary slightly with the height above ground.

As mentioned above, the loops need to be adjusted to an almost-perfect square for best performance. When the extreme ends of the loops were stretched out in a diamond shape to raise the bottom of the loop higher above ground, the low-angle gain fell off in comparison with the yagi. The lower corner of each loop is only 6 feet off the ground and is kept in place through the use of a one-pound weight which just touches the ground when the loop is taut. Raising the entire array should further improve its performance.

This antenna is simple to build and performs well in two directions. There are deep nulls in the plane of the loops. The maximum radiation is broadside to the wire. Each loop is made up of 73 feet of #14 enameled wire, which makes each side of the loop 18 3/4". Use lightweight ceramic or plastic insulators and depend on nylon rope for additional insulation. The insulator which terminates the coaxial feedline is shown in detail in Fig. 1.

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>SWR (min: max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>1.2:1</td>
</tr>
<tr>
<td>14.05</td>
<td>1.1:1</td>
</tr>
<tr>
<td>14.10</td>
<td>1.0:1</td>
</tr>
<tr>
<td>14.15</td>
<td>1.1:1</td>
</tr>
<tr>
<td>14.20</td>
<td>1.1:1</td>
</tr>
<tr>
<td>14.25</td>
<td>1.2:1</td>
</tr>
<tr>
<td>14.30</td>
<td>1.25:1</td>
</tr>
<tr>
<td>14.35</td>
<td>1.3:1</td>
</tr>
</tbody>
</table>

Table 1. SWR readings for the bi-loop antenna. Readings on 7 MHz and 21 MHz were high (at least 7:1), but from 28.0 MHz to 29.0 MHz, the SWR was almost constant at 1.8:1.
ANTENNA SYSTEMS

Multi Band Beam Super DX Series

NEW HIGH PERFORMANCE TRI-BAND BEAMS AS GOOD AS FULL-SIZE MONO BAND ANTENNAS. These beams employ hybrid system which is a combination of separated full-size driven element for each band individually and Hi-Q trap parasitic elements. These feature result high radiation efficiency, high power rating and excellent VSWR in entire band width.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>3F37DX</th>
<th>3F35DX</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAND</td>
<td>14 21 28</td>
<td>14 21 28</td>
</tr>
<tr>
<td>ELEMENTS</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>ELEMENTS PER BAND</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>20m</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>15m</td>
<td>5</td>
<td>3</td>
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<tr>
<td>10m</td>
<td>5</td>
<td>3</td>
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<tr>
<td>ANTENNA GAIN</td>
<td>20m</td>
<td>8.5dB</td>
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<tr>
<td>15m</td>
<td>10dB</td>
<td>8.5dB</td>
</tr>
<tr>
<td>10m</td>
<td>10dB</td>
<td>8.0dB</td>
</tr>
<tr>
<td>FRONT BACK RATIO</td>
<td>25dB</td>
<td>20-25dB</td>
</tr>
<tr>
<td>MAX. POWER INPUT</td>
<td>3kw</td>
<td>3kw</td>
</tr>
<tr>
<td>VSWR</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>IMPEDANCE</td>
<td>50 Ω</td>
<td>50 Ω</td>
</tr>
<tr>
<td>MAX. ELEMENT L.</td>
<td>10.5m</td>
<td>10.5m</td>
</tr>
<tr>
<td>BOOM LENGTH</td>
<td>7.5m</td>
<td>5.0m</td>
</tr>
<tr>
<td>BOOM DIAMETER</td>
<td>50mm</td>
<td>50mm</td>
</tr>
<tr>
<td>TURNING RADIUS</td>
<td>5.3m</td>
<td>5.25m</td>
</tr>
<tr>
<td>WIND RATING</td>
<td>40m/sec.</td>
<td>40m/sec.</td>
</tr>
<tr>
<td>SUITABLE MAST</td>
<td>50mm</td>
<td>50mm</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>23kg</td>
<td>17kg</td>
</tr>
</tbody>
</table>

“SWISS QUAD VHF SERIES”

SQ-22 TWO METER DUAL QUAD

ANTENNA GAIN AND FRONT TO BACK RATIO ARE WELL IMPROVED WHEN TWO ELEMENTS ARE DRIVEN AT ONE TIME WITH PHASE DIFFERENCE COMPARED TO A SINGLE DRIVEN ELEMENT SUCH AS A CONVENTIONAL QUAD OR YAGI. THE SQ-22 PROVIDES THE OWNER WITH SUCH FEATURES SIMPLE ASSEMBLY AND LIGHT WEIGHT.

KEN PRO ROTATORS

| MODEL | | |
|-------|-------|

425 Highland Parkway, Norman, Oklahoma 73069
Tel (405) 360-6410
Simple RTTY IDer
— uses five ICs

Automatic operation at the press of a switch.

Paul J. Tew G3MEJ
1-B Morton Road
Morden, Surrey
England SM4 6EF

To provide identification on RTTY without the use of keys or mics, this circuit was used for automatic operation at the press of a switch. It provides a matrix of 80 bits. With a Morse dot = 1 bit, dash = 3, letter space = 3, and word space = 5, it allows for DE and most 5 letter calls, i.e., DE G3MEJ. The DE could be omitted to give sufficient space for longer calls or, alternatively, other ICs could be used to give a matrix of, say, 128, 160, or 256 bits.

A momentary push of the ID button sets the flip-flop and enables the counters, IC1 and IC2. The BCD output of the first counter, IC1, is decoded by the 7442 and the message is selected, via the diodes, by the 74151 and output on IC4, pin 6. Complementary output is available on pin 5. At the end of the count sequence, IC2, pin 11 goes high and resets the f-f ready for the next push.

The clock, IC5A, while perfectly satisfactory, needs careful setting up. A socket for IC5 is recommended. Select a value for R1 (say 1k-4k) while tweaking RV1 to obtain oscillation at pin 6. Then adjust the value of the 100-uF capacitor to give the frequency required. RV1 allows only for a stable start and operation of the clock and is not intended as a frequency adjustment. If the output level at pin 6 is too low, change the IC! Even those of the same make and batch give different results—hence the socket. An alternative clock using a 555 or 7413 might be preferable, but this all makes the PCB larger.

Values shown gave a frequency of 10 Hz and a Morse dot length of 100 ms. This is long enough to stop a mechanical printer doing its nut at 45 baud. Note that the reading of CW via two tones may need brain adjustment if you are used to single tone CW. Allow for this before assuming the circuit is not functioning correctly.

Read the matrix as a page, starting at the top left-hand corner and ending at the lower right-hand corner. The diodes can be anything in the junk box, preferably germanium, but silicon also work (1N914, etc.). Note on the matrix that there is a space at both ends of the "message," so that whichever tone is being keyed, there is a break before or after the ID. Otherwise, the first/last ID bit would merely blend into the steady tone state. A PROM could have been used instead of the diode matrix, but they cost real money against peanuts for the diodes.

A convenient PC board size, without getting cramped, is 3 x 4 inches. The output transistor, VT1, should be suitably rated for your own keying arrangements.
### RECEIVERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX28C</td>
<td>28-35 MHz FM receiver with 2 pole 10.7 MHz crystal filter</td>
<td>$64.95</td>
</tr>
<tr>
<td>RX28C W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$64.95</td>
</tr>
<tr>
<td>RX30C Kit</td>
<td>30-60 MHz rev/2 pole 10.7 MHz</td>
<td>$64.95</td>
</tr>
<tr>
<td>RX50C Kit</td>
<td>same as above - wired &amp; tested</td>
<td>$64.95</td>
</tr>
<tr>
<td>RX144C Kit</td>
<td>144-170 MHz rev/2 pole 10.7 MHz crystal filter</td>
<td>$74.95</td>
</tr>
<tr>
<td>RX220C Kit</td>
<td>210-240 MHz rev/2 pole 10.7 MHz</td>
<td>$131.95</td>
</tr>
<tr>
<td>RX220C W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$74.95</td>
</tr>
<tr>
<td>RX432C Kit</td>
<td>432 MHz rev/2 pole 10.7 MHz</td>
<td>$131.95</td>
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<tr>
<td>RX432C W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$84.95</td>
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### TRANSMITTERS

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<th>Price</th>
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<tr>
<td>TX50 Kit</td>
<td>transmitter exciter, 1 watt, 6 mtr</td>
<td>$44.95</td>
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<tr>
<td>TX50 W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$71.95</td>
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<tr>
<td>TX144B Kit</td>
<td>transmitter exciter - 1 watt, 2 mtrs</td>
<td>$34.95</td>
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<tr>
<td>TX144B W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$65.95</td>
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<tr>
<td>TX220B Kit</td>
<td>transmitter exciter - 2 watt, 220 MHz</td>
<td>$142.95</td>
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### POWER AMPLIFIERS

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<td>PA2501H Kit</td>
<td>2 mtr power amp - kit 1 watt in - 25 watt</td>
<td>$69.95</td>
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<tr>
<td>PA4010H Kit</td>
<td>2 mtr power amp - 10 watt in - 40 watt</td>
<td>$69.95</td>
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<tr>
<td>PA50/25 Kit</td>
<td>6 mtr power amp, 1 watt, 25 watt</td>
<td>$50.95</td>
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<tr>
<td>PA144/15 Kit</td>
<td>144 mtr power amp - 1 watt 1-15 watt</td>
<td>$49.95</td>
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<tr>
<td>PA144/25 Kit</td>
<td>same as PA144/15 but 25 watt</td>
<td>$50.95</td>
</tr>
<tr>
<td>PA220/15 Kit</td>
<td>similar to PA144/15 but 220 mtr</td>
<td>$49.95</td>
</tr>
<tr>
<td>PA342/10 Kit</td>
<td>power amp - similar to PA144/15 except 10 and 432 MHz</td>
<td>$59.95</td>
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### POWER SUPPLIES

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<tr>
<td>PS15C W/T</td>
<td>15 amp - 12 volt regulated power supply w/ case, fold-back current limiting and overvoltage protection</td>
<td>$99.95</td>
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<tr>
<td>PS15C Kit</td>
<td>25 amp - 12 volt regulated power supply w/ case, fold-back current limiting and overvoltage protection</td>
<td>$134.95</td>
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<tr>
<td>PS25C W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$134.95</td>
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<tr>
<td>PS25C Kit</td>
<td>same as above - wired &amp; tested</td>
<td>$169.95</td>
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<tr>
<td>PS25W Kit</td>
<td>same as PS25C with meters</td>
<td>$158.95</td>
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<tr>
<td>PS25W Kit</td>
<td>same as above - wired &amp; tested</td>
<td>$180.95</td>
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### REPEATERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>RPT50 Kit</td>
<td>repeater - 6 meter (less crystals)</td>
<td>$59.95</td>
</tr>
<tr>
<td>RPT50 W/T</td>
<td>repeater - 6 meter, wired</td>
<td>$59.95</td>
</tr>
<tr>
<td>RPT144 Kit</td>
<td>repeater - 2 mtr - 15 watt complete (less crystals)</td>
<td>$59.95</td>
</tr>
<tr>
<td>RPT220 Kit</td>
<td>repeater - 220 MHz - 15 watt complete (less crystals)</td>
<td>$59.95</td>
</tr>
<tr>
<td>RPT432 Kit</td>
<td>repeater - 432 MHz</td>
<td>$64.95</td>
</tr>
<tr>
<td>RPT144 W/T</td>
<td>repeater - 15 watt - 2 mtr</td>
<td>$69.95</td>
</tr>
<tr>
<td>RPT220 W/T</td>
<td>repeater - 15 watt - 220 MHz</td>
<td>$99.95</td>
</tr>
<tr>
<td>RPT432 W/T</td>
<td>repeater - 10 watt - 432 MHz</td>
<td>$94.95</td>
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### TRANSCEIVERS

<table>
<thead>
<tr>
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<th>Description</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>TRX250 Kit</td>
<td>Complete 6 mtr FM transceiver kit, 20w out, 10 channel scan with case (less mike and crystals)</td>
<td>$254.95</td>
</tr>
<tr>
<td>TRX144 Kit</td>
<td>same as above, but 2 mtr &amp; 15 watt</td>
<td>$259.95</td>
</tr>
<tr>
<td>TRX220 Kit</td>
<td>same as above except for 120 MHz</td>
<td>$259.95</td>
</tr>
<tr>
<td>TRX432 Kit</td>
<td>same as above except 10 watt</td>
<td>$422.95</td>
</tr>
<tr>
<td>TRC 1</td>
<td>transceiver case only</td>
<td>$34.95</td>
</tr>
<tr>
<td>TRC 2</td>
<td>transceiver case and accessories</td>
<td>$54.95</td>
</tr>
</tbody>
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### SYNTHESIZERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYN II Kit</td>
<td>2 mtr synthesizer, transmit offsets programmable from 100 KHz -10MHz. (Mars offsets with optional latches)</td>
<td>$169.95</td>
</tr>
<tr>
<td>SYN II W/T</td>
<td>same as above - wired &amp; tested</td>
<td>$239.95</td>
</tr>
<tr>
<td>SYN 220 W/T</td>
<td>same as SYN II except 220 - 225 MHz</td>
<td>$169.95</td>
</tr>
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### OTHER PRODUCTS BY VHF ENGINEERING

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD1 Kit</td>
<td>10 channel receive xtal deck</td>
<td>$8.95</td>
</tr>
<tr>
<td>CD2 Kit</td>
<td>10 channel xmit deck w/switch and trimmers</td>
<td>$16.95</td>
</tr>
<tr>
<td>CD3 Kit</td>
<td>UHF version of CD1 deck, needed for 432 MHz multi-channel operation</td>
<td>$14.95</td>
</tr>
<tr>
<td>COR2 Kit</td>
<td>carrier operated relay</td>
<td>$23.95</td>
</tr>
<tr>
<td>SC3 Kit</td>
<td>10 channel autoscanner decoder</td>
<td>$21.95</td>
</tr>
<tr>
<td>Crystals</td>
<td>we stock most amateur grade pairs from 146.0 - 147.0 (each)</td>
<td>$5.00</td>
</tr>
<tr>
<td>CWID Kit</td>
<td>159 bit, field programmable, code identifier with built-in squelch tail and ID timers</td>
<td>$42.95</td>
</tr>
<tr>
<td>CWID</td>
<td>wired and tested, programmed</td>
<td>$64.95</td>
</tr>
<tr>
<td>CWID MIC</td>
<td>3,000 ohm dynamic mic w/ P.T. and eoi cord</td>
<td>$13.95</td>
</tr>
<tr>
<td>TS1 Kit</td>
<td>tone squelch decoder</td>
<td>$59.95</td>
</tr>
<tr>
<td>TD2 Kit</td>
<td>installed in repeater, including Interface accessories</td>
<td>$94.95</td>
</tr>
<tr>
<td>TD3 Kit</td>
<td>same as above - wired &amp; tested</td>
<td>$39.95</td>
</tr>
<tr>
<td>HL144 W/T</td>
<td>4 pole helical resonator, wired &amp; tested, swept tuned to 144 MHz ban</td>
<td>$34.95</td>
</tr>
<tr>
<td>HL220 W/T</td>
<td>same as above tuned to 220 MHz ban</td>
<td>$34.95</td>
</tr>
<tr>
<td>HL322 W/T</td>
<td>same as above tuned to 42 MHz ban</td>
<td>$34.95</td>
</tr>
</tbody>
</table>

---

**VHF engineering**

**DIVISION OF BROWNIAN ELECTRONICS**

*Prices and specifications subject to change without notice.*
Tales of Speech Processing
—including a practical design

Tolerating the screamers and whisperers.

Thomas C. Harper WA4JHS
11109 Carmon Street
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Conversation overheard on 20 meter band, SSB:
"Old man, I'd like you to give me a report—I want to switch in my processor and see what it sounds like."
"OK, switch it on. You're about 5 and 9 now."
"*#$'&##'&2&?""... Ah... Yeah... Ah... Sounds pretty good... Really brought my S-meter up. But I think I missed the question... Try me again."

Anyone who works even a little SSB regularly has heard that conversation, usually many times. At the same time, we are all familiar with the low duty cycle characteristics of human speech. This attribute of speech has led to many schemes, some wilder than others, but all aiming to improve information transfer by speech. And listening on the bands tells one that some of the more elaborate designs can sound as awful as some of the more rinky-dink ones.

A short history of speech processing is probably in order. The basic character of speech has been known since at least the advent of the oscilloscope, and in the old AM days, several transmitters (Heath/Johnson/others) incorporated speech clipping followed by a suitable filter. The reason for the filter was obvious when the top is lopped off a signal, harmonics are generated, increasing the modulation bandwidth and causing a fuzzy sound in the recovered audio. Some of these clipper/filters were very simple and straightforward and some of them sounded very good, with a tremendous improvement in intelligibility; some of them sounded awful.

Then SSB came along, and at first it sounded awful enough to the AMers without complicating the whole thing with speech clipping/processing. In fact, in the great SSB vs. DSB controversy of the 1950s, reported in the proceedings of the IRE and other journals, it was alleged that one of the problems of the then "new" SSB was that it didn't lend itself to simple speech processing. This attitude persisted for many years, even though some unreconstructed mavericks were using speech clippers of one kind or another on SSB, and they could see a difference on the plate current meter. Some of them neglected to mention to their contacts that they were using clippers. Possibly there were some guilty feelings, especially after hearing conversations such as the one above.

A hairy mathematical proof made the rounds and found its way into the Handbook (ARRL). It demonstrated to everyone who had been through first year trig that clipping at audio for SSB was wrong-headed and possibly dangerous. It had terms like $\sin^n X$, where $n$ was between zero and one. Oh, it was wonderful! Mathematicians rejoiced at the elegance of it.

There appeared to be one unwarranted assumption, however, and that was that the operator would attempt to modulate an SSB transmitter with these (nearly) square-topped waveforms. And as the argument proved, you can't reproduce square waves directly using

---

Fig. 1. Demonstration clipper/filter.
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SSB. Neglected was the fact that most operators would have used a filter after the clipper which would have rounded the sharp square edges by removing the harmonic energy.

Most of us are aware of the fact that a square wave is composed of a fundamental frequency and a whole drove (infinite number) of harmonics. Some have waded through the Fourier series analysis, and some can see it intuitively. But if you have never seen it on a scope—even if you have been through Fourier analysis forward and rearward—you should hook up a simple clipper, followed by a sharp filter that cuts off just above the frequency you are clipping. See Fig. 1 for a simple hookup.

Try this circuit; it is very dramatic. It also serves to illustrate one of the problems with audio speech clipping. The clipped waveform is cleaned up, that is, restored to a single frequency, only if the filter cutoff is relatively close to the frequency being clipped. For instance, if you clip a 200 Hz sine wave, and pass it through a 2 KHz filter, the nice sine wave does not come back. What you get is a mess; now the waveform is still sharp-edged but is usually tilted as well, due to the phase shifts through the filter.

And since the filter for an audio speech system cannot cut off before about 2000 Hz, there is an irreducible problem. Do not despair, however, there is a compromise solution which is well worthwhile. It is possible to have an audio clipper which does not sound bad.

Why do so many sound bad? One reason is obvious. The operator can’t stop turning the level knob soon enough—depending on other stations to set clipping levels is haphazard at best.

Some indication can be obtained, however. You know you have gone too far when signals are 10 over 9, you are hearing no QRN/QRM and the other operator keeps asking you to repeat what you said. Many clippers, especially home brew ones, suffer from rf pickup. Rf pickup can destroy an otherwise good clipper. In addition to these problems, the low frequency phase shift/tilt problem is often heard. And finally, some operators using transmitters with sweep tube finals have discovered the tubes were not able to stand the increased duty cycle.

In spite of these caveats, clippers, as well as other forms of speech processing, are becoming more common now. The new all-transistor rigs are as comfortable with 100% duty cycle as they are with 30%, and the FCC has started to meddle with linear amplifiers.

And—are you ready?—The Handbook (ARRL) has a graph on page 392 (Figs. 13-20) in the 1977 edition showing 15 dB of audio clipping improves the signal-to-noise ratio by nearly 4 dB. Now you wouldn’t build a linear amplifier for a four dB gain, unless you were a CBer, or instructed to by the FCC, but with an audio clipper you can get 4 dB for peanuts. Four dB, just lying around waiting for you to pick it up, like loose change, like found money.

Another goody, but not quite as satisfying as found money, is the text in the 1977 Handbook (ARRL) on clipping, clippers, and related subjects. A rather elaborate processor is detailed. It is good to read about, even if you don’t build it; in the 60s we called stuff like that mind-expanding.

But enough of that; let’s build a clipper. It ought to be simple. It ought to be cheap so some money will be left to build something else. But it ought to sound good. The filter/clipper/filter in Fig. 2 satisfies these objectives.

Looking back to address the problems listed above:

1. Rf. The 10k resistor and the .001 capacitor form a low-pass filter which keeps out r.f. The 10k resistor could be replaced with a 1 or 2 mH choke, but the 10k resistor is cheaper, and adequate.

2. Low-frequency square waves and tilt. This problem is addressed by using low-frequency rolloff. All frequencies below 500 Hz can be greatly attenuated or even eliminated. The first MPF 102 source-follower feeds a T-section high-pass filter which attenuates the low frequencies, before clipping.

3. Tweaky fingers, or Oops! My plates just melted. The prototype has no knobs on the outside. Knobs on the outside are OK, if you can restrain yourself. Otherwise, you are better off to set it and forget it. Use a scope.

Additional notes: TP1 and TP2 are used with a scope to initially set the clipper. You can set it for whatever clipping level you want, up to the power supply voltage limitations. Eight volts p-p at TP1 sounds good. D1 and D2 are silicon junctions, so the level at TP2 will always be about 1.2 volts p-p. However, it is interesting to look at this point anyway.

The second MPF 102 source-follower feeds the low-pass filter. Output level is set with the 1k pot. A DPDT switch is included for those people who feel insecure if they can’t do a regular comparison with distant operators.

My filter is used maritime mobile, and I find it a lot easier to carry around than a linear amplifier. It is very handy when running phone patches for the crew; I can tolerate the screamers and the whippers— without external knobs. It’s not as effective as a 2 kW linear amplifier, but it’s a lot easier to pack into my suitcase.
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Often, during a QSO, one can hear the distant operator begin each transmission with "Aahhh" or "Uuhhh" or some such. There can be three different reasons for this characteristic:

a. The guy really doesn't know what to say.
b. He is using a maladjusted VOX.
c. He is using a Ten-Tec Model 405 linear amplifier. The first two problems fall under the heading of

![Diagram of COR circuit showing modification switch.](image)

Fig. 1. Schematic of COR circuit showing modification for PTT switch. Leads from B section of DPDT switch are miniature 50-Ohm coax with shield grounded at switch end only.
"operator headspace" and can only be corrected by personal endeavor. The third problem was mine, and involves a slight deficiency in an otherwise outstanding solid-state rf amplifier by Ten-Tec.

The linear is keyed by an rf-actuated transistor switch which controls two relays—sort of an AM COR. The main problem is that the mechanical action of the relays is just too slow. If one doesn't say "Ahh" or "Uhh" to begin the transmission, the first word and a half will be lost to relays alone. My first thought was to replace the relays with quicker reed-type relays. However, I didn't have any, and they proved to be rather expensive. I finally decided on PTT and was pleasantly surprised to find that this only involved the addition of a DPDT slide switch and a phono jack.

The switching circuit is on the rf-changeover board (90163). The theory of operation is simple. See Fig. 1. Rf from the exciter (the book claims 1/4 Watt is needed) is rectified and used to activate Q1 and Q2. When Q2 is activated, it allows current to flow through the coil of K2. When K2 is energized, it allows bias voltage to flow to the PA and energizes K1, the antenna changeover relay.

To make the modification, just follow these simple steps:

a. Drill a hole in the back of the cabinet just large enough for a phono jack. See Fig. 2. I placed mine between the B+ connector and the rf-output connector.

b. Where the switch is put is really up to the individual. Some folks don't like to mess up the face of their equipment, but I had a miniature DPDT slide switch which fits nicely beside the T/R Delay potentiometer. If the switch is put in the front, the mounting plate, located behind the front panel, will have to be cut away to fit. See Fig. 3.

c. Locate the rf changeover board. This board has the two relays and is located behind the swr meter. Remove the rf changeover board from the amplifier by extracting the two screws holding it to the terminal strips and gently pry it loose with a screwdriver. Locate C2 on the board (see Fig. 4) and unsolder the lead connected to the foil trace leading from the rf-input pin to K1A. Leave the other end of the capacitor soldered to the circuit.

d. Strip the shielding back from two pieces of miniature rf cable (RG-178 or equivalent) about seven inches long. Clip the shielding completely away from one end of the cables and connect the shielding of both cables together at the other end. The ends of the cables with the shielding completely removed are connected to the circuit board. One center lead is soldered into the hole left by the lifted lead of the capacitor (C2) and the other is soldered to the lifted lead of the capacitor.

e. Turn the board to the foil side and locate the foil trace which is the junction of the Q2 emitter, D6, and K2 coil. See Fig. 5. Using a sharp knife or file, scrape away the foil between the D6 solder point and the K2 solder point. Two pieces of #22 stranded wire were used for the connection at this point. One wire was soldered to the K2 side of the break and the other wire soldered to the D6 side of the break.

f. Replace the board in the terminal strips. Make sure that the pins don't get bent in the process and make sure that the board isn't in backwards. K2 is supposed to be located right behind the swr meter. Also, do not forget the piece of cardboard which shields the circuit board from the chassis.

g. Wiring the switch. See Fig. 6. The coax center lead, which is soldered to C2's lifted lead, is soldered to the wiper of section B. The other center lead is soldered to pole 2 of section B. The shielding is grounded at the ground point for the lamp behind the swr meter. The wire which is soldered to the K2 side of the foil break is soldered to the wiper of section A of the switch. The wire which is connected to the D6 side of the break is soldered to pole 2 of section A. When the switch is in this position, the COR circuit operates normally and PTT is disabled. Connect a piece of #22 stranded wire to pole 1 of section A, and run it along the cabinet to the center connection of the phono jack. Leave pole 1 of section B open. When the switch is in this position, the COR is disabled and the linear will operate PTT from an external voltage.
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Fig. 3. The location of slide switch.

source

Speaking of the external voltage source to energize K2, where do we find it? If you are using the Argonaut, Model 509, the answer is easy—from the accessory jack on the back of the 509. Pin 2 of the accessory jack accesses a little rascal called “T Voltage,” which exists only when the transceiver is in

9.3 V dc, but I found that adequate to energize the relay, and it doesn’t seem to strain the exciter. Users of the Argonaut, Model 505, the “PM” series CW transceivers, or other QRP rigs will have to do some more modifying. For the Argonaut, 505, and the “PM” series rigs, an additional reed relay was installed between the mike PTT and ground with the contacts between B+ and a phono jack added to the rear of the set.

As I wrote this up, I realized that there are many other ways to provide PTT to the amplifier or to install quicker relays. However, the parts for this mod came from a junk box, so it was the cheapest way to go.

The main thing is to completely isolate the COR circuit when operating PTT. I had originally isolated K2 from the rest of the circuit, but the COR still takes ¼ Watt to operate. That’s a 10% reduction in power at 2⅔ Watts input from the exciter.

For the past year I haven’t sounded like I didn’t know what to say, nor have I received complaints about a maladjusted VOX. The circuit works great and when SSB starts to drop out, it is easy to switch back to the COR for some CW work.
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OF A NEW AGE.
By the second day after the earthquake that devastated most of the cities in Guatemala, it was easy to know where the victims were buried. The smell of decomposing bodies guided the rescue workers. Removing the debris and taking out the corpses was a very painful and grueling job.

Back in Miami, after three days covering the disaster for the Miami Herald, I still had the stench deep in my nostrils. As I was looking at the prints coming out of the dryer, memory of the smell gave an added dimension to my thoughts. For a few seconds I believed I was still there, and in my ears I heard the voice of the little girl who sat in the dirt near the field hospital, crying, "Where is Mama? Where is Mama?"

When you are in this kind of situation, you are unable to believe that it could happen in your country, your city, your community...

But you are dead wrong, old man... This can happen to you and to your town, any time, any second. Are you prepared to cope with such a situation?

You are a ham radio operator, and your duty in disaster circumstances is to establish communications in the shortest period of time. That is what amateur radio is all about. We have a responsibility, and we must act accordingly.

Check Equipment

After you read this article, go into your shack and take inventory of your equipment. Then go to the main power switch (yes, the one in the rectangular gray box!) and turn the power off. Back in the shack, find out if you can call a fellow ham in Washington DC and tell him that there was an atomic explosion close to your town and the power plant evaporated with all the personnel inside.

I am not talking about war. An accident can happen. Not long ago, a Russian satellite, with an atomic plant in its guts, landed in northern Canada. Fortunately, the plant did not explode.

On a minor scale, electric power can be knocked out by a tornado, hurricane, earthquake—take your pick of many possibilities. The chance of an emergency is real, and you could be in the middle of it.

Emergency Power

After you find out that you can’t establish communications without commercial power, it is time to find another remedy. A small portable electric generator could be the answer. Storage batteries are a cheaper solution and may be more reliable and safe. With a good 12 V dc power supply, you can operate the 2 meter rig to get in contact with local ham radio operators and get organized. With the same battery supply, you can go
airborne in the HF bands, if you are fortunate enough to own a solid-state rig. Long-distance communications are a must in an emergency.

There are a few all-solid-state little rigs for HF on the market, covering ten to eighty meters. Some, like the new Atlas 350-XL, go all the way to 160 meters, with listening capabilities in the WWV frequencies. Ten-Tec also makes a nice all-solid-state little rig, and jumping on the bandwagon are Drake, DenTron, and Alda. The Alda 103 is a three-band rig with battleship construction, capable of taking a lot of punishment.

Of all the rigs, I like Atlas best. Do not make the mistake of believing that the new 350-XL is a deluxe version of the popular 220-X. The 350-XL is a completely different transceiver, with many sophisticated improvements.

But let's stop talking about transceivers and get back to our hypothetical emergency situation with your lack of power.

A gas power plant costs money, and not everybody is ready to invest a lot of dough on something that will be standing by doing nothing but smell. I believe that one or two storage batteries, with 50 or more Ampere-hours, can provide power for a single sideband operation on two meters for the critical early hours after a disaster strikes.

Because storage batteries emit corrosive fumes, it is not wise to keep them indoors. Put them in a wooden box, vented on the sides, sitting on a stand, in the backyard, protected with plastic tiles. Perhaps you could use solar cells to keep them charged. I'll leave that part up to your imagination.

Mobile Equipment

Having mobile transceivers in the car for the HF and VHF bands is an ideal backup for the base station. Actually, the first news relayed to the world of the earthquake that leveled the city of Managua, Nicaragua, was sent by a ham radio operator from his mobile rig. (Enrique Gabuardi YNTEGL). After he and his family escaped from their crumbling home, he went airborne on 20 meters and contacted Adrian Espinosa YN1AE0/W4 in Miami. With tremors of fear in his voice, he told him of the disaster they were witnessing. Espinosa called Rafael Estevez WA4ZZG on the land line. Estevez was the president of SIRA (International Society of Ham Radio Operators).

Gabuardi's faint signal from Managua, from a mobile station, sparked the chain reaction that was translated into a gigantic rescue movement staged by the US Government, the Red Cross, and local and national ham radio organizations. Together with doctors, medicines, food, and clothes, two meter rigs and a group of volunteer Miami radio operators were flown to Managua to help the Nicaraguan hams in the establishment of emergency traffic.

A wounded man is helped by a friend. Thousands lost families, homes, and were injured.

An emergency situation could mean that you, yourself, are forced to leave your home and be relocated in a safe area. In a case like that, you should report
This woman faces a grim future, with her home destroyed and her husband dead.

to the authorities that you are a licensed ham radio operator and can assist with communications. This could facilitate your transportation with your equipment and power source. This is one reason why I emphasize the importance of small solid-state rigs. (Another is that in flood conditions electrical equipment is dangerous, and low-voltage rigs like all-solid-state are safer.)

Disaster Training

Field Days are traditional among amateur radio operators. Every year, clubs and radio organizations all over the country get airborne and compete. But is this the real kind of training we need?

During the last ten years, I have been covering, as a newspaperman, revolutions and major disasters in the Caribbean and Central America. In my trips, I made contact with the local radio amateurs. These experiences taught me that while Field Day operations are a lot of fun, they are not remotely close to conditions one finds in a real situation. Technical skill to establish communications is not enough if you are not adequately prepared.

Preparedness and coordination within local ham clubs and Civil Defense organizations are very important. If you belong to a club which sponsors a repeater, be sure that the technicians in charge have that repeater backed up by storage batteries in case of power failure.

Hurricane and tornado warning notes are important. A well-organized system can save many lives. Mobile operation is a must and if you can work all the bands from your car, that will put you in a favorable position to help your fellow citizens. Another point: Don’t risk your own life unnecessarily! You are more useful alive and in one piece.

Be Ready Yourself

Finally, provide for your own basic needs. Water contamination and food shortages must be anticipated. Water purifying tablets like Halazone should be on hand. Non-perishable foods, cereal, canned beef, milk, and sugar should be stored at all times for yourself and your family.

First aid articles like cotton, bandages, aspirin, iodine, alcohol, and other standard items should be stored in a box for easy access and transportation. Good first aid kits can be purchased at any drug store.

Take your immunization shots regularly and keep your certificate on hand. This will give you clearance with the authorities to move around with freedom. It is a good idea to take courses in first aid and rescue operations with the local Red Cross. Try to stay in good physical shape. Remember that a good pair of legs can save your life when everything collapses around you.

Good luck, and 73!
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Recently I became the proud owner of one of Wilson’s latest innovations, the Mark II. This new hand-held is quite compact, light, and easy to carry.

I have included a couple of features on my rig I feel make it more versatile and easy to handle.

First, I have added a belt clip to the back of the unit. The best clip I have found is by Motorola. It matches the color and texture of the plastic of the Wilson case exactly. The only way I have been able to get this clip is by ordering the complete back with clip for the HT220 from Motorola. It is part number NLN6675A and costs $9.63. (It has the big Motorola “M” on it, but just look at it as a “W” upside down.)

Installation is easy—just drill two small holes near the top of the battery cover and attach the clip with two screws.

Second, I made an addition at the antenna. When carrying hand-held rigs that are restricted to rubber ducky antennas on your belt, the ducky tends to get stuck under your armpit. To avoid this uncomfortable experience, I added two 90° BNC connectors. This allows the rubber ducky to be swiveled down alongside the rig out of the way. Granted, this is not the most ideal position for such a high gain antenna for DX work, but it’s good around a hamfest to monitor for your buddies to call and even to transmit short distances or listen to nearby repeaters. When you need to work DX, just swivel the antenna into the up position.

I took my modified Mark II to the Atlanta hamfest and was stopped several times by people inquiring about the antenna arrangement. When I returned to the hamfest the next day, I noticed half a dozen people with “bent” rubber duckies on their Wilsons.

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An 8080 Repeater Control System
—part III: software

The finishing touches.

A development system is necessary to write and debug a program of the size and complexity of that of the repeater control. There are commercial development systems available, and hams lucky enough to have access to these systems have the opportunity to modify the program presented here with ease. Medium-to-large-size hobby computers are also equal to the task. I used my personal homemade computer for development. It has 60K of read/write memory, a high level operating system including a text editor and assembler, printer, debugging tools, and the capability to program 2708s. The processor itself is an 8080, so I was able to actually execute the repeater program on it before burning it into ROM.

A good development system is a must when starting from scratch, but if the program is to be used as presented with only code changes, most any hobby computer can be made to program the ROMs. Major modifications would necessitate reassembly.

Program Analysis

The repeater control program is fairly long and it may appear quite complicated at first glance. Everything is broken down into manageable subroutines, so it is not too difficult to follow program flow. The software consists of two programs: the foreground program and the interrupt program. The two programs are separate and operate independently. The foreground program counts time, and when it is time for an identification, it performs the CW ID Touchtones™ interrupt the processor, and control is passed to the interrupt program (which performs whatever task is required). The foreground program may be interrupted at any time, and when the interrupt service routine exits, control returns to the foreground program at the point where it left. This is apparent when listening to the repeater. If the repeater is identifying, and a touchtone is sent, the ID halts, and, after the tones are handled, the ID resumes where it left off. The beauty of the scheme is that the interaction of the programs is handled entirely by the interrupt hardware.

Foreground Program

Refer to the program listing. At the beginning, some labels are defined. The various ports are set equal to the proper values. CWSPD sets the speed of the CW. At its present setting, the speed is 19 wpm. The CW speed should be proportional to CWSPD. IDTM0 through IDTM3 set the time duration between successive IDs. This is currently set at three minutes.

When the 8080 is reset, it begins executing com-

Fig. 1. Foreground program.
mands at address 0. Refer to Fig. 1, a flowchart of the foreground program. At BEGIN, a lock is cleared. The lock permits the removal of the ability to enter the control mode. This will be explained in detail later. Control passes to RESET, where all variables are initialized. All of the output ports are zeroed. A note is in order about how the program handles output. The 8080 can output to its output ports, but it cannot read its output ports back in. Since we need the ability to be able to change only one bit at a time in the output ports, a memory byte is reserved for each output port. Every time the processor outputs data, it writes the output information in the locations OUT0M through OUT7M for ports 0 through 7. This way, if an output bit needs to be changed, the corresponding memory location can be read, the one bit changed, and the byte output. All bits of port 7 are set, because the row and column inputs to the touchtone generator are active low. The stack pointer is loaded, and control jumps around the interrupt location to MASLP.

At MASLP (master loop) the interrupt is enabled, and TIME is checked. If TIME is 0, the system is in the rest mode; as soon as a repeater is used, it will ID. When TIME is 1, the system is counting time to see if it is time to ID. In the program, if TIME is 0, the 150 PTT is checked to see if the repeater is in use. If not, the 450 PTT is checked at MAS2. If neither repeater is in use, the program loops around, continuously waiting for one to be used. When a repeater is activated, either a 150 code or a 450 code is put into MASK. MASK is a variable which tells the CW sending program which repeater to ID. At MAS3, TIME is made 1, and control goes to ID. At ID, TIMER is zeroed. TIMER is a four-byte counter, used to time up to three minutes. The repeater identifies, but before explaining how that occurs, the other path to ID will be explained.

At MASLP, if TIME is 1, control passes to MAS1. In this portion of the loop, the repeater has identified sometime in the past three minutes. In the subsequent three minutes, the processor keeps tab on the repeaters to see which ones should ID later. At MAS1, MASK is modified to reflect which repeaters are in use. TIMER is incremented, and, at MAS6, TIMER is checked to see if it equals IDTM (ID time). If not, three minutes have not elapsed, and the program loops back to MASLP. When time is up, control passes to ID, as before.

At ID, after TIMER is zeroed, MASK is checked to see if either repeater has been utilized in the last three minutes. If not, control resumes at MASLP after clearing TIME, placing the system back into the idle condition. If a repeater has been used, control goes to ID1. At this point, it must be determined which ID message is to be used. IDS (ID status) may have values from 1 to 7. 1 through 5 specify that that ID number is to be used, 6 indicates that the first four should be cycled, and 7 indicates that all five should be cycled. IDN (ID number) specifies the current ID number. IDN goes from 1 to 5. If IDS is between 1 and 5, IDN is set to IDS and control goes to ID3. At ID1, if IDS is 6 or 7, control goes to ID2 where IDN is incremented, advancing to the next ID message. At ID4 and ID5, IDN is checked to see if it is greater than it should be, and if so, it is set back to 1, and control goes to ID3.

At ID3, the HL registers are set to the address of the proper ID message, and the CW sending program is called. After sending the ID, MASK is zeroed and control goes to MASLP. The CW sending routine is shown in Fig. 2. It is assumed that the address of the message to be sent in CW is in the HL registers, and that MASK indicates which repeaters to send the message to. If the destination is 150, MASK contains CO; if the destination is 450, 6

![Fig. 2. CW routine.](image-url)

![Fig. 3. Interrupt service routine.](image-url)
80, the character is done (described in Byte, October, 1976, page 36). After CWLET, the tone is turned on. If the character is a dash, an additional delay of 2 units is appended. At CWDOT, the tone is removed, and a trailing 1-unit space is added. The routine loops back to CWLET until the character is finished, where 2 more units are added to create a 3-unit intercharacter delay. At CW2, the next character is fetched and control loops back to CW0. The CW routine is used both by the ID section of the foreground program and various routines in the control section.

The Interrupt Service Program

The interrupt routine is shown in Fig. 3. When the 8080 is interrupted, it goes to address 38. It jumps to T T T (touchtone), where the service routine is located. Since the foreground program may be interrupted at any time, it is necessary to save all registers. As an error-recovery technique, the stack pointer is checked to see if it is in the limited address space where RAM is located. If not, something is wrong, and the program jumps to the beginning, resetting everything. If the stack is okay, MASK is saved, since it may need to be modified by the interrupt programs. OUT1M is saved because some bits are changed there as well.

The CW tones are killed, in case an ID has been interrupted (which could leave a constant tone on the repeater until return to the foreground program), and BLK is set high, enabling the blocking function. The decoder is checked to see if the digit is a *, the knockdown digit. If so, the KD output is pulsed for about a millisecond to kill any possible autopatch or remote-base function. If the repeaters are linked, the routine ROGER is called, which sends the "R" in CW. The repeaters are unlinked, and the timeout timer is placed into the timing mode in case a single-digit autopatch was in progress. Control goes to TTON2, the exit point.

If the incoming digit is not a *, LOAD is called, which gets a three-digit code. The code table is checked for the three-digit code. If the code is not found in the table, control goes to TTON2, and nothing happens. If the code is found in the code table, the address of the routine to execute that particular code is obtained. At that point, the program jumps to the particular routine. After the routine is executed, control jumps to

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TTON2

At TTON2, everything that was saved upon entry of TTOONE is restored and the interrupt routine returns to the foreground program.

BITS is a bit set routine used to set a bit in an output byte. The address of the byte is placed in register DE, and a 1 is placed in the desired bit in register B. BITC clears bits the same as BITS sets them.

Shown in Fig. 4, LOAD gets a three-digit code from the touchtone decoder. Upon entry, LOAD waits for SVTT. For user codes, SVTT is immediately present, since it is SVTT which caused the interrupt. For control codes, where several three-digit codes are used, LOAD waits for a code to be entered. When a digit is ready, LOAD calls DECOD. DECOD reads the input ports and decodes the digits into binary form. The digit is stored, and HURRY is called. HURRY checks VTT while counting time. If a tone occurs before three seconds elapse, HURRY returns with the carry clear. If no tone is received in three seconds, HURRY exits with the carry set. The timeout is detected in LOAD, the program is aborted, and LOAD returns. Otherwise DECOD gets the next digit, the sequence repeating. The third digit is fetched in the same manner. After exiting LOAD, either three digits are stored or an invalid code is stored because of failure to send successive digits within three seconds.

DECOD reads the decoder. Presumably, a tone is present when DECOD is called. The digits 1 through 9 are stored as those numbers, and 0, *, and # are stored as decimal 10, 11, and 12. A digit stored as 0 indicates an invalid code. LOAD presents the three digits to 0, so timing out results in one or more stored digits remaining 0.

The routine WCD is used to wait for a carrier drop. It is possible to lock out the ROGER routine. If this is done, it also eliminates the need to wait for dropping carrier when controlling the repeater. Upon entry, WCD checks for this, and normally proceeds to check to see if it is in the phone control mode. If so, WCD returns. If not, it checks to see if the control receiver is being used. If so, it waits for the signal there to drop. If not, it waits for the COS signal to disappear. In this manner, WCD only waits when necessary, and waits for the proper signal. The LINK routine checks if the function is to be permitted. If so, it links the repeaters and calls ROGER.

The TAPE routine checks to see if the function is enabled, calls WCD, activates the tape, and exits. The SELCL (selective call) routine clears BLK, calls WCD, and exits. This permits any tones after #3 and before the carrier drop to pass.

TTTST, the touchtone test routine, is shown in Fig. 5. If the function is enabled, GETTT (get touchtone) is called, which loads a sequence of digits. Control goes to TSST1, where the digit count is checked. For each digit, the digit is converted to CW and sent. The addresses of the CW conversions are at DIGAD. The actual CW codes are at CWD1 through CWD7. After the buffer is sent, the digit count is restored and TSST exists.

The GETTT routine is shown in Fig. 6. Upon entry, the digit count is cleared and register pair DE is initialized to the start of the buffer. If carrier is present at GETTT, the VTT is checked. The program loops until either the carrier is dropped or a digit is received. When the latter happens, DECOD is called and the digit is placed into the buffer. The digit count is incremented, and checked to see if the buffer is full. The buffer is loaded in this manner until the carrier is dropped, when GETTT returns. If the buffer length reaches maximum, WCD is called and then GETTT returns.

When the three-digit control code is sent, the program goes to CNTRL, shown in Fig. 7. If the control mode is locked out, CNTRL exits immediately. Otherwise, WCD is called, and then LOAD. The HL registers are

![Fig. 4. Load, wait for carrier drop, link, tape, and selective call routines.](image-url)
RESET, initializing the entire program with the exception of LOCK. If the digit is a *, TIME is cleared; otherwise, the digit must be a # and CNTRL jumps to LNUM (load number). Each routine, at completion, goes to TTON2 and exits.

Fig. 6. Get touchtone routine.

Fig. 7. Control routine.

loaded with the address of the confirm code. Jumping to TTON6 enters TONE at a point where the code received is checked against the code table, now consisting only of the confirm code. If the received code is not in the single entry table, the interrupt is aborted as usual. If agreement is found, TONE sends control to CNTRL. WCD is called, and CNTRL then loops at CNTRL1 until a tone is received. A single-digit code is expected, and DECOD is called to get it. WCD is again called, and if the received digit is invalid, control exits. Otherwise, ROGER is called and the proper program must be selected. If the received digit is between 1 and 7, IDS is loaded with that digit. The command is done, and CNTRL exits. If the digit is 8, CNTRL jumps to IDLD (ID load). A 10, which is digit 0, sends CNTRL to OUT, and 9 has the program jump to RESET, initializing the entire program with the exception of LOCK. If the digit is a *, TIME is cleared; otherwise, the digit must be a # and CNTRL jumps to LNUM (load number). Each routine, at completion, goes to TTON2 and exits.

Fig. 8 shows IDLD. The HL registers are loaded with the address of the programmable ID. The character byte in register B and element count in register C are cleared at IDLD0. IDLD1 waits for a digit to be received, and DECOD is called. If the digit is 3, the stop byte is stored, ROGER is called, and IDLD exits. Otherwise, control goes to IDNTS (ID not stop), where the digit is checked to see if it is a 2. If so, at IDDLT (ID done, left justify) register B is justified by the element count in register C. The character is stored in the message buffer at IDDL (ID done letter). The character count is stored in the message buffer at IDDT (ID done digit). If the digit is not a 2, it is checked to see if it is a 1. If it is a 1 is shifted into register B and the element bit count is incremented. Otherwise, the digit is checked to see if it is a 0, where a 0 is shifted in. If the digit is not a 3, 2, 1, or a 0, then an invalid digit was sent and it is ignored.

The OUT routine, in Fig. 9, outputs selected bits to the output ports. LOAD is called to get a three-digit code. If the first digit is a *, ROGER is called and OUT exits. Otherwise, the digits are checked to see if they are 0, which is invalid. If an invalid entry is made, after carrier drop, control loops back to OUT. If port 0 is selected, the 10 is changed to a 0 for later use. Several validity checks are made, checking to see if port, bit numbers, and output levels make sense. If they do, ROGER is called. At OUT2, the binary code for the bit number is converted to a 1 in the proper bit of register E. At OPRT (output to port), a machine output instruction is set up in RAM with the required port number. The bit is either set or cleared, and the output instruction in RAM is called. Control loops to OUT, and the cycle continues until OUT is exited with a *.

LNUM (load number) is shown in Fig. 10. The digit count is zeroed, and at LNUM1 LNUM waits for a received digit. DECOD is called, and if the digit is a *, ROGER is called and the routine exits. Otherwise, the digit count is checked and the digit is stored. If more than 11 digits are attempted, the last digit keeps being overwritten.

LOCK has two functions.
Program listing.

It can block access to the control mode, and it can eliminate the ROGER routine. After the LOCK sequence is given, LOAD is called to get three digits.

The second digit eliminates the ROGER routine if it is a 1, and the third digit locks the control mode out if it is a 1. ROGER is then called, and LOCK exits. If the second or third digits of a LOCK command are 0, the normal state of the appropriate function is resumed. The LOCK function is intended as a fail-safe measure, available only to the person who constructs the system. The reset instruction (9) is purposely constructed so that it does not reset LCKR, the locker
where the control mode may be inhibited.

PATCH, the autopatch routine, is one of the more complicated subprograms. Shown in Fig. 11, PATCH first checks to see if the autopatch is enabled.

NOTIM (no timer) is cleared so that the timer will be present unless changed later. GETTT gets the requested telephone number. The digit count is then checked. If no number was sent, and a direct autopatch is allowed, then at PTC1 AP is pulsed, giving the user the line to dial his own number. Otherwise, the attempt is aborted. If 7 digits were entered, control passes through PTC2 to PTC8. If the first digit of the number is a 1, the patch is aborted. If not, at PTC3 AP is pulsed, bringing up the line. At PTC5, a one-second delay is introduced to allow time for the telephone company equipment to produce the dial tone.
Our exchange is an electronic switching system and is very rapid. If it commonly takes longer than one second at your exchange, change the number 15 to a larger number in line #1057. A 1 is sent to the LD output, preparing to dial the number. At PITCH6, the number is dialed. Each tone is on for 65 ms and off for 65 ms, the time DELAY waits. The binary digit numbers are converted to the proper row and column format by the TTMTAB (touchtone table). When the number is completed, LD is turned off, and if NOTIM is not 0, the timer is disabled. Similarly, if 8 or 11 digits are requested and the first digit is a 0, the same procedure applies. If a single-digit number is requested, a table is searched at PCH10. The single digit table, SDTAB, has the single digit followed by the address of the corresponding telephone number. At the loca-
tion of the number, the number of digits precedes the actual number, permitting any digit length. A 0 must be stored as a decimal 10. If the number is not found, PATCH exits. If found, the digit count is checked, primarily for the programmable number. If the number is valid, the telephone number is copied into the GETT buffer, NOTIM is set, and control goes to PTC3, where the rest is normal.

The remote base routine, RBASE, merely pulses RB, TAP2, the secondary tape access, jumps to the appropriate point in TAPE. DIAL, the 585 function, makes various checks and jumps to TTTST at a point where the existing buffer is sent.

The two ROMs are set up in a fashion to permit as many changes as possible in the second ROM without requiring a replacement of the first ROM as well. Most
the lower ROM go to the beginning of the second ROM, which will not change if a routine in the second ROM is modified. The code preceding the address of the program to service the ID that code. The end of the 25 bytes reserved for the 25 bytes reserved for the

forward references from a fixed location rather than reading an address directly. Naturally, the published digit buffer, including one digit, is not the ones in the buffer length 12 bytes reserved for the ID, the space left for the digit #1 telephone number. Above that, space is left for the programmable ID. 22 bytes at the top are variables and

The code table is organized with a three-digit code preceding the address. The CW ID messages are set up with leading and trailing spaces to clean up the ID. The RAM has the bottom programmable ID. 22 bytes at the top are variables and

If OK 17
large for the required functions that for even the longest imaginable ID message there will be plenty of room left for the stack. I do not suggest testing the system by loading an ID of 197 characters! Up to 150 should be safe. OUT0M is a dummy output port. Although it is set up as an output port, there is no physical port. This is convenient for both programming and operation.

Design Philosophy

As previously mentioned, several years ago I had constructed a microprocessor system to perform a similar
function. At that time, I built the hardware first. After completing this project, I have no doubt that the proper procedure is the other way around. A general idea of the hardware should be in mind, but the program should be written first. Writing the program defines the parameters of the system. By doing so, I found that some hardware modifications were needed that otherwise I would have had to go back and redo.

The program was written and debugged on the development system described. I configured the I/O ports so that the program could be executed on my large system. The program was in operation on it before a single wire was cut to construct the hardware. Clip leads and external oscillators were used to test the system. Did you ever try to simulate touchtones with clip leads, trying not to be caught by a three-second timer?

The program was modularized as much as possible. If any routine is longer than about two or three pages, it is too long and should be broken down into smaller routines. Not only is it easier to write that way, but it is also easier to understand how it works a few months later. For routines with many conditionals, flowcharts are a must. Originally, a skeleton program was written — just enough so that the entire program was self-consistent. Gradually the individual routines can be added to the code table and debugged. The throughput using these techniques can be quite high. I wrote the skeleton program in one day, and debugged it the next. Once an operational program was ready, the hardware was constructed. In the week or so it took to build the thing, the program was beefed up. By the time the hardware was ready, the software was refined. I cannot overemphasize the fact that a 100% operational program is necessary before building the hardware. When the ROMs are plugged in, if the program is in any doubt, and the system does not work, you do not know if the problem is hardware or software, resulting in an exercise in futility.

The hardware/software tradeoffs previously mentioned are important. A lot of thought is necessary before plunging ahead with design. The total software and hardware development time/cost must be considered. Even though the individual pays nothing for his own software, thinking like the businessman who must pay for his software will give a more balanced design.

When building hardware, it is advantageous to freely add LEDs on signal lines. You may not need them after the circuitry is in operation, but they are invaluable when debugging and testing the system. Design a system that not only works properly, but also can be made to operate properly in a reasonable amount of time.

Fault tolerance is an area at the frontier of theoretical knowledge. The discipline is about a decade old, and much remains to be worked out satisfactorily. Semiconductor technology is increasing at a rate which is hard to keep up with. Writing programs which merely function, and programs which both function and are error-tolerant, are two different things. Instead of making equivalence tests, it is better to make relational tests. Otherwise, if an error occurs, a test may fall through. Subprograms are usually expected to be entered with certain initial conditions. They should be constructed so that if those conditions are erroneous, the subprogram will exit soon. The worst thing that can happen is an erroneous input condition resulting in an endless loop. In a controller, it may not be as easy to push the reset button when something goes wrong as it is on a general-purpose computer. I certainly did not follow all of these tenets in writing the software; however, I attempted to keep them in mind as much as possible.

The original program, somehow, did manage to crash twice. After that, I added the error recovery portion. It is a very simple, first-order attack, but it covers more errors than a first glance shows. If the program gets into a false state, it will often go to a faulty address. Since the hardware uses a small amount of the address space, it is quite likely that the program will be sent to

---

Fig. 8. ID load routine.

Fig. 9. Out routine.
A place where there is no memory. This results in reading all highs; the instruction FF is the interrupt instruction, so effectively an invalid memory address interrupts the program. That is why I placed the recovery routine at the interrupt location. The processor is not being interrupted, but it interprets the error as an interrupt. A second different thing about the fault-tolerant program is that the enable interrupt instruction was placed into the master loop. Otherwise, if the interrupt were ever disabled when in the foreground program, there would be no way to communicate with it.

I am not claiming that the system is totally fault-tolerant, but by the addition of some very simple checks, the fault tolerance can be increased tremendously. This entire project has been a good education.

Expansion

There are many additions and improvements which can be made. The advantage of the whole arrangement is that for many changes, hardware need not be touched. Many functions can be added by software changes only. It is more pleasant to sit in an easy chair at home rewriting the program than to sit on the cold, hard floor at the repeater site to effect changes. If changes don't work, all that has to be done is to put the original ROMs back in.

Additional hardware can be added to mate with the existing circuitry, and it is not necessary to worry about the additional control functions, as plenty of spares are already provided. A possible improvement to the software would allow interrogation of the status bits. This is a simple addition which is not required but might be useful. A planned hardware addition to the system will provide downlink telemetry from the site. Lights on the voting selector indicate which receivers are being accessed, and which receiver the voter selects. The telemetry will transmit the voter lights in real-time. Incorporated in the telemetry package will be an analog-to-digital converter. Upon command from the control system, the telemetry will switch from the voter lights to meter readings read by the A/D; plate voltage, plate and grid current for each repeater, and cabinet temperature could be read. With the existing central control system, the possibilities for expansion are straightforward and exciting.

Acknowledgements

I would like to thank Carroll Van Ness K3HZU for his able assistance in designing the autopatch circuitry. Until this time, Carroll has been the father of the control circuitry and the autopatch. His equipment always functioned fine, but there is only so much that can be done with relays. Carroll is now a microcomputer convert.

I received help from Vern Chapin K3VC with the metalwork. Despite broken saw blades and bruised fingers, he finished the panels.

I thank Frank Ayd WA3ILR, who stayed with me over 13 hours at the site on the day of installation. We were both dirty, tired, cold, and hungry, but he remained with me while making frantic pleas that we quit.

Thanks go again to Vern Chapin K3VC, and also to Marc Leavey, M.D., WA3AJS, for their photography.

And if not for Jack Biggs K3SP and Larry D'Anna WA3KOK, with the assistance of many others over a period of several years, I would not have had the excellent repeater for which to develop the control system.
The January VHF Sweepstakes is a very popular contest. It brings out operation on the VHF frequencies that usually does not exist at other times. In fact, anyone with a modest setup capable of 100 Watts on CW and SSB with a beam of 11 elements or better can make hundreds of contacts during this weekend on one band alone. Since I am equipped with just a TS-700A and 16 elements at 50 feet, I decided to try my luck on two meters.

A few glasses of wine later, my wife, Chris WA2KOU, and Bill WA2RZR became more interested in coming up with a computer dupe sheet for the contest than operating the contest itself. The computer system is the Heath H8/H9. The program calls for the operator to enter the call of the station. The computer will then ask if you have entered the call correctly in order to prevent typing mistakes. Upon answering with a "Y" for "yes," the computer will then ask if you wish to have the station logged into memory. This was placed into the program to allow the contest operator the opportunity to work (or try to work) that particular station. If you work that station and answer "Y" to the last computer question, the program logs that call and returns to the beginning.

If you answer "N" for "no" to the computer question "Do you have the call correct?", the computer will return again to the beginning and ask for another call to check.

In the event that you enter a call that has already been worked and logged, the computer will respond with "DUPE - DUPE - DUPE - DUPE" or any other obscenity you wish to include and then return with a question for the next call. A sample of the program is shown in Fig. 1.

As can be seen, Fig. 1 is a rather simple program and can be expanded to include such things as different bands, etc. But the main purpose was to have an easy dupe sheet for the minimum amount of time and energy, and the maximum amount of glasses of wine. It works well, and it does not take much time to run in between contacts. If you make it too complex, it may take time away from hunting down the points. The program listing for this little gem is shown in Fig. 2. Good luck, and I'd like to hear about any changes.

DUPE SEARCH FOR CALL? ------- WB3MIC
DO YOU HAVE CALL CORRECT? ------- N
DUPE SEARCH FOR CALL? ------- WB2MIC
DO YOU HAVE CALL CORRECT? ------- Y
STATION NOT WORKED - CALL IT ------- Y
SHOULD STATION BE LOGGED? ------- Y
DUPE SEARCH FOR CALL? ------- WB2MIC
DO YOU HAVE CALL CORRECT? ------- Y
DUPE - DUPE - DUPE - DUPE - DUPE - DUPE - DUPE
DUPE SEARCH FOR CALL? -------

Fig. 1. Sample run.

10 REM VHF S/S LOG WB2MIC and WA2RZR
15 DIM CS(250)
20 PRINT : PRINT : LINE INPUT "DUPE SHEET FOR CALL? ..... ",A$
30 LINE INPUT "DO YOU HAVE CALL CORRECT? ..... ",B$
40 IF B$ = "Y" THEN GOTO 60
50 GOTO 20
60 LET X = 0
70 X = X + 1
80 IF CS(X) = "" THEN GOTO 150
90 IF CS(X) = A$ THEN GOTO 200
100 GOTO 70
150 PRINT : PRINT "STATION NOT WORKED - CALL IT ..... 
160 LINE INPUT "SHOULD STATION BE LOGGED? ..... ",B$
170 IF BS = "Y" THEN GOTO 190
180 GOTO 20
190 LET CS(X) = A$
195 GOTO 20
200 PRINT "DUPE - DUPE - DUPE - DUPE - DUPE - DUPE - DUPE"
210 GOTO 20

Fig. 2. Program listing. Please note that, in statement 15, the number of contacts that the program will keep track of is 250, but can be changed by altering the number within the parentheses.
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T his program was written for a Poly-88 microcomputer. However, since it is in BASIC, it is easily modified for other 8080-based computers that have a BASIC interpreter or compiler available.

A disassembler’s task is very difficult. It must be able to jump into the middle of the computer’s memory, help the user to read the mixture of ASCII and numerical data stored there, and change the numerical instruction codes into mnemonic assembler code. Instructions on the 8080 are of variable length, and if the disassembler happens to start in the middle of an instruction rather than at its beginning, what comes out is garbage.

To help cure these problems, this disassembler displays the contents of each location in hexadecimal, in ASCII, and in assembler code. It takes into account the variable length of the instructions. The misalignment problem is quite difficult, and if the disassembler is started in the middle of an instruction, it usually takes a few instructions before it is back on the track. However, this program incorporates a heuristic method for obtaining correct alignment. A special code “P,” for “Previous instruction,” attempts to find the nearest previous instruction that seems reasonable. What it actually does is this: first it jumps back in memory twelve bytes, then it disassembles its way forward to the last instruction that does not overlap the one you started in. The odds are very good that, during this process, the disassembler will find the proper alignment. This feature is, perhaps, the most interesting advance this disassembler exhibits. The other features that make it very convenient to use are explained in the operating instructions.

The disassembler was written by Douglas Wyatt, with a little bit of the code (and probably most of the bugs) supplied by me. A few comments on changing Poly BASIC to your BASIC might help. The exclamation point (!) means "PRINT." Anything shown in lowercase may be changed to uppercase. We think that it is nicer for the computer to talk in standard English if it can, so we use lowercase where appropriate. The function INP(1) grabs a character from the keyboard. Thus, lines 110 and 120 take a character, C, and ask if it is a RETURN (ASCII-13). If it is, the computer does a RETURN and a LINE FEED. The slash (/) allows two instructions to appear on the same line. You can modify this so that they are on separate lines if your BASIC doesn’t support this feature.

Knowing the symbol equivalent of various ASCII codes is useful in understanding the program. Your BASIC must have the PEEK function, of course. On some, this is called EXAM. We also use TAB. If you don’t have the multiway branch (the ON instruction) you will have to use a list of IFs. It’s not all that hard.

Operating Instructions

When the program is running, a press on the space bar disassembles the next instruction. Any key
other than a command just repeats the previous instruction. The following six commands form the entire assembler. When they are pressed, no RETURN is required if you use the INP function or its equivalent. (Address)

When this command is given, you have to supply a hex address. This address proceeds from that address.

(Jump)

If the instruction just disassembled was any kind of jump, this command causes disassembly to proceed at the jump’s destination address. Thus, you can use the disassembler to trace through a program. (Back)

This causes disassembly of the previous instruction. (Call)

If the instruction just disassembled was a CALL, then this instruction causes the first line of the called subroutine to be disassembled. Disassembly proceeds through the subroutine until you give the instruction. (Return)

Disassembly proceeds with the statement following the CALL Subroutines may be nested. Use of the Return instruction is not limited to when you find the subroutine’s RTN instruction; it can be used at any time to return to disassembling the calling program. Previous instruction)

This command has the disassembler go back twelve bytes, then scan forward to the last instruction before the one you started in, trying to align itself to the correct instruction boundaries. If the code you are disassembling isn’t making sense, try this instruction. There is a good chance (although it is not certain) the disassembler will now be properly aligned with the program. Of course, if you are in a region of memory that is full of data, then a glance at the ASCII or the hexadecimal columns should show the structure of the data.

Output Format

The address appears at the left edge, followed by the contents of the location (and the next one or two locations if the disassembler thinks that a multi-byte instruction lives there) in hexadecimal. Next is the ASCII representation of those contents (or underlines if they are not printing characters). This is followed by the assembler mnemonic, and then an asterisk. ■
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Antenna Bonanza for 10

— CB is good for something

Modifying your antenna is easy.

Joe Goode W6LVT
918 North Mabury St.
Santa Ana CA 92701

Most CB equipment can be modified, tuned, or used as is to operate on 10 meters. Many excellent articles have been published on the modification of transceivers. I am working on a VFO to work with these modified units. Each CB modification results in the necessity of a good 10 meter antenna.

The CB industry is manufacturing an array of excellent economical antennas that can be easily modified to 10 meters with a near perfect match. If you are looking for a real bargain, don’t overlook your local swap meets.

Here is how to modify several types of antennas. The tuning will be covered later. The actual length will vary with each type of antenna.

Mobile — Base-Loaded Steel Whip, 47 Inches

It was necessary to reduce the whip length to 41 inches. The original whip was retained for 11 meters and another whip was cut for 10 meter operation. SWR, 1.2 to 1—29 MHz.

Fixed Station — Vertical Half Wave

No modification; SWR 1.8 to 1—29 MHz. This antenna is known as a Star-duster. If you don’t mind a little SWR, use it as is. Cutting it to length would be difficult since the coax is inside the bottom element.

Fixed Station — Quarter-wave Ground Plane

This antenna had three 106-inch radials and one 106-inch vertical driven element. The vertical element was shortened from 106 to 96 inches. The three radials were not modified; SWR 1.2 to 1—29 MHz.

The above antennas are being used on 10 meters. The measurements are actual. The following is theoretical.

Mobile — Quarter-wave Whip

Reduce length in accordance with the pruning procedure.

Mobile — Fiberglass Wire-wound

These antennas are made by winding wire around a fiberglass rod and then applying shrink tubing over the entire length. The tuning consists of removing turns of wire from the top end. The frequency is determined by the number of turns rather than the overall length of the glass rod. The size of wire determines the power handling capability. 18-gauge wire will handle 200 Watts.

Fixed Station — 5/8-wave Vertical

These antennas normally have a loading coil to obtain electrical length without extending the mechanical length. Tuning would consist of reducing the mechanical length. The loading coil is located in the bottom end of the antenna assembly, and is not readily available for modification. If the loading coil is wound with small wire, it will not handle power. This is a good antenna to stay away from!

CB Beam Antennas

For the modification of beams, refer to antenna handbooks. Check SWR and, if it is not more than 2 to 1 and it has a front-to-back ratio on receive, try using it as is.

A contact was made with a ham in Michigan who was using a vertical three-element CB Super Scanner beam as is. S9 reports were received on both ends of the contact.

Mobile — Center-Loading Coil

Tuning is accomplished by shortening the whip on the top end of the coil. The actual length will be critical and the bandwidth narrow.

Loading Coils

Antenna loading coils are sealed against moisture. This is normally accomplished by injection molding or potting the coil in epoxy. Do not attempt to remove coil turns unless you have determined a satisfactory method of resealing.

Power Handling Capability

Antennas without
loading coils are usually good for a kW. RG-58 coax is satisfactory up to 200 Watts input. Above this level, use RG-8/U.

Antennas with loading coils have power limitations. The larger the wire in the loading coil, the more power it will handle. Visual inspection of wire size is usually impossible due to moisture seals.

A clue to power capabilities is the outside diameter of the loading coil housing. If it's ½ inch or less, the power handling capability will be low, not more than 25 Watts. Excess power will cause the coil to heat and possible coil destruction. If there is a gradual increase in swr when the transmitter is turned on, the chances are that the loading coil is working up a fever.

Antenna Tuners
Antenna tuners are not required. Do not have one in the line when changing the length of the driven element. There is nothing wrong with trying a tuner with a CB antenna as is.

Pruning Procedure
Regardless of antenna type, the tuning from 27 MHz to 29 MHz requires the reduction of the electrical length of the driven element.

An swr bridge is required. The function switch is first placed in the forward position and adjusted for set level. The switch is then placed in the reflected position and the swr recorded.

Let's assume your modified transceiver has the following transmit frequencies: channel 1—28,965 kHz, channel 13—29,115 kHz, and channel 23—29,255 kHz. The center frequency is 29,115 kHz, so this is where you should adjust for minimum swr.

Minimum swr will not necessarily be a perfect match—1 to 1. It could be 1.3 to 1 or even 1.5 to 1. Do not settle for more than 1.5 to 1. This would indicate there is a problem somewhere.

A base-loaded mobile CB antenna, when operated on 10 meters, will show an swr reading of approximately 4 to 1. A quarter-wave base antenna will show an swr reading of approximately 2.5 to 1. A loading coil narrows antenna bandwidth.

While pruning a mobile antenna whip, cut off 1 inch at a time until the swr drops below 2 to 1. From this point on, cut only ½ inch at a time. The best way to cut a stainless steel whip is to use the edge of a file to notch the whip and then break off the notched piece with pliers. All mobile antennas have an adjustment screw which allows at least a ½-inch adjustment. With this adjustment, it is possible to obtain minimum swr at the center of your operating frequencies.

Pruning Fixed Station Antennas
The procedure is the same but not as critical. Cut off 2 inches at a time until the swr drops below 2 to 1, and then cut only 1 inch at a time until you obtain minimum swr at the center of your operating frequencies.

In the pruning of any antenna, all swr measurements must be made with the antenna in its permanent position. If it's going to be mounted on the roof, that's where you adjust it. If it's a mobile installation on the trunk lid, close the lid and position the car in the clear, away from all obstructions such as trees, buildings, and other automobiles. Close the car doors during swr measurements.
Lightning!
—a case history

If you’re not careful, it’s one strike and you’re out.

Jerrold A. Swank W8HXR
657 Willabar Drive
Washington Courthouse
Ohio 43160

This is the story of what happened to Bernie Witherspoon W8GKM during the storm of July 14, 1978. It will show you what can happen even without a direct lightning strike to your antenna. Very few amateurs realize that a distant strike on a power line can cause more damage than a direct strike on your antenna. This is Bernie’s story.

“At 4:30 am on July 14th, there was a sudden double click, together with a flash of lightning, in the radio room which is just off the kitchen where I was standing.

“I went into the radio room to check and saw that the pilot light on the two meter rig was out. It is left on all of the time so that the memory will hold the channels on which it is set.

“When I saw that the light was out, I knew that something was amiss. The antenna was switched off for storm protection, and it was free. Otherwise, the damage to the equipment (about $5000 worth), if connected to the antenna, would have been extensive.

“The lightning surge apparently came through the entrance panel and knocked out the fuse for the radio room. It then went through the NCR 12-volt regulated power supply, which originally sold for about $200, and now runs between $50 and $60 as NCR surplus. The in-side of the power supply showed extensive damage. It was completely useless.

“The surge then travelled through the equipment via a common power circuit. It knocked out several transistors and a diode in the Yaesu FT-227R, knocked out a key-circuit in the TR-4CW, and burn-damaged the low voltage circuit in the L4B amplifier.

“It knocked out the power circuits in the R4C receiver. It went through the control box of the Ham III rotator and through one of the screws holding a rubber foot on the control box. The box was sitting on top of a transmatch. It jumped about one-half inch to the case of the transmatch and made a punched hole the size of a ten-penny nail. The surge burned a spot on the transmatch about the size of a silver dollar. It went through the transmatch to the outside, doing a little damage to the inside of the transmatch by burning some of the wiring.

“The amazing thing about this whole bit is that it went through the L4B low voltage panel and R4C control box, and then jumped to the chassis through the transformers without damage to the transformers. It went through several other transformers and did not damage them, although it did knock out two other transformers.

“The ground braid on the coax was welded to the Cantenna dummy load. Although the switch was off on the L4B, the filaments on the 3-500Zs were lit, but not at full brilliance. There were carbon deposits on the switch contacts making a high resistance connection.

“The fuse on the wiring for the rest of the house was not blown. However, it did burn out the transformer on the furnace and the doorbell transformer, plus various small items around the house.

“Since there were two cracks of thunder, I went out to see if the antenna showed any damage. I found half of an insulator on the ground. A neighbor who had been watching said that it looked as if little fireballs were dancing all over the antenna.

“I found that one of the insulating blocks, which hold the center conductor, was broken in two and showed burns. On the metal inserts, which hold the insulators, one of the screws was burned and badly melted. Also, there was some melting where the insulator block was burned in two.

“That strike went down the coaxial line, and each one of the wires in the RG-8 showed signs of being burned. It was not charred, but discolored. When I took the jacket off some of the coax and looked at the clear insulation, it looked like a dark streak inside. Stripping that off, I found that on the inside of the cable each stranded wire was burned.

“Where the coax entered the house under the porch there was a 15-foot length of RG-8, and in that, a PL-259 and a PL-258 were fused together. I was finally able to pry them apart. It short circuited three other PL-259s, badly burned a PL-258, and melted metal on the outside so that it was not usable. There were short circuits in three places in the 15-foot length of RG-8 under the house.

“The estimate of total damage was most fortunate—$332.67. However, I did much of the repair work myself. I replaced the bell transformer and the cable to the dumb-
"Some years ago my father was in the yard holding a steel rim off a buggy, and a cat. Lightning struck the steel rim and went through him, struck the cat, and then hit a boy standing nearby. It killed the cat and the boy, but did not kill my father.

"I have seen lightning strike the ground in an open field less than forty feet from a tree which was thirty or forty feet tall, so it isn't always the highest point that gets hit.

"I have seen it strike water. Once, when I was in the army, I saw it hit a telephone pole. The top third of the pole disintegrated.

"A man on a farm was once hit by lightning and killed. The nails in his shoes were formed into little balls which were rammied up into his feet all the way to his ankles."

Some years ago, WBMPJ, a friend of mine in Dayton, Ohio, had his antenna hit by lightning and it went through the wiring in the house. It burned a pattern on the wall all the way through the house, wherever there was wiring. Strangest of all, in the bathroom, it stripped all the mercury coating off the mirror. On the little side lights by that mirror, there were little knurled nuts that held the lights to the brackets. Those little nuts were unscrewed by the strike and were found on the floor.

The light fixtures were hanging by the wires, still connected. The total damage to the house, for replacing the wiring and fixtures, was over $2000.

Some years ago I had an NCL-2000 amplifier, which was on, and at the same time I was seeing in the distance what we usually call heat lightning. It was a clear day, and there were no clouds in the local sky. But in the distance, miles away, these little flashes could be seen, but no thunder was heard. I noticed that every time I saw these little distant flashes, my NCL-2000 tank would flash over. I disconnected it and stayed off the air until the storm passed.

There is only one word for lightning—unpredictable.
Build a CW Memory

— fun!

Try another one of our $10 projects.

Larry Kasevich WA1ZFW
78 Jackson Road
Enfield CT 06082

 Probably the most useful of electronic components today is the solid-state memory. This device comes in all sizes, packages, and families. There are RAMs, ROMs, PROMs, EROMs, static and dynamic, and even something called "bubble" memory. These devices are used in so many applications that the list is endless. Even with the latest and greatest microprocessors, the memory is as important as the microprocessor itself.

With the availability and low cost of solid-state memory, I put it to use for the amateur radio operator. Since CW only consists of two states, carrier on or off, this type of memory suits this application quite well. My goal was to design a unit that would be a useful tool for the CW operator. It consists of a
memory to store a coded message. The unit actually records what an operator sends with his key. In order to make this recorder more versatile, the rate of speed of the code can be varied without changing the output tone. This makes the unit useful for the beginner when learning the code because he could increase the speed slowly. (This unit could also be valuable in contests for repetitive information such as name, QTH, etc.—ed.)

The schematic and parts identification are shown in Fig. 1. There are ten connections to the circuit. The keyer is connected between pin 1 and ground. This could be a straight key or an electronic keyer as long as the signal is open or ground. An 8-Ohm speaker is connected between pin 2 and ground. The speaker will produce a tone whenever the key is depressed or whenever code is being played back from memory. This tone can be adjusted using either C4 or R6. A volume control can be added by simply putting a pot in series with the speaker. Two switches control the operation of the unit. The play/stop switch, connected to pin 3, when in the open position, applies a reset to U5, the memory address register. This puts the unit in a mode where the memory is idle and the unit can be used as a code-practice oscillator. With ground applied to pin 3, the unit will play back the code that is in the memory. The other switch, the record button, is connected to pin 4 and, upon momentary depression, sets the U6 flip-flop and puts memory ICs U1 through U4 in the record or memory-write mode. The play/stop switch must be in the play position during recording.

Power is applied to pins 5 and 6. A positive 5 V dc is required at about 500 mA. A normal transformer, rectifier, and filter with a voltage regulator, like an LM309, works just fine. To control the speed, a 100k pot is connected between pins 7 and 8. This controls the clock which is used to advance the address of the memory. This pot can be set in any position to record, and any position for playback. With the 4096 bits of memory, good resolution can be obtained from 3 wpm to 30 wpm. Don’t try to record 30 wpm code with the pot set for 3 wpm. It won’t work. Message times will vary from about 1 minute for a speed setting of 30 wpm to about 6 minutes for a speed setting of 3 wpm.

The Code Memory can drive a transmitter, if desired, provided an interface circuit is used. Pin 9 is available for this, but, note that the signal is CMOS, which is extremely limited in its drive capability. Consult the data sheet for the CD4011 NAND gate before you design an interface. Pin 10 can drive a buffer which, in turn, can be used to drive an indicator to tell the operator that the unit is in the record mode. It should be noted that when in the record mode, the unit will stop recording once the memory is full. The operator can instantly start from the beginning at any time by cycling the play/stop switch.

This Code Memory should be a useful tool for any CW operator, contesteer, or person learning the code. The cost of the components is less than $10.00, so not only is this a practical project, but also an inexpensive one. To make the construction easier, a two-sided printed circuit board is available for $10.25 from Larry Kasevich WA1ZFW, 78 Jackson Road, Enfield CT 06082.
Wire-Wrap on a Budget
—home-brew your tools

For building many integrated circuit projects, a printed circuit board is considered essential. The alternative is to make many connections in very limited space, and point-to-point soldering techniques are most tedious. One alternative to these wire techniques is wire-wrapping, where each connection is made by wrapping a square post with no 28 to 30 wire—no solder is required. One limitation to starting wire-wrap construction is the cost of the tool—$6.00 (minimum)—and many people are reluctant to get the starting tools. If your budget is limited and you want to experiment with wire-wrap, there is a no-cost way to begin.

Almost all of us have a few dozen ballpoint pens that refuse to write. Inside many, the refill is a metal tube. These are the type you need, get at least two of them. Some of the more expensive refillers have larger upper reservoirs which also make good handles, but any metal ones will suffice. First, clean the remaining ink out of each one. The metal plug containing the ball point should be carefully removed to clean it. Be sure to save the end piece! Cleaning is the hard part and is a little messy. Soapy water and a few pipe cleaners help.

Next, look at Fig. 1 and see how to file the notch in the side of the plug. This is the groove in which the wire will be placed, so make the V-shaped groove large enough for a #30 wire or a little larger so the insulation can also slide in if you prefer the first turn to be of insulated wire. Do not cut the pen end off before you file the groove. It is easier to hold it by that end while you file, and it's small enough anyway. (I lost the first one somewhere in my shop.)

After you have finished the groove, carefully cut off the small end of the plug flush with the large diameter. You may insert this almost all the way into the refill tube now and check to see if a wire will pass through the groove satisfactorily. The center hole should be just the right size to fit over a standard .025 x .025 pin. You may wish to file a groove across the diameter end of the plug, connecting the groove and center hole. This aids in causing the very end of the wire to be wrapped against the pin, but is not essential.

Another optional feature is a small hole, just above the groove in the plug, in the wall of the refill tube. This allows you to see the wire pass through the groove. If you look into the hole and cannot see the wire, it went into the center hole, which is wrong. Again, this is an option—drill as small a hole as possible. A no. 80 is large enough, but few of us have that small a drill. A hand grinder with a no. ½ dental burr will cut a nice groove and also drill a small hole, if you have access to one.

This completes the wire-wrap tool. Try it out. With a little practice, you can do as well with it as with any professional model. You will find that more time is spent cutting and stripping wire (if you do not buy the prestripped lengths) and inserting the wire than is spent in wrapping, so that manual tools are only a slight bit slower than motor-driven ones.

Now for the eraser for your mistakes! You need an unwrap tool, too, because you will want to remove wires to make tests, make changes, and correct errors. Since you may wrap a wire in either a clockwise or a counterclockwise direction, you want a tool that works in both directions. Look at Fig. 2 This time, the plug is put into the tube, the small end cut off and filed flush, and the plug is filed back to form a sharp edge which will pick up the end of the wire and unwind it. A triangular file or jeweler's file will help here to get the undercut edge. The edge should be beveled somewhat, as shown in Fig. 2(c). Grooving below the outside edge of the tool is optional. This makes it pick up the wire a little more easily sometimes. Try it on a few of your wraps to see how it works.

Now you are all set to wire-wrap your next IC project. All you need is wire, sockets, and a stripper. A cheap stripper which works well on no. 30 Kynar insulated wire-wrap wire is hard to find. Try using a good double-V stripper set carefully to nick the wire.

Fig. 1. Wire-wrap tool construction.

Fig. 2. Unwrap tool construction.
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It seems that in the last several months, 73 has carried more than its share of regulated power supply articles. I started to build one of them for use with my TR-22 and my Heathkit® amplifier. Sure, for three bucks or so, anyone can build a regulator for his power supply using a 2N3055 pass transistor, a zener diode, and a few resistors. The only problem is that such a circuit has no protection against short circuits and excessive current draw. To add the extra circuitry for protection can increase the cost considerably.

The solution to my problem was found in a new regulator subsystem by Fairchild. The device, a Fairchild 78H12, is a complete regulator with internal current limiting and thermal-shutdown circuitry in a TO-3-type case. It will handle 5 Amps at 12 V dc before current limiting begins. In other words, the device is indestructible. The price is about $9.00, which is expensive in this day and age, but not for complete protection in a TO-3 case. Other than the power supply capacitors and an output bypass capacitor, no other external parts are needed.

Fig. 1 shows a schematic of my supply. I added the regulator to an already-assembled power supply. Because the device is complete in itself, modification of the power supply was minimal. Also, the company that built the power supply was thoughtful enough to have drilled the holes for a TO-3 pass transistor. So, I simply mounted the regulator in the holes provided, and used a little heat-sink compound. If you plan to draw more than a few Amps, I would recommend using a heat sink—the bigger, the better. Two more steps completed the addition of the regulator. First, I had to break the positive lead between the filter capacitor and the output terminal strip. Then ran a wire from the capacitor to the input (pin 1) of the regulator, and a wire from the output (pin 2) of the regulator to the

The rear of the power supply shown with the 78H12 regulator installed in the holes that were provided by the manufacturer for a pass transistor. The white area around the regulator is not an insulator (the regulator case should be grounded to the chassis), it is common heat-sink compound which helps transfer the heat to the chassis from the regulator.

Inside view of the power supply. The two white wires connect the positive side of capacitors C1 to the input (pin 1) of the regulator, and the other is the output to the terminal strip on the rear. The capacitor on the terminal strip is C2, which bypasses any noise at the output of the regulator to ground.
develops about 18 volts of the chassis.

12-volt transformer which simulate the regulator from my power supply uses a ply from scratch, I would like the regulator must be at the case of the chassis, since the regulator needs to be insulated from the chassis.

If you are building a supply from scratch, I would recommend the use of a 15- or 18-volt transformer. My power supply uses a 12-volt transformer which develops about 18 volts of unregulated dc output. But, after the current passes through the regulator, the output is only a regulated 11.5 volts dc. Although I haven't tried, I don't think that the full 5-Amp capacity could be reached. Keep in mind, though, that the peak input voltage to the regulator cannot exceed 25 volts.

I've used the regulator with my 2 meter amp and TR-22. Under key-down conditions, the regulator will become warm to the touch after about one minute. Again, a larger size heat sink would allow more current to be drawn while keeping the regulator cool.

Two other versions are available: the 78H05 for 5 V dc, and the 78H15 for 15 V dc. Both will handle 5 Amps, and are priced the same as the 78H12.

Fig. 1. Power supply schematic.
Has Anyone Seen OSCAR 7?

—find it with your SR-56

An off-the-wall program for on-the-air fun.

Recently, I became a proud owner of a PC-100A printer. Now I'm swamped with printing tape, with every program imaginable all over the kitchen bar. There's even a program strip for how to figure wall paneling with prices and even how many panels per wall. It's amazing how a fellow can come up with off-the-wall programs, especially with the PC-100A.

There was one problem that had been bugging me ever since I heard QSOs on ten meters about a year ago. The problem was how to use the orbit times supplied in 73 Magazine. I've used the standard 115 minutes added to each orbit, but, when it comes down to the next initial orbit data given, it doesn't figure precisely. Once I got my new toy, it only took 40 feet of paper and an hour to figure out the math of it. The calculator I use is the Texas Instruments SR-56.

Now, here's how I figure orbits. After loading the program (Fig. 1) in the calculator, the next step is to load the initial time inversely into the calculator. For example, 0056:56 goes in as 56(sec) R/S, 56(min) R/S, 0(hrs) R/S. At this point, the

| 00 54 | 20 03 | 40 84 | 60 34 |
| 01 03 | 21 06 | 41 02 | 61 01 |
| 02 06 | 22 00 | 42 04 | 62 97 |
| 03 00 | 23 00 | 43 94 | 63 84 |
| 04 00 | 24 94 | 44 35 | 64 34 |
| 05 94 | 25 33 | 45 02 | 65 04 |
| 06 33 | 26 02 | 46 34 | 66 94 |
| 07 01 | 27 41 | 47 02 | 67 12 |
| 08 41 | 28 54 | 48 74 | 68 27 |
| 09 54 | 29 06 | 49 34 | 69 07 |
| 10 06 | 30 00 | 50 01 | 70 05 |
| 11 00 | 31 94 | 51 94 | 71 97 |
| 12 94 | 32 35 | 52 33 | 72 22 |
| 13 35 | 33 02 | 53 03 | 73 06 |
| 14 01 | 34 01 | 54 54 | 74 03 |
| 15 41 | 35 03 | 55 01 | 75 41 |
| 16 35 | 36 33 | 56 03 | 76 42 |
| 17 01 | 37 00 | 57 94 |
| 18 41 | 38 15 | 58 33 |
| 19 54 | 39 41 | 59 04 |

Fig. 1.

Fig. 2.
program is awaiting the next day's initial time crossing, 0134:24, and this will be loaded as the previous time was, inversely: 24(sec.)/5, 34(min.)/5, 1(hour)/5. The printout will be in decimal hours, such as 1.573333333. To change the decimal hours into hour-min.-decimal,-sec., refer to Fig. 2. Use this program or subtract the hour and multiply the fraction by 60, which will give the minutes. Then subtract the minutes (the integers to the left of the decimal) and multiply the fraction by 60. This will produce the seconds. Fig. 3 shows the process via the PC-100A for 1 hour, 34 minutes, 24 seconds. Should your times start to run over the 23rd hour, remember to subtract 24 from the hours portion to be in the right frame. This is noticeable whenever you're figuring out orbit times in your locale. In reality, 1.573333333 = 0.573333333 x 2.573333333. Now for the longitudinal crossings—Fig. 4 shows the program and Fig. 5 shows the results of two days. The positive initial crossings are between longitudes 0 degrees and 180 degrees on the Americas side, and the negative values are on the opposite side. Asian and European side of 1800 degrees. On the initial orbit of Jan. 28, 1978, it was a positive number (58.4); the next orbit crossing will be heading for the international date line at 180 degrees. After the OSCAR crosses the date line, its orbits will take on a negative number; therefore, the first orbit longitude after the date line crossing will be -157.9, and so on and so on.

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Some of the rf energy is also sampled and rectified to provide a muting voltage. Simply connect this output to the agc line of any modern receiver and adjust the mute level for the desired signal level. This circuit works with the agc only when it's fully active, of course.

The circuit shown will work well at powers up to 100 Watts. Additional power may be handled by inserting additional pilot lamps in series with the 15 pF capacitor. This unit causes some loss of received signal strength, but its simplicity and effectiveness will far outweigh this in all receivers. If you aren't fully QSK by now, spend an evening and join in the fun!

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Reader Service—see page 195
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Reader Service—see page 195
Need for RIT

One of the main problems of not having RIT is what happens, for example, when I am talking with another ham who doesn't have RIT, and each of us is busy trying to improve reception of the other's voice. I will retune my transceiver to get a more "natural-sounding" voice; then he will retune his—and we both end up jumping around in frequency. This could end us up close to another station, causing some interference or being interfered with. Since the majority of hams on the air today appear to be using a transceiver, jumping around in frequency or being slightly off frequency are all too common events.

For a time, I used a Ten-Tec Argonaut for a bit of QRP work and became attached to using its offset feature. Upon completion of my HW-104, the first thing I considered doing was incorporating RIT and regaining some of the versatility of the Argonaut's offset control. After the "lids" were on the 104, however, and looking with some affection at my handiwork, I began to have second thoughts.

I've seen additions to equipment by others. Sometimes there is very professional work which doesn't detract from appearances, and in other cases you have to pretend you don't notice the additional switch, jack, meter, or whatever to keep from offending the obviously proud installer (All the while you're fighting off an impulse to ask what brand of chewing gum was used to stick the little goodie on with.)

An Outboard Vfo

After weighing the pros and cons, I came to the conclusion that, if at all possible, RIT would have to be obtained without any modification to my new 104. Another factor is the ability of the 104 to go from one end of the band to the other without any peaking, tweaking, or anything else changing the vfo frequency (providing you didn't mess up your antenna impedance design homework). Therefore, to be able to take full advantage of the broadband characteristics of the 104, it dawned on me that an outboard vfo would act as an RIT if proper switching or relay action were provided. In this case, not only would I get RIT, but I would be able also to make use of split operation—perfect for contests and DXing.

Once the decision was made to go to outboard or remote vfo, I began to look around for the best available remote vfo for the price, with ruggedness, durability, and stability, coupled with good eye-appeal. After using the 104, I knew the vfo in the rig was capable of meeting my ideals, but at the time, the engineers at Benton Harbor were on the verge of coming out with the SB-104.
104A. The remote vfo for the 104 wasn’t listed in the catalog, and it would not have had RIT had I obtained one.

Looking around and considering what was still available on the market, I discovered that I could get a remote vfo and RIT in the same box for about the same price as the Heath remote vfo, had it been available. The only problem would be with the controls necessary to obtain selection of internal or external vfo and the push-to-talk (PTT) control for selecting the desired vfo on transmit.

My selection was Kenwood’s model VFO-520 remote vfo, since it was readily obtainable and promised to do everything I needed. According to the stated specifications, it was compatible with the requirements of the 104.

The plan from the beginning was to utilize an outboard vfo with no modification either to the vfo or to the 104. This was accomplished by placing all interfacing components inside a miniature aluminum box which I placed out of sight behind the 104. Interconnection between the 104 and outboard vfo was neatly tucked away, and the interfacing was done silently and effectively.

A small cable from the interfacing box connects to the remote vfo. Two short pieces of RG-58 or RG-174 extend from the interfacing box to the rear of the 104, where Heath has provided convenient jacks for the vfo output from the internal vfo and for vfo signal input. Normally, if no external vfo is used, a simple jumper is installed between the two jacks. Only three other wires are necessary: 13.8 V dc, ground, and the PTT signal line. Two-conductor mike cable, with shield, may be used for these last three wires.

Kenwood has come out with a new design level since I purchased my VFO-520, but I imagine the new remote vfo and the old one are electrically equivalent. However, before buying the new one, in case the old one is hard to find, verification with a Kenwood dealer is recommended. Used equipment dealers should be eager to sell remote vfos if they have them in stock, because most hams don’t need a remote vfo immediately when buying a new station, and this may leave the dealer with some extras.

The interfacing detailed in this article is what makes the combination work, so parts of the circuitry may be adaptable to other transceiver-to-remote hookups. Before planning to use combinations other than Kenwood to Heathkit, remember the two primary considerations: vfo frequency and which way the vfo is designed to tune. In this case, the Heathkit requires (a) that the vfo tunes from 5 to 5.5 MHz, and (b) that the vfo must tune backwards—which means that for a higher frequency of operation, the vfo will be producing a lower frequency, and vice versa.

The Circuit

A look at Table 1 will give an idea what the requirements of the vfo are and will aid in explaining what the interfacing connections accomplish. Block diagrams in Figs. 1 and 2 show how connections are made and demonstrate just how simple the project is. Figs. 3, 5, and 6 show the builder how few parts are required and may be followed as wiring diagrams. I will briefly discuss the various sections of the circuit, without details of the action of each electron, so that a better understanding of the circuit design and function can be achieved.

The power supply is the most complicated part of the interfacing box, but is actually a very basic circuit. For purposes of explanation, refer to Fig. 4 and notice that current flow is through zener diode D1 by way of resistor R1. Since a zener diode is designed to pass a large amount of current in the reverse direction, when voltage across the diode reaches a certain level, it performs as a voltage reference device. In other words, as the voltage is raised across the diode, more current is passed by the diode at a certain voltage level, increasing the voltage drop across R1. In turn, this tends to stabilize the voltage across D1. The value of R1 is chosen to provide enough current for stable zener diode operation and to limit current through the diode to a safe value.

You may recognize transistor Q1 as operating in a standard emitter-follower amplifier circuit, but it is enough to remember that when Q1 is operating, a nearly constant voltage difference of a specific value is maintained between the base and emitter, mainly determined by the physical properties of the type of material used in making the transistor. For
and due to the clamping action of D1 on the base, the emitter circuit will supply current at a constant voltage. Capacitor C1 is used for insurance against the possible generation of white noise in the zener diode, due to random current paths in the silicon permitting "bumping," or friction, between groups of electrons, and resulting in a hissing sound.

Transistors Q2 and Q3 are used to operate relays, acting as current switches. R2 and R3 limit current in the base circuits to a safe value in the transistors and provide some isolation between the circuits. Diode D2 is used to limit to a safe value the "flyback" voltage generated as the relay winding is de-energized, since the inductive kickback voltage is usually high enough to jeopardize the switching transistor. Without this diode, the transistor could be "punctured" and destroyed.

**Construction**

All parts are common parts which either I had on hand or I bought at the local Radio Shack store. Table 2 gives a list of parts, and, while some substitution is possible, I recommend going with a winner and sticking with the circuit given, unless you like to experiment.

Silicone rubber compound, such as General Electric's RTV, would make mounting the relay a snap if you have it around. Perforated experimenter board can be used to mount the parts, but I soldered the parts to the pins on the 9-pin socket and rf connectors and experienced no mounting problems. Sockets for the rf cables between the interfacing box and transceiver may be considered unnecessary, but are recommended in order to keep everything grounded and shielded.

The VFO-520 comes with an interconnecting cable which has a 9-pin plug on each end. This cable is straight-through—that is, pin 1 goes to pin 1, etc., on each end of the cable. Also, pin numbering is standard, counting clockwise, starting from the large space between pins while looking at the bottom.

Remember to use the ground wire provided to strap the transceiver and vfo together, since depending on signal wire shields for grounding is poor practice. If the ground wire provided isn't long enough, one should be made up, since noise could be experienced later as connectors become dirty or oxidized.

**Operation**

Since placing the remote vfo in service, I have not had any problems whatsoever. Stability is as good as the 104 vfo, and that's pretty good. In fact, for almost all general operating, the Kenwood vfo is used exclusively. At first, one might think the price is pretty high just to get RIT, but not only do I now have RIT and the capability of comparing vfo operation, I also have the ability to set up operation on another band by verifying frequency availability and then moving with just a flick of the bandswitch. Actually, I now have the same capabilities as if I were using a separate receiver and transmitter, except for crossbanding.

I thought at one time I had a stability problem, but it turned out to be an oxidized bandswitch in the 104, and cleaning with a pencil eraser did the trick. (Take note, 104 owners.)

The function switch on the remote vfo gives total control over operating frequency. The four positions of the function switch are as follows, along with operating mode if the indicated position is selected:

- **OFF**—Remote vfo is off. Transmit and receive frequencies are controlled by vfo in rig.
- **REC**—Remote vfo controls receiver; rig's vfo controls transmitter.
- **REC/XMIT**—Remote vfo has total control.
- **XMIT**—Remote vfo controls transmitter; rig's vfo controls the receiver.

**Summary**

I don't expect any trouble from my vfo in the future because, upon inspection of the interior of the VFO-520 (I have a thing about looking inside every new thing I buy), I found good construction techniques were used, both electrical and mechanical. There was shielding where I didn't expect it, in fact. There is no reason why the VFO-520 cannot be used with other rigs with a little bit of homework, and I hope I've made it clear enough so others can duplicate the project without too much trouble. I also hope that those who do will get as much enjoyment out of the expanded operating capabilities as I have—all without modification to the rig or the vfo.
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73 Magazine
An 8-Element, All-Driven Vertical Beam
— super array for DX

Good news from New Hampshire.

The most popular 20 meter beam antenna in use today is the yagi mounted horizontally on top of a tall tower. A "package" price on such an antenna, a three-element triband beam, a rotator, a 51-foot crank-up tower, and 100 feet of coax and rotator cable was recently advertised in ham magazines at $1,095. In addition, you will have to pay for shipping and cost of erection (including concrete, guy wires, anchors, etc.), to say nothing of the legal fees to defend yourself against the local zoning board because you erected a 51-foot structure on your property without a building permit. To avoid the above expenses, I designed and built a vertical array over a ground plane with a maximum height of only 16.4 feet and a total erected cost of only $60, plus a few bucks for the extra RG-58/U needed, thus saving well over $1000, well over $1000.

Vertical beams described in the literature are generally either two- or four-element ground-mounted phased arrays for 3.5 or 7 MHz.' The directivity of these beams can be changed by various switching arrangements. The usual method is to switch in coils of coax cable cut to the required length for the number of degrees lag required. This is relatively simple for two elements. However, the gain from such a two-element beam is also relatively low. To increase the gain, it is necessary to increase the number of elements in the beam. Four is usually the

A general view of the array in relation to the shack which is in the upper rear room of the old farmhouse.
maximum number of elements used. These may be arranged in a straight line, a square, or a triangle, with the fourth element in the center. The complexity of the switching and phasing increases at a faster rate than the gain from such an array. Although the gain is low from such an array, it is more than adequate on 3.5 and 7 MHz, where rotatable beams are very expensive and difficult to construct.

To get enough gain on 14 MHz from such an array to be competitive with yagis and quads on towers, at least eight elements are necessary. Therefore, I sketched up an eight-element phased array with switchable directivity, but gave up the idea after calculating the number of relays and the feet of coax cable that would be needed.

Parasitic Array
One-half of an eight-element yagi (split down the middle) mounted vertically over a ground plane looked really interesting since it only required a single length of RG-8/U for a feeder and could possibly be made into a tribander for 20/15/10. An eight-element parasitic beam could not have its directivity switched, but since I had already given up that idea, I decided to go ahead with a large high-gain unidirectional beam fixed on Oceania. It was decided to start with four elements, a reflector, a driven element, and two directors, later expanding it to eight or more elements by adding more directors. With this in mind, I reviewed the literature on yagi antennas. A 20 meter beam is generally limited to three elements only because of the difficulty in supporting a long boom 50 to 60 feet up in the air. Imagine the wind and ice load of an eight-element beam with an 80- to 100-foot boom! This is no problem on VHF where high-gain 10- to 16-element yagis are common. Neither is it a problem on HF when the beam is vertical with each element mounted on its own ground post.

Since I wanted my beam to point to Australia, which is 270 degrees true from central New Hampshire, I drove a 5-foot ground stake of 1-inch diameter pipe into the ground and attached the driven element to it. At precisely noon sun time, a stake was driven at the end of the shadow of the driven element. This established true north. Next, I measured off 90 degrees and drove another stake, marking the true east/west axis of my new beam. The three ground posts for the reflector and two directors were installed next, together with their elements, along this east/west line. A length of RG-8/U was hurriedly run from the shack to the driven element just before dark. There was no time to install radials, but I did have a good (?) ground, four pipes driven into the moist soil to a depth of 3 feet.

At 6:00 am the next morning, I called CQ and was elated that VK3AKK answered and gave a report of strength 5 on a rather poor band. I was delighted that the first QSO on my new Australian beam was with a VK station. Anxious to see how much better it was than my other antennas, I switched in turn to a Hustler 4BTV, a dipole, and an eight-wavelength longwire. Ken came back saying: "Don't slash your wrists or cut your throat with this report, but although your new beam is a good 5-5, the 4BTV ground plane is an S-7 and the dipole is an S-9. The longwire (pointing at South America) is an S-6."

So, back to the drawing board! It seems I have read somewhere that a pipe driven into the ground makes a good lightning arrester but not an rf ground! An swr check showed an extremely high swr ratio, so a 50-Ohm dummy load was placed at the far end of the coax. The swr came down to 1 to 1, showing the cable to be OK. Realizing that the trouble was probably due to the lack of a ground plane, four radials, each ¼ of a wavelength long, were installed at the base of each element. The swr immediately came down to 3 to 1.

A field-strength meter was set up about 60 feet in front of the beam, and the lengths of each element were varied in steps of 2 to 3 percent both ways with no very conclusive results. The elements did not want to tune. It appeared that I was trying to adjust the length of an element an inch or so at a time against some unknown random length of a ground system. Four more radials were added, making a total of eight radials per element. I reset the lengths of each element to 5 and 10 percent shorter for the directors and 5 percent longer for the reflector and ran another swr check. The swr was now down to 2 to 1, a worthwhile improvement.

The next morning, another CQ raised VK4AGL. The new beam was beginning to work. Joe gave me the following comparative report: new beam S-9, dipole S-8, 4BTV S-7, longwire S-5. It appeared I was now in business, so I started adding more elements, more radials, and a 4-to-1 step-down transformer. After each change, I would collect comparison reports for about a week. The greatest improvement in reports resulted from increasing the radials to 16 per element. The final 8-element
yagi beam gave a consistent two 5-unit increase in signal strength (about 12 dB) over the best of my reference antennas. I still was not happy with the beam because I could not see any definite results from trying to tune it. Adjusting the lengths of each of the eight elements became very tedious and time-consuming. It was decided, therefore, to try an all-driven 8-element phased array, starting with two elements, then going to four, and then to all eight.

Phased Array

In a phased array, there are two things to watch out for: First, if \( \frac{1}{4} \)-wavelength spacing between elements is used for end fire, then there must be a 90-degree lag between elements, and second, the power must be divided equally among all elements. The first problem is solved by feeding the first element directly from the coax from the transmitter and then feeding the second element through an extra \( \frac{1}{4} \)-wavelength of coax. Now, obviously, an electrical \( \frac{1}{4} \)-wave of coax, 11.4 feet, will not reach between two \( \frac{1}{4} \)-wave spaced elements, 17.3 feet; therefore, we must lengthen the coax to each element by an equal amount. For ease in grid-dipping each length of coax, I chose to lengthen each coax by \( \frac{1}{4} \) of a wave. Refer to Fig. 1 for the power division and phasing of the first two elements. The formula for the electrical length of a quarter wavelength of coax is: \( L = \frac{246 \times \frac{V}{f}}{11.39} \) feet when \( f \) (frequency in MHz) = 14.25 MHz and \( V \) (velocity factor) = .66.

Handbooks say \( V \) equals .8 for foam dielectric RG-8/U and 66 for solid dielectric. This makes a good starting point. Be sure to grid-dip your particular coax to 14.25 MHz, each time checking the grid-dip frequency on your receiver. Solder a 1-inch diameter loop onto a coax chassis fitting and then screw on the length of coax to be checked. If it is solid dielectric cable, then it should be cut to a few inches longer than .66 times \( \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, \) or \( 1\frac{1}{4} \) wavelengths and then pruned to length with the grid-dipper. When dipping the \( \frac{1}{4} \)-wave coax, set the dipper at 7.125 MHz and read its second harmonic at 14.250 MHz. For all odd quarter wavelengths of coax, set the dipper at 14.250 MHz. The end of the cable you are pruning must be open-circuited. It was interesting to note that none of my coax had a velocity factor, \( V \), of .66; it varied from .59 to .62.

Referring again to Fig. 1, you will note that the power from the transmitter is hopefully divided in half by the coax "T", one half going to element \#1 and the other half going to element \#2. Also note that points A and B are equidistant from the coax "T"; therefore, there is no phase difference between them. There is, however, an additional \( \frac{1}{4} \)-wavelength of coax between points B and C; therefore, it takes the signal that much longer to reach point C. Since there are 360 degrees in a wavelength, \( \frac{1}{4} \) of a wave equals 90 degrees, and the signal in element \#2 is said to "lag" that in element \#1 by 90 degrees. This same method of feed will be used for each pair of elements.

This 2-element phased array was used for a week working VKs and ZLs, with results equal to the 4-element parasitic beam. Of course, by now I had a better ground plane than earlier. Next, two more driven elements with \( \frac{1}{4} \)-wave spacing were added. In each case, the division of power was hopefully accomplished by simply installing a coaxial "T" in the line as shown in Fig. 2. Phasing was accomplished by feeding the two pairs of elements through a \( \frac{1}{4} \)-wave and a \( \frac{1}{4} \)-wave section of coax as shown. The reason for doing this was to avail myself of a pair of \( \frac{1}{4} \)-wave matching transformers. If each of the driven elements had feedpoint resistances of 50 Ohms, they would be in parallel at the first "T", producing 25 Ohms of output. Now, if we connect in a 50-Ohm coaxial transformer an odd number of quarter waves in length, we can raise this 25 Ohms to 100 Ohms \( Z_0 = \sqrt{\text{Zr} \times \text{Zs}} \), where \( Z_0 \) is the line impedance (in our case, for RG-8/U, 50 Ohms), \( Zr \) is the impedance at one end, and \( Zs \) is the impedance at the other end, 25 Ohms. \( Zr = Z_0^2/Zs = 50 \times 50/25 = 100 \) Ohms.

Now, at the next "T", we have two 100-Ohm resistances in parallel, giving us the desired 50 Ohms for the RG-8/U. An swr check bears this out. The swr with two elements was a little over 1.5 to 1. With the four elements and the transformers, it dropped to almost 1 to 1. The element lengths and the spacing had been calculated from the following formulas: All \( \frac{1}{4} \)-wave elements, length in feet = \( 246 \times \frac{95/14.250}{16.4} = 16.4 \) feet. All element spacing, in feet = \( 246/14.250 = 17.26 \) feet.

A week of operation proved that the four phased elements equaled the 8-element parasitic beam. Many VKs and ZLs were worked, as well as some long-path contacts to
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<th>Proportional Oven Accuracy Over Temperature</th>
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<th>75MHz To 500MHz</th>
<th>500MHz To 1GHz</th>
<th>Number Of Digits</th>
<th>Size Of Digits</th>
<th>Power Requirements</th>
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<td>50Hz to 700MHz</td>
<td>2 PPM 0° to 40°C</td>
<td>50MV</td>
<td>10MV</td>
<td>NA</td>
<td>8</td>
<td>5 Inch</td>
<td>115 VAC-BATT 8 to 15VDC</td>
<td>3&quot;H x 8&quot;W x 6&quot;D</td>
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<tr>
<td>C1000</td>
<td>10Hz to 1GHz</td>
<td>1 PPM 0° to 40°C</td>
<td>20MV</td>
<td>1MV</td>
<td>&gt;50MV</td>
<td>9</td>
<td>5 Inch</td>
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Among CBers. I often notice truck drivers looking out their windows with mike in hand . . . "Got your ears on, good buddy?"

A view of the array from the highway with our old cattle barn in the background. This view is looking to the east off the back of the array and causes considerable comment among passing CBers. I often notice truck drivers looking out their windows with mike in hand . . . "Got your ears on, good buddy?"

the Indian Ocean, South Africa, and the South Atlantic. Another set of four elements was installed, one at a time, in line and phased, the same as shown in Fig. 3. The second group of four elements was delayed the proper number of degrees each by feeding them off another "T" with a 1¼-wavelength coax line.

The method of power division into eight equal parts is patterned after the way you would divide the power to eight two meter beams. I used this method very successfully in the 1950s on a 32-element beam for 144 MHz. Fig. 4 shows how it is done. No measurements have been made to find out exactly what the power division actually is between elements; however, judging by the array’s performance, it must be fairly correct.

Swr measurements with various numbers of elements are as follows: 1 element, 1:1; 2 elements, 1.5:1; 3 elements, 3:1; 4 elements, 1:1; 5 elements, 2:1; 6 elements, 3:1; 7 elements, 2:1; 8 elements, 1.5:1. The addition of a ¼-wave Q transformer, Fig. 5, made up of 2 parallel lengths of 75-Ohm coax, as shown, raised the 25-Ohm output of the last "T" to 56 Ohms, close enough to 50 Ohms to give an swr of 1:1 for the transmitter to look into. Several weeks of tests on the completed 8-element phased array show that it tops the parasitic beam by a good 5-unit. This is perhaps because I was never able to get all six directors and the reflector properly tuned for maximum gain. It appears that a parasitic element requires a much more perfect ground plane for tuning than does a driven element. At any rate, the all-driven array was much easier to get going than was the parasitic array. I suspect that an all-driven 4-element rotary beam would outperform a conventional yagi.

Construction
A readily available source of inexpensive tubing for this array is thin-walled galvanized steel electrical conduit, found at most electrical supply houses or discount stores. Each element is made up of a 10-foot top section of ½-inch diameter tubing telescoped into an 8-foot bottom section of ¾-inch diameter tubing. The two sections are accurately measured to 16.4 feet and then fastened together with three 10/32 machine screws tapped into the outside tube.

The ground post is a 5-foot section of 1-inch-diameter tubing driven 3 feet into the ground with a sledgehammer. Be careful to get it exactly vertical using a carpenter’s level so that all your elements will line up nicely. Cut off the top 2 inches to get rid of the deformed part caused by the pounding.

The driven elements are each insulated from the ground posts with thick-walled plastic conduit or rigid plastic water pipe.
This is cut into 3-inch lengths and split lengthwise, one size to fit the ¼-inch conduit and one size to fit the 1-inch ground post. See Fig. 6. The RG-58/U is attached to the bottom of the element with a 10/32 machine screw, while the braid, after tinning, is clamped to the ground post along with 16 radials by using a stainless steel hose clamp right at ground level. The plastic insulators are squeezed into place with a C-clamp about 18 inches apart and held there with black vinyl electrical tape until the elements are secured with TV U-clamps.

Remember that the element length is from the top of the element to the point where the radials are clamped to the ground post. Fig. 7 shows the right and wrong way of attaching the radials. Keep the leads on the end of the coax as short as possible, as these add to the length of the driven element. It would be wise to give all the pieces of conduit a couple of coats of rust-proof paint before erection. Also, put corks in the top of each element and ground post to keep out water which will freeze and split the tubing in the winter. Tape the joint of the ½- and ¼-inch tubes with vinyl tape for the same reason.

Ground Plane

There have been a number of papers published recently on the importance of ground radials or ground planes for vertical radiators. Most of these have been for single-element verticals or for shortened verticals. They have compared the efficiencies of several different ground planes using various numbers and various lengths of radials. A broadcast band station normally uses 120 radials, each 0.4 wavelengths long. If you plan to do this at 14 MHz for each of 8 elements, you will have to bury about 5 miles of wire in your yard, and if you do not want any TVI, you had better solder each place that the wires might touch each other or insulate them well. See Fig. 8. A poor joint will rectify your signal and generate harmonics.

Since I had found no information on the number of radials needed for an 8-element array, I decided to start with none and add them a few at a time until there was no longer any noticeable improvement. You have already read of the disastrous results with no radials and of the improvement as radials were added. If you decide to stop at 16 radials as I did, you will need $16 \times 8 \times 17$ or about 2176 feet of wire, just under ½ of a mile. I bought two ¼-mile spools of #17 galvanized electric fence wire from the local farm supply store for $12. To solder the crossover points before burying the wire, I used acid core solder and then brushed the joint with baking soda to neutralize the acid. The radials were buried a maximum of 1 inch in the sod so that they would not get

Looking west along the line of the array: The Connecticut River flows in the valley and the hills in the distance are in Vermont. Note that the top of the 7th element is just even with the horizon. A little trig with a pocket calculator tells us that our minimum angle of radiation is about 6 degrees.
tangled up in the lawn mower. The less "lossy" the dirt over the radials, the better. Fig. 8 shows the layout of the radial system. The dots indicate soldered crossover points.

Coaxial Cable
RG-8/U solid dielectric coax was used for the feedline from the transmitter to the first "T". RG-59/U, 75-Ohm, was used for the 37.5-Ohm ¼-wave transformer, and RG-58/U was used for the phasing harness. Of course, you could use the larger coax throughout if you have it available.

Results
How do you report on the merit of a new beam? The usual method is to set up a field-strength meter and rotate the beam, noting how the field strength varies with different headings. You could calculate the theoretical gain" or perhaps program a computer to do it for you. In this way, you could find out what the beam should do under certain conditions. What I wanted to know was what would the beam do under actual conditions. The only way to find this out is to call CQ DX and see from what direction your answers come. Then instantly switch back and forth between the beam and a fixed reference dipole and a reference ¼-wave ground plane antenna and request the DX station to give you comparative reports on the three antennas.

As a general rule of thumb, the gain of a beam increases by about 3 dB when you double its size. The ARRL Antenna Handbook states that a 3-element phased endfire beam has an average gain of 5 dB depending on several variables, while a 6-element beam has a gain of 8 dB. In an attempt to measure the gain of our new array with a homemade field-strength meter with a remote indicating meter, we got a gain figure of 12 dB. In a test with W1PFB/mobile on a hill 20 miles away in Vermont on a bearing of 270 degrees, Glen reported the array was S-9, the Hustler 4BTV was S-4, and the dipole was S-2. At six dB per S-unit, this looks like a 30 dB gain, 1,000 times in power, well, you know how S-meters are. The average VK and ZL station, however, also reports the array 3 to 5 S-units better than the two reference antennas. The proof of the pudding is in the high percentage (about 95%) of answers to CQ DX that come from VK, ZL, and other southwest Pacific Ocean areas.

A possible explanation for the reports of 20-to 30-dB gain at a distance of 10,000 miles from an antenna that should only have a gain of 9 dB is that perhaps its angle of radiation exactly matches the angle of propagation for that distance and that the angles of radiation of the 4BTV and the dipole do not. The Handbook states in Table 1, p. 18, that at 14 MHz, signals arrive 99% of the time at between 6 degrees and 17 degrees and...
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Since the maximum single arrival 50% of the time between 6 and 11 degrees, it might be several S-units weaker than the array, thus accounting for the discrepancy in the gain figures between the array and the dipole.

Fig. 10 shows the vertical radiation of a vertical dipole with its center ¼ of a wave above ground. It is believed that a ¼-wave ground plane would have a similar pattern. Note that the effect of ground attenuation absorbs most of the radiation below 10 degrees. My 4BTV has 16 ¼-wave radials, more than usually used, but far less than the recommended 40 radials, each 0.4 of a wavelength long. Therefore, it may have a higher angle of radiation than the array and take one or two extra hops to reach Australia. Thus, with the ground attenuation and the extra hops, it might be even weaker than the dipole, and it appears to be. This phenomenon, of course, also applies to rotary beams. For example, three identical beams with a gain of 8 dB will each exhibit completely different gains at a point 10,000 miles away, depending on the height at which they are mounted. The one exactly ¼ of a wave above ground will be the weakest, the one 1 wave above ground will be an S-unit or so stronger, while the one 1½ waves high will be by far the strongest. At 2500 miles, however, they may be all equal.

Over a three-month period, more than 150 VKs and ZLs were worked, many of whom could not even be heard on the 4BTV or the dipole. QR from the west is louder, of course, because the array points that way; however, most of these stations are still asleep at 6:00 am Eastern Time. The side-to-front and front-to-back ratios must be fairly good because QR from Europe and South America is rarely a problem.

If you already have a quad at 60 to 100 feet, this array will not help you. If, on the other hand, you only have a tribander at 35 feet, you may do better in one direction with this phased array, saving the cost of a taller tower. If you are considering spending a bundle for a 60-foot tower and rotatable beam, you may do well to consider two or three of these arrays, each pointing toward needed new countries. Your ability to instantly switch direction with several of these arrays without waiting for a cumbersome rotary beam to turn is indeed a new experience in DXing.

This array, with its method of phasing and power division, may be scaled to other amateur bands. It is possible that top-hat loaded elements could be used on 80 and 40 to keep the height down to 16 feet.12

The directional characteristics, both horizontal and vertical, are shown in Figs. 8 and 9.

---

Each of the eight elements is attached to its ground post as shown, using split sections of plastic water pipe for insulators held in place with mylar electrical tape and clamped together with TV U-clamps. Refer to Fig. 6.

Arrive 50% of the time between 6 and 11 degrees. It is also pointed out that since the maximum single hop via the F2 layer is 2500 miles,11 a signal traveling from New Hampshire to Australia, 10,000 miles, would require a minimum of four hops. A signal radiated from a dipole ½ of a wave high would have a pattern like that in Fig. 9, with most of its power being radiated at an angle of 28 degrees. It would, therefore, require more hops to reach Australia, and since each hop attenuates the signal, it might be several S-units weaker than the array, thus accounting for the discrepancy in the gain figures between the array and the dipole.
and vertical, of antenna arrays similar to the one discussed in this article may be found in various handbooks.\textsuperscript{13}

The direction of radiation of this array may be switched end-for-end or broadside by bringing equal lengths of RG-58/U from each element into the shack to eight single-pole, three-position coaxial switches. Three different phasing harnesses would be switched into circuit.

**Operation of the Array on 21 and 28 MHz**

Recently, during a 10 meter band opening, I decided to check the SWR of the 4BT vertical on 28 MHz, and, to my surprise, it was 1:1. I was more surprised to find that the coaxial switch was in the 20 meter array position, not the 4BT position. Further measurements showed the SWR of the array on 10 meters to be as shown in Fig. 11. Next, the SWR was measured on 21 MHz. These figures indicate that the array should work on both 10 and 15 meters, and indeed it does. On 10 meters, the SWR is 1:1 around 28.5 MHz and is below 1.5:1 from 28.1 to 28.8 MHz as shown. On 15 meters, the SWR is 1.3:1 at 21.150 and is below 1.7:1 from 21 to 21.450 MHz. Listening and transmitting tests confirmed that on the ten meter band the directivity was essentially the same as that on the 20 meter band. Signals from the west peaked up a couple of S-units, while signals from the south and northeast fell off a couple of S-units compared to the 4BT and the dipole. On 21 MHz, the directivity was less pronounced, but the array proved to be effective, equal to or better than the 4BT or dipole in the westerly direction.

Why does a 20 meter array work on 15 and 10 meters? Terman\textsuperscript{14} states that an endfire array consists of identical antennas arranged along a line carrying equal currents excited so that there is a progressive phase difference between adjacent antennas equal in cycles to the spacing between these antennas in wavelength. He further states that the gain of the array is proportional to the length of the array, but is independent of the spacing of the elements provided that the spacing does not exceed a critical value of about \( \lambda/3 \) wavelength. Greater spacing is permissible under certain conditions. The array being described fulfills the above conditions on 14 MHz with a 90-degree phase lag and \( \lambda/4 \)-wave element spacing. On 21 MHz, using the same phasing harness, the phase lag becomes 135 degrees with the \( \lambda/3 \)-wave spacing between elements. On 28 MHz, we have a 180-degree phase lag with \( \lambda/2 \)-wave spacing. In other words, the phase lag between elements is correct for the element spacing on each of the three bands. The element lengths, however, are incorrect on 21 and 28 MHz. On 21 MHz, the elements are \( \lambda/3 \) of a wave long, as are the \( \lambda/4 \)-wave Q transformers. It is not quite clear why it works as well as it does on 15 meters. On

![Fig. 9. Vertical angle of radiation of a half-wave dipole at a height of \( \lambda/2 \)-wave above a perfectly conducting ground.](image)

![Fig. 10. Vertical angle of radiation from a half-wave vertical antenna whose center is \( \lambda/4 \)-wave above a perfectly conducting ground.](image)
28 MHz, where the elements are ½ of a wave long, it would appear that we are trying to feed a high impedance point with a low impedance feeder. There is undoubtedly a very high swr on the coax nearest to the elements. The losses will be low since the coax is short. Since our ¼ wave Q transformers are now ½ of a wave long, they no longer act as Q transformers but simply repeat the impedance from one end to the other. At each “T”, we parallel these impedances and cut them in half, thus reducing the swr as we get nearer to the transmitter. Terman shows that the gain with ½-wave spacing is only about ½ that of ¼-wave spacing, however, since the array on 10 meters is twice as long as it is on 20 meters, the gain doubles and therefore is about the same as on 14 MHz.

P.S. It works like a bomb on CB. ■

References

Fig. 11. Swr curves for 7 MHz through 28 MHz for the array.

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Dear ICOM,

This letter will explain what happened to my ICOM IC-215 while on a Two Meter Fox Hunt. First of all, I want to thank you for making such a fine fox hunting radio. I have had eight first place wins in a row using this radio. However, as you can see by the enclosed photographs, I had a mishap with the rig.

While on my last hunt (which was a first place by the way) I had dropped the radio out of my Jeep Cherokee while getting out to find the fox. I didn't realize that I had done so until we were leaving the area in which they were hiding. Well the fox was hid deep in the woods, and the ground was very muddy, and all the other four wheel drive vehicles were on the way to the spot where I thought that the radio might have dropped. So we raced back to the spot, to find that the radio was run over by a seven thousand pound truck and mashed into the ground! Now this might have been a real catastrophe, but the radio was still in working order. One of the other hunters had found the radio just before I had arrived on the scene and thought that the sound coming from the ground was the fox!

Well as you can see, the only real damage is to the case, and my self-installed tone pad has expired. So thanks for making a tough little radio, and keep up the good work.

Sincerely,

Paul J. Mayer, Jr.
WB9ZHG
CW with a Nordic Flair
— new life for the Viking I

Butcher your boat anchor.

For the CW op who is looking for a respectable signal with minimum cash outlay, here's a chance to put a quarter kilo on the bands for about two bits per Watt.

The recipe for this treat has, as its main ingredient, one of the old boat anchors that were "in" before the advent of the filamentless tube. We refer to rigs in the Viking class which can be acquired at hamfests for anywhere from $30 to $100. Prices generally are inversely proportional to the algae accumulation, that is, the more shine outside, the higher and bigger the ticket. I can only encourage prospective buyers not to worry about outside rust, dents, and scratches, but rather to get a close evaluation of the innards, mainly the power transformers and rf section.

When I acquired a Viking I, the cost of the rig was less than the follow-up chiropractic costs from hefting this unmobile monster. So, numero uno for the mod squad was a requirement to trim, slim, and debulk the critter. If you have a Viking, compare it with the photograph which shows a lot of gaping space left when we retired from surgery.

I don't have any "remove the third bolt and cut the green and white wire three inches from the end" type of description for these mods. But take heart and use judgment and a certain amount of caution. It's your rig to butcher as you bloody well please, so you're the only judge of what you do. An old friend used to assay his home jobs in two categories—for fun or for sell. You won't have much of a shot at selling it, except on performance, so have fun like I did.

Check the circuit of the unmodified power supply. There are really a powerful lot of iron components floating around, iron that means good design but is not really needed in a strictly CW machine.

Transformers T1 and T2 are needed, of course. But chokes L1 and L2 were promptly relegated to the junk box (which is one way to build up one of those junk boxes that builders always seem to have). These chokes serve to smooth out the ripple in the outputs of their respective power supplies. You learned about them studying for the General exam without getting involved with more complicated stuff like $E = L \frac{di}{dt}$, which has to do with the notion that a changing cur-
rent through an inductor causes a back electromotive force (emf). The back emf tends to oppose the change in voltage trying to take place, with the net effect that one tends to cancel the other, particularly when load demands change, as in modulation. So, instead of a changing voltage at the rectifier output (a ripple), you get a smoother dc voltage, which is why it's called a smoothing choke.

Those chokes are fine for ten meter phone rigs, but, since this is a CW rig, we care less about phone and don't need the super design of smoothing chokes to get a T9 report. But something is needed in there to work with the filter capacitor, which turns out to be a series resistor. L1 was replaced with a 200-Ohm, 50-Watt resistor, and L2 with a 500-Ohm, 25-Watt.

From there, I moved over to the audio section, and, in a flash, two more big hunks of iron, T3 and T4, passed on to the junk box, probably never to rise again, since these are the modulation and interstage transformers.

Right about there is where paring the iron takes some steely nerves, because it's a no-return point. Those transformers go and so does any phone mode. You could always sit back and rationalize that you just might like to take a whack at AM some day and all that. Well, that's your decision.

Without the transformers, there wasn't much sense in leaving the audio tubes in their sockets, so out they came, at a saving of 15 Watts of filament power.

Meanwhile, back at the power supplies, further mods were made. It was with some pleasure that I relegated the rectifier tubes V8, V9, and V10 to the junk box, saving another 30 Watts in filament power. Solid-state rectifiers were installed.

The low-voltage power supply was converted quite simply with a plug-in replacement, the 1N2389. But you don't have to go to that expense. Use a pair of diodes in a full-wave circuit from the Handbook. Type 1N4006 diodes rated at 800 volts, 1 Amp, are advertised at 15 cents each. Buy a bunch and run some front-back resistance measurements to select the best with the highest back resistance.

I went to a three-diode series arrangement shown in the diagram, using three of the 1N4006s to get a safe peak inverse voltage level of 2400 volts in the high-voltage power supply. The shunt resistors and capacitors are there to protect the diodes in case one of the critters has different characteristics than the others and might take an ungainly bigger slug of peak voltage. That would have you back in there with the soldering iron right soon. The Handbook also talks about this situation.

The high-voltage rectifier was built on sandwiched pieces of perfboard and wired to an old tube base (that I happened to have in the junk box) from a discarded 5R4, and that just plugged into the old 5R4 socket.

After all these chops, the net change was to have cut out four hunks of iron and seven hot bottles, which was a significant weight and power reduction. I went back in to add a small 24-volt transformer, rectified with another pair of those 1N4006s, and regulated by a small 15-volt solid-state voltage regulator (Radio Shack has them for $1.50). This supply is intended for a vaguely-distant outboard FET vfo (one of these years). A VR150 was also added to the screen grid of the oscillator, and an antenna relay was thrown in for full break-in.

The first thing I noticed on firing up the rig was a hefty slug of plate voltage, well over 800 volts. Just to bore you a bit as to why there was so much more soup over the nominal

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**Fig. 1.** Original Viking power supply diagram.

**Fig. 2.** Modified diagram. Diodes—1N4006s. R—1 meg C—.01 µF.
600-volt former value, it was the replacement of the vacuum tube rectifier with the more efficient solid-state rectifier. In the theory of vacuum tubes, there is that characteristic known as the tube’s dynamic plate resistance. This is a simple cut at Ohm’s law, which says that anytime there is voltage across a gadget through which current is flowing, that gadget has a resistance. More properly with respect to a tube, a changing voltage with respect to a changing current gives a changing, or dynamic, resistance. Trouble with the tube is that its dynamic plate resistance can’t drop as low during heavy conduction as the semiconductor’s can, so the voltage across the tube is voltage wasted. Since the semiconductor doesn’t have that kind of hang-up, very little IR drop is across the semiconductor under heavy forward conduction and all the soup goes into the pot, right at the final plates. (Our low value of resistance in the filter also helps.)

Also noticed real quick-like was the way rf zapped around the plate tuning capacitor. There’s a lot more rf kicking around the final with higher voltages, and you really have to be careful in tuning. Had I not buttoned up the rig and gotten subsequently sidetracked, the smart addition would have been a switchable resistor in series with the screen grids to the final. I felt bad about this one getting by and strongly recommend breaking the screen lead to insert a 10k or 20k resistor in series with the present dropping resistor. Then put a switch (use the old phone-CW switch) across it so that for tune-up the switch is open and you’re in QRP with low screen voltages.

With over 800 volts on the 6146s, you shouldn’t walk away with the key down. You could get some experience with cherry red plates by holding the key down for a while (properly loaded) and observing. The rule under such is: red, si; blue, sick. In other words, a cherry red (I don’t know why they always say “cherry” red) on the plates won’t hurt, but a blue glaze or glow around the envelope when you key is a no-no. It means the tube is gassy and will do unpredictable things. You could get away with using it on 80 and 40, but on 10 or 15 you might well be in trouble (as I was when my blue final brought in a pink QSL once). Best bet is to learn exactly what the dials read when the rig is properly tuned for your antennas on each band, then log those readings. Next time you QSY, go right to those readings before keying down.

The 6146s were loaded to 300 mA with no problems to get that quarter kilowatt. There is occasional arcing, but that’s a fun experience that you don’t get every day. Fact is, if you had a new checkbook rig and it dared to arc over, you just might have a mild coronary. But with an old clunker like this, what could be more typical ham fun than disturbing the quiet of a pre-dawn QSO with a companionable splat-t-t-t on a long dah. Shucks, that’s how you store up memories for the day you join QCWA.

In summary, here’s a rig with certain anatomically connotative improvements—it didn’t cost an arm and a leg to get a quarter kilo on the air, it doesn’t quite break your back to heft it around, and you don’t have to sprain your wrist writing out a check for the electric bill.
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House-Hunting for Hams
—caveat emptor!

Avoid nasty surprises.

Consider the sad tale I heard on 15 meters the other night.

A ham and his XYL, along with their real estate salesperson, went looking for a new house. In the car, he explained the kind of house he wanted and said that he was looking forward to having his first full-fledged antenna farm. They found the dream house in a fairly new development. He didn’t notice any antennas on roofs, but it was early spring and most people had moved in during a long, cold fall and winter. To be safe, they drove by city hall and got a copy of the ordinance pertaining to towers. Everything looked OK. They bought. Months passed. As he was laying out the parts to a 65-foot tower in the backyard, a neighbor casually asked what he was doing.

To his grief, to his agony, he was told that the homeowners association had a rule against all external antennas.

He is not the first ham I, as a real estate broker, have counseled, either on the air or in person, about buying a home. But for him it was too late. He is now reading articles about “cliff-dweller” antennas, and “how to work the world on your attic antenna.”

His first reaction, of course, had been, “Can they do that?” You’d better believe it! In this case, the builder founded the association with the intent of keeping property values at some high common level. It’s a great idea for 99% of the people, but for our friend it was tragedy. Buried in the mounds of paper accompanying the normal real estate transfer was a deed restriction giving certain rights to the association regarding the grounds and exteriors of the homes in the subdivision. One rule restricted antennas.

Let’s understand one thing right away. There are many ways to get fouled up when buying real property, and new ones are being invented every day. Self-servingly, but realistically, I recommend a trusted broker. You may need to talk with several to find the one you want, but when you do, show your trust by listing the what’s and whys of your property needs.

Then stay with that broker. He/she will work hard for you and chase information if he knows he’ll get paid in the end.

Consider the following in your early discussions with the broker.

1. Homeowners associations. Don’t think that townhouses and condominiums are the only places that can restrict you. Many single-family areas of all price ranges have these associations or are attempting to form them. Even the voluntary ones exert peer pressure on non-complying owners. Many times they will have an architectural control committee that can cite you for such things as the wrong color door, a trellis extending above the fence line, or unacceptable installation of children’s swing sets. Just try to get them to let you have an 80-foot tribander! I still think associations are a good thing. They do tend to keep values up, and most are reasonable. But I don’t know of any allowing what hams dream of.

The listing broker should have information about mandatory or voluntary associations, but if not, your broker can contact the association or its management agent, if there is one.

2. Restrictive covenants (deed restriction or condominium declaration, if any). “Condominium” pertains to a form of ownership law, not architectural arrangements. Many single-family detached homes are coming under the condominium law. I once sold a house that was not under condominium law but had a 1908 deed restriction regarding the size and cost of the outhouse. We found it by checking the records at the county recorder’s office. The existing title policy (or other evidence of title in your area) should indicate the existence, but not necessarily the nature, of restrictions. In a subdivision, at least in our area, you can check the documents filed when the division was made and be pretty safe. In non-divided areas, you must check the documents filed on that property.

3. Zoning laws or building ordinances. Most of us are familiar with the battles that hams have had nationwide to keep these laws fair to all. Be care-
ful—just because someone has a tower nearby, or just because one went up recently, does not mean it was legal then or now. Taking down is less fun than putting up.

4. Building permits. In some cases, you may even be required to appear before the town council. You may be restricted as to height, distance from property lines and power lines, and crank-up towers may be allowed only on Tuesdays when the moon is full. That is my way of saying that town councils and those that serve them are very creative when they write laws. The only way to know for sure is to get a copy of the law and ask someone there how they enforce it. You will not find that person in the day you call. In fact, he'll probably be the eighth person you talk with on the tenth day.

Knowing what to look for and being sure are two different things. Start by having a conversation with the broker about your regular home needs. (How about 4 bedrooms, 2½ baths, family room, full basement, 2½ car garage, at least an acre of yard, for not over $35,000? This is a little real estate humor, since that home sells for over $100,000 in our area—but these calls still come.) Then tell about your special needs—some of which will follow. Mention the problems as above. Discuss local areas.

If you are new to the area, contact the ARRL for a list of clubs there. Or get on two meters and find out what the local problems have been from the people who know. But remember, they may not be aware of some of the hidden restrictions, unless someone has had a specific problem in that subdivision. (And then, too, some subdivisions have more than one association.)

If you decide you want or need an attorney, find a good real estate attorney (the broker can help you). I prefer a local one who knows the area. Get some wherefores and whereas to add to the standard sales contract. They might take the form of a rider making the sale subject to no association, deed restriction, or building/zoning ordinance prohibiting you from doing whatever it is you want to do, or a rider voiding the sale if a building permit to construct (insert what you want) cannot be obtained in some reasonable time. I know many people don't want to spend money for an attorney. Most transactions go rather smoothly for the buyer without an attorney. But on those that don't, it's generally too late for one to help after you find you need one. It's better to get one up front.

Now that you have a broker and attorney working on your behalf, you should monitor their work. Even if you don't understand the law, you can make a judgment about their thoroughness. Ask questions. Remember, they are getting paid to answer your questions. Ask about every aspect of the transaction, not just ham-related ones. If they can't answer, won't answer, or don't try to get the answers, consider someone else.

Here are some more things to check: electrical capacity (verify amperage, but not by counting fuses), wiring (among other things, aluminum wiring was popular at one time and if not installed properly is a fire hazard), elevation (topographical maps, flood plain maps, and elevations above sea-level are available through the broker or city hall), power lines (do you really want to live under high-tension lines next to a substation?), airports (remember height restrictions), common television antennas (the preamps in these small systems pick you out of the ether better than channel 2), and look for a suitable quiet room away from the family traffic pattern (hi, hi).

One amazing thing I notice about home buyers is that they seldom walk the grounds. Walk all over the yard. Plot antennas as well as geraniums. Get a copy of the survey and plan the future. If the market is fast, the house might be sold before you get that done. Having the attorney prepare safeguards on a rider, prior to looking, gives you the ability to move rapidly even if you are not finished checking everything out. Once you sign, it's too late to ask about towers unless you have caused the contract to give you that right over the next few days.

Perhaps it will never happen to you. Some old deed restriction from a farmer in 1898 won't crop up (did I really write that?), and you'll always luck out, and your only worry will be airplanes dodging your guy wires. Maybe you've bought and sold ten homes and had no problems (Murphy's Law times ten squared), but a little work by you and your broker can make sure you'll get what you want.

Finally, ask about financing. Some of the new plans permit less down payment, but the monthly payment is still affordable. Since less is needed up front, you'll have more available for furnishings such as refrigerators, amplifiers, stoves, transceivers, dishwashers, and so on.

When you get the tower up and have a stacked array on top, give me a call on 15. We can all use the good news!
editorial by Wayne Green

From page 4

waiter asked me if I was a ham. I nodded and he asked my call. Just to be smart, I tilted my belt buckle up and read the engraved call... W2NSD1. The waiter laughed and introduced himself as Fred Scully W6BFR.

Since most of us had our HTs with us, Fred clued us in on the repeater in nearby Glenwood Springs... 146.67.

The next day, while we were having lunch at the Tiehack restaurant side of Buttermilk Mountain, I tried out my Tempo S1 HT and switched to 67. Sure enough, I raised the repeater and resident user Bob K9WMW. We talked while I ate the delicious pea soup, and then I asked Bob what kind of business he was in out here in a small Colorado town. I just about lost my breath when he said he was writing computer programs for the Radio Shack TRS-80 and selling them to local businesses. It turned out that he reads both 73 and Kilobaud Microcomputing. You can be sure that Bob joined us the next day for skiing.

It appears that Instant Software will be able to distribute some of Bob’s business programs, so by next year he may have considerably more leisure time for skiing. How many small towns around the country harbor a programmer writing microcomputer business programs? That’s just too much of a coincidence.

On the following day, our Denver legal staff drove in and we had a great time spending a full day hashing over growth plans with them. I’ve long had the desire to take 73 Magazine public so that the readers would be able to own the magazine, but every time I’ve approached professionals about this, they have pointed out that it is necessary to have five years of certified bookkeeping before this can be entertained.

Now, with a new corporation (Instant Software, Inc.), perhaps it will be possible, once the corporation shows some significant signs of success, to take it public. Our lawyers seem enthusiastic. It would be fun to be in on the ground floor of something with the growth potential which software publishing seems to provide. Watch out, Xerox!

Between the software, the talks with manufacturers and dealers, the legal discussions, etc., the conference at Aspen was a great success. The skiing was fabulous, the meals dito, and the company first rate.

Funny thing. I got a beef about the conference last year. One chap showed up with his wife, attended one dinner, and was not heard from again. His employer was bent out of shape at me for this! The purpose of the week-long conference is to get industry people together in a relaxed atmosphere and have ideas discussed on marketing, advertising, the future of amateur radio, etc. Discussions somehow seem to get better when you are on a ski lift together... eating lunch on a mountaintop... in a sauna... or having dinner at a superb restaurant.

While talking over my HT from the center of town, I was stopped by a chap who asked me the repeater frequency for Aspen. It seems that he’d read in 73 about the conference, but his wife wouldn’t let him talk with other hams while he was there, so he wasn’t checking in with us.

ARRL BLOWS $100,000?

Several of the insiders at the League are bent out of shape over the recent dumping of about 50,000 1978 ARRL Handbooks. I gather that the people wanting to blow the whistle first turned to HR Reports, but got nowhere. I don’t know any good way to check all these allegations out, but perhaps you can get in the right area and ask your directors the next time they talk at a hamfest or convention.

It appears that the chap in charge of ordering Handbooks made just a little mistake in 1977 when he ordered 30,000 more than the League could sell. No one seems to know just what happened to these 30,000 Handbooks or who collected for them.

At least someone seems to have learned by experience, for in 1978 they ordered 50,000 more than they could sell. Now, in the business world, it is not unusual to have some books left over, so publishers send out a letter asking for bids on overstocked books. In this case, when the book was receive, they offered $6 and perhaps selling wholesale for $4, ham stores around the country probably would have jumped to buy out the lot at $3 per book. Since they probably would then sell for $67. Springs... 146.67.

himself as Fred Scully W6BFR.

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plane and arrived at LaGuardia at 1050. By 1115 I had arrived at the subway station and was on my way to Manhattan. I arrived at my destination at 1200. Now, if I’d driven directly to New York, I’d have arrived at about 1220. I saved 20 minutes and spent a bloody fortune on the plane.

While going past the 61st Street Woodside train stop, I got to thinking back a few years to my visits there with John Williams W2BFD. John died in 1961, and I picked up some of his old equipment at the auction—I still have it around here.

John was the primary pioneer of amateur radio Teletype™. He got going with this back in 1946, and he provided most of the circuits and equipment for the entire hobby for the first few years. John ran this sort of side business out of a grubby little storefront shop In Woodside, Queens—a radio repair shop. You remember radio? This store, usually closed, made enough for John to support his hobby of RTTY, and that’s all he wanted. He designed most of the equipment we used, set the standards, made the templates, sold the parts, and generally nursed this hobby along.

John also got into trouble a lot. Ma Bell was very uptight with him because he had rigged up an automatic telephone-answering device in his store and wouldn’t let his inspectors come in to see how he’d done it. They were sure that he was connecting directly to their wires, but couldn’t prove it unless they could get in to inspect. They would always find the store closed.

He did indeed connect to the verboten Bell wires and had a corking-good answering system going, years before it was popular. He could talk over the phone from his home a mile away via a carrier current system. The phone-answering system used a phonograph record to give his message and a wire recorder (remember them?) to record the response. He was generally monitoring the call from the shop or home and would break in if he wanted to talk with you. You ran into the same problem at the store door... with an intercom speaker which went via carrier current to his home... and a similar system at home going to the store. You just were not about to be able to locate John if he didn’t want to be located.

I remember the day the FBI came to my house to ask questions about him. That surprised me. All I knew about were his radio repairs, the RTTY involvement, and his problems with Ma Bell, so I couldn’t have helped them if I had wanted to. A few years later John confided that he had been involved with a good deal of building and using of bugs, telephone and otherwise, and that this was what the FBI was wanting to know about. He had made a system which the Arabs had put into the Israeli cars in New York to allow them to follow behind and hear what was being said in The cars. I think he also got into telephone modifications which would allow the radio transmission of phone calls over a short distance, a concept which interested the Arabs, too.

The income from these efforts probably went more to keep him going than the radio repairs, as I seldom ever saw him doing any radio repairing. And most of the stuff in his store was RTTY gear, not radios in for repair.

John, with my help, set up the first amateur radio two meter repeater in the country. We set it up on top of the New York municipal building in downtown Manhattan. I will never forget putting up the antenna for the repeater in the middle of the night in a blinding rainstorm— with me up there on a very steep copper roof, holding on to little pegs here and there to keep from falling about 20 stories. I was in my mid-20s at the time and often did silly things like that in the interests of amateur radio.

There was, unfortunately, a slightly crooked side to John, too. I don’t know how many hams sent him money for Teletype equipment which he never delivered. It was petty larceny, but aggravating to those of us who knew him and appreciated the extent of his genius. John, at that time, had a virtual corner on all used Teletype gear, so if you didn’t buy it from him, you didn’t buy it. We were buying Model 12 Teletypes at that time... somewhere in my barn I have John’s old original Model 12, in case there is an opportunity for a shrine to this pioneer to be erected. I also have a couple of the complete W2BFD systems which I built, with auto-start and stop. They were quite modern, except for the use of dozens of tubes in each one.

Amateur Teletype, when I got interested in it over 30 years ago, was stuck up on two meters (and 11 meters), and we had about 30 stations working on one frequency in the vicinity of New York. We were on 147.96 MHz using 8220 KHz crystals with SCF-622 systems, for the most part. Using audio frequency shift (21252.975 Hz), we could leave the receivers on all the time. Our printers would start up if a standard start signal was received... a couple seconds of mark signal. A steady space signal would turn everything off.

Some of the fellows left their receivers on all the time, while others hooked them into a small clock which sampled the frequency every hour for two minutes. We could then leave messages with anyone by sending the start signal for one minute during this window. I left my receiver on all the time, wanting to keep track of what was happening when I was away from home. I’d come home after a weekend to find a hundred feet of paper on the floor, filled with chit-chat and messages.

A few of the fellows had an automatic confirming system. They put a microswitch behind the Teletype carriage so that it would turn on when the carriage was in one particular position... say, the tenth letter along. This would turn on the transmitter filaments and warm them up. Then, after a minute in that position, the release of the carrier would trigger a double pulse of the confirming transmitter as a “roger” that the message had indeed been received. Of course it wasn’t exactly legal, but then what experimenting is?

Oh, on the repeater, it enabled all of the RTTY hams in greater New York to keep in constant touch and was fantastic. The FCC put it off the air after a few months. They didn’t like any automatic relay systems like that. If we could have an operator present, OK, but otherwise, no go.

It was RTTY that got me into this whole ham publishing mess. I started out in 1951 with a monthly newsletter to RTTY hobbyists... now look at it!

GRABBING THE BUS

One of the more innovative concepts which microcomputers have introduced is the idea of using a bus structure for electronic circuits. In the case of computers, this means that all of the significant signals are made available to every board

John Williams W2BFD, on the left, about 1954. I forgot the chap in the middle, but the right-hand chap is Doc W2BV, a Brooklyn dentist.

John again, taken during a RTTY meeting about 1954. We'd often get a dozen or more RTTYers out to these meetings.
plugged into the bus. The board can then avail itself of any needed signals with no further interconnections needed.

Could such a concept be adapted to the home transceiver? Well, let's suppose we wanted to build our system in a modular way and then make any needed connections for accessories available via a bus. We might have on the bus the +5 volts for logic circuits, +12 for control and power circuits, audio for earphones, audio for speaker, mike input, i-f output, local oscillator, A/C line, etc.

With that array of signals available for accessories, we could design boards for interfacing SSTV, for RTTY, for CW encoding or decoding, for audio filters, a flying noise lock, synchronous detection, a keyer with memory, VOX, automatic ID, a panadapter, an autocalloc unit, programmed tuning, a phone patch, a voice processor, a cassette recorder, a two-tone test, a CW regenerator, etc. There are many possibilities which such a flexible situation would open up for the super transceiver of the future.

This type of structure would make it possible to buy a barebones transceiver and then add plug-in modules as money and technology permit. It would make it possible for the CW fan to get any bandwidth i-f desired, add audio filters, a regenerator, and end up with an incredible CW receiver. The weak-signal VHF CW experimenter could narrow down the i-s, put in the filters, a flying noise lock, a recorder, and all those things which such a strange craft requires.

The Saturday afternoon ragchewer could have his system monitor any set of channels for calls from friends, all done automatically ... complete with a beeper alerting call on a VHF band, if wanted.

How much further would such a system have to be pushed to decode CW signals and look for expected DX? No strain ... and the next step, with such a structured system, would be automatic DXing.

AUTHOR PREROGATIVES

One of the publisher's newsletters mentioned that writers can charge off magazine subscriptions as a business expense. That makes sense ... and might be just another reason to become a professional writer for the ham magazines such as 73.

As a professional writer, your expenses would include the cost of any equipment you have built or reviewed ... costs of your writing office, reference works, test equipment, etc. It's worth checking out with your tax accountant.

What kind of articles are we looking for at 73? First choice goes to state-of-the-art projects ... perhaps a microprocessor-run something hammy ... small and medium construction projects are always popular. It's difficult to get too much in the way of home-built equipment articles, antenna articles, microcomputer articles ... just about anything on new techniques and modes. We need more on satellite equipment and techniques ... AM on ten meters ... new RTTY equipment ... even very low frequency articles are of interest.

I'm always on the watch for any really hot new aspect of amateur radio which I might be able to use to get thousands of amateurs interested and involved. Look what happened when I plugged the devil out of two meter FM and repeaters! This can be done by just having something with good possibilities comes along ... so if you think you've got it, please start writing and let's see if it flies.

Writing for 73 isn't very difficult. Remember to double space your typing (please type it), do not use all capital letters, and get me the very best pictures you can.

WEIGHTY MATTER

There are, I understand, several dozen 73 readers who have no problem with their weight ... and possibly a few of those with wives with no concern about weight, though this seems unlikely. What this all boils down to is dieting at least every now and then. Erma Bombeck classifies "diet" as one of the dirty four-letter words, and I tend to agree with her.

Heath has come out with a very nice electronic scale (the GD-1186) for the bionic people. It reads to a tenth of a pound, which is fabulous for dieters. Most of us serious dieters long ago shifted to what are known as doctor scales. These monstrosities are accurate down to a quarter of a pound and are excellent because they tend to give a guy a fast reinforcement to even the first day's dieting when it was needed the most.

The Heath scale is small ... about a foot square, if you'll pardon the expression ... and it's high for the readout. It's light enough so you can even take it with you on trips and make your life miserable after every fantastic meal.

Like all other Heath stuff, this comes in kit form. Figure on one good evening to put it together. It's relatively simple, and no one but me could stretch one evening's work out over a couple months ... 99.9% of which was pure neglect. Now that it's done, I don't know how I got along without it.

As many of you, I am an incipient fat person. I have all the bad traits of a fat person ... like eating because the food is there, with little relationship to any sense of hunger. I love things with butter or rich sauces, and can easily list over 500 deserts which are tops with me. Only by doing my best to keep my breakfasts and lunch simple am I able to avoid zooming up to over 250 pounds ... a weight which I have managed to attain in the past.

It's very difficult to seriously diet when I'm eating out. After all, I'm paying for the damned food, so why not eat it? So I cram down as much as I can of everything, making sure that I do my best to get my money's worth. And if I can't get it down the old hatch, it goes into a doggy bag for tomorrow night. I don't have a dog.

All this got a little out of belt a couple of years ago, so both Sherry and I started cutting down. One day the other said, "You order one meal between us and still end up with something to take home ... particularly if there is a salad bar. But this still calls for a careful watching of the scales at home ... and the Heath is absolutely wonderful for that. The tenth-pound readout makes it immediately apparent when I've snacked too much.

One of the better snack cutters I've found of late has been the VTR video recorder. With this system, as I've mentioned before, virtually all TV programs I watch are recorded so that I can see them without the commercials. Otherwise, I find myself getting up, wandering around, looking for something to eat during the breaks ... heck, a cup of coffee and some cookies wouldn't hurt much ... perhaps a tenth of a pound. Maybe some nuts and fruit? Better to get up and fast-forward the VTR and not snack. Then there is more to see of interest on the Heath scale in the morning.

The Heath scale would make a great present for the XYL for her birthday, Mother's Day, etc. And it would be something you put together for her. It costs $99.95, which is a very good buy compared to the much less accurate doctor's scales.

DECEMBER WINNER

Johnny C. Chestnut WA4PIN and John L. Wolcott WA4CCX will each receive a $50 bonus for authoring December's most popular article, "The Lunch Counter." Remember, your ballot is your Reader Service card.

Ham Help

I would like to hear from anyone who has converted a 23-channel CB Cobra Camm 88 for use on the 10 meter band, for either the Novice Tech CW portion or the phone portion of the band.

Berand (Henry) Kirschner WB9YCO
12756 Newport Ave., Apt. C
Tustin CA 92680

Will anyone living in the San Diego, California, area volunteer to administer the Novice exam to a fine young man? His name and address: Mike Batson, 15150 Motor Way, San Diego CA 92145; (714) 566-2910.

Robert D. Cummings U.S. Navy PEP DET Netherlands
c/o U.S. Embassy
APO NY 09159
Microcomputer Interfacing

from page 24

interrupt to the microcomputer. Some real-time clocks are free-running, always keeping time. Others are programmable or preset for a particular period. The free-running clock interrupts the computer at repetitive intervals, while the programmable clock interrupts the computer only once, at the end of its preprogrammed period. Integrated circuits such as the Intel 8253 and Texas Instruments TMS 5501 contain time-keeping circuitry which is easily interfaced to most 8080 systems. For simplicity, we will use the software clock in our example rather than an interrupt-based real-time clock. The software for the 100-point data acquisition program is shown in Table 2. After completing the program, the computer might be programmed to jump to the type of data display software discussed previously. If you look at the program carefully, you will not find a separate register used to count the 100 passes through the data acquisition software. Since the memory address stored in registers H and L is already a counter, we have chosen not to detect the 200th address rather than the 100th loop. This saves an internal register. Instead of decrementing a counter and detecting a zero condition, the contents of register L are compared to the final address and equally is used to signal the end of the loop.

Analog-to-digital converters are not "instantaneous" devices which take only a few microseconds to perform a conversion. In many real situations, the analog input to the converter will vary while the ADC is trying to perform a conversion. This presents the converter with a problem. How does it know what the real value of the voltage is? In most systems, the ADC module has a sample-and-hold (SH) on its input. The SH circuit samples the analog voltage when pulsed to provide a steady analog output to the ADC for conversion; the ADC is then pulsed to start the conversion. The Intersil HI 510 is a typical sample-and-hold device.

OSCAR Orbits

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk, 90 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute, at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.4 MHz. Mode B: 432.15-174 MHz uplink, 145.975-925 MHz downlink, beacon at 145.972 MHz.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

Corrections

A reader, Wilbur Stevens, was nice enough to point out an error in "Build a $10 Digital Thermometer" (January, 1979). In Fig. 4, on page 54, the values on the pots are reversed.

Gary McClellan
La Habra CA

Thank you for printing my OM's story about CW music ("This Station Plays Beautiful CW") in the February issue of 73. His secretary and I both appreciated the celebration dinner made possible by the author's fee.

Nevertheless, I would like to caution the XYLs of your readers who may build a keyboard. While the diode matrix is usable, I found that the OM could not make the hookup "while the XYL is talking," it does not necessarily follow that the OM will hear what the XYL is saying. Further, if the impasse reaches the point where not even an "uh huh" is expressed, the XYL should step up and point out that there is an error in Fig. 1. Each bus (Kg-Ky) is fed through a 10k resistor which is not shorted out as the schematic indicates.

It is a worthwhile project because, after it is completed, the XYL can carry on a CW conversation with other XYLs. All that is necessary is to use the OMs as interfaces between headssets and conventional typewriters. This will suffice until WB9WRE completes his low-cost CW typewriter.

Ham Help

I need the schematic for a Fujukawa Multi-7 (FDX) FM Radio, as well as the alignment procedure. Can anyone help?

N. W. Zimmerman W7MAF 1815-17th Ave. So. Great Falls MT 59405

James M. Zacher
15 W. Cypress
Arlington Hts IL 60005

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each successive orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode B: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

Jean Crome
XYL of WB8WRE
Mt. Prospect IL

I need the schematic of a Dage model 6SA-3 TV camera (or of a similar tube-type model) manufactured by Dage.

James M. Zacher
15 W. Cypress
Arlington Hts IL 60005

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**Social Events**

from page 29

and flyers, contact Richard Spahl K1SY at (617)-943-4420 after 8:00 pm.

**TRENTON TN MAY 20**
The Humboldt ARC will hold its annual hamfest on Sunday, May 20, 1979, at Shady Acres City Park, Trenton, Tennessee. There will be a flea market, prizes, children’s activities, and food. For further information, contact Ed Holmes W4IGW, 501 N. 18th Ave., Humboldt TN 38343.

**BURLINGTON KY MAY 20**
The Kentucky Ham-O-Rama will be held on May 20, 1979, at the Boone County Fairgrounds, Burlington, Kentucky. For easy access, take the Burlington exit off I-75 south. There will be a chance for prizes included with the $3.00 gate ticket. There will also be hourly drawings, exhibits, a flea market, and refreshments. Talk-in on 146.199 and 52/62. For more information, contact NKARC, Box 31, Ft. Mitchell KY 41017.

**EASTON MD MAY 20**
The fifth annual Easton Amateur Radio Society Hamfest will be held on May 20, 1979, from 10:00 am to 4:00 pm, at the Easton Senior High School cafeteria on Rt. 50, south of Easton at mile marker 66. From the Baltimore or DC areas, go across the Chesapeake Bay bridge, the mile marker is about 27 miles from the bridge. There will be hamfest signs on Rt. 50, north and south. Refreshments will be available. There will be a donation of $2.00 for tables or tall-gates. Talk-in on 52 and 146.445/147.045. For more information, write Charles C. Walgren WA32WX, Box 7, Trappe MD 21673, or the Easton Amateur Radio Society, Inc., Box 781, Easton MD 21601.

**HAMBURG PA MAY 27**
The Reading Radio Club will hold its annual hamfest on Sunday, May 27, 1979, beginning at 9:00 am, at the Hamburg Field House in Hamburg, Pennsylvania. There will be door prizes, food, tag sale items, and dealer space available. The hamfest will be held rain or shine. Talk-in on .31/91 and 146.52. For more information, write The Reading Radio Club, Hamfest Committee, PO Box 124, Reading PA 19603.

**UPPER HUTT NZ JUN 1-4**
The 1979 Annual Conference of the New Zealand Association of Radio Transmitters will be held on June 1-4, 1979, at Upper Hutt, New Zealand. Visitors are welcome to attend this conference. For registration forms, tickets, and other information, contact College Ave., W. Guelph, Ontario, Canada. Commercial displays will open at 10:00 am. Admission is $75 per person with children 12 years and under admitted free. Admission for vendors is a nominal $2.00. There will be a large indoor and outdoor flea market, commercial exhibits, free balloons, free handouts, and operating ham stations. Talk-in on .52/52, .371.97 VE3KSR, and .96/36 VE3MGM.

**WEST HUNTINGTON WV JUN 3**
The Tri-State ARA will hold its 17th annual hamfesl and family picnic on June 3, 1979, starting at 10:00 am, at the Camden Amusement Park, West Huntington, West Virginia. There will be a planned program for the XYL and kids, or you can enjoy the amusement park if you prefer. There is a possibility the FCC will administer amateur exams. There will be major prizes, a large flea market, exhibitors, and displays. Dealers are always welcome to space in the covered pavillion. Talk-in on 34/94 or 167/8. For more information, write TARA, PO Box 1256, Huntington WV 25715.

**MANASSAS VA JUN 3**
The Ole Virginia Hams A.R.C., Inc., will hold the Manassas Hamfest on Sunday, June 3, 1979, at the Prince William County Fairgrounds, 1/2 mile south of Manassas, Virginia, on Route 234. There will be indoor and outdoor exhibit areas for dealers, manufacturers, and tailgaters. Also included will be plenty of parking, prizes, an FM clinic, breakfast and lunch, a YL program, and children’s entertainment.

**PRINCETON IL JUN 3**
The Starved Rock Radio Club will hold its annual hamfest on Sunday, June 3, 1979, at the Bureau County Fairgrounds, Princeton, Illinois. The fairgrounds are centrally located and easily reached via routes 80-5-34-69-26. Watch for the large yellow “Hamfest” signs. There will be free speakers’ area and parking. New equipment dealers, manufacturers, and their representatives are invited to request details on reserving space in our inside display area. There will be food and refreshments available during the day. Camper, van, and trailer spaces are available for a nominal fee and should be reserved in advance. Please include an SASE for map, motel information, and advance reservations at $1.50, if postmarked before May 20 ($2.00 at the gate). For more information, write W9MKS/W9AFG, Starved Rock Radio Club, RDF #1, Box 171, Oglesby IL 61348, or phone (815)-667-4614.

**GUELPH ONT CAN JUN 9**
The Central Ontario Amateur Radio Flea Market will be held on Saturday, June 9, 1979, at the Bluegrass Convention Center, Louisville, Kentucky. Activities include a flea market, and experimenter’s area as well as activities for the entire family. Seminar and exposition admission is $4.00. Pre-registered Ramada Inn guests ($29.00, single; $34.00, double) receive free admission. For advance mail information, write Computerfest ‘79, Louisville Area Computer Club, PO Box 70355, Louisville, KY 40270, or phone Tom Eubank, Chairman, (502)-895-1230.

**BELLEFONTAINE OH JUL 1**
The Champaign Logan Amateur Radio Club, Inc., will hold its annual hamfest on Sunday, July 1, 1979, at the Logan County Fairgrounds, South Main Street and Lake Avenue, Bellefontaine, Ohio. There will be admission and door prizes. Trunk and table sales are $1.00, and there will also be a bid table. Talk-in on 146.52. For more information, contact John L. Wentz W6HFK, Box 102, West Liberty OH 43357, or Frank Knoll W6JS, 402 Lafayette Ave., Urbana OH 43078.

**PITTSFIELD MA JUL 21-22**
The NoBARC Hamfest will be held on July 21-22, 1979, at Cunningham Fairgrounds, Pittsfield, Massachusetts. There will be tech talks, demonstrations, and dealers. Flea market admission is $1.00. Advance registration is $3.00 single and $5.00 with spouse, and $4.00/6.00 at the gate. Gates open at 5:00 pm on Friday for free camping. Talk-in on 146.31/91. For reservations, contact Tom Hamilton WAVPX, 206 California Ave., Pittsfield MA 01201.

**MOOSE JAW SASKATCHEWAN CAN JUL 27-29**
The Moose Jaw Amateur Radio Club held its 1979 Hamfest ( Participest 79) on July 27-29, 1979, at the Saskatchewan Technical Institute, 600 600 Saskatchewan St. W., Moose Jaw, Canada. Registration will be held on Friday evening with a full day of activities on Saturday culminating in a banquet and dance. Most of the meetings will be held on Sunday. There will also be a busy schedule for the XYLs.

**FINDLAY OH SEP 9**
The Findlay Radio Club will hold its 37th annual Findlay Hamfest on Sunday, September 9, 1979, at Riverside Park, Findlay, Ohio. There will be both commercial and amateur display space available. Ticket donation is $1.50 in advance and $2.00 at the hamfest site. For more information, write the Findlay Radio Club, c/o Randy Peterson, Hamfest Chairman, 6016 Marion Twp. 243, Findlay OH 45840.
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167
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<td>3.00</td>
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<td>UG-27/C/U</td>
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<td>PL-259</td>
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<td>SO-239</td>
<td>.43</td>
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<td>UG-175</td>
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<td>PL-258</td>
<td>2.99</td>
<td>2N3866JAN</td>
<td>2.70</td>
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<td>UG-106</td>
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<td>UG-177</td>
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<td>UG-274/U</td>
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<td>UG-308/U</td>
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<td>UG-646/U</td>
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<td>UG-1094/U</td>
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<td>UG-701/U</td>
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<td>.59</td>
<td>LM566V VCO/FUNCTION GENERATOR</td>
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<td>2N5589</td>
<td>4.60</td>
<td>LM340T-5 &amp; LM340T-12</td>
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<td>TRIMMERS 5-80pf</td>
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<td>45¢ each or 10/3.50</td>
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<td>or 100/25.00</td>
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<td>CHOKE (U252) 2.5mH</td>
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<td>150ma 30MHz</td>
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<td>TRIMMER CAPS</td>
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<td>small enough to fit in your watch</td>
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<td>3.5-11pf 75¢ each</td>
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<td>or 10/$6.00</td>
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<td>PISTON CAPS 1.2-10pf</td>
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<td>75¢ each or 10/$5.50</td>
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<td>MINIMUM ORDER $5.00</td>
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<td>Minimum Shipping $1: Insurance 35¢ per $100. COD charges 85¢ to street address only! We prefer street address as we ship UPS and P.O. Box #4725 is up to 50% longer to deliver. We accept VISA or Mastercharge. Please list complete card number and expiration date. Allow 10% extra for shipping of heavy items. We reserve the right to change prices without notice. All items listed are subject to prior sale. Some items listed are in small quantities.</td>
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**GALLIUM PHOSPHIDE L.E.D.**

Provides Higher Intensity Than Regular L.E.D.'s, T1-3/4 Dome (Red, Clipped) AND Part #114R 1.99 . 25¢ 100 ea. . 20¢

We stock the full line of AND L.E.D.'s.

**MOTOROLA 4 MHZ XTAL OSCILLATOR**

MTI Oscillators. 14 pin dip. 5 VDC in, 4 MHz out. TTL compatible. $1.85 ea.

**NATIONAL SEMICONDUCTOR—6 DIGIT CLOCK MOD-ULE**

A 12 hour clock featuring alarm and snooze alarm function. Comes complete with everything. All you add is a power cord and switches. Each module utilizes discrete components and is ready for you to mount in your enclosure. Displays 6 x 6 each seven segments, 3 inches high, clockip is MM5375. Can easily be mounted in either of our instrument clock case kits. $14.95.

**CALCULATOR GUTS**

Experimenters delight. Each board contains a monolithic calculator chip and a display. These are rejects. It might be something simple to repair or it could be very nasty. At this price, who cares! 9 volt. $1.50 ea. 5033.50.

**HOBBY BAGS**


**DB-25 FEMALE CONNECTOR**

A unique, 25 pin connector for RS232 Type Connector to flat cable. $1.50 each or 252$. 50.

**INSTRUMENT/CLOCK CASE KIT**

Perfect for your opto projects. Solid aluminum construction with real walnut sides. O.D. 5-3/8" by 5-3/8" by 2". $6.95 ea.

**AMPHENOL #17-20250-1**

(dob-25) Male chassis mount. $2.50 ea.

**MINIATURE DBDT (PUSH BUTTON)**

momentary, rated 6A,250 VAC, microswitch part #8N201. Only $1.54.

**FLAT CABLE CONNECTOR**

Female 34 Pin Socket. 50¢ each

**PLASTIC PARTS BOX**

A nice little hinged-lid box for storing all your small parts. O.D. 6" x 2 3/4" by 2". 75¢ ea. 10 for $7.

**COMPUTER POWER SUPPLY TRANSFORMER**

Prl. 110/220 Vac; 300 VAC 5 1/2". 4.40 uF at 2.5 A, 12.9 V; 2.0 A. 12.9 V @ 3.2 A. Only $14.95 ea.

**EDGE METER**

10000-100 ua 1/2" by 11/16". Compare with other meters costing $6.00. ONLY $2.00 ea. Why pay more?

**CALCULATOR BUBBLE DISPLAY**

BRAND NEW pocket calculator displays. Ranging from 6-9 digit. Your luck $1.25 ea. 3.53.30

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Compare, then really save with our calculator hobby bag assortment. Each one contains 3 calculator keyboards. All this for only $1.75.

**TRANSFORMER**

Prl. 110 VAC Sec. 11.2 and 5 VCT @ 1 amp. 95¢ ea.

**CLOCK DISPLAY**

National Semi. 6 Digit Multiplexed Display, 33" Characters (Common Cathode), A REAL BUY AT JUST $1.00.

**TRANSFORMER**

P.C mount. prl. 110 VAC Sec. 12.6 g 1 amp. $1.25 ea.

**REPEAT OF A SELL-OUT**

A complete 12 hour digital clock. Some are manufactured line rejects, some are returns, and some are just scratched. Features: hour, minutes, alarm snooze alarm. Parts value alone would equal $20.00, you pay only $8.00 ea.

**INSTRUMENT CLOCK CASE KIT**

A real jewel for those smaller projects. Hinged top door allows you to test your control area. O.D. 4 1/4" x 4 1/4" x 1 1/8". $1.99 each.

**AMPHENOL**

Bk, Brn, Red, Or, Yel, Grn, Blk, Wh, Gry, Wh.

We will do our best to ship the color you specify. To ensure prompt delivery of your order we will substitute colors should we be out of stock, unless you specify otherwise. We will also substitute 1000uf cap for 100uf, $2.50 per dozen, $14.16 per thousand foot spool; Multiples of 100 only.

Call us for quotes on larger quantities.

**DETECTIVE CALCULATORS**

Well, some are and some are not. We can't afford the time to test them. $2.50 ea. Battery not included. 2540.00

**#30 KYNAR**

Bk, Brn, Red, Or, Yel, Grn, Blk, Wh, Gry, Wh.

We will do our best to ship the color you specify. To ensure prompt delivery of your order we will substitute colors should we be out of stock, unless you specify otherwise. We will also substitute 1000uf cap for 100uf, $2.50 per dozen, $14.16 per thousand foot spool; Multiples of 100 only.

Call us for quotes on larger quantities.

**PLANTS PARTS BOARD**

A great way to buy parts on bulk, as we will price to your money's worth. ONLY $1.00 ea.

**CAPACITORS**

Capacitance Voltage Style Price
1000uf $2.50 VDC P.C 25¢
220uf $2.50 VDC P.C 25¢
2000uf $2.50 VDC AXIAL 50¢
40/40 $2.50 VDC AXIAL 45¢
1uf $1.50 VDC AXIAL 19¢
.018 100 V MYLAR 25¢
.001 100 V MICA 11¢
.01 DISC 7¢
.02 DISC 6¢
1 DISC 9¢

**CLAIM PHOTOS CELL**

There is a real usefulness range to them. Any project involving control from ambient light levels will utilize this photo cell. Light resistance 1K. Fast response. 156 Diameter. 75¢ each or 251.90.

**ROTRON WHISPER FAN**

WR2H 1 3 Blade 4" Diameter; 75CFM 115VAC. NET $17.00 YOUR PRICE $9.95

Wait now, these are not pull-outs or something like that, these are new!

**10 STATION PUSH BUTTON SWITCH ASSEMBLY**

4 Push-On/Push-Off 4-Ganged Push-On/Push-Off DPDT $2.50 Each

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These items are chosen from our vast inventory of Industrial Components: Extruded heat sink 10 7/8" by 2 3/4" by 5/8".

500 Ohm P.C mount trimmer. 20¢
Line cord #46 6x6" 25¢
74LS175 Quad N Flip flop 50¢
S.P.D.T. sub-m. switch. $1.25
S.P.S.T. PC Switch. 20¢
ACID BRUSH 10¢
2 cond. 14 gauge spool lead. 10¢
14 PIN DIP HEADER . . . . 35¢

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DO YOU EVER WISH YOU COULD DUPLICATE THE SOUND OF A STEAM TRAIN OR A PHANTOM GUN? HOW ABOUT GHOSTS, WHISTLES, BIRDS, MARINING DOGS AND OTHER SOUND EFFECTS? NOW YOU CAN WITH OUR PROJECTABLE SOUND EFFECTS KIT. IT USES THE NEW 28 PIN T.L. SOUND COMPUTER CHIP, 78L077, AND SUPPORT CIRCUITRY. 5 TO 10 DAYS IS REQUIRED TO GIVE APPROX. 1/4 WATT DUAL AUDIO OUTPUT. WE PROVIDE THE F.C. Geeks, Parts & Instructions Along With A Chart to Program Some Good Sounds. USE YOUR IMAGINATION TO CREATE ORIGINAL SOUND EFFECTS.

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YOU'VE SEEN IT ON QUALITY STEREO GEAR

SMALL INSERT

STEERING WHEEL

SPEEDOMETER

WALL MOUNTING COMBINATION FOR REMOTE CONTROL

STEERING WHEEL

PLASTIC CASE

WIREWRAP Wire

30 GUAGE

KYMAX Insulated

500 FT

4.50

DYES

14A003  600V  1A

151.50

14A006  600V  1A

121.00

14A240  Germanium Diode

18.00

14A350  Germanium Diode

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14A440  Cut  & Bent for

PC Sound Interlock

1201.25

UNMARKED POWER DIODES with cathode bands. Guaranteed to be at least 600V 1A. 100 Pack parts. Economical.

115.00

POWER SUPPLY KIT

PS-14

- Buffer, JFET and FET Regulator

- Index Control. No Feedback

- Thermal Protection

- Peak Current Limiting

- Minimum Output Slew Rate

- Rollover Protection

- 2000 Hz to 2 KHz

- TO-218 460.00

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15A CONT.

20A INT.

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Provides circuitry for your expensive equipment. Guaranteed for life. Instantly fixes shorted 120V SCR and allows you to control almost any circuit with 14VDC. Easily compatible with the PS-12 and PS-11. Adapts to any applications. Uniform-plated PC boards. Border (1) 1/28 1/28 290.00

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13417 FET Input 140 Op Amp Half. #4400 Op 3.10

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30000 MFD

15.37 Computer Grade Cap 39V 91.30 180 1/28

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FREQUENCY COUNTER KIT
 Outstanding Performance
 Incredible Price $89.95

SPECIFICATIONS:
Frequency range: 6 Hz to 65 MHz, 600 MHz with CT-600K
Resolution: 10 Hz to 0.1 Hz, 1 Hz to 1 MHz
Readout: 6 digit, 0.1" high LED, direct readout in MHz
Accuracy: adjustable to 0.5 ppm
Stability: 0.2 ppm over 10 to 40°C temperature
Compensated input: BNC 50 ohm, 2000 V peak, 50 ohm with CT-60K
Overload: 50VAC maximum on all measures
Sensitivity: less than 25 nV/50 MHz, 50-150 mV to 600 VAC
Power: 110 VAC 50 or 60 Hz, 200VAC, 400 mA.
Site: 6" x 4" x 2", high quality aluminum case, 2 lbs.
ICs: 13 units, all socketed

Order your today!
CT-50: 60 MHz counter kit $89.95
CT-50W: 60 MHz counter, wired and tested $119.95
CT-600, 600 MHz counter option, add $20.95

FM MINI MIKE KIT
A super high performance FM wireless mike kit! Transmits a stable signal up to 200 yards with exceptional audio quality by means of its built-in equalizer that includes mike, on-off switch, antenna, and battery super instructions. This is the finest kit available!

Order your today!
FM-3 kit $129.95
FM-3 wired and tested $169.95

CAR CLOCK
The UN-KIT, only 5 solder connections
Here's a super looking, rugged and accurate auto clock which is a snap to build and install. Clock shown on the far right exemplifies what you only need: 3 wires and 2 switches. Takes about 15 minutes!abay is bright and accurate and with automatic brightness control photocell...assures you of a highly readable clock display. Comes in a wide finish anodized aluminum case which can be attached 5 different ways using 2 sided tape. Choice of silver, black or gold case (specify)

DC-3 kit, 12 hour format $22.95
DC-3 wired and tested $29.95
110V AC adapter $5.95

UNDER DASH CAR CLOCK
12-24 hour clock in a beautiful plastic case features: 6 Jumbo RED LEDs, high accuracy (1min=1sec) easy 3 wire hookup, display blankets with brightness and super instructions. Optional dimmer automatically adjusts display to ambient light level
DC-11 clock with miq. bracket $27.95
DM-11 dimmer adapter $5.00

PRESCALER
Extend the range of your counter to 600 MHz Works with any counter Includes a 2 transistor pre-amp to give superb results, typically 20 mV at 60 MHz. Specify: 10 or 100 ratio.
PS-1B, 600 MHz prescaler kit $59.95
PS-1BK, 600 MHz prescaler kit $49.95

Ramsay's famous MINI-KITS
FM WIRELESS MIKE KIT
Transmits up to 300 ft to any FM broadcast radio, uses any type of mike. Runs on 3 or 9 V. Type FM-2 has added sun-shield mike preamp stage.
FM-1 kit $12.95
FM-2 kit $14.95

COLOR ORG/ORG/MUSIC LIGHTS
See music come alive 3 different lights flicker with music. One light for any counter and one for the highs. Each channel individually adjustable and drives up to 300V. Great for parties, band music, etc.
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A great attention getter which alters your counter to the name of the band or name badges. Buttons, warning panel lights, anything runs on 3 to 12 VDC.
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Converts any TV to video monitor Super stable, tunable over ch 4-6. Runs on 9-15V accepts 3 volt video signal. Best unit on the market.
Complete kit VT-1 $6.95

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A complete tone decoder on a single PC board. Features: 100-6000 Hz adjustable range via 20 turn pots, voltage regulation, 567 IC Useful for touch-tone decoding, tone burst detection, FSK etc. Can also be used as a stable tone encoder. Runs on 5 to 15 volts.
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Complete triple regulated power supply provides voltages stable to 6 to 15 volts at 200 mA 0.5 + 5V at 1 A. Excellent load regulation, good filtering and small size. 3 transformers required, 6.3V, 5V, and 1.25 V.
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-8B-
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• Broadband PA • No Tuning Required • Class C PA
• 430-470 MHz • 13-15W Out • 200 mW Drive
Model T80 = $79.95 Wired & Tested

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C30 30-32 MHz 146-148 MHz
C144 144-146 MHz 28-30 MHz
C145 145-147 MHz 28-30 MHz
C146 146-148 MHz 28-30 MHz
C110 Aircraft 26-30 MHz
C220 220-222 MHz 28-30 MHz
C222 222-224 MHz 28-30 MHz
Special Inquire About Other Ranges

ONLY $34.95!

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C432-4 432-436 MHz 144-146 MHz
C432-5 435-437 MHz 28-30 MHz
C432-7 437.25 MHz 61.25 MHz
C432-9 439.25 MHz 61.25 MHz
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let you hear the weak ones!

Great for OSCAR, SSB, FM, ATV. Over 10,000 in use throughout the world on all types of receivers.

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Specify Band When Ordering

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let you hear the weak ones!

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P8 Kit $10.95
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Specify Band

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  FULL LEADS! BRAND NEW!
  COMPUTER MFG. SUPRUS.
  100 FOR $2
  1000 FOR $17.50

FIVE CHANNEL SCANNER
PC Board only. A sensitive two band RECEIVER on a board measuring only 3x2½". Units were purchased when HYGAIN closed its Puerto Rico plant.
Will scan four crystals on the VHF (high) band or the UHF band. Works off 6VDC. Some units may require slight tuning. We provide basic hook ups, but have no schematic at this time. LIMITED QTY.

$5.99 each

MOTOROLA POWER TRIAC
TO-220 CASE
15 AMP 400 PRV
SPECIAL: 89¢ each
5 FOR $3.95

FAIRCHILD RED LED LAMPS
#FLV5057. Medium Size. Clear Case. RED EMITTING. These are not retested off-spec units as sold by some of our competition. These are factory prime, first quality, new units.

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FILTER CAP
2200 MFD 16/6DC
BY PANASONIC. SMALL SIZE.

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SILICON NPN AND PNP. TO-220 CASE.
VCEO - 40V PD - 30 WATTS
YOUR CHOICE

TIP29 - NPN
TIP30 - PNP
3 FOR $1

FAIRCHILD PNP
"SUPER TRANSISITOR"

8 FOR $1

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OP-AMP AND RELAY CONTROL BOARD
We do not know what these boards were used in, but they do contain a wealth of quality components. Board has: 2-12VDC 200 OHM SPDT Mini Relays. 1-CD4001 CMOS, 4-LM358 High Performance OP AMPS (same as 1/2 LM324), 1-MOTOROLA MC3340 Mini Dip, 1-Audio Output Transformer, 1-TIP30 30 WATT PNP Power Transistor, plus 70 more assorted components. All parts easily removed.
LIMITED STOCK: 24 each

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**KIT FEATURES:**
1. Doubled sided PC Board with solder mask and silk-screened layout. Gold plated contact fingers.
2. All sockets included.
3. Fully buffered on all address and data lines.
4. Phantom is jumper selectable to pin 67.
5. FOUR 7805 regulators are provided on card.

[Blank PC Board w/Documentation $29.95]
[Low Profile Socket Set. $13.50]
[Support IC's (TTL & Regulators), $4.50]

**ASSEMBLED AND FULLY TESTED**

**OUR 450NS 2708’s ARE $8.95 EA. WITH PURCHASE OF KIT**
MA1003 matching case:

NOW GET BOTH FOR $19.95!

The MA1003 is a popular clock module that features blue-green fluorescent readouts (won't wash out in daylight), a highly accurate built-in timebase (excellent for mobile/portable operation and battery backup applications), and really easy assembly ... add time setting switches, +12V DC, and you're ready to go. So simple, it makes a great one evening project; so inexpensive, you can afford to have accurate, electronic time-keeping not only in your home but in your car, truck, or van.

Our matching case has a simulated woodgrain front, mounting bracket and hardware, and a blue filter that really brings out the best in the MA1003 readouts. Best of all, it's compact ... and even has pilot holes pre-drilled for 2 time-setting switches and an optional display switch. Comes complete with applications data.

It's about time someone came up with a simple, inexpensive, easy to assemble clock ... here it is. If you wish, the clock module is available separately for $18.50 each ($35/46), and the case for $5.95 each.

MA1003 clock module, MA1003 matching case: $19.95

12V 8A POWER SUPPLY $45

WHAT'S BIPOLAR, REGULATED, SIMPLE, VIRTUALLY BLOW-OUT PROOF, DELIVERS ±250 mA MINIMUM, AND COSTS ONLY $15?

A GODBOUT BIPOLAR POWER SUPPLY KIT!

These power supplies are great for fixed voltage applications. Available in ±5V, ±6V, ±8V, ±9V, ±12V, and ±15V models — specify project #13-XX, where the XX stands for the desired voltage. Compact, simple assembly.

RF POWER transistors

2NRF-1 2 GHz RF power transistor. Pd max (@ 25 degrees C) 3.5W, Pout min @ 2 GHz 1.0W, Pin 310 mW, efficiency @ 2 GHz 30%, round shape, similar to RCA 2N5470. $4.95

2NRF-2 2 GHz RF power transistor. Pd 8.7W, Pout 2.5W, Pin 300 mW, efficiency 33%, cross shape, similar to RCA TA8407. $5.95

2NRF-4 2 GHz RF power transistor. Pd 29W, Pout 7.5W, Pin 1.5W, efficiency 33%, cross shape. Factory selected, prime 2N6269. $7.95

2NRF-3 2 GHz RF power transistor. Pd 21W, Pout 5.5W, Pin 1.25W, efficiency 33%, cross shape. Similar to RCA 2N6269. $6.95

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These power supplies are great for fixed voltage applications. Available in ±5V, ±6V, ±8V, ±9V, ±12V, and ±15V models — specify project #13-XX, where the XX stands for the desired voltage. Compact, simple assembly.
Transistor Checker

- Completely Assembled -
- Battery Operated -

The AGI Transistor Checker is capable of checking a wide range of transistors, either "in circuit" or out of circuit. To operate, simply plug the transistor to be checked onto the two steel pins and turn on the test switch. No additional test leads are required. The unit is compact and can be conveniently used on tabletop or on the operating bench. Since 3/4" w. x 5/8" h., the Transistor Checker is supplied in a plastic molded carrying case. Tested. Check: $29.95 ea.

Custom Cables & Jumpers

See JAMECO Catalog for pricing.

Connectors

- DB 25 Series Cable Part No. Cable Length Connectors Price
  - DB25P-4 4 ft. $2.95 ea.
  - Dip Jumpers
    - DBJ-1 1 ft. $1.15 ea.
    - DBJ-14-1 1 ft. $1.15 ea.
    - DBJ-24-1 1 ft. $1.25 ea.
    - DBJ-14-14 1 ft. $1.25 ea.
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    - DBJ-24-24 1 ft. $4.95 ea.

For Custom Cables & Jumpers, see JAMECO Catalog for pricing.

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- 0.4 volts
- Can be added in series for higher voltage or parallel for greater current
- 100mA
- 41 MW
- "SCS-2x2" $1.95 ea or 3/8$b.0.5

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The Switchboard is a single pole normally open switch which the magnetic is arranged so that the contacts are open. This switch easily installs between doors and windows.

The Incredible "Pennywhistle 103"

- $139.95

The Pennywhistle 103 is a complete kit for building your own 4K TRS-80 System 16 Kit. It comes complete with:
- 8 each UPD416 (16K Dynamic RAMs)

- Documentation for conversion

TRS-80 16K Conversion Kit

- Expand your 4K TRS-80 System 16 Kit. It comes complete with:

- 8 each UPD416 (16K Dynamic RAMs)
- Documentation for conversion

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- UHF Channel 33 TV Interface Unit Kit

- Wide Band B/W or Color System
- Connects directly to your home computers, CTV, cards, Apple II, works with many other popular PC's - all with only 2 leads

- Includes coaxial cable and antenna transformer

- $29.95 Kit

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- 25 Pin Subminiature

- DB25 (6 pin) PLUG (Meet RS232) $2.15
- DB25 SOCKET (Meet RS232) $3.50

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- 3½" SMD Panel single male panel normally open switch which the magnetic is arranged so that the contacts are open. This switch easily installs between doors and windows.

$250.00-002 2/5.00

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- For use with small electronic devices
- 150/250 volt model

- AC 250 170V/60hz 12 VAC 250mA $3.95
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- Guaranteed frequency range of 100 Hz to 50 MHz
- 6 Digit display shows the actual frequency
- LCD display reads the actual frequency
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- Battery powered
- Built-in recalibration
- Built-in recalibration
- Battery powered

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Reader Service—see page 195

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Ceramic Element/High Imp
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Has 3 slide switches—28 different keys—keypads removable by removing 4 screws.

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450-470 MHz 10W
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$20.00 ea.

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Telephone Style Handset
$7.00 ea.

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1½" x 1" 50c ea
3 for $1.25

MINI TOGGLE SW
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SPDT
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6/5.00

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Rugged, great for mobile use
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Low Loss
Polyfoam
Coax Cable
$3.50 ea

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EF 45/5K
$3.50 ea

GOLD PLATED CARD EDGE CONNECTORS

<table>
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<tr>
<th>Double Row/Wire Wrap</th>
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<td>25 pins</td>
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<tr>
<td>22 pins</td>
<td>$2.44 ea</td>
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All material guaranteed. If for any reason you are not satisfied, our products may be returned within 10 days for a full refund (less shipping). Please add $3 for shipping and handling on all orders. Additional 5% charge for shipping any item over 5 lbs. COD's accepted for orders totaling $50.00 or more. All orders shipped UPS unless otherwise specified. Florida residents please add 4% sales tax. Minimum order $15.00.
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ORDER FORM

<table>
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<tr>
<th>Item</th>
<th>Price Each</th>
<th>Shipping</th>
<th>Total Price</th>
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<tr>
<td>U.S. CALLBOOK</td>
<td>$15.95</td>
<td>$1.75</td>
<td>$17.70</td>
</tr>
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<td>FOREIGN CALLBOOK</td>
<td>$14.95</td>
<td>$1.75</td>
<td>$16.70</td>
</tr>
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</table>

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Reader Service—see page 195
ALDELCO ELECTRONIC CENTER

OVERVOLT 12
Crow Bar circuit protects Transceivers & Tape Decks from runaway power supply voltage that can zap expensive components. OV 12 causes fuse in Power Supply to blow if voltage exceeds preset level (approx. 16 to 18 volts). Rated at 25 Ampere.
Model OV5. Protects 5 Volt circuits. Triggers at 7.5 Volts $8.95
Other units available at 3.3 to 100 Trigger Voltages $10.95 ea.

Aldelco can supply 3 PC boards. Silk screened front panel and complete instructions for only $12.50 & shipping.

SOME PARTS USED IN COUNTER

<table>
<thead>
<tr>
<th>Counter</th>
<th>Price</th>
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<tbody>
<tr>
<td>11C90 Prescaler</td>
<td>14.50</td>
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<tr>
<td>74C925 Multiplex</td>
<td>9.95</td>
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<tr>
<td>F936A Driver (2)</td>
<td>7.90</td>
</tr>
<tr>
<td>1 MHz XTAL</td>
<td>7.95</td>
</tr>
<tr>
<td>1.60 pf trim cap</td>
<td>.60</td>
</tr>
</tbody>
</table>

See six page construction article in Dec. 1978 73 Magazine

AEC 1074 50Watt @ 30 MHz $21.15
AEC 1076 75Watt @ 50 MHz $24.00
both cases 500 4FL

Hard to find replacement for VHF Mobile & Marine use.
Successfully used in Standard and other VHF's.
Rated 12 Watts at 200 MHz.
12.5 Volts with 5.3 DB Gain.
Heat Sink stud (602) isolated from leads. Only $12.30

RF DEVICES

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Model</th>
<th>Price</th>
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<tr>
<td>2N2876 18W</td>
<td>200 MHz</td>
<td>$12.35</td>
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<td>2N3375 3.0W</td>
<td>400 MHz</td>
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<td>2N3253 2.5W</td>
<td>175 MHz</td>
<td>1.40</td>
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<td>2N3366 1.0W</td>
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<td>2N3369 2.0W</td>
<td>400 MHz</td>
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<td>2N4147 1.0W</td>
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<td>2N3386 2.0W</td>
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<td>2N5546 1.0W</td>
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<td>2N5591 2.5W</td>
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ALDELCO KITS

DUAL DIGITAL 12/24 HOUR CLOCK KIT WITH NEW WALNUT GRAIN WOOD CABINET

Features:
- 12 or 24 Hour Operation on either clock
- Each Clock separately controlled
- Freeze feature for time set

Easy assembly for clock and cabinet

MODEL AFD 5-2

ONLY $49.95

ALARM CLOCK KIT

6 Big 0.5 LED Displays - On Board AC Transformer - 12 Hour Format with 24 Hour Alarm - "Snooze Feature" - Ellipsoid Timer. Timer feature makes this Popular in Broadcast Stations. It's a natural for cars, boats and campers when used with optional crystal time base. Fits our standard cabinet.
Crystals time base when purchased with clock. $21.95

12 or 24 HOUR DIGITAL CLOCK KIT

Uses 0.5 Display LED. 5144 Clock Chip. Freeze feature for accurate set. Fits our standard cabinet.
ONLY $19.95

CLOCK CABINETS
Woodgrain or black leather

CRYSTAL TIME BASE KIT
Includes PC Board. Crystal, all parts and instructions.

$4.95

CLOCK FILTERS
Blue, Red, Green, Amber or Smoke $6.60

Blinky Flasher Kit
PC board, 555 & all parts works on 9 volts. Mouse button - $1.00

DIGITAL MULTIMETER & THERMOMETER

3½ Digit -0-5 ranges on each function AGDC - 2 Volts to 2000 Volts Current 2 Microamps to 2 Amps Resistance 2000 Ohms to 2 Megohms. Includes PC Board, ICL7107 Chip and all parts. Only $49.95

CRYSTAL SOCKETS

HOLDS 8 HC25U $59
Single HC25U $29

NATIONAL A1188A
9 digit calculator readout 89

NEW! Tunable 420 MHz Fast Scan TV Converter

Receive Fast Scan Amateur TV in the 420 to 450 MHz Band with any TV set. Low noise, high gain & Amp with varactor tuned input and outputs. Built in AC supply. Comes in two tone walnut & beige cabinet measuring 1 7/8" x 4 1/4" x 4 1/8" Factory wired with 2 year guarantee.
$59.95

ADJUSTABLE POWER SUPPLY KITS

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<td>12.28 Volts 500 MA</td>
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BUILD A 6 DIGIT 500 MHz FREQUENCY COUNTER

Look for us at Dayton

COMPLETE LUNCH COUNTER KIT $99.95
Includes a reprint of six page construction article from Dec. 1978 73 Magazine
For reprint only send 50 cents for handling

THE VERY POPULAR TOPE

ACCUEYER KIT

- Simple low cost Memory Kit. Uses 2 programmable 111 Memory chips. Provides 2 canned messages of 30 Characters each. Adaptable to Handbook and other Accueyers. Includes PC board (same size as Accuey board) and all parts. Requires 5 VDC. $19.95

ACCUEYER MEMORY KIT

Simple low cost Memory Kit. Uses 2 programmable 111 Memory chips. Provides 2 canned messages of 30 Characters each. Adaptable to Handbook and other Accueyers. Includes PC board (same size as Accuey board) and all parts. Requires 5 VDC. $19.95

ALDELCO

2789A MILBURN AVE, BALDWIN, N.Y. 11510
516 378 4555

Add 6% shipping. Add $1.00 for orders under $10.00. Out of U.S.A. add 15% shipping and certified check or money order in U.S. funds.

Reader Service—see page 195
**DIOSES/ZENERS**

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Molex pins .01 To-3 Sockets .25

2 Amp Bridge .100 prv

25 Amp Bridge .200-prv .150

**TRANSISTORS, LEDS, etc.**

2N2222 (2N2222 Plastic .10) .15

2N2907A PNP .19

2N3906 PNP (Plastic Unmarked) .10

2N904 PNP (Plastic Unmarked) .10

2N904 NPN .45

2N905 NPN 15A 60v .60

TIP125 PNP Darlington 1.35

LED Green, Red, Clear, Yellow .15

D.L.747 7 seq 5/8" High com-anode .95

MAN72 7 seq com-anode (Red) .125

MAN810 7 seq com-anode (Orange) .125

MAN832 7 seq com-anode (Yellow) .125

MAN74 7 seq com-cathode (Red) .150

FND869 7 seq com-cathode (Red) .125

**9000 SERIES**

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**SPECIAL DISCOUNTS**

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<td>24 Hour Toll Free Phone 1-800-864-2211</td>
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<td>(714) 278-4394 California Residents 1-800-542-6239</td>
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**C.O.D. WILL CALL**

| UPS | NET 10th of the MONTH | PO # |

**ALL ORDERS SHIPPED PREPAID - NO MINIMUM - COD ORDERS ACCEPTED - ALL ORDERS SHIPPED SAME DAY - OPEN ACCOUNTS INVITED - California Residents add 6% Sales Tax. PRICES SUBJECT TO CHANGE WITHOUT NOTICE.**

We accept American Express / Visa / BankAmericard / Master Charge
VARIABLE POWER SUPPLY KIT $11.95

- Continuously Variable from 2V to over 15V
- Short-Circuit Proof
- Typical Regulation of 0.1%
- Electronic Current Limiting at 300mA
- Very Low Output Ripple
- Fiberglass PC Board Mounts All Components
- Assembly in Under One Hour
- Makes a Great Bench or Lab Power Supply
- Includes All Components except Case and Meters

ADD $1.25 FOR POSTAGE/HANDLING

SPECIALS — THIS MONTH ONLY

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A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair
G = Good
P = Poor
SF = Chance of solar flares

April

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