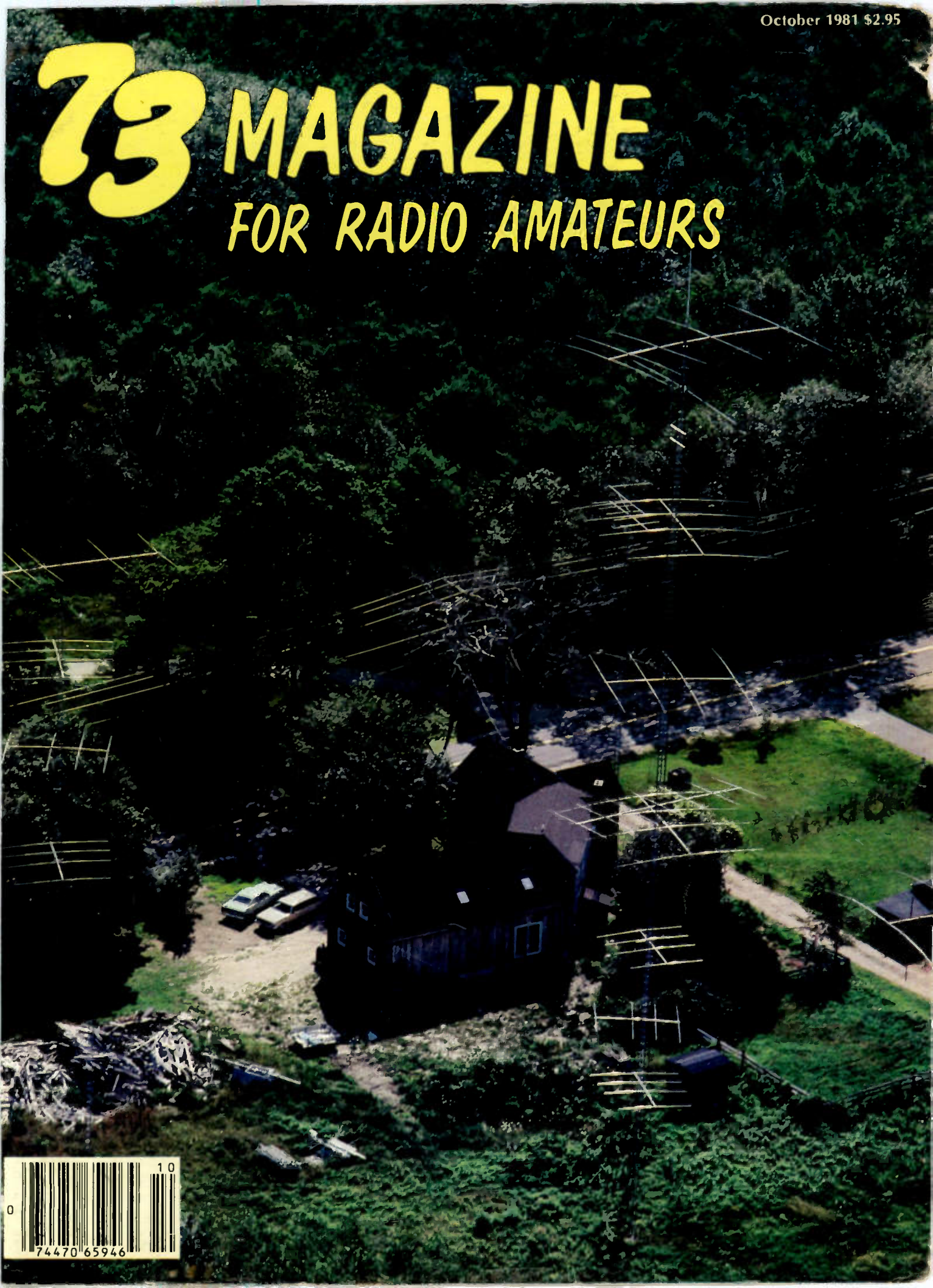


October 1981 \$2.95

# 73 MAGAZINE

FOR RADIO AMATEURS



# tempo does it again



## THE WORLD'S FIRST 440 MHz SYNTHESIZED HAND HELD RADIO

Tempo was the first with a synthesized hand held for amateur use, first with a 220 MHz synthesized hand held, first with a 5 watt output synthesized hand held...and once again first in the 440 MHz range with the S-4, a fully synthesized hand held radio. Not only does Tempo offer the broadest line of synthesized hand helds, but its standards of reliability are unsurpassed...reliability proven through millions of hours of operation. No other hand held has been so

thoroughly field tested, is so simple to operate or offers so much value. The Tempo S-4 offers the opportunity to get on 440 MHz from where ever you may be. With the addition of a touch tone pad and matching power amplifier its versatility is also unsurpassed.

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

#### Specifications:

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

#### Optional Accessories for all models

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

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10W	80W	80A10	\$149
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2W	30W	30A02	\$ 89

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

### Tempo S-1

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

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\*For use with S-1 and S-5

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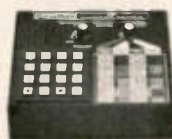
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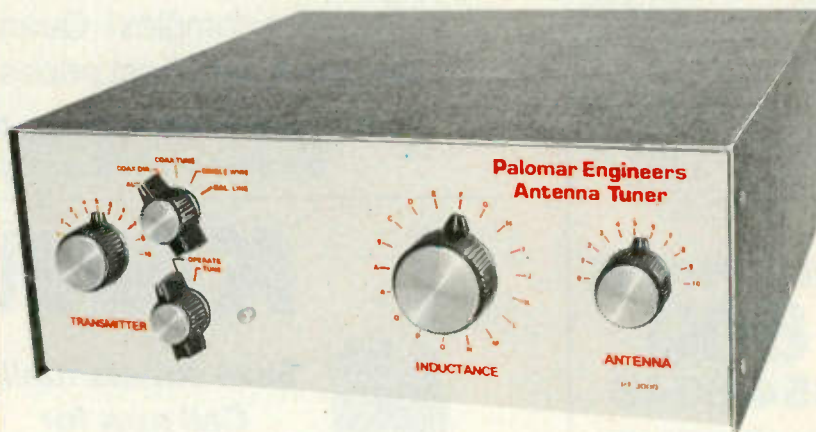
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# Antenna Tuner



## New low profile design.

Here is the famous Palomar Engineers high power tuner in a new compact size. Only 5½" x 14" x 14" yet it has all the features, works from 160 through 10 meters, and works with coax, single wire and balanced lines. And it lets you tune up without going on the air!

### WE INVESTIGATED

All tuners lose some rf power. We checked several popular tuners to see where the losses are. Mostly they are in the inductance coil and the balun core.

So we switched from #12 wire for the main inductor to ¼" copper tubing. It can carry ten times the rf current.

### IMPOSSIBLE FEAT

The biggest problem with tuners is getting them tuned up. With three knobs to tune on your transceiver and three on the tuner and ten seconds to do it (see the warning in your transceiver manual) that's 1½ seconds per knob.

We have a better way; a built-in 50-ohm noise bridge that lets you set the tuner controls without transmitting. And a switch that lets you tune your transmitter into a dummy load. So you can do the whole tuneup without going on the air. Saves that final; cuts QRM.

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Cover: K10X's multi/multi station is a contester's dream (article begins on page 18). Photo by Paul Grupp KA1LR.

# W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



## THE OLD OLD-TIMERS

While talking with someone about the sudden stopping of growth of amateur radio in 1963, when the "incentive licensing" proposal was put to the FCC, I was able to put this situation in better perspective by making a simple calculation.

From the period of 1946 to 1963, a seventeen-year period, amateur radio grew at the rate of 11% per year. This was fairly steady growth. Then it instantly stopped, with a net loss in hams over the next ten years. Since then, it has been growing again, but very slowly. Today, 18 years after incentive licensing was proposed, our growth is only where it would have been by 1965, two years later. We've lost almost a whole generation of hams... sixteen years worth!

Let's put that further into per-

spective. This means that on the average, hams have gotten sixteen years older. Well, I think we see that at clubs and hamfests. We have a huge proportion of retired hams these days. I think this has a lot to do with the drop in the buying of ham equipment, since retired people are for the most part trying to eke out an existence from Social Security and are in no position to spend a thousand dollars or more for a new station.

We see it also in the drop in the inventiveness of hams. Most retired hams are not up with the latest in technology and are not able to do much to keep up the ham reputation for inventiveness and pioneering... which is a young man's game. We shut the young men out for a sixteen year period, so we don't have many of them any more. No wonder amateur radio has produced so little in the way of innovation in the last 20 years.

The ham inventors and pioneers were, for the most part, youngsters. I was 26 when I got going strong on NBFM and RTTY, running beacons on 6m and so on. Copthorne McDonald was a young chap when he developed slow-scan television. Oh, a few old-timers hang in

there, working away. A recent article on Reinhart told about his inventions... well, he was still going strong right up until he died. He wrote articles for 73 in the early 60s. And Bill Hoisington did tremendous UHF developmental work in his 60s and is still going strong in the Philippines. But these up-to-date old-timers are few and far between. Most older hams are still thinking tubes and kc instead of ICs and GHz.

With over one million electronics engineers and technicians kept out of the American work force because they never got into amateur radio, it is no wonder that our country is getting further and further behind Japan in electronic technology. Our hobby and our country are paying the price for that loss of a generation of hams.

If we just want to try to catch up with the growth that we would have had were it not for the incentive licensing disaster, we will have to grow at the rate of 33% per year for the rest of this decade. If we can figure out how to do that, I think that American technology could catch up with Japan. Other than that, I see no serious hope of our country ever regaining our ground.

Should we just shrug our shoulders and give up? Or is this something worth fighting for? This is something which I can't do alone... and which no one of you can do alone. But it is something which all of us together, if we really want to, could tackle and win.

I am not going to butt my head against the wall trying to do something which most hams don't care about. We can get amateur radio growing again. We can even get it into a 33% growth pattern... if we really want to. It will mean cooperation and a dedication of purpose which we have not seen in amateur radio in many years. It seems to me that we're going to need to have every ham possible join a club, and see that we get every high-school student we can into our license classes.

In a recent talk with the FCC, I brought up this situation and I believe that our fight may be helped from the highest office... the White House.

My own preference is to tackle the problem with new ideas. I realize that by far most hams are opposed to a no-code ham license, no matter how fantastic this has been for the Japanese... and what great operators they are... and how much this has packed their research labs with enthusiastic ham engineers who are pushing their country ahead of ours. Okay, if you don't want to even think about that... what do you propose which could get us growing?

Could we help the FCC by taking over both the teaching and the granting of ham licenses as a function of our ham clubs? This would cut FCC expenses enormously and might bring new life to ham clubs. Hams have always shown that they can be responsible and self-governing. Well, perhaps it is time to take that next step.

What are your ideas? Is it worth the bother?

## W2NSD/1 ON-THE-AIR SCHEDULE OCTOBER, 1981

1	15-20 Phone
13	20m RTTY
20	20-40 Phone
27	15-20 CW

Response to our 15- and 20-meter phone sessions has been especially strong, so we have scheduled additional time on these two bands. On both phone and CW nights, look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first, from 7:00-10:00 pm eastern time.

## DF BREAKTHROUGH

Readers should be aware that construction or use of the direction-finding system described in the article "DF Breakthrough" which appeared in the June, 1981, issue of 73 may possibly be an infringement of US Patent #4,041,496, issued to Paul Norris.

Any unauthorized construction or use for commercial purposes of a patented invention is an infringement of that patent. Construction of a single unit for the experimental or personal use of the constructor is not considered commercial use.

## ST. LUCIA

Against my better judgment, we took off a few days and zipped down to St. Lucia. No negatives as far as the island is concerned; it was mostly worry about keeping up with the work load brought on by the introduction of a new magazine: *Desktop Computing*. When a new magazine is being started, there is al-

# Dyna "mite."



## Miniaturized, 5 memories, memory/band scan

### TR-7730

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

#### TR-7730 FEATURES:

- **Smallest ever Kenwood mobile**  
Measures only 5-3/4 inches wide, 2 inches high, and 7-3/4 inches deep, and weighs only 3.3 pounds. Mounts even in the smallest subcompact car, and is an ideal combination with the equally compact TR-8400 synthesized 70-cm FM mobile transceiver.
- **25 watts RF output power**  
Even though the TR-7730 is so compact, it still produces 25 watts output for reliable mobile communications. HI/LOW power switch selects 25-W or 5-W output.
- **Five memories**  
May be operated in simplex mode or repeater mode with the transmit frequency offset  $\pm 600$  kHz. The fifth

memory stores both receive and transmit frequency independently, to allow operation on repeaters with nonstandard splits. Memory backup terminal on rear panel.

- **Memory scan**  
Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Extended frequency coverage**  
Covers 143.900-148.995 MHz in switchable 5-kHz or 10-kHz steps, allowing simplex and repeater operation on some MARS and CAP frequencies.
- **Automatic band scan**  
Scans entire band in 5-kHz or 10-kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **UP/DOWN manual scan**  
With UP/DOWN microphone provided, manually scans entire band in 5-kHz or 10-kHz steps.
- **Offset switch**  
Allows VFO and four of five memory

frequencies to be offset  $\pm 600$  kHz for repeater access (or to be operated simplex) during transmit mode.

- **Four-digit LED frequency display**  
Indicates receive and transmit frequency during simplex or repeater-offset operation.
- **S/R/F bar meter and LED indicators**  
Bar meter of multicolor LEDs shows relative receive and transmit signal levels. Other LEDs indicate BUSY, ON AIR, and REPEATER offset.
- **Tone switch**  
Activates internal subaudible tone encoder (not Kenwood-supplied).

#### Optional accessories:

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

More information on the TR-7730 and TR-8400 is available from all authorized dealers of Trio-Kenwood Communications  
1111 West Walnut Street,  
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## Synthesized 70-cm FM mobile rig

### TR-8400

- **Synthesized coverage of 440-450 MHz**  
Covers upper 10 MHz of 70-cm band in 25-kHz steps, with two VFOs.
- **Offset switch**  
For  $\pm 5$  MHz transmit offset on both VFOs and four of five memories, as well as simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- **DTMF autopatch terminal**  
On rear panel, for connecting DTMF (dual-tone multifrequency) touch pad (for

accessing autopatches) or other tone-signaling device.

- **HI/LOW RF output power switch**  
Selects 10 watts or 1 watt output.
- **Virtually same size as TR-7730**  
Perfect companion for TR-7730 in a compact mobile arrangement.
- **Other features similar to TR-7730**  
Five memories, memory scan, automatic band scan (in 25-kHz steps), UP/DOWN manual scan, four-digit LED receive frequency display (also shows transmit frequency in memory 5), S/R/F bar meter and LED indicators, tone switch, and same optional accessories.

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We went to St. Lucia anyway, and it was worth the trip. It was worth it many times over. Firstly, there is no way that I will ever be

able to thank the St. Lucian hams enough for their attention, their help, and their interest in making the visit enjoyable. In addition to Sherry, Tim Daniel N8RK of the 73 staff went along, as did Chuck Martin WA1KPS of Tufts Electronics. The ham business was slack in June, so Chuck said what the heck and joined us on the trip.

Though we arrived late at night, we were met by a bunch of the local hams, complete with a cooler full of beer, champagne, and even some soft drinks. It was warm, so the refreshments were a great beginning for our visit. When they offered to drive us to the hotel, that seemed like a good idea . . . and it sure was. We had no idea that the hotel was on the other end of the island, an hour and a quarter drive over a twisty, narrow potholed road. It was like driving a high-

speed obstacle course at night, whipping around deep holes in the pavement every four hundred yards. Fortunately, there is little traffic on the St. Lucia turnpike, which is just two cars wide and goes through mountains just about all the way.

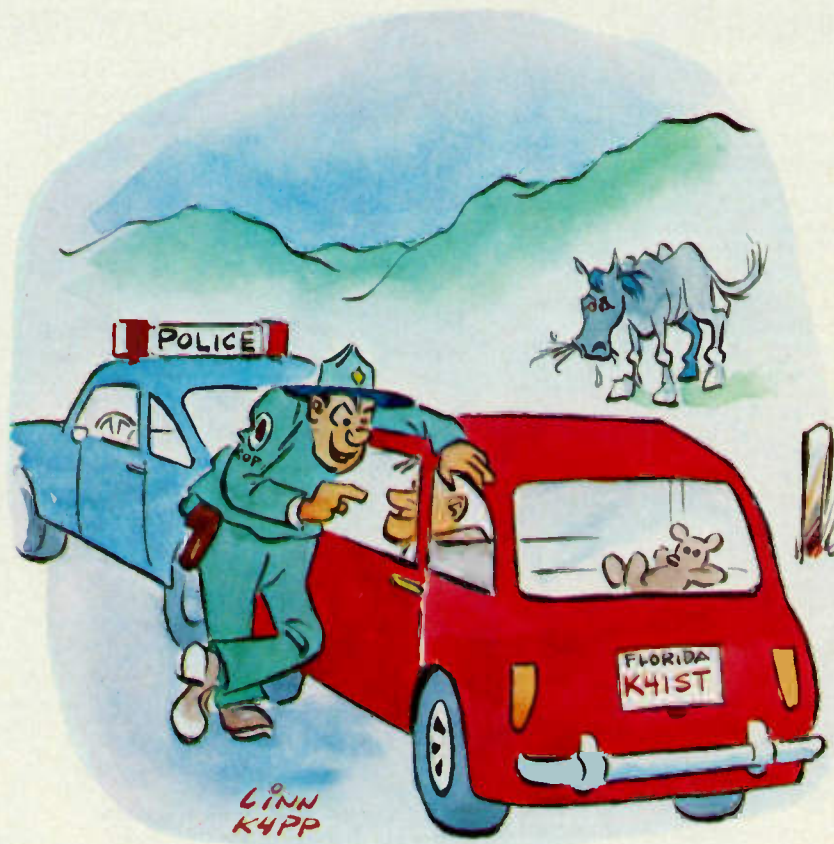
Our hotel, recommended by Eastern Airlines, was a bit of a disappointment. It was wonderfully located, right on a gorgeous sandy beach with palm trees. But the meals were uninspiring. There we were in the middle of a tropical paradise, with fruit at every turn, and the hotel couldn't manage a banana or any other fruit for breakfast. Canned orange juice.

The rooms were clean and some of the air conditioners worked, so I had no complaint about that . . . nor the ocean

*Continued on page 175*

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

by Bandel Linn K4PP



"I saw your license plate! There's a traffic jam ahead! Follow me and I'll lead you around it!"



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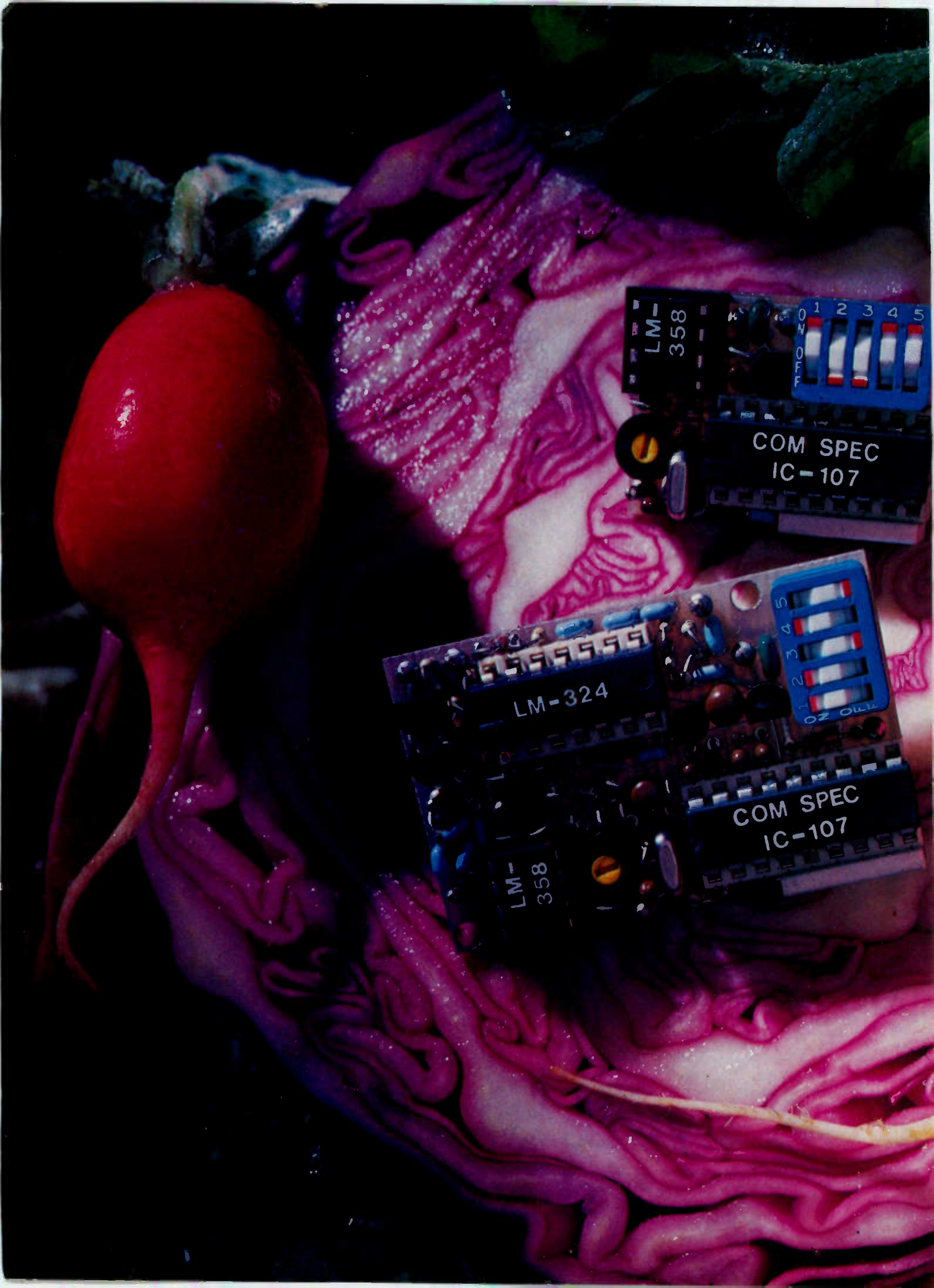
\*Sale of the ST-7/T is subject to FCC Certification.



The SANTEC HT-1200 is approved under FCC Part 15 and exceeds FCC regulations limiting spurious emissions.

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77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
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# Contesting from VP5

## — the other end of the pileup and how to get there

It began as a fantasy in August, 1980, and ended seven months and 8,100 QSOs later as a contester's dream-come-true. Tim N8RK had just returned from a week in the Caribbean, where he'd been working with other hams to assist the devastated island nation of St. Lucia to recover from the effects of Hurricane Allen (See "Hams vs. Hurricane Allen," *73 Magazine*, November, 1980). We were examining a detailed map of the Caribbean, discussing his trip, when one of us turned to the other and said, "I wonder which of these islands is rare enough

to be a good spot for a DXpedition?" It was just idle chatter, or so we thought. As it turned out, none of the easily-accessible islands could be considered really rare. However, a couple of places, notably the Turks and Caicos Islands (VP5), were heard less often than most of the others. An idea began to grow. What if we did an expedition? Pretty heady stuff, that! After all, weren't DXpeditions the business of such DX luminaries as Don Miller, Gus Browning, and the Colvins? We set out to prove that a couple of average guys could do it, too.

### Getting Organized

As with any complex project, proper planning became the key to success. In order to give ourselves sufficient time to bring together the hundreds of details, we selected the first week of March, 1981, as the departure date, giving us a full seven months to organize our trip. This date also coincided with the phone weekend of the annual ARRL DX Competition, in which we planned to enter the multi-operator, single-transmitter category. We still didn't know for sure where we were going, but at least we knew when!

From the outset, planning the trip was an unwieldy exercise in long-distance communication. Tim returned to Terre Haute, Indiana, in late August to continue the pursuit of a degree in electrical engineering, while I remained in New Hampshire. We would not see each other again until March 1st, two days before leaving for VP5-land.

The following seven months were busy, punctuated by long QSOs on 20 meters, lengthy letters, and

late-night telephone calls. Tim's acquaintances in the midwest and mine in New England thought our remote-control organizing of such a trip was more than a little unusual, especially since neither of us had ever before been involved in any sort of expedition.

Tim set to work researching the licensing procedures for VP5 and several other countries, while I investigated travel and accommodations throughout the Caribbean. At this juncture, a chance conversation with Joe WB4OSN saved us weeks of work. Joe had visited the Turks and Caicos Islands several times, and he heartily recommended this tiny British possession as an ideal destination for our DXpedition. He spoke with special favor of a place called the Third Turtle Inn, on Providenciales Island (forever after known as "Provo"), one of the largest islands in the Turks and Caicos group. As if this weren't enough, Joe even provided information on air connections to Provo, which was handy, since the commercial airlines do not yet fly there directly from the U.S.A. After educating our



Our first view of the Turks and Caicos—the tiny island of Grand Turk. Note the airport runway, which runs from shore to shore.



*The Third Turtle Inn on Grace Bay, site of our VP5TDX/VP5JDT operation. Built into the side of a cliff, the inn is a popular spot for DXpeditions. We stayed in the small building at upper left.*



*A partially-completed cinder-block wall provided a sturdy support for our tribander. Here, Tim prepares to hoist the antenna into place on a protruding piece of reinforcing rod.*

travel agent on the whereabouts of the islands and getting his assurances that rooms were indeed available at the Third Turtle, the die was cast... we were going to VP5!

We soon learned that the Turks and Caicos in general, and Provo in particular, were the home of some of the world's very best snorkling and scuba diving. Throughout the winter of 1980-81, first one and then another skin-diving magazine sang the praises of Provo and the Third Turtle Inn. We decided we had picked the right place.

Meanwhile, Tim was discovering conflicting information on the best route for obtaining our reciprocal operating permits. In fact, we came up with no less than three plausible ways of getting a VP5 license. Fortunately, while Tim's first attempt failed to bring a VP5 license, it did bring the correct information from the Magistrate's office in Grand Turk, the capital city. It was a tight squeeze, however, with our licenses eventually arriving less than three weeks before D-Day. Having these precious documents in hand was a tremendous relief.

It appears that, in the absence of any special request, the Magistrate issues

callsigns based on the applicant's initials. Thus I received VP5JDT, while Tim came away with VP5TDX. Applicants who ask for particular suffixes seem to get them, as long as they have not been issued previously.

#### **Details, Details**

From the first, every bit of advice that came our way emphasized the importance of careful equipment selection and organization. Coming up short on something as simple as PL-259s could completely ruin an otherwise well-planned trip. The list of required items, from transceivers to suntan lotion, grew almost daily for six months. It eventually occupied seven pages in the small notebook that became my constant companion. In many ways, it was like planning a large Field Day effort, except that the nearest junk box or ham store was 750 miles away.

Early on, we decided to take along a pair of transceivers from the same manufacturer. We reasoned that this would allow us to exchange components in the event of rig failure. It also made all microphones, headsets, keyers, etc., interchangeable without rewiring connectors when going from one rig to another.

In the end, we chose Kenwood gear: a TS-520 loaned to us by good friend Bill W1HCS and an 830S from the OM himself, W2NSD/1. Antennas would be a trap vertical (again courtesy of HCS) and a Cushcraft A3 tri-band beam. Telex ProComm 200 headset/boom mikes, an MFJ antenna tuner, and a remote vfo for the 520 completed the inventory of major gear.

W1HCS also volunteered his address as the mail drop for the many incoming QSL cards that were certain to follow our trip. Both Tim and I had changed our mailing addresses so often in the past few years that our *Callbook* listings were accurate only in the most recent editions. It may seem like a very minor detail, but the use of a long-established address such as Bill's greatly simplified our on-the-air response to requests for QSL information. Bill's lovely wife, Lynn, accepted this imposition with extraordinarily good grace.

As planned seven months beforehand, Tim arrived in New Hampshire just two days before departure for VP5. Those last 48 hours were spent carefully packing the four suitcases and two antenna bundles which comprised our gear. A fifth bag held all our personal

items. The trap vertical and most of the beam were stowed in a red, white, and blue ski bag. Aside from getting us a lot of strange looks in the sunny Caribbean, this proved to be an efficient way to carry those dozens of aluminum tubes. It also had the advantage of sticking out like a sore thumb amongst the piles of baggage at the airports through which we passed; no chance of losing that one. Just in case, however, we decided to carry a minimal station with us aboard the aircraft. On Monday afternoon, March 2, we dashed through our several-hundred-item checklist one last time. Then, it was off to Boston's Logan Airport for a night flight to Miami.

#### **Slowly, Slowly**

After seven months of anticipation and a frantic last two days, Tim and I were on a natural high as we flew first to Miami, and the next day, on to Grand Turk, the only place in the Turks and Caicos served by jets from the U.S. We had booked reservations on the Turks and Caicos National Airlines (TCNA) for a connecting flight to Provo, our final destination.

Although the runway at Grand Turk spans the entire width of the island, it's still a short one. Our small 737



Once atop the wall, the antenna was tied off to prevent the ever-present tropical breezes from tearing it to pieces. Kansas is dead ahead.

jetliner used all but the last 100 feet or so in making a smooth landing. After clearing customs and immigration, a task made easier when we showed officials our reciprocal licenses, the first order of business was to check the status of our TCNA flight to Provo. On this matter, there was bad news and good news. The bad news was that the TCNA plane had already departed...without us. The good news was that it had been filled to capacity anyway, so we really hadn't missed anything. Oh, well!

It was quickly obvious that both life and business in the Turks and Caicos ran at a somewhat more relaxed and informal pace than we were accustomed to. We began to explore alternative transportation to Provo and encountered a pilot, an American, who offered to fly us to Provo at no charge, since he lived on the island. The only hitch was that his single-engine plane refused to start, even when jumped from a truck battery. Three hours later, no apparent progress had been made, although our erstwhile pilot was still trying. His only comment was, "Slowly, slowly." We began to wonder if we'd ever see Provo.

The sun was setting behind the Grand Turk con-

trol tower when opportunity knocked in the form of charter pilot Howard Hamilton and his beautiful twin-engined Cessna. Howard was bound for Provo and announced his willingness to take passengers if we could leave immediately. Leaving the bulk of our ham gear in the hands of an airport official, Tim and I grabbed the 520, the antenna tuner, some wire, and our cameras and jumped aboard Howard's plane in the failing light. More than an hour later, we arrived over Provo in almost total darkness, at which time Howard executed a near perfect landing without benefit of runway lights or any sort of traffic control. We'd made it.

#### Faster, Faster

The Third Turtle Inn has played host to a number of visiting hams over the years and has one room which is ideally situated for amateur radio operations. This cliffside QTH was to be our home for the next seven days. Shortly after our arrival, Tim wandered among the bushes and small trees at the cliff's edge, rigging a very-random wire antenna. The wire tuned up just fine on 15 meters, and we were on the air within minutes.

We had decided to use Tim's VP5TDX callsign dur-

ing the contest and my own VP5JDT before and after the big weekend. Since the contest was still three days away, it was VP5JDT (with Tim at the mike) which called CQ and worked W2JLO for QSO #1 of our week in paradise. A handful of contacts were made that first night prior to a wonderful seafood dinner and some much needed sleep.

By 1:30 the following afternoon (Wednesday), TCNA had managed to ship the remainder of our ham gear from Grand Turk to the Third Turtle Inn. In between excursions to the beach, we managed to get the vertical on the air, and the pace began to quicken. We settled in for some serious pre-contest operation that continued until 2:00 am, and whichever one of us wasn't working the pileups was bolting together pieces of the beam. We spent time on both modes and found 20-meter CW especially productive.

Things really began to hop when the beam went up Thursday afternoon. The pileups became enormous. As our proficiency grew, so did our contact rate—from 60 to 90 to 150 contacts per hour. Our beam was fixed on the center of the United States, since that's the area we'd be working in the contest. Despite this, a number of Japanese and European stations were worked, mostly as a result of superb operating on their part, especially on CW. About 1500 contacts were made by VP5JDT in the days preceding the contest weekend.

Not that we spent all our time operating. Are you kidding? This was our vacation, too, and we took full advantage of the superb beaches, fine swimming, and delicious food served up by the Third Turtle. When Friday evening rolled around, we were warmed up, rested up, and eager to have at it. At 0000 UTC, we switched call-

signs to VP5TDX and plunged headlong into the fray, with KB0PR as the first of 6,300 contest contacts.

The vast majority of the contest is a blur of QRZs, signal reports, and call-signs. However, several highlights, both good and bad, do stand out.

- We made 200 QSOs during the first hour of the contest. Suddenly, we knew we'd be competitive.

- Saturday found us running 10 meters for 8 consecutive hours, averaging 189 QSOs per hour for the duration. The 10-meter propagation was superb, resulting in 2,700 contest QSOs on this band alone.

- Our initial goal of 3,000 QSOs was exceeded with more than half the contest still to go.

- With our adrenalin really pumping, neither one of us did much sleeping during the entire first night of the contest. As a result, we made a lot of mistakes on Sunday morning, and we each fell asleep at the mike at least once.

- We managed 27 contacts on 160 meters, despite the world's worst antenna—a 75' random wire just five feet above the ground.

- Chaos reigned when the 830S gave up the ghost on Sunday morning, blowing a filter capacitor in response to an overvoltage on the power line.

- Only five minutes after the last contact (with KC4IW), our remaining rig, the TS-520, also went down for the count, popping an FET on the rf board. Fortunately, the contest was over, with 6,300 QSOs in the log. We'd averaged 130 QSOs per hour for 48 hours!

#### The Aftermath

Monday morning found us hard at it, scavenging parts from the 520 to get the 830S back on the air. We succeeded and made 325 more contacts before closing down for good late



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Monday night. WB2RWW was the last of some 8,100 contacts made during our one week sojourn in the Turks and Caicos Islands. All too soon, it was back to reality, and reality was a cold March night in New Hampshire, with a temperature of 35 degrees, about 50 degrees lower than in the islands.

The two of us spent three weeks duping our logs, finding about 300 stations that had worked us unnecessarily. The duping chore was greatly eased by the use of two TRS-80 microcomputers. Our final tally of 5991 QSOs and 4,924,602 points broke no records, but compared quite favorably to the high scores turned in after past contests. We should at least win the certificate for VP5!

QSLing has proved to be a very time-consuming chore. In fact, answering our mountain of cards has

required the most time of any single aspect of the whole project. And lest you think DXpeditions always receive envelopes stuffed to bursting with green stamps, be advised that our income so far hasn't even paid for the extra stamps we've had to buy as a result of last spring's 3¢ postage increase. And cards are still arriving, six months later.

It's been debated whether a trip to a pleasant and not-so-rare place like VP5 should be called a DXpedition. Some prefer to reserve that term for visits to more exotic and extremely rare spots such as Spratly Island and Clipperton. But whether you call it a DXpedition, a DX vacation, or something else again, it's a fact that many of the cards we have received bear the inscription, "Thanks for the new country." As we all know, any country is rare if you haven't worked it yet.



*A very frazzled WB8BTH near the end of the contest. At this stage, one rig was dead and we had run out of contest log sheets. The sign on the lamp became an increasingly-needed aid to remembering our callsign.*

From our viewpoint, the thrill was in being on the other end of the pileup at least once in our lives. It means calling CQ and always getting an answer. It means a QSO rate limited only by how fast you can send or talk. It means finding out just how courteous most hams really are. It

means being a celebrity, if only for a little while.

Would we do it again? In a minute! Would we do it differently? Of course; it's always easy to spot your mistakes using 20-20 hindsight. Should you give it a try? By all means! If we can do it, so can you. ■

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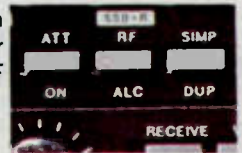
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**ICOM**

# In Profile: Ted Gamlin, A Contester

Chris Brown KA1D  
73 Magazine Staff

In a darkened farmhouse on the crest of a wind-swept New England hill, conventional time has stopped for 13 men. For them, the hours of the day hold no importance, other than that of marking the approach of sunrise and sun-

set and the attendant shifts in propagation. This weekend, time is a 48-hour continuum for these men within which they must contact as many DX countries as possible, amass as many QSOs as possible, and do so on as many HF bands as possible. They measure time in the hours of the contest, not of the day.

In their kitchen, dirty dishes, scattered silverware, coffee-stained mugs and half-eaten casseroles

litter the countertops like the aftermath of some great feast, but there has been no feasting. Most meals have been gulped in silence and eaten alone. In serious ham radio contesting, there are no communal suppers.

In another part of the house, the contest wing, lights brighten, then dim again, as six Alpha linears bang on and off line. Haggard operators, their voices hinting hoarseness, drive on through the night with their

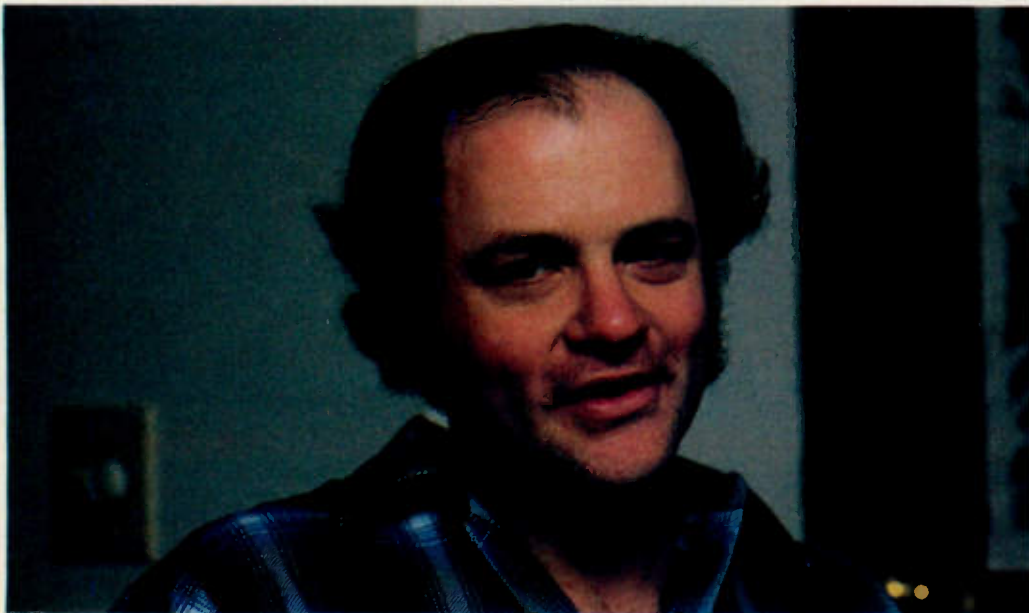
incessant message—CQ CONTEST, CQ CONTEST, CQ CONTEST. The refrain is always the same at Kay One Ocean X-Ray.

K10X is both man and machine. The man, Ted Gamlin, is an affable and outgoing medical equipment salesman with an extremely competitive nature. The machine is one of the top multi-operator/multi-transmitter contest stations in America and, possibly, the world.

The machine is in high gear this weekend for the phone portion of the 1981 ARRL International DX Contest. With its staff of 13, the big multi/multi contest juggernaut is bullying its way through this contest with a vengeance.

The man has a migraine that won't quit.

Stakes are high, but not in terms of dollars (though Ted Gamlin has spent quite a few in the course of adding five skylight-equipped rooms to his house for the sole purpose of contesting, and has raised six towers and twenty antennas in his backyard). The stakes are high in terms of pride. Put simply, Ted Gamlin and the K10X machine want to kick



Ted Gamlin K10X: like a general on the battlefield.

everyone's butt in this contest for the simple pleasure of being the best: the best in America, the best in the world.

Sitting in his darkened kitchen on Saturday night, 28 hours into the ARRL International DX Contest, Ted is putting the finishing touches on an intercom signaling system that will tie the six operating positions of his station together.

Amid the chaos that is big-time contesting, he shares his thoughts with *73 Magazine*.

*73: This place is a zoo, Ted! Halfway through the contest and you're still building the station.*

*Gamlin:* Yeah, I might finish it someday, too. It's getting to be a full-time job.

*73: Speaking of jobs, what do you do for a living?*

*Gamlin:* I'm in the medical field. I sell blood-chemistry analyzers for a New Jersey-based company called Electro-Nucleonics. And, I've been doing this for about eight years now. Man, time flies!

*73: Always been in sales?*

*Gamlin:* No. I started out in field engineering. My background is in electronics and I've got an associate degree. But, when the opportunity came up to go into sales, I just couldn't pass it up. It has worked out pretty well.

I like sales. It's a lot of aggression. I guess that's what life is now. Here we are multi/multi contesting... aggression at its best, in ham radio, anyway.

*73: Do you do any other aggressive kinds of things... play sports for instance?*

*Gamlin:* Yes, I enjoy sports. I play ice hockey in the winter, softball in the summer, and I played football and baseball in school. I generally like aggressive things.

*73: Were you into hamming as a kid?*

*Gamlin:* Yeah, I got my license in November of 1961,



*Diet Pepsi and visual aides help keep K1OX's ten-meter rate high during a morning JA run.*

when I was twelve years old.

*73: And how did you get into contesting?*

*Gamlin:* It's kind of funny. It seemed to happen the way most things do in life: One thing led to another. I was living in an apartment, hiding all sorts of wire antennas in the woods next door, and got the urge to get a house of my own on top of a high hill. I had bolted 40 feet of Rohn 25 to my balcony without bothering to ask the landlord—when you ask, they always say no—and it was time to move. I searched for a

W1RR and took third. The next time out we took second place in the ARRL contest. That was in the old house before I added the contest wing. Everything was in two rooms and half-way through most contests the well would run dry. There was always lots of yellow snow around the house in those days. I'm amazed I could get anyone to operate.

*73: How about other ham activities? Do you get into traffic-handling or DXing, etc.?*

*Gamlin:* It's funny, I'm seasonal. At certain times of

and alive and healthy and happy, that's all.

*73: And ready to go up towers at a moment's notice?*

*Gamlin:* Well, you know, that's why I started body-building. In the summer, I'm always active. In the winter, I play hockey but don't do any really heavy work. So, for carrying things up towers in the winter, I wasn't always prepared the way I should have been. That's why I started lifting weights in the off-season... the off-contest and off-tower-climbing season.

*73: What dedication!*

*Gamlin:* Well, I lift my share of weights in the winter and when summer comes I'm ready. It works out very nicely. I think tower-climbing is one of the best exercises in the world. When you climb up, say, 100 or 160 feet straight in the air, it's amazing what it does to the thigh muscles.

*73: Sounds like you're one of the few hams who enjoys tower work.*

*Gamlin:* I do. But I try to pace myself. I climb so that I always have enough energy left to get myself out of a pickle should anything go wrong. Nothing ever has yet, although I've been in my share of binds.

**"I never do anything halfway."**

house and finally found one. Within eight months of moving in, I was contesting. At first I just wanted to chase DX, but friends talked me into contesting because the site was so good.

I never do anything halfway. Towers began going up out in the backyard, and soon I had four. We started contesting and found that we were really competitive. In the first contest we were in, CQ World Wide DX, 1976, we used the call

the year, I chase DX like mad and at other times I could care less. It's really odd; my interests are seasonal. In the summer, I don't think much about HF. I play around with VHF on six and two.

*73: Have you got any other hobbies besides contesting and playing sports?*

*Gamlin:* One of my hobbies is body-building. I've got a full weight set in the basement and I lift heavy weights. I do the general kinds of things to stay thin



Janice Gamlin: a wife who has learned to live with ham radio contesting.

73: So I understand. There is an anecdote I've heard about the assembly of your 160 footer that's pretty scary.

Gamlin: That's for sure. I built all my towers myself, including the 160-foot Rohn 45. One day, I had climbed up about 130 feet with a 70-pound section hooked to my belt. I was putting on the last few sections without a gin-pole and I said to myself, "Man this thing seems heavy!" I looked down, and the rope left on the ground had looped around another section. I was climbing with 150 pounds of tower sections hanging on my belt. I couldn't let go and I couldn't hang on much longer. The old "What do I do now?" routine.

73: You're crazy!

Gamlin: You're right. Many people have said that, too, including my wife. I've been up these towers in windstorms, total blackness, rain, you name it. I've got stories about what's happened to me on those towers that you wouldn't believe, like the time I got a wrench stuck to my tongue.

73: To your tongue?

Gamlin: Yes, on last Christmas Day. It was about 20 below zero with a wind chill of minus 60. Unbelievable! My lower 20-meter monobander in the stacked array had broken loose in the high winds and was hanging by its truss lines. Before it beat itself to death, I had to go up and secure it. That is the coldest day I've ever been up a tower. I got up to it and just ran out of hands.

I put the wrench in my teeth knowing I couldn't touch it with my tongue. But, it wobbled, caught my tongue, and froze to it instantly. There I was, hanging off the tower, freezing to death, trying to pry this wrench off my tongue without giving up too much skin.

73: Speaking of towers, Ted, I've noticed a few around the house. Could you fill me in on the antenna farm?

Gamlin: QK. On 160 meters, we're using a full-size inverted vee. The apex is at 160 feet and the ends are at 90 feet.

On 80 meters, I have a pair a full-wave delta loops in phase. The apex of those is at 160 feet and the bottom legs are about 72 feet off the ground. They are horizontally fed and are on a 42-foot cross-boom. I also have a full-size, 1/4-wave vertical with 98 radials underneath it. It's a Rohn 25 tower on an insulated base. There also is a simple dipole hanging flat-top at about 54 feet and two beverages.

73: That's quite a setup. How about on 40?

Gamlin: On 40 meters, I have a four-element KLM monobander at 95 feet. I also have a two-element monobander at 75 feet which has not been performing very well.

73: And on 20...?

Gamlin: On 20, I've got a rotatable, five-element monobander at 160 feet. Fixed in the European direction, on the same tower, there is a four-over-four array made up of two four-element monobanders. There also is a four-element monobander fixed on the Caribbean on the 20-meter tower. By the way, all these antennas are switched by Transco low-loss remote relays and fed with RG-9/BU, a silver-plated, double-shielded coax.

73: I see. And on 15...?

Gamlin: On 15, basically the same situation. A six-element monobander at

105 feet, a fixed four-over-four array to Europe, and a single four-element monobander on the Caribbean.

73: And, finally, ten?

Gamlin: On 10, the top antenna is a seven-element, wide-spaced, home-brew monobander at 95 feet. Then a four-over-four array to Europe at 60 and 30 feet and in the middle of that a four-element monobander on the Caribbean.

73: Are most of the yagis home-brewed?

Gamlin: No. The fixed arrays are all Cushcraft Skywalkers and on 20 and 15 the rotatable beams are both KLMs. Only the 10-meter beam is home-brewed.

73: How about the operating positions? Does each have two transceivers and a third, spotting, receiver?

Gamlin: Yes, except for 160. Right now, I'm a victim of everyone else's equipment. Trying to set everything up in three or four hours before a contest is just murder. Surprisingly, we've had relatively few problems so far.

73: About the station, did you build it all yourself?

Gamlin: Mostly. I had a contractor do the big stuff on the new wing I've added and I'm doing most of the wiring and finish work.

73: How about the station engineering? That, too?

Gamlin: Yes. That's the hard part. Inter-station interference can be very tough to get rid of.

On all bands, you have to have suck-out filters that null the second harmonic of each transmitter, plus bandpass filters all over the place. We've found that the Japanese equipment is very susceptible to overload. Great pains must be taken to keep the level of all that garbage down, and especially no broadbanded transmitters. They are the worst.

I'm really happy with the way everything has turned out, though. It's funny. This

thing has sort of evolved. I never had a complete plan from day one. Once the addition was underway, I realized that there was going to be lots of extra room. It was then that I decided to use it for a massive multi/multi. So, I had five separate rooms framed, lots of sound-deadening insulation put into the walls, solid-core doors hung for each room. Did everything to keep ambient noise down. Ambient noise is the enemy of every multi/multi. It kills them.

With the spiral staircase I put in, I'll never be able to take queen-size beds up to the contest wing so I guess they won't make great guest rooms. They sure make good contest rooms, though.

73: *Ted, you seem to have the ultimate setup here in*

*terms of the facilities and equipment. At what point does the human take over and make the difference between winning and losing?*

Gamlin: At this level, you have to have the best of both, men and machines. As far as the ultimate setup goes, I'm not quite there, yet. I'd like to have all the equipment in place so that the guys could just come in and operate. My objective here is to keep the people operating under optimum conditions, to keep it enjoyable.

Unfortunately, the building drained me financially to the point where I couldn't provide all the equipment needed. In time, I hope to have good quality radios of my own up there in all the positions. Slowly but surely, I'll get everything set up.

73: *So, most of the rigs are now brought in by the operators?*

Gamlin: Yes.

73: *I thought that you had five Kenwood TS-830s ordered for the station.*

Gamlin: I did. But, as I say, the building drained me financially and I couldn't supply an 830 at each operating position.

73: *Are you pretty well sold on the 830 as the best contest rig?*

Gamlin: More or less. I've looked at lots of rigs, and we have lots of different ones here this weekend, and the 830 seems to have the best receiver in it of any Japanese rig I've ever used. In all cases, we run an outboard receiver anyway so Kenwood's problem of receiver overload is minimized. I also prefer tube-

type transmitters. They tend to have cleaner audio and seem more able to take the abuse we give them in a contest. At some point in the future, I'll probably have the five Kenwoods.

73: *Ted, I must admit I find it a little strange that after all your effort and expense you don't operate.*

Gamlin: If I did, I would be constantly interrupted. I would never be able to sit down, uninhibited, and operate because there always would be people saying "Where's this," "I need that," "What's happened, here," "This went dead."

73: *Don't you ever miss operating in these big contests?*

Gamlin: Not really. I think I feel more pressure on me than all of these guys. Typically, in every contest

### CONTESTER'S WIFE—JANICE GAMLIN

73: *As we sit here, you've got a house full of contesters. Do you think your husband is a bit crazy for inflicting these madmen on you several weekends a year?*

Janice: Not at all. I think it's a lot of fun... a lot of good constructive fun. They have all worked very hard this weekend and some are so punchy from lack of sleep they can't see straight. But I don't see it as crazy at all. They are having too much fun for it to be crazy.

73: *Ted tells me that you are studying for your Novice license. Is that true?*

Janice: Yes, I'm trying to, anyway. I go to class two nights a week and I hope to take the test soon.

73: *Any plans to get into contesting?*

Janice: Well, maybe. I probably would try it if I thought I wouldn't get in their way. They get a little...uh, excited up there during a contest.

73: *How long have you and Ted been married?*

Janice: A year this past June.

73: *And you knew about this contest business before the ceremony?*

Janice: Oh, yes. I remember when I first came over to the house, though. I looked at what turned out to be the antenna farm and said, "You've gotta be kidding! Those aren't clotheslines out there."

Ted said, "No, dear, they're not," and then explained it all to me. I never thought that anyone could be so enthusiastic about anything. I had heard of hobbies, but never anything like this. He has it in his blood.

73: *I thought it rather unusual that you had a wing added to the house for the purpose of contesting. Ted mentioned something about always having plenty of room for guests. Any comments on that?*

Janice: He told me at first that we would have five guest rooms above the new family room and two-car garage. Truthfully, I knew from day one that there was something funny about that, especially when I saw the skylights go in.

Then, Ted told me about the wonderful spotlights he was going to put around the house. He said that they would be pointing up in the air, though, and I asked myself "Why do we want spotlights around the house that point up in the air?" Then it dawned on me: So the contest operators in our guest rooms could see their antennas at night through the skylights!

I went along with the guest-room story until he installed the operating tables, intercom units, and 220-volt wiring. I finally asked him where the guest beds were going, but I knew all along, really.

73: *Do you usually have lots of guests around here?*

Janice: I mean how many guests can you have at one time? After all, we're not running a motel. Now that I think of it, most of our guests arrive at contest time.

73: *Have you met any of the other wives or girl friends of these contesters?*

Janice: Well, I have met a couple of wives. That's a problem that I'm up against. The wives of most hams that I've met do not like the hobby; they don't like the people associated with the hobby, either.

Most wives think that because ham radio doesn't bother me and that I'm happy for Ted, that there is something wrong. They look at me like I'm on their (the hams') side. That's a difficult thing, because I sometimes don't know where I fit in. I have felt that animosity and it's no fun.

73: *What do you think the problem is? Why don't wives like their husbands' hamming?*

Janice: It competes with them for their husbands' time. We have 13 guys here this weekend who are not at home with their wives and families. Ted has been working on his station every night for the past two weeks. That kind of commitment can get to you.

73: *But it hasn't gotten to you?*

Janice: If I were the type of person who got upset about things like that, I probably wouldn't have married Ted.

Band	W2PV, 8.43M points		K1OX, 7.8M points		K2UA, 6.94M points	
	QSOs	Multi-pillers	QSOs	Multi-pillers	QSOs	Multi-pillers
160m	19	14	13	11	14	12
80m	171	72	141	67	113	63
40m	214	73	253	82	281	68
20m	1525	137	1288	140	1100	142
15m	1773	141	1603	133	1441	127
10m	1300	125	1409	120	1365	127

Fig. 1. Some claimed multi/multi raw scores from the 1981 ARRL International DX Contest.

from Friday night right through Saturday night, I develop a massive migraine headache from the tension. I feel the tension and excitement of running six stations, not just one. I never could sit down and actually operate because I'd be worrying about all the problems that might occur in the other operating positions. I just couldn't give my full attention to what I was doing.

73: You do seem to enjoy

*being the general on the battlefield, don't you?*

Gamlin: You know, it's funny you should mention that. Have you noticed the skylights in the ceilings of the operating rooms? My wife saw me looking out of one the other day and told me that I looked like Patton riding in a tank. I had never thought of that before but it came to mind again when I looked out behind the house at the heavy artillery in the backyard, all those

towers and antennas. What a trip!

We'll soon find out if we can win with it. I have put together the best facility I could and I've tried to get the best operators available. Now, it's up to them.

73: Do you have trouble finding operators worthy of the station?

Gamlin: Well, I've got to be choosy, and I import ringers when I can. I try to recruit the best operators I know. It takes special kinds of skills to operate different bands, and the ones necessary on 40 or 80 are much different from those needed on 10 or 20, or even 160. Low-band contesting demands lots of endurance. It really can get tedious after a while.

73: So staffing is a problem?

Gamlin: Not really. Lots of guys want to operate from a big multi/multi. It's the highest category and demands a tremendous effort. But, it takes a special kind of operator for each band.

The 10-, 15-, and 20-meter operators have to be able to handle those high morning rates, to be able to pick calls out the first time and ask for a minimum number of repeats to run them as fast as possible. Those early-morning runs to Europe and Asia are wicked.

73: I noticed that you've got a 10-meter operator who speaks Japanese.

Gamlin: Oh, A1 W1FJ. Yes, he was stationed over there at one point. Those JA runs are another thing. You need someone who isn't intimidated by the little S2 mash

of Japanese fellows calling, all running 5 and 10 Watts each. It kills you 'cause you're 20 over 9 to them and they are barely creaking through the noise. It takes guys with ears and stamina who can maintain concentration and handle it for hours and hours. Speaking their language doesn't hurt, either.

73: So you are choosy?

Gamlin: Yes. This station is only as good as the operators behind it, and these guys are great.

73: I'm curious, Ted. What are your goals in contesting, both short- and long-term? What do you want from it?

Gamlin: Obviously, I want to win. I think we have all the artillery here: I think we've got some of the best operators around, the facility is convenient, and the inter-station interference is down to nil. I've covered a lot of ground very quickly and now I want to win.

73: Fine, but in terms of competition, are you looking at domestic stations or are you looking internationally?

Gamlin: Internationally is where I enjoy competing but there are some situations, like NP4A who sits just off the coast and racks up some outrageous scores, that are tough to compete against. He's in a different situation than I and, in a way, a different league.

73: And, domestically...?

Gamlin: Domestically, my goal is to beat everyone else in the states. A guy like W2PV has been at it for years. For me to beat him my second time out with this station would be a phenomenal achievement. Whatever happens in this contest, I'm sure it won't be a runaway. If he beats me this time, it's gonna be a squeak-through and he knows it.

At 9:00 pm on Saturday evening, about half-way through the contest, the



Aluminum, copper, and blue sky over K1OX.

running scores are tabulated. Since each operating position at K1OX keeps a constantly-updated multiplier check sheet for its particular band, interim scores are always available. In addition, each operator keeps track of a "need list" for bands other than his own and arranges skeds for the K1OX operation on other bands with as many multiplier stations as possible. An intercom system ties all the operating positions together.

Though Ted's big multi/multi is doing well, it is running slightly behind its chief rival, W2PV. Ted has arranged to exchange scores with W2PV via a two-meter repeater and, as the numbers come in, it becomes obvious that K1OX is not performing up to snuff on 10 and 15 meters. Behind in multipliers (DX countries), K1OX hopes to make up the deficit in Qs (QSOs).

*73: Do you normally exchange scores halfway through contests?*

*Gamlin:* No, this is the first time we've been linked by the repeater. It can be very helpful in picking up multipliers, but not enough guys have been using the machine to its full advantage. We should be hearing about more multipliers on it. I'm going to plunk myself on that mother through the last half, I'll tell you that.

*73: Would you rather be ahead or behind at this point?*

*Gamlin:* Obviously, I'd rather be ahead. I always want to be ahead. This is only our second time out, though, and while we've got most of the bugs out, it's still a matter of making the operation efficient, flawless. The station which has the most flawless operation, coupled, of course, with the propagation, is going to win.

*73: I guess I was thinking in terms of strategy down the*



*What a multi/multi needs in order to be heard in the world of big-time contesting.*

*stretch. When they might tend to slack off due to fatigue, is it good for your guys to know that W2PV's numbers were a little better than K1OX's so that they will push harder in the last half?*

*Gamlin:* I took great pains to go into each room and show these guys that we are behind, so there is some psychology involved. I hope it will fire them up.

*73: Of course, the competition reports the real numbers. . . you don't think he's using some psych of his own do you?*

*73: How about strategy, Ted? Do you have a scenario which you are trying to follow during this contest?*

*Gamlin:* A strategy sheet would be important in a single-op or multi/single situation. These operators have got to know when to change bands in order to follow the propagation. In a multi/multi, we are on all bands at all times, so it isn't a matter of puzzling out when to be where. Our key is to monitor the propagation on a given band and get a jump on where to have the antennas

K1ZM, who is on 20 meters, always has won 20 for me in the past. He's just a great 20-meter operator. He's extremely aggressive, one of the most aggressive of the bunch, though I have some close contenders. I've nicknamed him "Animal."

He's great at holding the frequency and driving other stations off it when necessary. He goes 48 hours straight and never seems to get tired. He always amazes me. I don't know how he does it but, I'll tell you one thing, I'm sure glad he's on my team and he better remain on it in the future.

*73: About the future—any big plans for K1OX?*

*Gamlin:* As far as antennas, I could go to longer booms, but the severe weather on this hilltop would cause problems and, in the long run, I don't think it would be worth the grief.

Right now, I have no plans. Well, maybe a seventh tower will go up or another 40-meter beam, I'm not sure. I really can't improve much on what I've got. I'm kind of catching my breath financially, too. I'd like to get some carpets on the floor—that kind of

**"In every contest. . . I develop a massive migraine headache. I feel the pressure of operating six stations, not just one."**

*Gamlin:* No, no. He's telling it like it is. There's no doubt in my mind.

*73: Where is the difference in scores coming from?*

*Gamlin:* 10 and 15 are the biggies. We have had problems with one of the radios on 15 throughout the contest which have hurt us. We would be doing a lot better if it weren't for that.

pointed to take advantage of shifts.

*73: So a multi/multi operation is simpler in terms of strategy than a multi/single or single-operator effort.*

*Gamlin:* Well, in a multi/multi, there is some strategy to consider, but my guys are chosen for their operating strengths on each band.

For instance, Jeff Briggs

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thing. In general, get everything I already have working right. Oh, yes, and finish these blasted intercom signaling units.

73: *I get the impression you're going to stay with contesting.*

Gamlin: After every contest, I'd say "Never again." But, every year when contest time rolled around, the fever would strike. It's hopeless, I love it.

73: *Does you wife have the fever, too?*

Gamlin: Would you believe that Janice is working on her Novice ticket? She goes to class two nights a week.

73: *Really?*

Gamlin: Oh, yeah, I don't think she'll ever be an avid contester, she's much too nice for that. She does get a kick out of it, though. She loves to entertain and to feed everybody. She is a very special lady. Every day I realize how lucky I was to have stumbled upon her.

Ted Gamlin and the K10X machine did not realize their goal of winning it all the second time out. As the raw scores accumulated on an 80-meter, postmortem contest net (see Fig. 1), it became obvious that K10X had not been able to regain the half-million point deficit it had amassed early in the contest.

Ted Gamlin was stoic in his appraisal of the outcome. He simply said, "We'll be better prepared next year." ■

### The K10X Crew

160m	Ted Gamlin K10X
80m	Fred Hopengarten K1VR Bob Cunningham K1XR
40m	George Briggs K2DM
20m	Jeff Briggs K1ZM Bruce Rusch W1HNZ Ken Wolff K1EA
15m	Bill Way W1HD John Lindholm W1XX
10m	Mark Pride K1RX Rex Lint K1HI Richard Newell AK1A Al Rousseau W1FJ

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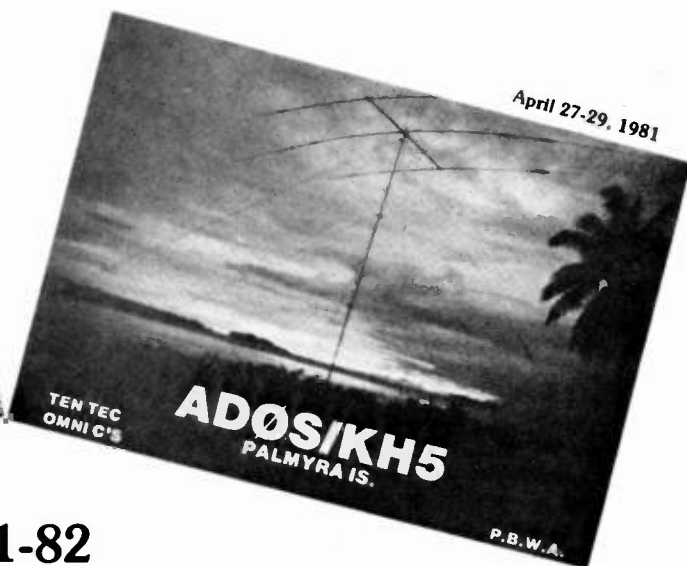
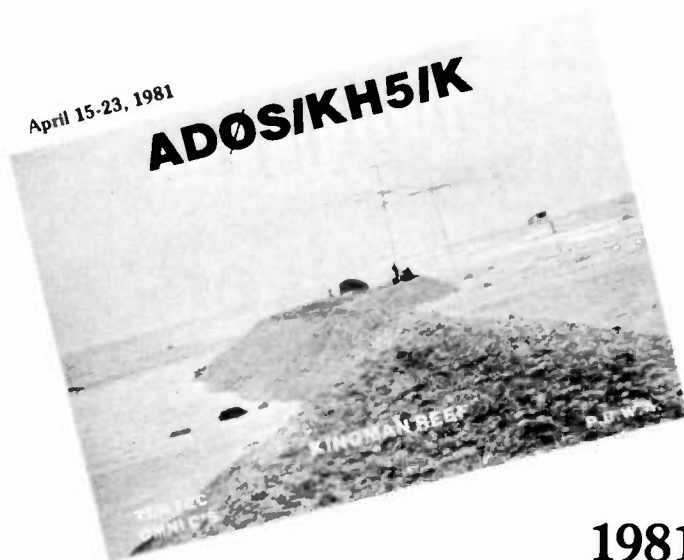
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# The Kenwood TS-530S HF Transceiver

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Paul Grupp KA1LR  
73 Magazine Staff

**W**hen Kenwood announced that the TS-520S was about to be discontinued and replaced with a new model, I was somewhat apprehensive. For many of us, the venerable 520 was an old friend, a perfect example of what

an economical transceiver should be—short on bells and whistles, but long on dependability and performance. Would the TS-530S be a worthy replacement? I had to find out, and you just might be interested in what I discovered.

For those who are not compulsive ad watchers, here is a brief description of the basic features of the new 530. As expected, all amateur bands (160-10 meters) are included. The output stages conform to the *de facto* industry standard for transceivers with tube finals—two 6146Bs and a 12BY7 driver. Both analog and digital frequency readout are provided. The digital readout is the traditional Kenwood blue and displays to 100 Hz; the analog dial is accurate to within a couple kHz. Speech processor, VOX, semi-break-in CW, XIT (transmitter incremental tuning), and full metering are all standard. The receiver section boasts a noise blander with a variable level control, fast or slow agc, an rf gain control and attenuator, i-f shift, RIT, and a 25-kHz crystal calibrator. Not a bad inventory! The manual is typical of those packed with recent Ken-



Kenwood's TS-530S.

wood equipment—good operating instructions and enough schematics and block diagrams to get you into trouble. A complete service manual is also available.

Our 530 arrived in perfect working order, which is somewhat unusual for equipment from almost any manufacturer these days. We immediately installed it in the 73 shack alongside its more expensive brother, the TS-830S. The first thing that strikes you about these two rigs is their similarity. They are built on exactly the same chassis and housed in the same cabinet. Even the rear panel holes are punched in the same place, so the 530 has a few empty spaces where the 830 has jacks.

The similarities between the 530 and the 830 are more than skin deep, however. They share identical final sections, power supplies, vfo, digital readout, and rf boards. Almost all accessories are completely interchangeable, making the 530 a logical choice for a backup rig in an 830-equipped station. Moreover, most of these accessories will also mate with the diminutive TS-130S. Such interchangeability throughout their entire line of HF transceivers is a thoughtful step which might cost Kenwood a few sales of accessories to owners of two or more of their rigs. It will pay off because Kenwood will earn the loyalty of customers who don't wish to replace the entire station each time they upgrade to a new transceiver. Another blow against planned obsolescence!

The 530 is not quite a carbon copy of the 830. In the bells-and-whistles department, it has an audio rather than an rf speech processor, and it lacks the transverter jacks, VBT, tone control,

notch filter, and digital hold switch of the 830. On the positive side, the 530 allows both CW and SSB filters to be switched in and out at will. Its big brother only accepts one or the other. Performance? Kenwood rates the 530 receiver's i-f rejection and the transmitter's sideband suppression each 10 dB worse than the 830. All other specifications are the same.

How important these differences are depends entirely on individual operating habits and tastes. Some may miss the extra features of the 830 sorely, but others will balk at spending the approximately 125 dollars more that the 830 costs to get them. One thing's for sure—the 530 has a lot more to offer than the 520 did!

#### On the Air

We could talk about features and performance until I ran out of paper and you ran out of patience, but it would all be meaningless if the radio in question didn't "play." The 530 plays! The 530S held a position of honor (front and center on the operating desk) for its entire stay at the 73 Magazine ham station. One of the things that makes it so successful is the sensible layout of the front panel. Every control has its own knob—there are no concentric controls to fumble with. If you adjust the carrier control, you don't run the risk of messing up the setting of the mic gain control. Nor will you go through an operating session where the band appears to be dead, only to discover that you inadvertently turned down the rf gain control while adjusting the volume! This clean front panel layout should make the 530 an excellent choice for a contest station. Our test was in the summer activity doldrums, so the only contest we could run it in was the Field

Day weekend. The QRM, pressure, and excitement were all there, and it performed admirably.

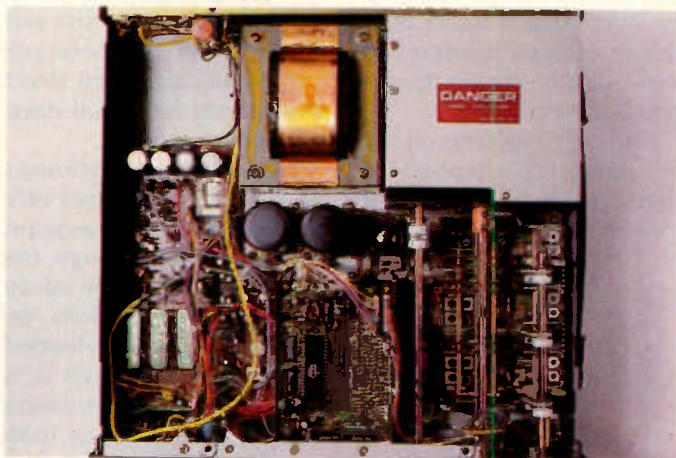
Receiver audio bears the distinctive Kenwood trademark of wide frequency response with a broad mid-range peak for added presence, with or without a good external speaker. Hams with good ears who have done a lot of listening to different transceivers could probably pick out the Kenwood every time in a blindfold comparison test.

I was very pleased at how easy the 530 is to tune up. I generally prefer solid-state finals, but the 530 is so easy to tune that I didn't mind a bit. Complaints? A particularly rabid CW operator (AG9V/1) felt that the 500-Hz filter didn't have enough ultimate rejection.

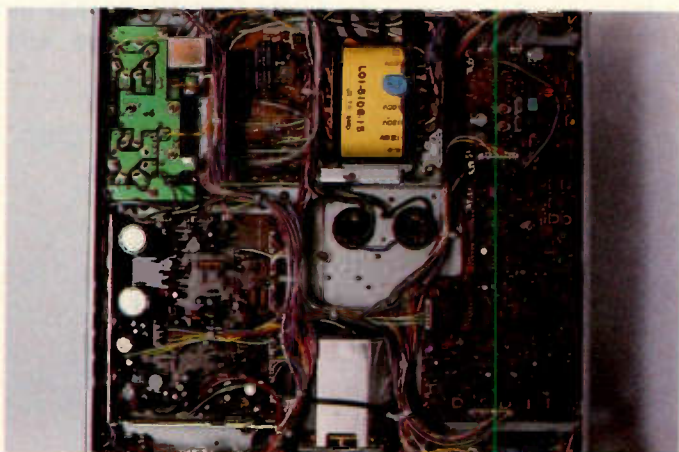
On the other hand, it is well known that he is hopelessly attached to the 250-Hz filter installed in his S-line at home!

#### Conclusions

What constantly surprised everyone here who used the 530 is how well it fares in comparison to Kenwood's top-dollar flagship, even though they are not necessarily designed to compete. The TS-520S would not compare as favorably, even though a digital-readout-equipped version retailed for quite a bit more than the 530 does! Kenwood has a worthy successor for the venerable TS-520S, a successor that has a lot to offer at a reasonable price. For more information, contact *Trio-Kenwood Communications, Inc.*, 1111 West Walnut, Compton CA 90220. ■



Top view of the TS-530S.



Bottom view of the TS-530S.

# Folded Unipole for 160

## — Top-banders, take notice! Here's a top-loaded radiator with the government's seal of approval.

The more you consider and study antenna phenomena, the more you become fascinated with the flow of ideas about radiation devices and their possibilities. Here is just one such interesting antenna type along with its development, which occurred step by step using a lot of published antenna information and much on-the-air discussion and revelation.

This is an uncommon but very effective antenna type that could interest most low-frequency hams. Zon-

ing height restrictions are admittedly something else, though this antenna idea works well at even a 35' height restriction. It works somewhat better at 70' to 130'—and even to 200' if you can arrange it. And, conveniently, it fits most real estate situations. So, it isn't necessary to miss out on the fun of 160-meter operation because you don't have room for a full-sized horizontal antenna.

Now, short antennas have been proven less efficient than full-size resonant antennas even though the former often provide fair to good communications on occasion. The top-loaded folded unipole (TLU) is a form of shortened antenna that is constructed by folding down the vertical portion to achieve low resonance (because of some height limitation), while increasing resistance and

bandwidth and retaining most of the properties and benefits of a high radiator (see Fig. 1).

Lots of hams have existing towers, poles, trees, or buildings from which to hang this efficient, effective, broadband, and easy-to-use-and-adjust antenna. And, happily, this is a low-cost way of getting up a really good low-band radiator—a real problem for most hams on city-size lots; a 30' to 50' TV push-up mast works well in this configuration.

The TLU is just one of many types of vertical antennas. It uses top feed and loading, which gets the antenna current up in the air where it belongs for maximum radiation efficiency. It differs from the series-fed vertical (Fig. 2) that is fed at the bottom, and is coil-loaded at the bottom, center, or top. The TLU is similar to the "umbrella" vertical that is grounded (Fig. 3), then fed at the top via the sloping guy wires which come down near to the ground adding length to the system and thus lowering the resonant frequency while simultaneously feeding the antenna. This TLU gives considerably higher impedance to the antenna structure than does the series- or gamma-fed ver-

tical (Fig. 4), a most important consideration. The TLU is a grounded vertical structure (Fig. 5) that is simple, follows the basic engineering principle that simplest is best, and easiest. This antenna is remarkably free of bugs.

This article covers my application of the radiator designed by the U.S. Navy at the Corona, California, antenna range for ship and shore use. Navy Captain Paul Lee (ex-K6TS) describes the principle of the antenna type in his book, *Vertical Antenna Handbook*, pp. 28-31, published by CQ.

It is a very low-angle and broadband vertical. Mine has a 400-kHz bandwidth and I have worked the world with it on 160. It also performs very well on 40 and 80 at a 70' height. On 160, this vertical (at 70') tunes with either just a series variable capacitor (when the resonant frequency of the entire structure is 3/8-wave, 160' to 200' total) or by adding a coil to ground the feedwire with a ceramic rotary switch, forming an L network. This may be necessary with various antenna heights, volumes, grounding systems, etc., and is required on 40 and 80 to resonate the structure.

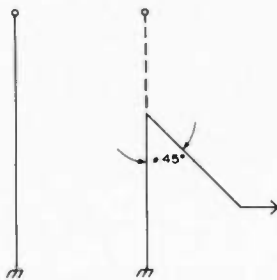


Fig. 1. Basic folded vertical.

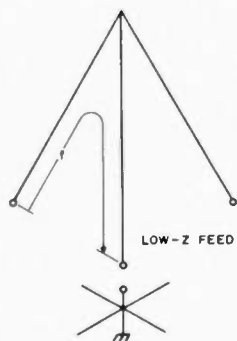


Fig. 2. Series umbrella.

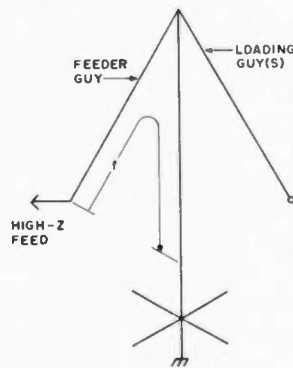
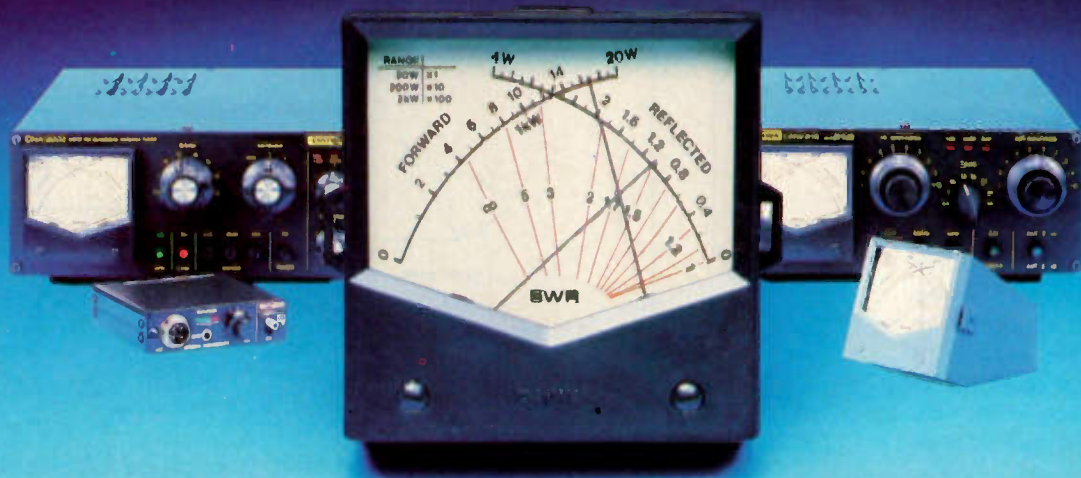


Fig. 3. Grounded umbrella.



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The structural basis for this TLU vertical is a grounded metal tower, tree, pole, building, or wood tower of from 30' to 200' in height for the 160-meter band, but should be as high as possible to reduce losses and to lower radiated wave angles. We can't always have a tower of optimum height for one reason or another, but a most effective radiator can be achieved with this TLU principle.

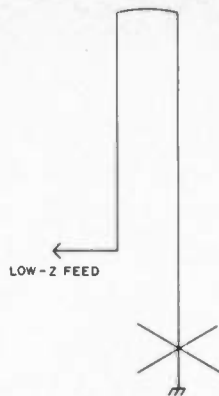


Fig. 4. Gamma feed.

Height, tuning, and loading can vary considerably with a TLU for efficient, effective performance and ease of adjustment. This radiator is simply a big, grounded, closed-loop, similar to any folded antenna, of up to a full wavelength in circumference, much like a grounded quad or triangle. The sloping (and loading) feeder and top guys descend at just under a 45° angle. The sloping line thus becomes part of the radiating portion of the antenna itself, much like the (higher-impedance) "umbrella" vertical that is fed at the bottom (series feed). In both cases, the top guy(s) bonded to the tower top increase the radiator's length and lower the antenna's resonant frequency.

The feedline (and any top-loading guys) descend to guy posts (trees or other guy anchors) at about ten feet above ground. Any guy angle higher than 45° introduces horizontal components into the radiated signal. The higher angle may better suit the purposes of those hams seeking higher-angle coverage for close-in contacts of under about 1000 miles. For serious DX work (low-angle radiation) a less-than-45° angle is a must. Further, the TLU has a considerably higher impedance than the series-fed vertical. Top-loading guys, long used by commercial and military

stations, raise the impedance to over 50 Ohms, a highly important and desirable factor. Resonating the antenna of course increases radiation efficiency. Q of the TLU is low—the bandwidth is about 200 kHz with only one feeder-guy. With 4 or 5 such loading guys, bandwidth is near to 400 kHz on 160.

The vertical portion of the antenna (a tower) can be simulated by hanging a grounded wire from any of a variety of structures (trees, buildings, etc.) and the feeder wire brought down at the 45° angle. A tower with beam atop simply becomes a more top-loaded vertical, the beam(s) increasing "top-hat" capacitance loading and further lowering resonant frequency. All this, in combination with some sort of ground system, has proven to be a top performer on all three of the low bands.

Vertical polarization has consistently proved to be optimum over the years under all sorts of propagation conditions on frequencies below about 8 MHz for more than, say, about 3000 miles. Any horizontal antenna on 160 meters would have to be about 130' up (1/4-wave) for consistent, effective DX work beyond about 3000 miles. This is obviously not an easy height to attain in urban areas, consequently, the desirability and need to go vertically. This TLU is not only a

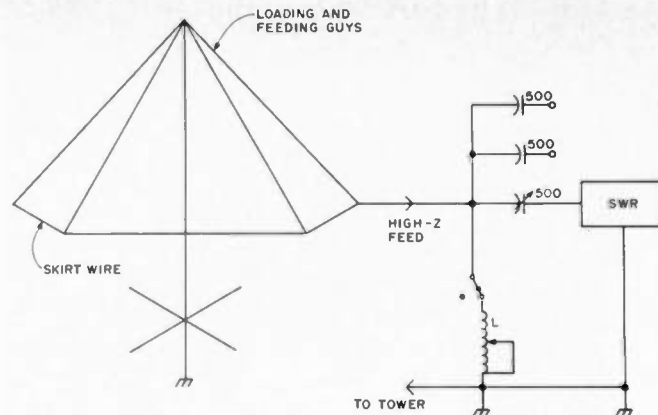


Fig. 5. High-Z umbrella (top-loaded folded unipole, or TLU).

top performer on the lower frequencies but is a very uncomplicated structure.

Inasmuch as the high-current portion of an antenna does most of the radiating, get current up at the vertical's top. In the TLU, the drooping and radiating guys do this current raising well even when the vertical tower is not very high, but, of course, the higher the better (up to 5/8-wave high). A top-loading coil in a coil-loaded vertical is a lossy device and acts like an rf choke, though the coil-loaded and series-fed vertical can be very effective within its narrow bandwidth of 15 to 18 kHz on 160 meters.

It is, of course, a bit of a chore to have to run out in the back yard to adjust the base-matcher in the cold, wind, rain, sleet, snow, and maybe trip over lawn furniture, etc., or fall into the swimming pool in the dark (160 being a nighttime band), not to mention mosquitoes, stray dogs, etc. This, to me, seems to be the hard way to QSY beyond that 15 to 18 kHz and still keep your solid-state finals happy (low swr). Besides, by the time all this has happened, any DX pileup has gotten bigger and deeper. Imagine operating in a contest this way, all over the band—all night.

This TLU is a real convenience and can be adjusted right beside you in the

shack. While any artificially loaded antenna is a compromise, this wire-loading using folded-down sloping and radiating guys is a least-lossy compromise. This configuration becomes a sort of multiple-sloper, and acts as a 2-element driven array with maximum radiation (and some gain) along the tower-to-guy axis.

These guys descend to a point about ten feet above ground to where they are secured to guy posts, trees, etc. These guys are bonded to the tower top, and continued down the tower, bonded to the tower every few feet, down to ground level to be bonded into the grounding system—fencing, metal well-casing, etc. Connect these to the shack ground, radials, screen, etc., to complete the circuit and minimize losses which will make the system more broadbanded. These guy wires and/or feeder are tied together at the guy posts' level by a skirt wire which further adds capacity to the structure and feeds directly into a matching network. See Fig. 5.

I feed this antenna not from a gamma match device at the tower top as recommended by the developers, but from the skirt wire as it passes near the shack window about ten feet above ground. It is fed directly using an swr bridge through a series-variable capacitor (about 500 pF)

# Hustler Tribander 3-TBA

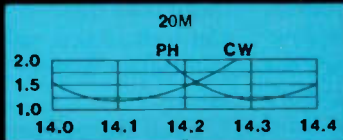
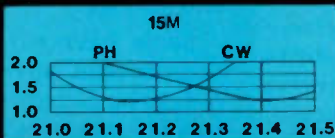
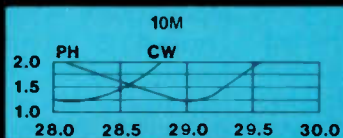
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with three 500-pF fixed capacitors added as required by a ceramic rotary switch.

All this has raised my signal by three S units on local and long DX contacts. The swr bridge is grounded to the station ground system and is connected by heavy cable to the grounded tower, all of which forms that big grounded loop. Spacing of the tuning capacitor plates of the matcher can be of the receiving type for power up to 200 Watts dc input. The higher impedance of the antenna makes it more flexible and easier to adjust.

The grounding system of a vertical radiator performs like the other half of a balanced antenna. As with most vertical radiators, the ground system is indispensable in balancing the system properly, fully grounding the vertical, and increasing conductivity of the soil or ground plane as much as possible to reduce losses

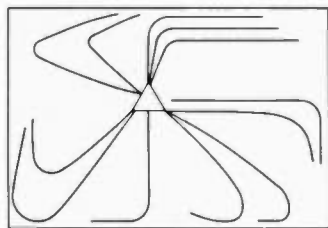


Fig. 6. Radial installation.

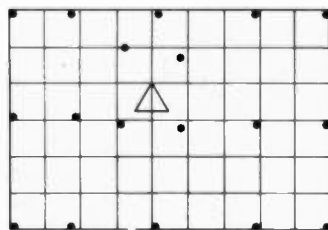


Fig. 7. Ground screen and ground rod installation.

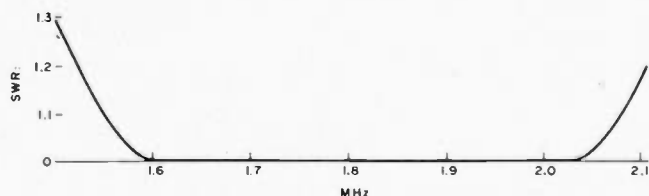


Fig. 8. System bandwidth.

and to bring down the angle of radiation. The grounding system may consist of only one ground rod, particularly in circumstances where there is not access to even a tiny patch of soil ground, but the grounding system should be as extensive as possible.

The first step in establishing a ground system is usually to install one or more ground rods, then add as many quarter-wave radials as possible to the tower, up to about 120. Some antenna experts claim that radials do not have to be any longer than the physical height of the tower, and do not necessarily (and ideally) need to be laid out symmetrically similarly to a fan or uniformly-spoked wheel. Also, that it is better in the case of a less than 1/4-wave vertical to have, say, 20 1/8-wave radials than to have 10 1/4-wave radials.

I am on a city lot, 50' x 100', with the tower in the exact center of the lot. I've "copper-plated" the entire lot with 51 82' radials (0.15λ on 160) spread out as symmetrically as possible and curved around clockwise to fit onto my lot (Fig. 6) Then, covering the entire lot, is a 3' mesh ground screen laid down over the buried radials—under the house, garden, and unpaved driveway! Oh, what a job! But the results make it all worthwhile to the striving, resourceful, dedicated ham.

The wires become invisible when they sink down in the earth from the original burial depth of 1" to 2" to more than 6" after the first rains of the season. All of this was secured to the

ground by 14 ground rods strategically placed (Fig. 7). Four more rods were put down around the tower ten feet from each other and from the tower. Old iron pipe (4' lengths) will be quite adequate.

To extend this ground plane as much as possible within my circumstances, I even stapled four 135' radials to the side of my wood-frame house. I put them just a few inches above where the cement foundation joins the wooden house siding, a few inches above ground, and spaced them about 2' apart. These also could be put up under the house eaves. The idea is to make that ground plane as extensive and dense as possible. All this means longer DX paths and contacts for your signal. The rig will load and perform better, too.

There are those experts who claim that an extensive ground system will add nothing to the receiving capabilities. But it has been my experience that after the ninth radial was put down I suddenly began hearing DX that I had not been able to hear before and that DX which had been regularly heard before became clearer (less "watery"), more distinct, and stronger.

Some have even buried large masses of metal like old car bodies, copper tubs, tubing, pipe, metal mats, fencing, etc., obtained from a junkyard. And, of course, connect to your lawn sprinkler system (and maybe that of an obliging neighbor), metal water pipes, and fences. I have worked hams with radials laid in their swimming pools or put down a well casing who get top results even though the antenna theorists belittle such ground systems.

Try studying your situation at length, be adventuresome and imaginative, and you may well surprise

and delight yourself with the results, as many of us old-timers have. So in spite of what the experts say about grounding systems, just get down whatever metal you can. There is a great deal of testimony and evidence about the validity of these grounding ideas. Every little bit of buried metal will pay off.

My "loop" is approximately 3/8λ wave in circumference, tuning fully with only a series capacitor of 1500 pF total. For larger or smaller "loops," an L network may have to be formed by switching in a coil from feeder wire to ground as shown in Fig. 5.

This also will have to be done on 40 and 80 meters to resonate the TLU to those bands. The coil should be tappable, mine is 50 turns of #16, 2" diameter x 5" long. Or, try using your commercial tuner of whatever type. I have successfully used pi and parallel networks as well. This will give a 1:1 swr across the entire band. With my feeder plus four top-loading guys and skirt wire, the bandwidth is excellent, as shown in Fig. 8.

I have tried various gamma-feed systems with this TLU with only fair results. The on-the-air reports were materially increased (3 S-units) both locally and on far DX by feeding the skirt wire rather than using a gamma-feed. The bandwidth becomes more than doubled with the same structure, which gives still better overall performance.

Even though an antenna can be properly matched and loaded, that antenna may or may not radiate the rf at desired angles. By folding down and, in a sense, diminishing by about half the vertical structure, this TLU method does not seem to materially degrade low-angle performance of a vertical antenna. Further data



may confirm this.

I keep large maps of the northern hemisphere and of the great circle on the shack wall beside me, and place colored-headed dressmaker's pins on the maps when contacts are made on 160 to record and check performance of my radiated signals. Interestingly, it became very evident that in the directions along the tower-to-radiating guy axes the transmitted signal is maximum, with various diminished reports from between those axes. Consequently, it would no doubt be a more uniform signal pattern if up to 12 nearly equally-spaced top-radiating guys were installed in order to better cover the entire 360°. I have yet to try this.

Utilizing wood towers, poles, buildings, trees, etc. (Fig. 9), from which to hang a TLU, makes for an unobtrusive antenna, especially when a tree is used, which largely hides a TLU. This antenna also can be hung from a building of suitable height or between buildings if necessary. This TLU has proved over the years by many to be a flexible and most worthwhile antenna, and its only limitations have occurred whenever the band is not open (long skip) to my area.

It is an effective DX-getter when the top band is open. Further, this is not a noisy receiving antenna as are most solely-vertical antenna structures. This is probably because of the 40° slanting guys, which pick up less noise (which generally is vertically polarized, thus readily flooding into a vertical.)

Whatever remnants of noise do get picked up are cut out with audio filters plugged into the output jack of the transceiver. So, I am hardly even aware of QRN. (See my article in 73 Magazine for February, 1980.) Besides, I like to use

this TLU structure for receiving because there is 900' of wire and metal surface up there in the air which seems to capture more wave-front energy than do the low receiving antennas of several types in use here. QSB does not seem to be as critical, either, as when using those low receiving antennas, perhaps also for the same reason (sloping feeder and guys).

In considering antenna performance in the case of 160 meters, there is the tendency to pass judgment quickly after only a short trial, giving a false or incomplete impression of actual performance potential, particularly under "closed" band conditions, and not being mindful of the variations—highs and lows of propagation conditions. Receiving and radiating phenomena should be observed over a sufficient period—a week or month—to allow for the inevitable change in propagation

At times I have wondered if any of my rf was going anywhere, but because I waited to make structural changes for some reason (weather, no time, or being just lazy), propagation conditions would change, the 160 band would suddenly open, long-skip DX would come roaring in as occasionally happens on 160, and my calls were answered with big signal reports. The

antenna would thus be vindicated and saved from unwarranted changes.

So, do yourself a big favor and be slow of antenna judgment on 160, a band of continual amazement, confoundment, and strong personal reactions. And another thing: On 160, those "openings" can be greatly selective, occurring only in some areas of any given state or region. There

is also the "pipeline" phenomenon to be considered.

After more than 50 years of ham radio and watching variations of band conditions on 160, it becomes apparent that conditions vary very widely even during a single hour of nighttime consideration. This type of grounded antenna (TLU) has been a fine if not outstanding performer, and is well worth trying. ■

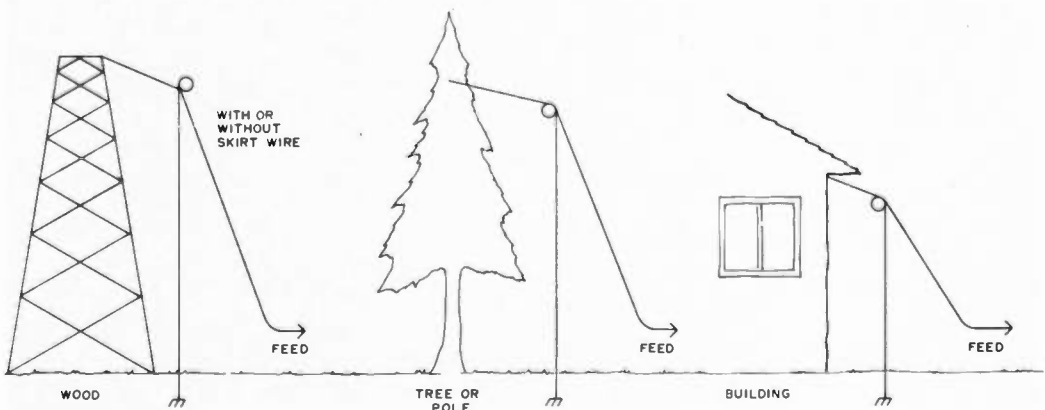


Fig. 9. Simulation of a metal tower.

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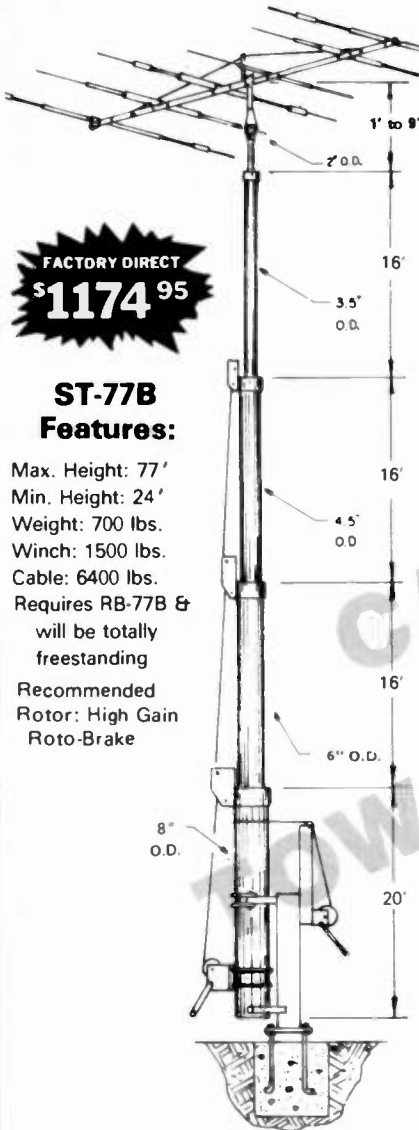
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# WILSON SYSTEMS TOWERS

— FACTORY DIRECT —



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**\$1174<sup>95</sup>**

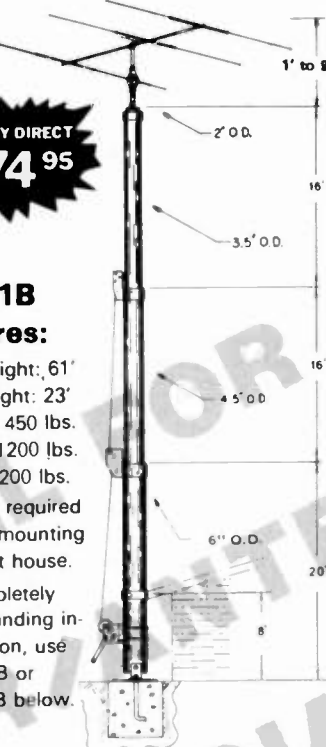
### ST-77B Features:

Max. Height: 77'  
Min. Height: 24'  
Weight: 700 lbs.  
Winch: 1500 lbs.  
Cable: 6400 lbs.  
Requires RB-77B & will be totally freestanding  
Recommended Rotor: High Gain Roto-Brake

**FACTORY DIRECT**  
**\$674<sup>95</sup>**

### MT-61B Features:

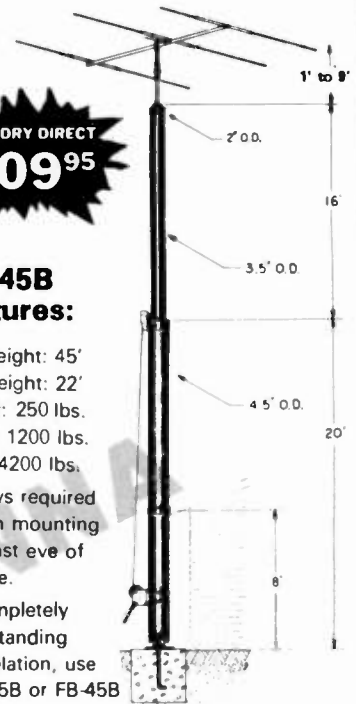
Max. Height: 61'  
Min. Height: 23'  
Weight: 450 lbs.  
Winch: 1200 lbs.  
Cable: 4200 lbs.  
No Guys required when mounting against house.  
For completely freestanding installation, use RB-61B or FB-61B below.



**FACTORY DIRECT**  
**\$409<sup>95</sup>**

### TT-45B Features:

Max Height: 45'  
Min. Height: 22'  
Weight: 250 lbs.  
Winch: 1200 lbs.  
Cable: 4200 lbs.  
No Guys required when mounting against eave of house.  
For completely freestanding installation, use RB-45B or FB-45B below.



WIND LOADING			
Tower	Height	Sq. Ft.	
ST-77B	69	16	Square Footage Based on 50 MPH Wind
	77	10	
MT-61B	53	18	
	61	12	
TT-45B	37	18	
	45	12	

BASE CHART		
TOWER	WIDTH	DEPTH
TT-45B	12" x 12"	30"
FB-45B	30" x 30"	4 1/2"
RB-45B	30" x 30"	4 1/2"
MT-61B	18" x 18"	4"
FB-61B	3' x 3'	5 1/2"
RB-61B	3' x 3'	5 1/2"
ST-77B	See Below	Bases
RB-77B	3 1/2' x 3 1/2'	6'

Wilson Systems uses a high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe. The tubing size used is 2" & 3 1/2" .095; 4 1/2" & 6" .1134. All tubing is cold dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally freestanding installation, use either of the tilt-over bases shown below.

The ST-77B cannot be mounted against the house and must be used with the rotating tilt-over base RB-77B shown below.

## TILT-OVER BASES FOR TOWERS

### FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower.

**FB-45B.. 112 lbs... \$209<sup>95</sup>**  
**FB-61B.. 169 lbs... \$299<sup>95</sup>**



### ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system.

**RB-45B.. 144 lbs... \$289<sup>95</sup>**  
**RB-61B.. 229 lbs... \$379<sup>95</sup>**  
**RB-77B.. 300 lbs... \$569<sup>95</sup>**



Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

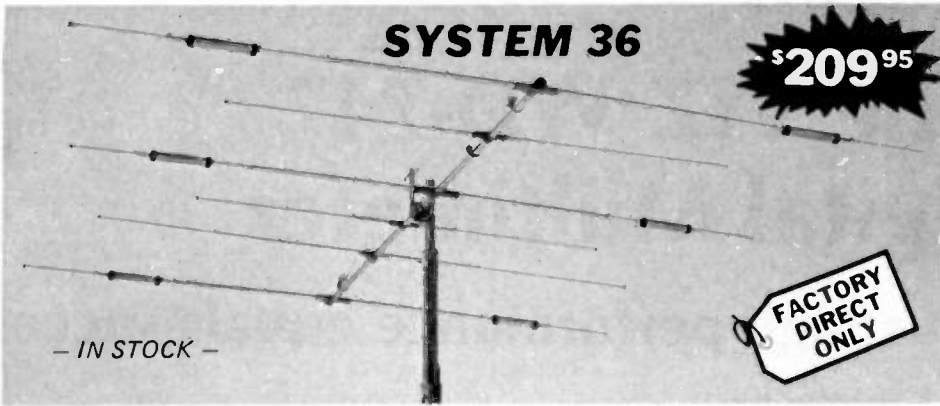
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# WILSON SYSTEMS INC. MULTI-BAND ANTENNAS



## SYSTEM 36

**\$209<sup>95</sup>**

- IN STOCK -

A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15 and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.

### SPECIFICATIONS

Band MHz	14-21-28	Boom (O.D. x Length)	2" x 24' 2 1/2"	Wind Loading @ 80 mph	215 lbs.
Maximum power input	Legal Limit	No. of Elements	6	Maximum wind survival	100 mph
Gain (dBd)	Up to 9 dB	Longest Element	28' 2 1/2"	Feed method	Coaxial Balun (supplied)
VSWR @ resonance	1.3:1	Turning Radius	18' 6"	Assembled weight (approx)	53 lbs.
Impedance	50 ohm	Maximum mast diameter	2"	Shipping weight (approx)	62 lbs.
F/B Ratio	20 dB or better	Surface area	8.6 sq. ft.		



## WV-1A

4 BAND  
TRAP VERTICAL  
(10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

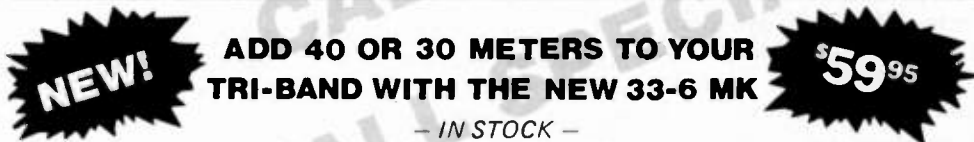
Easily assembled, the WV-1A is supplied with a hot dipped galvanized base mount bracket to attach to vent pipe or to a mast driven in the ground.

Note:

Radials are required for peak operation. (See GR-1 below)

### SPECIFICATIONS

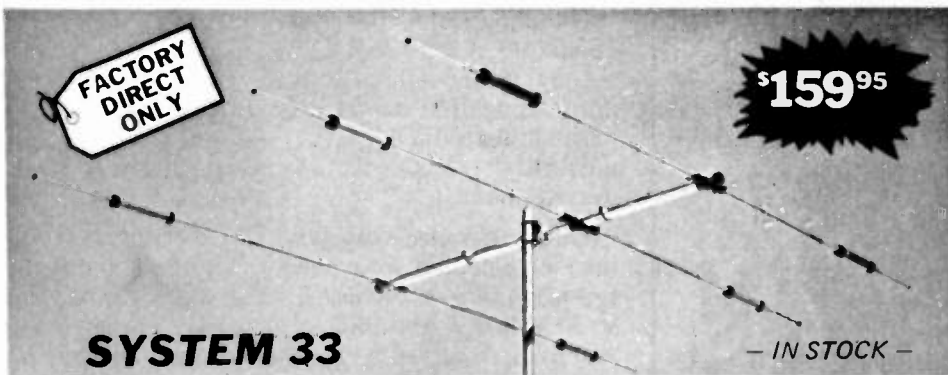
- 19' total height
- Self supporting - no guys required
- Weight - 14 lbs
- Input impedance: 50  $\Omega$
- Powerhandling capability: Legal Limit
- Two High-Q traps with large diameter coils
- Low angle radiation
- Omnidirectional performance
- Taper swaged aluminum tubing
- Automatic bandswitching
- Mast bracket furnished
- SWR: 1.1:1 or less on all bands



## ADD 40 OR 30 METERS TO YOUR TRI-BAND WITH THE NEW 33-6 MK

- IN STOCK -

Now you can have the capabilities of 40-meter or 30 meter operation on the System 36 and System 33. Using the same type high quality traps, the new addition will offer 200 HKZ of bandwidth at less than 2:1 SWR. The new 33-6 MK will fit your present SY36 or SY33, and using the same single feed line.



## SYSTEM 33

**\$159<sup>95</sup>**

- IN STOCK -

Capable of handling the Legal Limit, the "SYSTEM 33" is the finest compact tri-bander available to the amateur. Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excels with the "SYSTEM 33". New boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment. Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting. The use of large diameter High-Q traps in the "SYSTEM 33" makes it a high performing tri-bander and at a very economical price. A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the "SYSTEM 33" quick and simple.

### SPECIFICATIONS

Band MHz	14-21-28	Boom (O.D. x length)	2" x 14' 4"	Wind loading at 80 mph	114 lbs.
Maximum power input	Legal Limit	No. of elements	3	Assembled weight (approx)	37 lbs.
Gain (dBd)	Up to 8 dB	Longest element	27' 4"	Shipping weight (approx)	42 lbs.
VSWR at resonance	1.3:1	Turning radius	15' 9"	Direct 52 ohm feed - no balun required	
Impedance	50 ohms	Maximum mast diameter	2" O.D.	Maximum wind survival	100 mph
F/B Ratio	20 dB or better	Surface area	5.7 sq. ft.		



The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded aluminum wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the WV-1A by providing the correct counterpoise.

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# The VIZ WD-747 Digital Multimeter

— low cost plus high performance equals success

**A**lthough the name VIZ may seem to many readers a rather recent addition to the list of manufacturers of test equipment, it is not. For many years, this company maintained a low profile as a test equipment contractor for RCA. Now on their own, VIZ has announced a complete line of low-cost, technician-oriented test instruments.

The new WD-747 digital multimeter is an example.

An innovative feature is the inclusion of a transistor hfe (Beta) tester. The DMM is housed in a rugged, bright orange Cyclocac™ case. It is intended for one-hand operation, equipped with a line of squeeze buttons along the side, much like the popular Fluke instruments. The large (half-inch), 3½-digit LCD exhibits outstanding contrast, even in dim light. Settling-down time on all ranges is quite rapid.

The circuit is built around the ubiquitous Intersil ICL7106 chip, and features auto polarity and auto decimal (not autoranging, however). Power is derived from an internal 9-volt battery (supplied) or from an external ac adapter (optional).

Dc current consumption is very low—only 15 mW—and 200 hours of continuous operation may be expected from a conventional zinc-carbon battery. Even longer life should be forthcoming from an alkaline replacement.

Sampling rate under test conditions is 2.5 times per second. If an overload condition appears at the terminals, all digits blank except an initial "1" and the decimal point.

Direct current voltages may be selected from the following ranges: 200 mV, 2 V, 20 V, 200 V, and 1000 V. Accuracy is  $\pm 0.8\%$  plus one digit. Full overload protection is present on all ranges, and input resistance is 100 megohms.

Alternating current ranges of 200 V and 1000 V, each with a resolution of 0.1% and accuracy to 1.2% of reading + 10 digits, is provided on this scale, and input impedance is 5 megohms.

Five resistance ranges—200, 2k, 20k, 200k, and 2M—feature resolution to 0.05%

and accuracy to  $\pm 1\%$  of the reading plus 2 digits. Current across the resistive circuit under test is extremely small (a fraction of a milliampere on most ranges), with open-circuit voltage less than one volt (except 2.3 volts on 200-Ohm scale).

Direct current measurements are also divided into five ranges: 200  $\mu$ A, 2 mA, 20 mA, 200 mA, and 10 A. Resolution is 0.1% and accuracy is  $\pm 1.2\%$  of reading plus two digits. The current scale is fuse-protected from accidental voltage applications, and a spare fuse is included.

Either PNP or NPN transistors may be measured for current gain (hfe) static forward current transfer ratio. Direct readout is provided on the digital display.

Three distinct features of the VIZ WD-747 made the greatest impression to this reviewer: the crisp, contrasty LCD display, the rapid settling time on all ranges, and the wide selection of measurement ranges, all neatly grouped and color-coded for rapid, goof-proof selection.

At \$89.95 suggested retail, the VIZ WD-747 is a serious contender in the field of low-cost, high-performance test instruments. For more information, contact VIZ Manufacturing Co., 335 E. Price St., Philadelphia PA 19144. Reader Service number 486. ■

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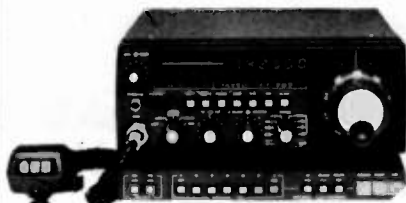
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FT-290R

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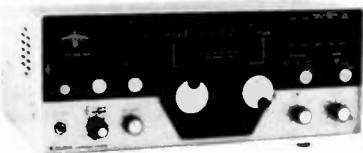


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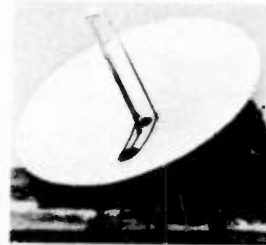
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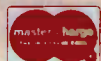
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- **MEMORY SCAN:** Memory channels may be continuously scanned for quick location of a busy or vacant frequency.
- **PROGRAMMABLE BAND SCAN:** Any section of the band may be scanned in steps of 5 or 10 kHz. Scan limits are easily reprogrammed.
- **DISCRIMINATOR SCAN CONTROL (AZDEN EXCLUSIVE PATENT):** The scanner stops by sensing the channel center, so the unit always lands on the correct frequency. **COMPARE** this with other units that claim to scan in 5-kHz steps!
- **THREE SCAN MODES WITH AUTO RESUME:** "Sampling" mode pauses at busy channels, then resumes. "Busy mode stops at a busy channel, then resumes shortly after frequency clears. "Vacant" mode stops at a vacant channel and resumes when signal appears. If desired, auto resume may be prevented by pressing one button. **COMPARE!**
- **REMOVABLE HEAD:** The control head may be located as much as 15 feet away from the main unit using the optional connecting cable. **COMPARE!**

- **PL TONE OSCILLATOR BUILT IN:** Frequency is adjustable to access PL repeaters.
- **MICROPHONE VOLUME/FREQ. CONTROL:** Both functions may be adjusted from either the microphone or front panel.
- **NON-STANDARD OFFSETS:** Three accessory offsets can be obtained for CAP/MARS or unusual repeater splits. CAP and Air Force MARS splits are **BUILT IN!** **COMPARE!**
- **25 WATTS OUTPUT:** Also 5 watts low power to conserve batteries in portable use.
- **GREEN FREQUENCY DISPLAY:** Frequency numerals are green LEDs for superior visibility.
- **RECEIVER OFFSET:** A channel lock switch allows monitoring of the repeater input frequency. **COMPARE!**
- **SUPERIOR RECEIVER:** Sensitivity is better than 0.28 uV for 20-dB quieting and 0.19 uV for 12-dB SINAD. The squelch sensitivity is superb, requiring less than 0.1 uV to open. The receiver audio circuits are designed for maximum intelligibility and fidelity. **COMPARE!**
- **ILLUMINATED KEYBOARD:** Keyboard backlighting allows it to be seen at night.
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- **OTHER FEATURES:** Dynamic microphone, built-in speaker, mobile mounting bracket, external remote speaker jack (head and radio) and much, much more. All cords, plugs, fuses, microphone hanger etc. included. Weight: 6 lbs.
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# The Winning

## — days in the life of a contester

**T**he contester is one of ham radio's most intriguing characters. For the better part of the year, he mostly lies dormant, occasioning a few club meetings and every once in a long while idly tuning the bands, looking for some hint of lost excitement.

The contest weekend hits. The resultant flurry of activity is of such a contrasting nature to his normal laconic presence that a casual observer would probably write the contester off as some sort of weirdo.

I've been what I thought was a contester for the past two years, only to learn—by way of a meeting with the Potomac Valley Radio Club, almost all the members of which are contest fanatics—that I was a mere piker. Shortly thereafter, my curiosity became aroused and I decided to investigate the experience of dedicated contesting.

"Experience" somehow falls short of expressing what actually happened. When you enter a contest for the purpose of winning, you have to assume a new being. You have to become ... *The Contester!* Da-dum!

The Contester, as such, gets *Psyched Up* for each and every point in each and every contest. Hypnotism is preferable, but a mite expensive. Zen is cheaper, but very deep and, as a result, more than a trifle difficult. So, the Contester usually musters the old standbys: power of concentration and physical conditioning.

Taking this in the literal sense, I decided that for the contest I chose, I was going to be *Psyched Up and In Shape*. What followed was a rigorous schedule of fitness-engineering designed to impress Muhammed Ali. For a month prior to the contest, it was up every morning at five, run several miles, eat a big breakfast, work out in the gym, rest, and lunch around noon.

In the afternoon, it was a daily session of meditation, mentally chanting the mantra, WIN...WIINN...WIIINNN! Later in the day, more working out and speech lessons (for the phone portion). Dinner was followed by CW work optimistically designed to improve my code speed to 40 wpm. By the end of the month I was a physical marvel. Well, almost.

The mental portion of my training, including the meditation, wasn't quite as easy. As I have mentioned, I would engage in my meditative session right after lunch. Aside from an occasional burp, there shouldn't have been much to distract my attention (especially with such an absorbing mantra). But, alas, I was to be foiled (for a while) in terms of one of the most crucial aspects of contesting: power of concentration.

Now, don't get me wrong. Contesters are very dedicated people, but most have one major flaw—they're dreamers. If they aren't dreaming about how nice that plaque would look just above the homebrew 4-1000, then they're dreaming about getting new and better equipment.

These comments are typical of what one might expect to hear at a contest-oriented club meeting: "Get an automatic CW machine, boy. You'll work 'em faster and log 'em easier. And while you're at it, get yourself a new speech processor. Ya need more punch. You'll cause more excitement, get more con-

tacts, and *make more points!*"

Ah, yes, I remember it well. My mind was wandering terribly during those first few meditation sessions. I was constantly dreaming of mortgaging the house so I could get a surplus 350-foot tower topped by 5-element monobanders for 40 through 10 meters (only 4 elements for 75). I also considered coaxing the Contest Advisory Committee to allow for a new operator/station category: single operator, multi-transmitter. Just think! I could have two programmable CW machines going at once, with a tape recorder taking all the calls. On phone, I could run pretaped reports by using cassette recorders remotely controlled and coordinated by computer. Wow! Wow! Woowww!

See what I mean? Finally, through sheer willpower, I began to channel my mind toward constructive thoughts of winning. I was just beginning to get my head straightened out when the big day was upon me.

I spent all of contest eve tuning and retuning my station to a fine pitch. I still have scars on my legs from



shinnyng up and down the trees in my yard in a last-ditch attempt to get the swr for my entire antenna farm down to a dB-encouraging 1:1. Now, before the state-of-the-art crowd protests that I was chasing the ghost of an old wives' tale, let me say that, with *this* Contester, old ideas die very hard. If nothing else, I was determined.

For a full hour before the contest was to begin, a well-rested, well-fed Contester-to-be sat in a lotus position, chanting and concentrating on making points. Finally, I leaped up, and screaming, "I'm psyched!", ran into the shack. Immediately I began to throw switches with such ferocity that I almost ruined forever the front panels of my precision-tuned Vehicles-to-contest-Victory equipment. Notice the capitalization of the Vs. Man, I was ready!

Since this contest was a one-weekend, one-shot, DX affair, I had to cram hundreds (preferably thousands) of contacts into 48 hours of living. Operation on all HF bands on both CW and phone was allowed. I decided to tear into the CW portion first and was pleased that my code speed was up to par as I racked up contacts left and right.

After a few hours of dah-ditting my way into contest history, I decided to switch to phone and, in my most mellow, pious voice, began calling "CQ Contest."

Twelve hours and a gallon of coffee later, I knew I had to take a break. I could feel the weariness creeping in rapidly and was beginning to have problems with my CW fist. I had planned two two-hour breaks so as to unwind from each fourteen-hour operating period (or spasm, as the case may be). I immediately hit the sack, but due to all the excitement and coffee, was unable to get to sleep. It seemed like two minutes

later when the alarm went off and I rolled out knowing I should have had more sleep and less coffee. Of course, it wasn't long before I rationalized that sleeping wasn't important, but points *points*, POINTS were! Back to the coffee urn. The XYL was graciously cooking some wing-dinger meals that could be consumed in 5 minutes or less without indigestion.

As I began my second period of operation, I noticed that the band conditions were kind of flat and, consequently, my QSO rate was pretty slow, at best. Later, as evening brought better propagation and more operation, things began to pick up. But by now I was beginning to feel the effects of my lack of sleep. My QSO rate seemed to be rocketing along at a snail's pace. Time was dragging so badly that I began to wonder if I was in a radio contest or a tractor-pulling event. Ten hours into my second period of operation, my dupe sheets began to send bad vibrations to my brain. With every call I heard I thought to myself, "I know I've worked him before. That call sounds so familiar." Then I'd furiously scan the dupe sheet with a disbelieving attitude. If the guy's call wasn't on the sheet, I'd think to myself, "I must've left it off when I worked him before." *POOF!* went my mental state.

At last my second "spasm" was over. Only one more to go. I cursed myself all the way to the bedroom, berating that insane man who not more than a month ago decided that he wanted to be "The Contester." Where was he now?! Why, the little beggar crawled off into a hole somewhere and was sleeping regular hours, eating regular meals, and watching the boob tube! Left in his place was an empty 4-1000A of a man. A glass

bottle that you could see clear through. Man, did I need sleep!

Two hours later, I groggily switched off the alarm and, feeling as though I'd managed to collect only one or two or my marbles, flopped out of the sack and into the dining room. The XYL timidly served my meal (was it breakfast or dinner?), not too sure of what my mood would be. I was courteous, but quiet. After eating, it was back to the shack for the last grueling episode in this very strange "experience."

My senses began to function just long enough for me to realize that it was around 8 am, Sunday. Most people on the east coast would be on their way to church, so maybe my competition won't be too bad. Fat chance! I'd forgotten all the other people in this contest were maniacs just like me, and church was out of the question.

My memory of what happened for the next 12-13 hours is very blurry. About the only thing that comes back to me is the feeling that my fist and mouth were molded from solid lead—very hard, very heavy, and quite immovable. Looking back on my logs, what I can read of them, I see that I managed to run a respectable QSO rate, considering my condition. I didn't even work too many people that I'd worked before.

However, my XYL's memory and description of the events during and after the third period of operation were a lot sharper. Apparently, I occasionally stumbled in and out of the shack with glazed eyes, mumbling something she was afraid to listen to. She claims my voice sounded like the buzzsaw at the local lumber yard, and there were times when she would look in and see me sitting at the desk going through the mo-

tions of speaking and sending CW at the same time, but actually doing neither. The keyer wasn't in my hand, I wasn't near the mike, and I wasn't saying anything! WOW!

At last the contest was over and, according to her, I got up, turned on my heel with military drill-team precision and proceeded to walk straight into the wall. She then quietly led me down the hall and tucked me into bed. All the while I was quietly saying, "dah-dit-dah-dit dah-dah-dit-dah," over and over again.

I can now say for the first time in my life, that I fully appreciate what it means to "crash." The youth of our nation are to be praised for coining such a descriptive term. I crashed so hard that it took me 18 hours to wake up and another 24 hours of very peaceful surroundings to come fully to grips with myself.

It's been months since the contest and I haven't dreamed of the "single-operator, multi-transmitter" category for a long time. In fact, I haven't really been on the air since the contest. Even so, I've occasionally gone into the recreation room, looked at the weight-lifting equipment that I had worked on so hard, remembered those hours of meditation, and smiled. Then, of course, I would turn and walk away. Until today.

When the mail arrived, the contest results were in the ham magazine that sponsored the event and, what's this? I placed third in my section? I beat out a whole raft of more experienced operators? WOW! If only I hadn't snapped out in the waning hours of the contest! Let's see, if I add another ten-foot section to the tower, how many dB of gain will that yield? When's the next contest? Only six weeks away? Oh man, here we go again! WIN... WIINN... WIIINNN! ■

# The GU-1820 Ac Generator

## — 100 pounds of portable power from Heath

A major problem in any emergency planning or Field Day preparation always seems to be finding a generator. Most commercially-available gas generators are either too large or too expensive to be practical for most hams to own. Finding a generator to borrow or rent isn't always easy, either. Now Heathkit™ has helped to solve this problem with the introduction of the Heath-Watt portable generator.

The Heath-Watt uses a five-horsepower four-cycle engine to drive a generator capable of providing 2200 Watts of continuous ac power. This is more than

ample to power, for example, a complete two-transmitter Field-Day operation if linears aren't used.

The only assembly involves mounting the engine to the main frame and assembling and mounting the generator itself to that frame. When the packages containing the kit arrived at the 73 ham shack, the question arose as to who should put it together. I am fairly handy with a soldering iron, but it is widely known that I am dangerous with a socket wrench in hand. It was therefore decided that I should be the kit builder—the others felt that if I could do it, *anyone* could!

Well, I did it. The total assembly time was about six hours, although that time included several delays for rag chews, refreshments, and snide comments from the more mechanically-adept members of the staff. This was not, however, the most enjoyable time I have had putting a Heathkit together.

I've always had a suspicion that the Heath technical writers are at their best when describing electronic assembly and not so hot on mechanical steps. This kit seems to prove that hunch correct. Don't get me wrong—if you follow the manual, you will end up with a work-

ing generator, but I feel the instructions are not as clear and straightforward as I've come to expect from Heath. Part of the problem is that the terminology of generators is not as familiar to most of us as is the language of electronic construction. I found that frequent reference to the pictorials both for parts identification and for an understanding of what each step entailed was necessary.

Construction of the Heath-Watt itself presented few problems. The only real difficulty encountered was in forcing a bearing into the end casing of the generator. Heath provides a wooden dowel to use with a hammer to drive in the bearing, and the instructions note that "it may be necessary to strike the wood bearing driver with considerable force to seat the bearing properly." The instructions are correct on that point. It took such "considerable force" to drive the bearing in that the wood dowel split in half long before it was seated properly.

In fact, we never could get the bearing in flush with the end casing and, as a result, a plastic bracket that mounts over the bearing ended up with a slight bow. This problem caused us some concern, but did not appear to affect the perfor-



Heath's GU-1820 ac generator.

Continued on page 51

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# Radio Rehab

## — how ham radio helps young offenders

Robert Stuart Zamalin WA6VIP  
7012 Newlin Avenue  
Whittier CA 90602

Can ham radio be used as a means of rehabilitating young offenders? Attorney Steve Stevens

KD6BS believes that it can. He belongs to the Volunteers in Parole, a variation of the Big Brother organiza-

tion, which pairs young parolees from the California Youth Authority and volunteer attorneys. The goal of the VIP is to help parolees to adjust to the outside world and become productive citizens after being released from the custody of the California Youth Authority.



Attorney Steve Stevens KD6BS in his shack.

Steve, who has been involved in radio since 1953, believes that ham radio is an excellent means of diverting the young parolee's interest from criminal activities into something constructive. He believes that the various activities in ham radio can help the parolee to associate with individuals outside his own peer group. Because of the fact that the hobby cuts across income, occupational, and ethnic boundaries, it is an excellent way of mainstreaming the parolee into the world outside a correctional institution.

The Volunteers in Parole grew out of the suggestion of Supreme Court Chief

Justice Warren E. Burger that lawyers get involved in the correctional system and help it become something other than a revolving-door process. The first VIP programs were set up in Los Angeles and Santa Clara in 1972, and since then, San Diego, Sacramento, and San Francisco have started VIP programs.

The parolees are matched up with volunteer attorneys who have the same basic interests in similar hobbies and sports. The attorneys are asked to spend at least five hours per month with their parolees over a period of six months. In reality, they often spend more time than that with their charges, absorbing a lot of the expenses out of their own pockets.

Motivating the parolee is not difficult if you try to set up a positive role model, claims Steve. "If you get a relationship with the kid

and if the kid is trying to emulate you, it is not difficult to motivate him. With the right type of relationship, he wants to try what he sees you doing."

Currently, Steve is working with a parolee named Kelvin, helping him to get his Novice license. This is the first parolee he has gotten involved in ham radio. He brings Kelvin to his house so that he can see firsthand what ham radio is all about. Steve is also considering setting up a Novice class at two of the juvenile detention facilities in California's Santa Clara County, locally known as the Boys' Ranch and the Girls' Ranch.

As much as he feels ham radio is good for diverting young people from criminal activity, he has serious reservations about using ham radio in rehabilitating adult offenders. "Most of the adult offenders would probably see it as a way of

communicating with each other as to whether or not the cops were coming—or something like that," he cautioned. "I don't want to run that risk."

Elaborating further, he indicated that "statistics show that normally 25 years of age becomes a turning point in life. An individual either gives up a life of crime altogether or he becomes a criminal for the rest of his life. What I am concerned with primarily, therefore, is catching those youngsters before they get to the big time."

Steve is well qualified for this sort of activity. He received his communications training in the Air Force in 1953. He has been teaching a Novice class for the past year, and he runs a 10-10 net. He is very active on two meters. His many pieces of equipment include a KLM Multi-2000 which is his all-mode base

station, a Tempo VHF/One Plus which serves as his mobile rig, a Santec handheld that he uses when traveling, and a old Polycorn that he uses when monitoring his favorite DX repeater. His interests also branch out to microcomputers, and he plans to purchase one to interface with his gear and so keep home accounts.

It is very important for young people who have been involved in criminal activity, especially those who have served time, to keep busy with constructive activities so they don't have time to revert back to their old behavior patterns and make the "big time." Fortunately, there are people like Steve who care enough to help young parolees coming out of the system and divert them from criminal pursuits to other, more worthwhile, activities like ham radio. ■

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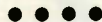
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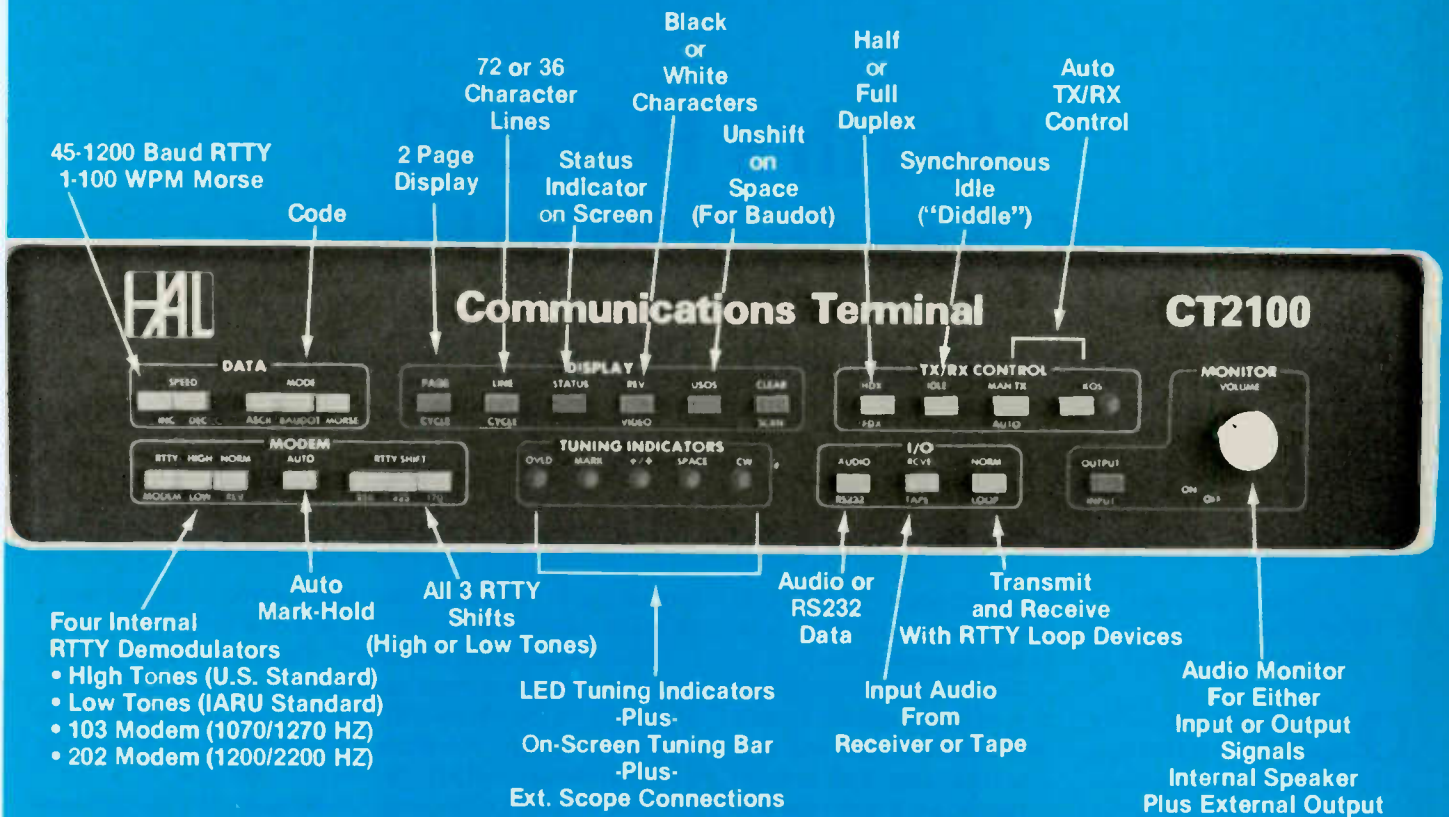
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Now replace L1 and L9 with a 3/4" piece of straight wire (similar to L2 and L3). Next, use a 22-pF capacitor you just removed from C11 or C12 to replace C3.

Since the case is already off, now's your chance to install a disaster-preventing reverse-polarity protection diode from B+ to ground just inside the case (see Fig. 2). Just about any silicon diode rated three Amps or larger will work. Be sure that the cathode band is connected to B+.

If you're like me and have just got to get that extra Watt out of an amplifier, then use a 5-to-30-pF ceramic trimmer in place of C3 and C13.

Now reinstall the PC board, but do not replace the C-shaped cover. Tune your HA-202 for maximum output starting with the output section. Typically,

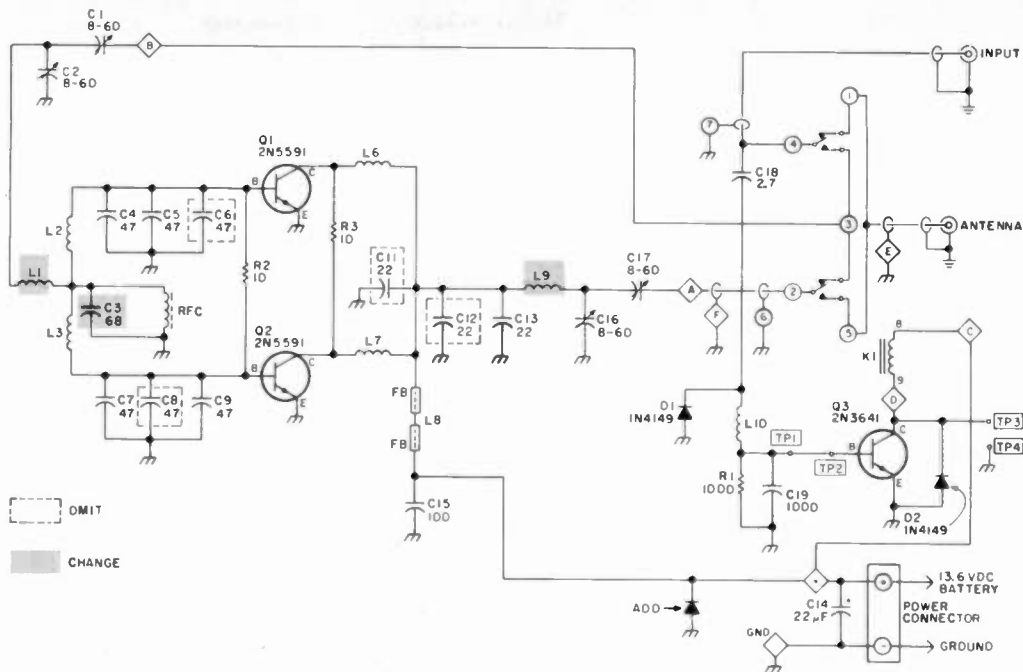


Fig. 2. HA-202 amplifier schematic.

the HA-202 produced 40 Watts out with 10 Watts of drive on two meters. On 220 MHz there is a slight reduction in output power, but

you can still expect 30+ Watts out.

My thanks to WB5WRR for confirming that this modification is an easy, in-

expensive way to generate some power on 220 MHz. Also, my thanks to KA5GWL for knowing how to put words together. ■

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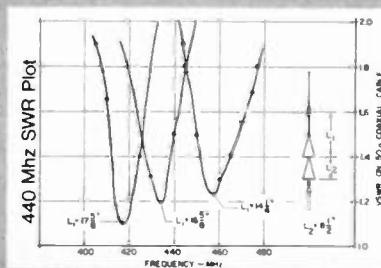
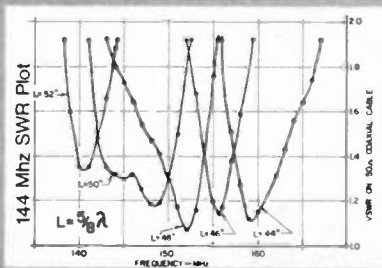
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# The Mirage B1016 Two-Meter Linear Amplifier

## — for those times when you have to be heard

When I moved to New Hampshire from the midwest a year ago, the repeaters out here really took me by surprise. The coverage is phenomenal by any standard I am accustomed to, but so are the dead spots when a mountain gets between you and the repeater! Clearly, 10 Watts of power is not enough for reliable communications. The final straw came when I became interested in 2m SSB—I had to have an amplifier, and preferably one that included a receive preamplifier. After pricing the market, I decided that I might as well go for something really “loud,” and one

of the most powerful amplifiers this side of a homebrew 4CX-250 is the Mirage B1016. For the uninitiated, this particular model is capable of putting out 160 Watts with only 10 Watts drive and is an extremely compact package measuring 12"×3"×5.5". It appears to be very conservatively designed and is covered by a five-year warranty on everything but the rf power transistors (which are covered by a one-year warranty).

When the B1016 arrived, I immediately installed it in my car. An amplifier that produces this much power is not to be taken lightly, so

I took the precaution of installing a short, heavy run of #10 wire directly to the battery. RG-58/U is not really designed to handle 160 Watts at two meters, so I fitted my Larsen roof-mount antenna with a good grade of RG-8/X. All front-panel switches may be removed using an optional control box, permitting the amplifier to be installed in an out-of-the-way location, with a remote-control box conveniently at hand.

It should have come as no surprise, but it was nevertheless exciting to discover that 160 Watts allows me to talk through repeaters I couldn't even kerchunk before. I had grown accustomed to losing contact along certain stretches of highway—from these same spots I was now into the machine with a reasonable level of quieting! Importantly, the B1016 is fitted with a very good 10-dB gain receive preamplifier. Switching it in kicks up the S-meter several units and quiets the received signal noticeably. The preamplifier does its best work on SSB. It never made a totally indecipherable FM signal readable, but it frequently allowed me to communicate with

SSB stations that I couldn't otherwise copy. I have yet to encounter a multi-mode two-meter transceiver that won't benefit from the Mirage preamplifier.

### How Do I Key This Thing?

You'll notice from the photograph that there is an FM/SSB switch on the front panel. Since the amplifier is biased for linear operation in both the SSB and FM modes, this has absolutely nothing to do with the linearity of the amplifier. It merely selects no delay rf-sense switching in the FM mode and adds some delay in the SSB mode. Rf switching is convenient but is really an unsatisfactory compromise. If you set the hang time long enough so that the amp doesn't cut in and out between words, it takes an uncomfortably long time to switch to receive after you let up on the PTT. Moreover, the Mirage has separate relays for the preamp and amplifier sections so that everyone has to listen to two relays chattering away. Do yourself a favor and wire up for direct keying when you install the amplifier. It only takes a moment, and think of the fun you'll have scaring your know-it-all friends every



*The Mirage B1016 two-meter linear amplifier.*

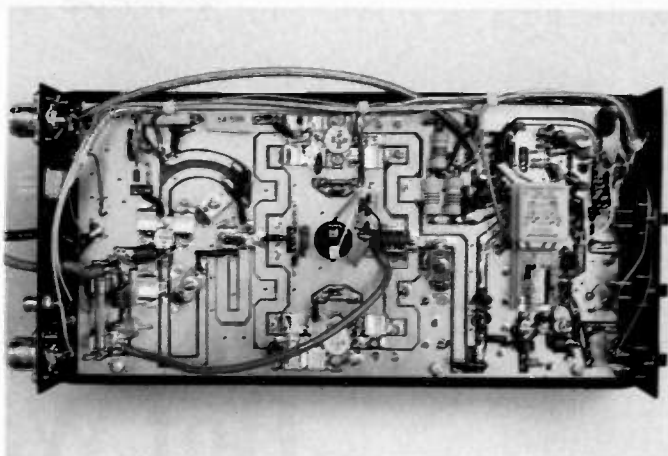
time you operate SSB with the delay switch in the FM position!

The B1016 can draw over 20 Amps of power (it's fused for 35) at 13.6 volts dc, so care should be taken in choosing a power supply. For a VHF contest weekend, I used a hefty Astron RS-35M supply, rated at 20 Amps continuous duty, and it barely got warm. The heat sink on the amplifier itself gets pretty hot after three or four hours of screaming "CQ contest" into the microphone, but at no time did I cause the temperature-sensing protective circuitry to cycle. At 170° F., a

thermostat shuts the amplifier off, and doesn't return it to normal operation until the temperature drops to 140° F.

### Who Needs 160 Watts?

Even in the flatlands of the midwest, a powerful amplifier is useful for FM operation. It is comforting to know you have an extra margin of power when mobiling at the fringe of a repeater's coverage area, and it's a pleasure to carry on simplex conversations over distances that would normally require a repeater. Nevertheless, two-meter SSB is where the B1016 really shines. You haven't lived



Bottom view of the Mirage B1016.

until you've worked some two-meter SSB DX, and the B1016 will allow you to do it on a regular basis! For more information, contact

Mirage Communications Equipment, Inc., PO Box 1393, Gilroy CA 95020. Reader Service number 488. ■

### GU-1820 from page 42

mance of the generator. A suggestion to Heath: Either manufacture the metal parts with slightly greater tolerances or provide the bearing already pressed in to place.

After assembly and fueling, the gang stood back and held its collective breath while the starter cord was pulled for the first time. The engine started beautifully, and the light bulb connected to the output lit just as Heath said it would. After letting the engine run long enough to make reasonably sure that the mechanical parts were working correctly, we hooked the output (through a step-down transformer) to an oscilloscope to have a look at the waveform. It definitely wasn't as clean as the mains, but the frequency was very close to 60 Hz and the line voltage was right on the money at 117.

After ensuring that it was safe to connect equipment to the output, we hooked up a transceiver to see how the Heath-Watt would do at providing useful power. It did very well. The TS-530S ran just as it did when connected to New Hampshire Public Service. The nicest

news of all was that the receiver suffered no interference at all from the generator—it was just as quiet as when running from the mains.

The generator's first real test came a few weeks later at the 73 gang's Field-Day site, where it was the sole source of power for our class 2A station. The Heath-Watt ran flawlessly for well over 24 hours and, although it was possible to tell by the sound of the engine when a rig was keyed, it handled the load of two transceivers, assorted keyers, lights, and rotors with no trouble whatsoever.

As generators go, the Heath-Watt was rather quiet. We set it up about

one hundred feet from the operating tent behind a large boulder and had no noise problems at all. The hundred foot hike through the brush for refueling did make that part of Field Day more exciting than usual. Heath says that the generator's half-gallon gas tank will provide about 1 1/4 hours of operation at 50% load. That estimate seems conservative, and there were times when it seemed as though the gas would last forever (those were usually the times an operator was waiting anxiously in front of a battery-powered rig to take over when the generator died). It would be nice if a still-larger gas tank were avail-

able—a generator should not really have to be fed every couple of hours during an emergency. A tank twice the size would produce half the aggravation.

The Heath-Watt seems to be the ideal answer for an individual or group wanting to have emergency power capability at a reasonable cost. This generator is relatively inexpensive for the amount of power it produces and is small and light enough so that storage and transportation are not a real problem; one man can easily move it if necessary.

For more information, contact Heath Company, Benton Harbor MI 49022. Reader Service number 487. ■



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# Gunnplexer Cookbook

**W**hy aren't you operating on 10 GHz? Surely, you have heard of the Gunnplexer, a Microwave Associates' product aimed at making the average ham a master of microwave magic. Despite its availability, reasonable price, and simplicity, the Gunnplexer is about as popular as an AM signal on 20 meters. Now there is new hope for discovering life on 10 gigs. The *Gunnplexer Cookbook* blows the top off the subject, eliminating the problem of finding information and applications.

Authored by Bob Richardson W4UCH, the book goes beyond the whys of Gunn diode theory and delves into the hows of put-

ting this technology to use. The sixteen chapters start with the basics and end with the design and construction of a computer or TV video link. Along the way, you'll learn about range, bandwidth, i-f amplifiers, antennas, and anything else that has to do with the practical aspects of life on 10 GHz.

The joy of W4UCH's book is that you can duplicate the projects. There are detailed plans for building frequency and power meters, power supplies, waterproof enclosures, parabolic reflectors, and temperature controls. These building blocks can be combined into a Level 1 or a Level 2

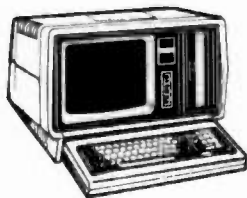
communications system. The author worked alone, at home, so he was forced to devise inexpensive and readily-available substitutes for exotic microwave gear. The text is supplemented by photos, diagrams, printed circuit layouts, and even information about suppliers.

If you have mastered the easy applications and are ready for experimentation, check out the *Cookbook's* discussion about making the Gunnplexer sing on single sideband. The proposed phase-locked-loop "crystal-matic" scheme has attracted some skeptical comments from other microwave aficionados. But the critics are sorely lacking

when it comes to suggesting alternatives. Another one of Richardson's ideas calls for using a conventional AM television to receive FM video signals. Common sense dictates that this cheap and dirty approach won't work, but the proof is in the viewing.

Still not convinced that 10 GHz is the place to be? Then maybe you should dust off that old AM rig. All jokes aside, *The Gunnplexer Cookbook* is the definitive source for information and inspiration for aspiring microwavers. It costs \$9.95 and is available from The Ham Radio Publishing Group, Greenville NH 03048. ■

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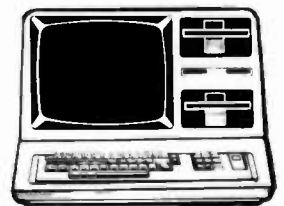
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# The Green Gallon

## — an HW-101 look-alike (except for those four 811As)

This article describes a project which evolved into a 1-kW linear amplifier. The unit has been several months in the making. The effort put forth in building this project is dedicated to the amateur who enjoys the satisfaction of creating, building, and operating his own professional equipment.

The parts and subassemblies required to fabricate the amplifier were obtained from local hamfests or were reluctantly surrendered from junk boxes by fellow amateurs. It is intended that the theme of this arti-

cle shall emphasize layout rather than circuit design.

The housing of four 811As, with filament, relay, and bias supplies into an HW-101 cabinet was preceded by many hours of planning. The power supply is housed in a separate box and connects to the linear via the control cable.

The Green Gallon linear amplifier is designed to be packaged into a Heathkit® HW-101 cabinet. The new assembly thereby creates a tabletop twin for my HW-101 transceiver.

Prior to building this amplifier, it was necessary to

send a shopping list in the form of an order blank to Benton Harbor, Michigan. The Heath Company is very accommodating about selling piece parts. The top and bottom cabinet sections for the HW-101, three large, and two small skirted knobs were major items purchased. Minor items included four rubber feet and two plastic risers; all items added up to a cost of \$35.00. Other front-panel parts such as the 1-1/4"-square panel meter, rotary band-switch, and power on/off switch were purchased at local hamfests.

After surveying the available tubes, the 811A was chosen for this design. The reasons for the selection were twofold: (1) The tubes are relatively inexpensive and readily available, and (2) They can be operated at a relatively low plate voltage of 1500 volts, thereby making the power supply components less expensive. The disadvantage of using the tube is that four are required for full legal input power.

With this major decision out of the way, consideration was given to the tank-circuit components



Photo A. Front view of amplifier showing all controls and taped top louvers.

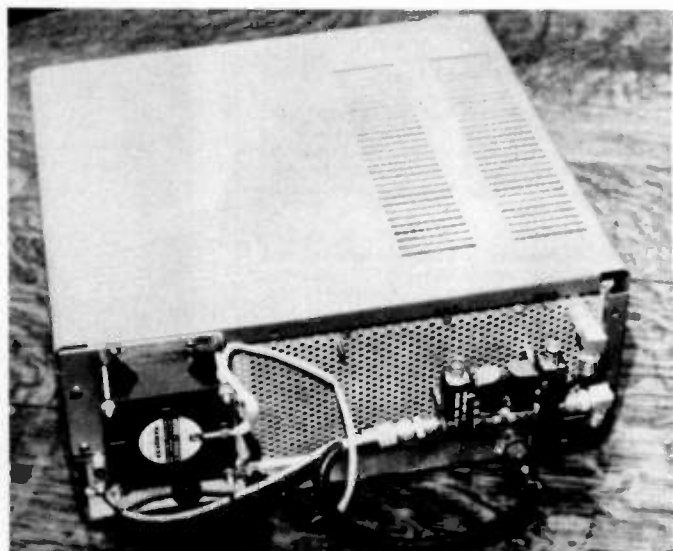


Photo B. Back view of amplifier showing cooling fan and dual coaxial relays.



because their physical size would dictate the entire layout. The tuning capacitor, a Cardwell, was purchased for \$8.00, along with the large four-contact bandswitch for \$1.00. The capacitor is a large unit with counterbalance weight, rated at 220 pF at 3-kV spacing. The four-position switch was part of a US Navy tuning unit and may be undesirable to some, but it did not cause any great problem in my shack because 40 through 10 are my prime bands of operation. For different bands, the tank could be modified easily to suit the individual's needs. The output loading capacitor is a conventional broadcast type with the three gangs wired in parallel, giving 1500 pF.

I constructed the main chassis using a sheet of 3/32" aluminum mounted on three angled pieces having dimensions of 1" on a side. Considerable thought was given to the layout and shielding of the rf input and output compartments. As shown in the photos, the four tubes were staggered horizontally in order to conserve space.

Orientation of the 811As is very critical due to their internal grid-support structure. The tubes must be placed with the grid-support posts aligned atop each other to prevent grid sagging and possible shorting when the tube is hot. The ceramic tube sockets are mounted to a piece of formed sheet aluminum.

The rf input circuit is completely enclosed, using a modified aluminum chassis and perforated aluminum sheet. A 10" x 5" x 3" standard chassis was cut lengthwise to make a 10" x 5" x 1-1/2" open shell. Next, the bottom side was removed so that a U-shaped shell remained which could be pop-riveted using L-brackets to the tube sup-

port. Although this may sound complicated, it is hoped that the photos reveal its simplicity.

The rear of the amplifier consists of a modified chassis box used as an rf input compartment, in which the 811A tube sockets were mounted. This chassis is covered with a perforated aluminum shield to complete the input enclosure. Input switching and tuned cathode circuits were eliminated because of space limitations. The decision was made knowing full well the risk of increased intermodulation distortion and high swr between exciter and amplifier. Prior to mounting the rear shield, the two Dow-Key coaxial relays were bolted to it with spacer.

The 6.3-V ac, 20-Ampere filament transformer was mounted toward the rear of the amplifier, providing its large secondary wires a short connection directly to the filament feedthroughs on the inner side of the rf shield. The feedthroughs were constructed using #6 machine screws and nuts, solder lugs, and insulating washers.

The bias and relay power

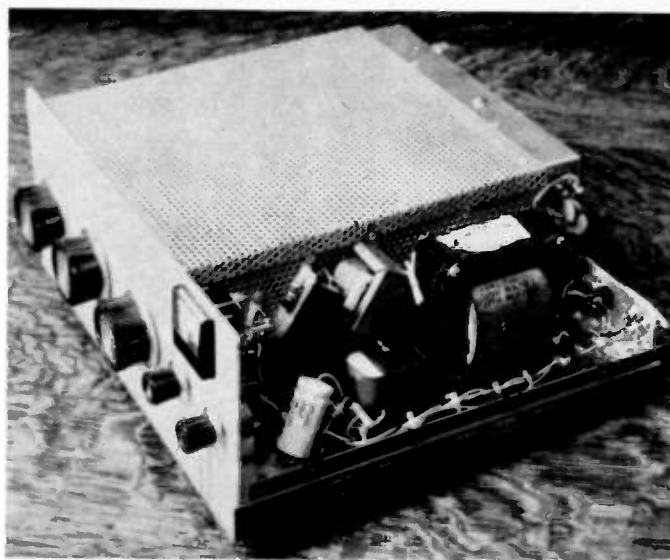


Photo C. Side view with top cover removed showing filament bias, and relay supplies.

transformers with their associated components were mounted directly in front of the filament transformer. The bias-supply uses a 6.3 V ac, 1-Ampere standard filament transformer in a reversed hookup, and feeds a simple half-wave filtered section. Components for the two supplies are mounted to lugged terminal strips. For simplicity, I pop-riveted the strips to the inner final rf cage.

The front panel was made from a piece of 1/8" aluminum obtained through the

courtesy of a fellow ham with a free junk box at the local fest. The piece was cut to 14-1/2" x 6-1/4", and its corners were filed round to match the HW-101's front panel. Now, the panel must match the color of the 101, so I searched at the local automobile parts outlet for one of those spray cans of touch-up paint. An acceptable green was found at \$1.00 a can (GM part #DS-GM 283). One can will supply several coats with some left over. Before spraying, remove all grease

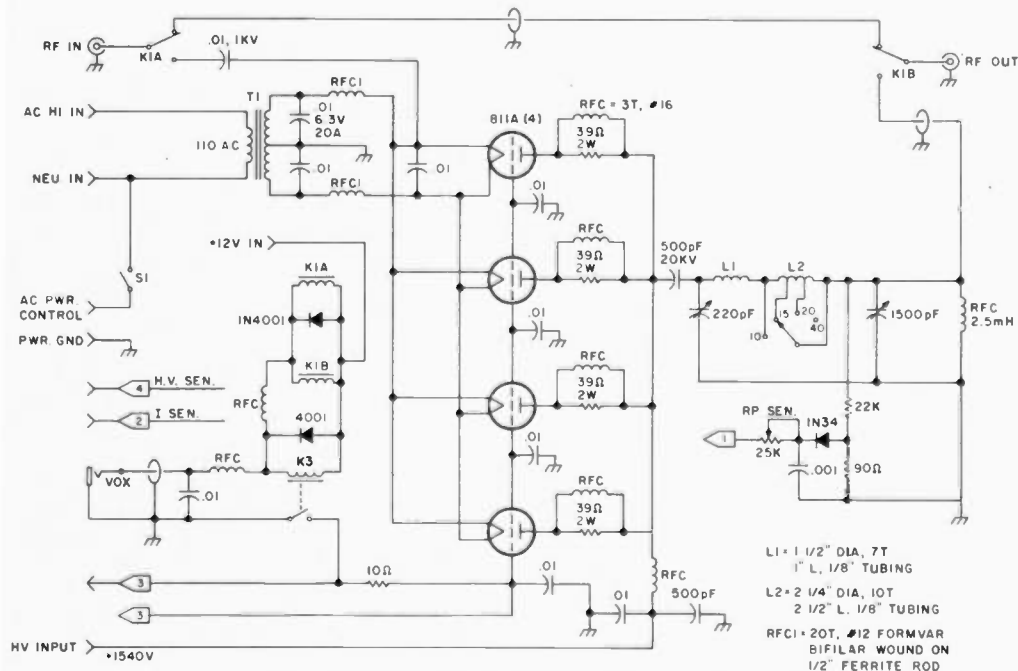


Fig. 1. 1-kW linear amplifier.

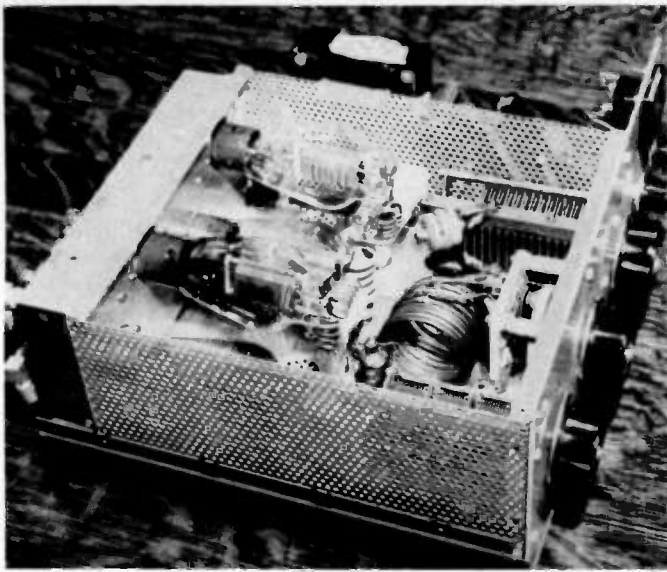


Photo D. Side/top view with top of rf cage removed showing 811As and final tank circuit.

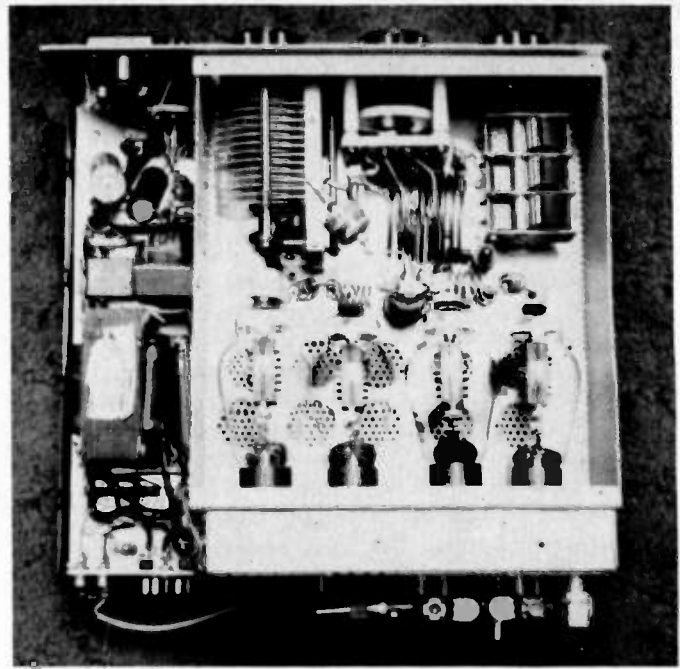


Photo E. Top view with rf cage removed, showing placement of rf tank components plus power supplies.

with a suitable solvent and then apply two coats of a suitable primer.

Like the HW-101 but unlike the SB-220 or SB-200, the power supply is housed in a separate box with a power control cable plus HV cable running between it and the amplifier. The heart of the power supply is the Berkshire 6181 transformer—all 30 lbs of it. This transformer has a dual primary to accommodate 120- or 220-V ac input and a

single secondary rated at 1100 V and 550 mA. The unit was purchased directly from the manufacturer at a cost of \$58.00 including postage and handling.

The rectification is handled by twelve 3-Ampere, at 1-kV diodes with 1/2-Watt carbon resistors in parallel with spike-preventing capacitors. A series of four capacitors, with bleeder/equalizing resistors, filters and increases the 1100 volts to 1540 volts. This level will

drop about 100 volts when the amplifier is pulling its full plate current of 600 mA. Incidentally, I bench-tested the power transformer at 1100 V with a 1-Ampere load with no apparent heating. The power supply is energized via a control relay in the power supply and a power switch located on the amplifier's front panel.

Surge protection for the

bridge diodes is assured by relay K2, with its contacts and a series resistor in the transformer's primary circuit. Time delay is about six seconds with 250 Ohms and 110 V ac on the primary. Sense resistors for the plate current and voltage are located in the bleeder-resistor string.

All metering is handled by a 100-uA meter. The meter function switch is a five-position ceramic type with the center position grounded. This gives a convenient meter-disable position between two active positions on each side. If a different meter movement is used, the calibration resistors will have to be altered accordingly. The meter face was re-scaled with 0-2 and 0-1 markings. The grid current and plate voltage use the 0-2 scale which provide 200-mA and 2000-volts full scale readings. The plate current and relative power output use the 0-1 scale, with 1000 mA and 1000 Watts, respectively.

When the power switch is activated, the grid bias supply immediately applies -125 V ac to all grids,

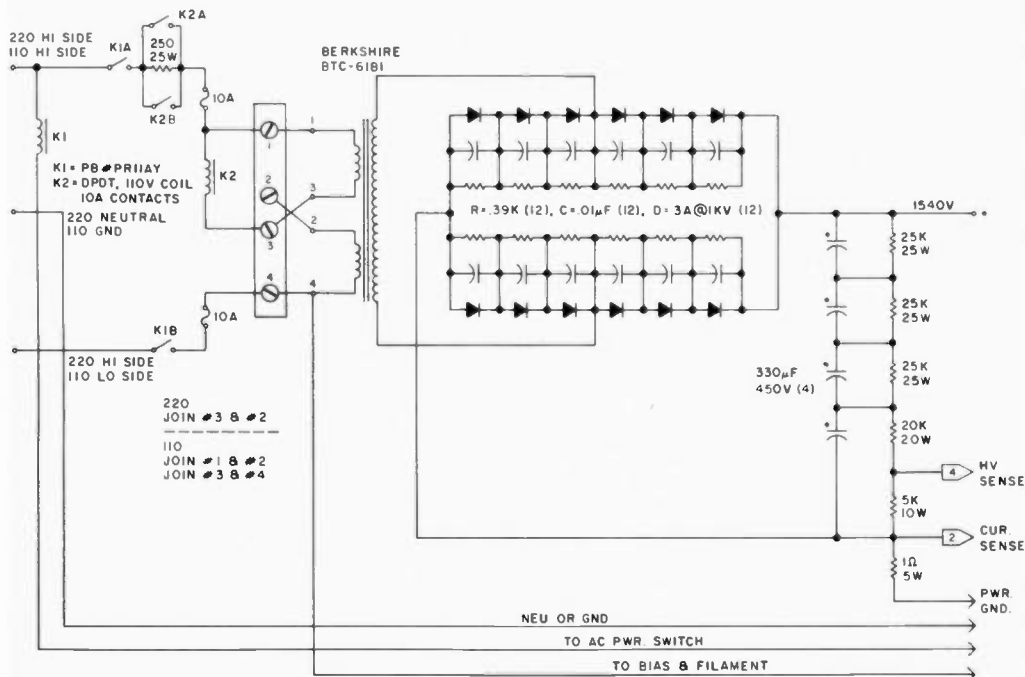


Fig. 2. Power supply.

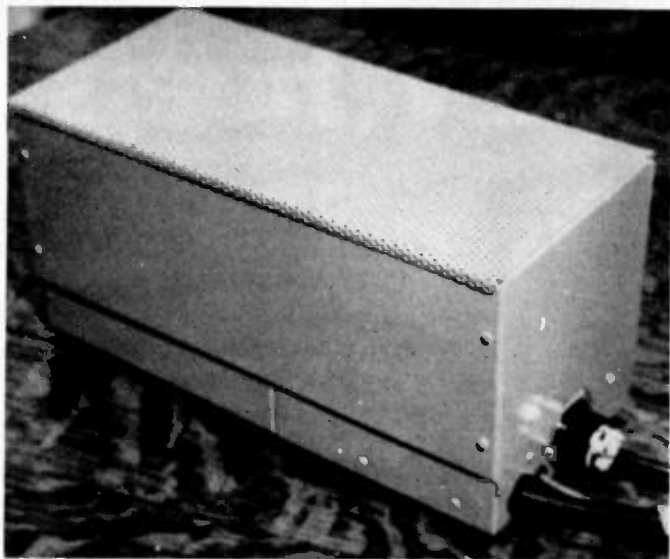


Photo F. High-voltage power supply with cables.

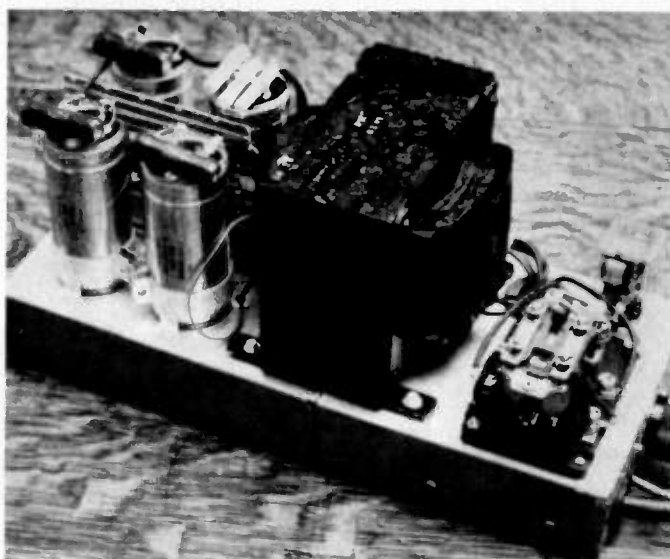


Photo G. Layout of high-voltage power supply. Rectifiers are on PC board mounted between the filter capacitors.

thereby cutting off all plate current flow during tube warm-up. The bias is controlled by a 12-V relay, K3, located in the rf input enclosure. Notice that both sides of the coil have rf chokes and disc capacitors ahead of the side wall feed-throughs. When the transceiver is operated, its auxiliary relay contacts are wired so that a contact closure to ground is generated thereby grounding one side of the bias relay coil and the two coax relays.

Cooling of the amplifier is achieved by using one miniature, high-speed muffin fan. The fan is mounted externally on the rear, fixed to the top cover. Direction of air flow is out of the amplifier, with the input path controlled. To gain maximum benefit from the fan, the louvers were taped closed on the inside of the top cover. Specifically, the right side and top right half were sealed. This action forces most of the input air to be pulled through the left-hand louvers into the rf output cage, picking up heat from the 811As and exiting it through the opposite side of the rf cage. The fan's motor cable was equipped with a male two-prong plug for easy removal. Incidentally, the amplifier can be operated with

the top removed (hence no cooling) for short periods of time. With the cover removed, full rf input and output shielding is maintained making very easy the *dummy load* adjustments in the metering; bias, relay circuits, etc.

Tune-up and placing the linear on the air is made quite simple with the aid of the built-in relative-power meter. After allowing a nominal tube warm-up of, say, 15 minutes, key the transceiver with the mike gain at a minimum setting. The meter function switch should be placed in the plate current position. Increase the mike gain until plate current reaches about 200 mA.

Do not keep the transceiver keyed for periods longer than 10 to 20 seconds at a time due to the heat generated by the 811As.

After a brief period, turn the function switch to the relative-power position while alternately adjusting the tank circuit and loading capacitors to peak the relative-power output. Now switch back to plate current and increase this value to about 600 mA, which is about the 860-Watt input level with 1440 volts on the plates. This allows for an additional 100 Watts of

driving power, keeping the total dc input power slightly less than 1 kW. A re-touch of the tank controls may be required at this time using the relative-power position. Typical CW operation on 20 meters shows a plate current of 600 mA with a grid current of about 40 mA.

The amplifier has been in use for several months on both CW and SSB. Although the rig is mostly used for CW, its linearity is acceptable for SSB operation. As with all grounded-grid linear amplifiers, the loading is a bit critical, but after you get the hang of it, operating becomes a pleasure. ■

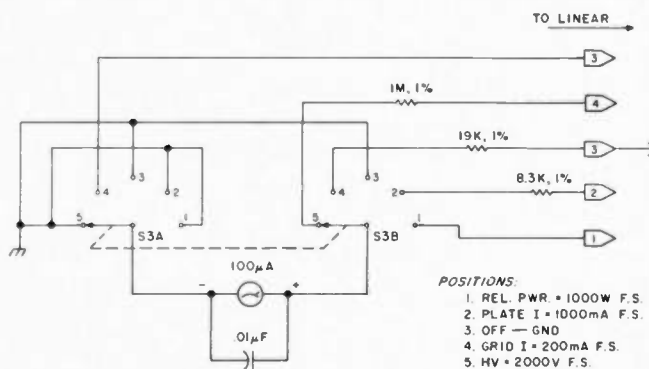


Fig. 3. Meter-function circuit.

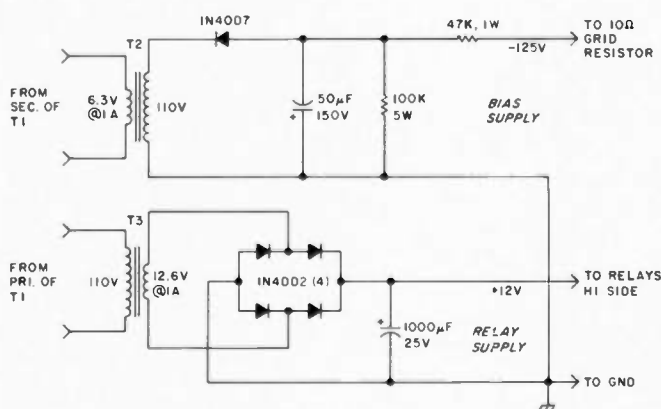


Fig. 4. Bias and relay supplies.

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The ASTRO-150A is an extremely high quality Transceiver in both circuitry design and construction. Emphasis has been placed on performance and human engineering. A leading editorial Review stated, "The quality of construction is second to none. In fact the reviewer was reminded of a well-executed piece of expensive commercial or industrial test gear."

MIL grade double sided plated through epoxy glass boards are used throughout. Circuit boards are interconnected by means of stripline connectors and coax microconnectors for reliability and ease of service. No bulky wiring harnesses. The choice of circuitry prompted a reviewer to also add, "It is this design choice that is probably responsible for the excellent dynamic range of the receiver."

The VRS tuning system employs a knob with a center detent. In the center position the receive or transmit frequency is locked and indicated by the LED frequency readout. If the knob is rotated clockwise or counterclockwise scanning up or down is initiated. The rate of scanning is proportioned to the degree of knob rotation. Returning to the detent position stops the scan. "Reading the mail" is a simple and automatic function!

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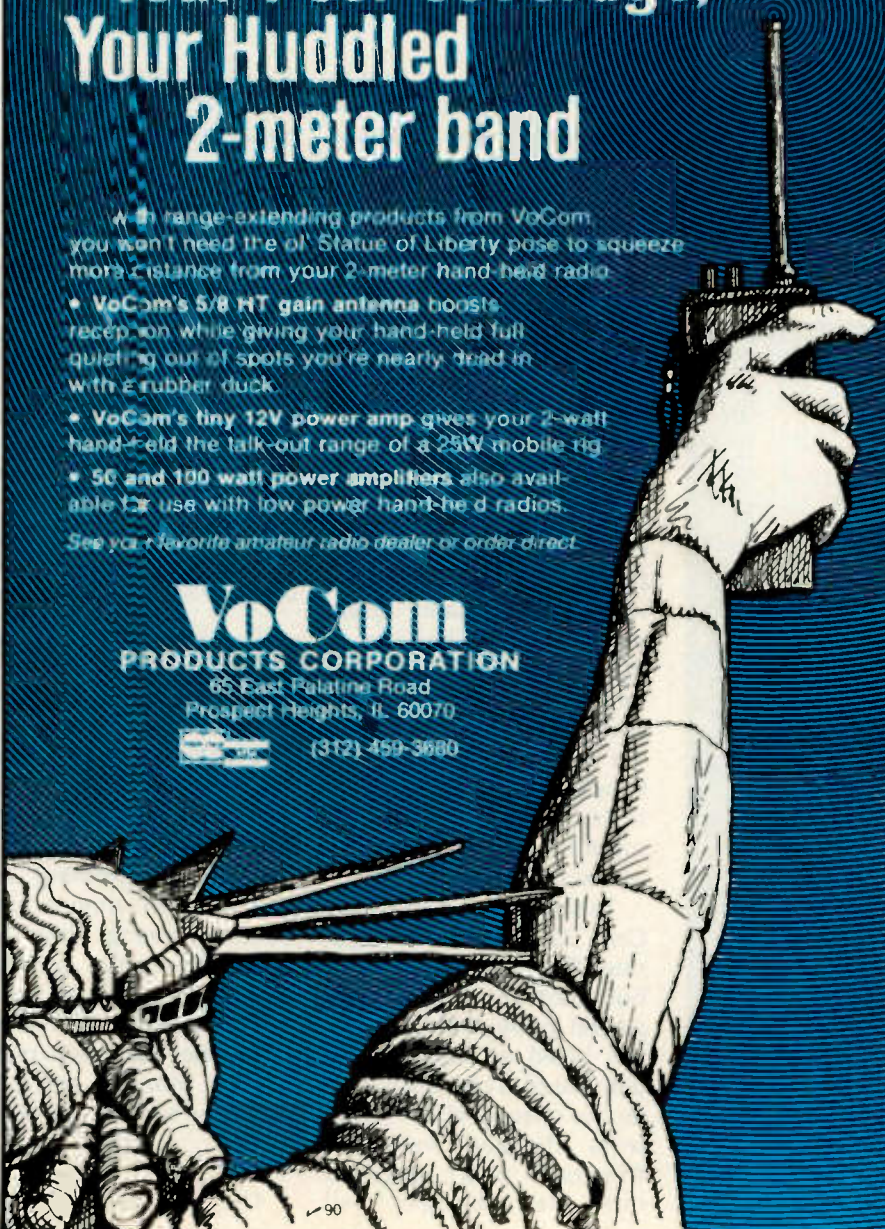
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# Controlled Chaos

## — getting the most out of state QSO parties

**H**ow would you like to be a sought-after station on the low bands? How would you handle a pileup when you, a stateside station in W2- or W4-land, call CQ?

Often the situation is reversed. A rare DX station has probably worked thousands of US stations in all 50 states, so why should he work another W2, W4, or W6? But, once or twice a

year, it can be your turn to be the hunted and have the choice of all who call you!

A controlled-fun kind of chaos, not quite as intense as the worldwide DX contests, is found in the state QSO parties. You, in the sponsoring state, are the station being sought by others. It's especially fun if you are in the county that has a small radio amateur population.

State QSO parties occupy relatively little spectrum space. Unlike the big DX contests or Field Day where every band disappears under a barrage of CQs, the state QSO parties tend to cluster around pre-announced frequencies in the phone and CW sub-bands. Unlike the big contests, there is plenty of room for those who choose not to contest.

Table 1 lists all 50 states. Only 32 states have separate QSO party contests, but another 16 are represented in regional QSO parties listed in Table 2. The data listed is obviously subject to change (about 6 contests changed weekends this past year); detailed rules are publicized well

ahead of time in 73 and most other amateur radio publications.

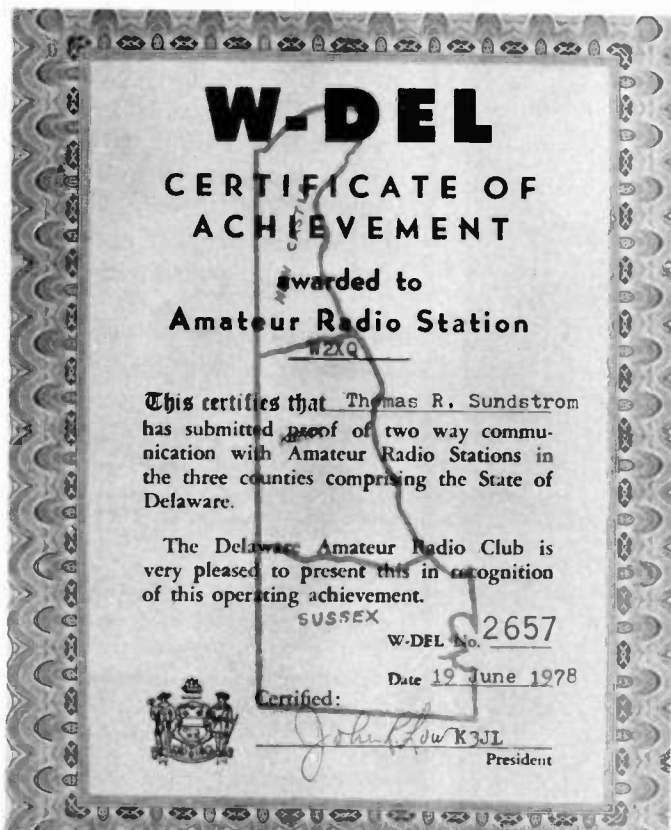
### Weekend Activity

All QSO party contests are conducted on the weekends. The data shows state and regional QSO parties in every month of the year except April. May has six contests, September and March have five, and February has four. State QSO parties will not compete with the major international and national contests such as CQ Worldwide or ARRL Sweepstakes.

The hours of operation are *usually* very convenient for those who have worked parts of Saturday or Sunday. Most contests do not begin until midday Saturday, have a rest period from late Saturday evening to late Sunday morning, and end around dinner time Sunday evening. There are, however, some contests that run the full 48 hours, and some others that do not have the Saturday night-Sunday morning rest period, so be sure to check.

### The Exchange

The contest exchange



One of many certificates available for participating in state QSO parties.

varies from contest to contest. Tables 1 and 2 summarize the exchanges.

Elements include a signal report, a serial number, county, state or ARRL section (see page 8 of any QST), or country.

An amateur in a sponsoring state would send a signal report and county, plus a serial number if required. On CW, for example, in the New Jersey QSO party, I would send:

CQ NJ CQ NJ DE W2XQ K  
W2XQ DE W2NSD/1 K  
W2NSD/1 DE W2XQ  
599010 BURLINGTON BK  
W2XQ DE W2NSD/1  
599001 NH BK  
QSL QRZ DE W2XQ K

In this example, 10 is my QSO number; for W2NSD/1, it's number 1. Regardless of band changes, QSO serial numbers continue consecutively and increment by one of each QSO.

### Object of the Contest

The object is for in-state amateurs to contact as many other stations as possible, with an emphasis on out-of-state and DX stations. Not all contests permit in-state-to-in-state QSOs. Out-of-state amateurs look only for amateurs in the sponsoring state.

Due to the relatively low number of stations participating (100 or more is a lot), a good deal of comradeship develops. For example, in the 1980 New York QSO party, six New York stations in six different counties ran a roundtable first on 75 meters and then on 40 meters over several hours. Anyone who wandered into the QSO could work W2TU, WB2SJC, WB2KEX, KB2DE, WB2IVX, and WB2IPX within two minutes flat! During slow periods, stations tend to cluster onto a few frequencies and call CQ in turn; as a newcomer answers, all those on the frequency can take turns in working the newcomer.

### Contest Scoring

Most QSO party contests are scored by multiplying the number of QSOs times the number of multipliers. For an in-state contestant, a multiplier is each different state, or ARRL section, and DX country. If in-state-to-in-state QSOs are permitted, then each county is also a multiplier. For out-of-state contestants, each county worked is a multiplier.

Most contests count multipliers once regardless of the number of bands they are worked on.

For those intending to submit a contest entry to the sponsoring organization, you can see why a rare county is very popular, especially if that station comes on the air in the later hours of the contest and the county has not been previously heard from. The out-of-state stations create one pileup and, if in-state QSOs are allowed, the stack of calling stations grows even larger. That could be you in that rare county picking through the pileup. It's a fun experience.

### Other Rules

Most contests permit one station to contact another station once per band per mode. Continuing with the example above, W2NSD/1 and I could work each other on phone and CW on each band from 160 to 10 meters for a total of 12 QSOs. For multipliers, however, I can count New Hampshire only once; W2NSD/1 could count Burlington county only once.

Florida's QSO party is one notable exception to this. The phone and CW entries are compiled separately; the scores are not added together if one station submits two logs.

Another standard rule is that the same in-state station may be worked more than once per band per mode if the in-state station changes counties. For ex-

State	Month	Weekend Number	Serial Number Required	Out-of-state contestants send:	
				State	ARRL Section
Alabama*					
Alaska*					
Arizona*					
Arkansas*					
California	October	1	x	x	x
Colorado*					
Connecticut	December	1	x		x
Delaware	November	2	x		x
District of Columbia	September	3	x		x
Florida*	May	3		x	
Georgia*	May	2	x	x	
Hawaii					
Idaho*					
Illinois*	August	1		x	
Indiana*					
Iowa*					
Kansas	May	3		x	
Kentucky*	September	3	x	x	
Louisiana*					
Maine	July	3	x	x	
Maryland	September	3	x		x
Massachusetts	May	3		x	
Michigan	May	3	x	x	
Minnesota*	June	1		x	
Mississippi*					
Missouri*	November	3		x	
Montana*	October	2	x	x	
Nebraska*	March	2		x	
Nevada*					
New Hampshire	February	2		x	
New Jersey*	August	3	x	x	
New Mexico*					
New York*	May	1	x	x	
North Carolina*	December	1		x	
North Dakota*	March	4	x	x	
Ohio	August	4	x	x	
Oklahoma					
Oregon*					
Pennsylvania	September	3	x		x
Rhode Island	August	3		x	
South Carolina*	February	1		x	
South Dakota*					
Tennessee*	March	4		x	
Texas	January	4		x	
Utah*					
Vermont	February	4	x		x
Virginia*	March	2	x	x	
Washington*	September	3	x	x	
West Virginia	January	3	x	x	
Wisconsin*	March	4		x	
Wyoming*					

Table 1. State QSO parties. All amateurs send a signal report and amateurs in the sponsoring state send the county. \*Some states have both individual and regional or district QSO party contests—see Table 2.

ample, in the 1979 New Jersey QSO party, K2NJ/mobile operated on 40 CW from all 21 counties in the course of the weekend; an out-of-state station could have worked K2NJ 21 times. In the 1980 Florida QSO party, I managed to work WD4INQ/mobile on 20 CW in six of the more-than-20 counties he ran through.

### Operating Strategies

For those wishing to submit contest entries, a high QSOs-per-hour rate is desirable, without forgetting about multipliers. Some contests also award 2 or 3 points per CW QSO, but only 1 point for phone; others award 2 or 3 points per DX QSO. Given those factors, time is probably most effectively spent on 20, 40, or

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80/75 meters. With a decline in the MUF, 10 and 15 probably won't be as profitable in the QSO rate.

The frequencies used in the QSO parties generally are in the sections of the bands where General class licensees are permitted. Some of the larger contests also specify frequencies in the Novice bands for Novice/Technician participants and allow 5 points per QSO

to encourage participation.

Obviously, the choice of bands will depend upon the distance between the sponsoring state(s) and the out-of-state participant and the time of day. The season also will have some bearing on the choice. For example, the 1980 Florida QSO party was held in May, and that weekend had very high static levels, rendering 40 and 80/75 meters useless for me

in New Jersey; most of my operating time was spent on 20 CW. In the 1979 New Jersey QSO party, 40 meters gave me the highest QSOs-per-hour rate, but 20 meters gave me the most multipliers in other states and countries.

Many more stations seem to be around at the beginning of a contest than at the end. As a strategy, I suggest picking a band and mode to work on multipliers and pick up the distant states early in the contest, then pick up the nearby stations on the lower bands later.

It should be emphasized that power amplifiers and large antennas are not always necessary to "play the game." Properly constructed wire antennas or verticals and a barefoot transceiver can be competitive. Don't forget that most stations only have wire antennas on 40 and 80/75 meters, and compared to 20 are great equalizers. The large antennas and amplifiers probably help in marginal conditions, but then you are probably better off on a lower band with a higher QSO rate anyway.

### In Closing

Some of the contest sponsors have a number of good ideas I'd like to see others adopt. More contests should encourage participation by Novices and Technicians. Most sponsors award certificates to first-

place finishers in each county and state, section or country, but some combine multi-operator entries with single-operator entries. That's not really fair to the single operators, and separate awards should be given.

Another "nice" idea used by the Tennessee QSO party sponsors is sending a reminder message about the upcoming QSO party to each participant of the previous year's contest. A book of messages is put into the ARRL National Traffic System timed to be delivered about a month before the upcoming contest. The Florida sponsors also use the ARRL NTS to send the book of messages acknowledging receipt of contest entries.

In most cases, an entry consists of nothing more than sending a photocopy of your logbook, as long as all the required data is recorded. Attach a summary sheet showing the calculation of the score, your name, call, and address. Most sponsors also require a checksheet if more than 100 QSOs are made, to ensure that duplicate QSOs have been eliminated from the score calculation.

As a general rule, it also is suggested that you send along a No. 10 business-size SASE for contest results and your certificate, if you qualify.

If you don't feel like submitting an entry, that's OK, too. Just come in for the fun of it. If you are in the sponsoring state, your participation—even if for 10 or 15 minutes—will be appreciated. Figure out what the contest exchange is and jump in for a few minutes whenever you have the time at the beginning, middle, or end of the QSO party. QSO party contesters and county hunters will appreciate it.

See you in the New Jersey QSO party! ■

Call area or ARRL division	Month	Weekend Number	Serial Number Required	Out-of-state/ region contesters send:	
				State	ARRL Section
2nd call area	February	2		x	
4th call area	August	4	x	x	
7th call area	July	1	x	x	
9th call area	October	2		x	
0 call area	January	1			x
Delta (AR, LA, MS, TN)	September	4	x		x
Rocky Mountain (CO, NM, UT, WY)	May	2			x

Table 2. Regional QSO parties. All amateurs send a signal report and amateurs in the sponsoring states send the county.



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- \* All controls on front panel
- \* Freq control variable 300 Hz to 2500 Hz will match any rig.
- \* LED flashes during decoder operation
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- \* Built-in speaker
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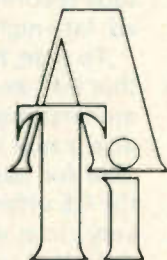
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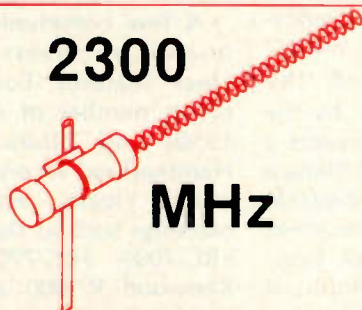
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who's a "softie" for anything programmable and digital, I knew I had to have one of these gems when the ads first appeared.

A few communications-quality receivers boast clock features. For example, a number of the fine 1950s and 1960s-vintage Hammarlund receivers had built-in clocks, and recent offerings such as the Yaesu FRG-7000, FRG-7700, and Kenwood R-1000 all con-

tain digital clocks which provide some degree of receiver and accessory control, such as turning on the receiver, and an external tape recorder for unattended, late-night DX recording.

To date, however, the author isn't aware of any communications receiver that's also a true clock radio suitable for bedroom use. But the GE offering comes very, very close, and should be of definite interest to the

sophisticated AM broadcast band (BCB) DXer and FM-skip listener, as well as to the ham who would like to own a clock radio that's got practically every imaginable feature.

The Model 7-4885 replaces an earlier, but little known GE programmable unit that has been around since about 1977, the model 7-4880. The earlier set was similar, but was channelized to accommodate only the present 10-kHz AM BCB channel splits. The newer version, in addition to incorporating more complex microprocessor-control circuitry, allows the user to instantly adapt the set for the possible adoption of 9-kHz channel spacings by the FCC in the not-too-distant future (more on this later). In a nutshell, the new GE radio is a dream to program and operate, and it especially appeals to individuals such as myself who are fascinated by microprocessor-controlled radio equipment.

The most prominent feature of the GE radio is an easy-to-use calculator-type



*General Electric programmable clock radio features precision and convenience not usually found in consumer-electronics products. Microprocessor-based circuitry affords direct keyboard entry of time and radio frequency, memory for six radio stations, multiple sleep/wake-up settability, and fluorescent digital display of AM/FM frequency and time. (Photo courtesy General Electric Company)*

touch keyboard used to program the digital time-keeping functions and frequency readouts for AM and FM tuning; there is no tuning knob to be found. Other features include direct digital readout of AM and FM frequencies, up-down scanning (search) of both AM and FM bands, direct keyboard entry of exact time and PLL-controlled radio station frequency, six programmable channel memories, two separately programmable memory "wake-up" circuits, automatic panel brightness control, and dual audible and visible power failure indications.

Essentially, the GE set does everything a conventional clock radio does, plus a lot more. It boasts some unusually sophisticated "fun" features including provisions for going to sleep listening to one radio station and waking up to another, having "his" wakeup alarm set to a certain time and station and "hers" to another time and station, punching-in your own desired interval between the wake-up start of music and the time the alarm jolts you to consciousness, and the ability to program the "snooze interval."

An even more important feature is that once set, all these complicated functions are retained, even through a power failure. Two user-supplied, standard 9-volt transistor-radio-type alkaline batteries provide power for the memory-holding system. This allows the radio to be unplugged and moved around yet keep track of time and maintain programmed radio stations and alarm times. Hold time is good for up to 8 hours using fresh batteries, according to the manufacturer. Should the batteries fail, the automatic power failure indicators will come on-

line when power is restored, helping to prevent a late wakeup.

Although this is a sophisticated consumer-oriented radio rather than a true communications receiver, there obviously was some thought given in the design to more than casual use. For example, there is provision for an outside FM antenna for reception in fringe areas, as well as a ground connection. However, there is no provision for connecting an outside AM antenna, though this probably could be done by inductive coupling to the set's internal antenna. A rear-apron headphone jack is provided, a real convenience for late-night DXing. Selectivity, especially on the AM band, is particularly good, with stations standing out with little or no apparent crosstalk when the radio is scanned (stepped) through the band in the pre-programmed 10-kHz intervals. Selectivity is better than is presently required since the radio is designed to accommodate the narrower 9-kHz spacing mentioned earlier, which would place an added demand on good channel separation and "9-kHz whistle" suppression. A slight bit of RFI from the microcomputer circuit was noticeable, especially when scanning through quiet channels, though it was not objectionable.

Perhaps the most forward-looking feature is the user-selectable 9/10-kHz channelization. By sliding a small, screwdriver-accessible switch on the cabinet bottom, the user can adapt the radio to the possible new standard broadcast format. Doing so will alter the spacing increment as the radio is electronically scanned or frequencies programmed in, from the usual run of frequencies from 530 to 1610 kHz, to 531 to 1611 kHz. Under the existing al-

locations, all AM stations in the US (and most of North and South America, but not the rest of the world) currently broadcast on frequencies with 10-kHz spacing, such as 540, 550, 560, 570, and 580 kHz, and so on. Under the proposed new arrangement using 9-kHz spacing, stations would operate on frequencies such as 540, 549, 558, 567, and 576 kHz, etc.

The compressed channelization scheme could allow as many as 1400 new stations to operate on the standard broadcast band, in addition to the 4000-odd now operating. However, many of the 450 million radios now in homes across the country would be rendered at least partially obsolete since their selectivity would be inadequate to handle the narrowed spacing. Many station owners claim that they would have to spend huge sums to re-tool their equipment for the new standards. Interestingly, the proposed change by the US may be welcomed by many foreign governments, particularly if other nations in the hemisphere go along, since we are now "at odds" with the 9-kHz spacing used in most other areas of the world. This disparity results in annoying inter-station heterodyning and beating, being most noticeable in coastal areas where transoceanic medium wave (MW) signals are most frequently received.

Living some distance from both the east and west coasts, I didn't try this, but the intrepid MW listener might want to experiment using the radio in the 9-kHz mode to try to snag overseas stations operating on what are presently odd-split channels to us in the US. For example, the radio would be a natural to attempt to receive such DX catches as the 1.5 megawatt, 657-kHz station at Kangnam, North Korea, the

135-kW, 666-kHz outlet in Lisbon, Portugal, Japan's 500-kW powerhouses on 747 and 774 kHz, Istanbul's 1.2 megawatt station on 1017 kHz; or the West German 800-kW outlet on 1593 kHz. The set's stability and sensitivity (although not measured by the author) were found to be quite acceptable and thus suitable for this kind of uncommon bedside DXing. No spurious signals could be detected on either the AM or FM bands. Apparently, GE's engineers thought the set might see double-duty as a DXer's bedside machine, since the radio's instructions even recommend that the user refer to *White's Radio Log*, a periodically updated listing of all Canadian and US stations referenced by location, frequency, and call letters. The log is published as a part of *Communications World* magazine, a Davis annual.

The next and perhaps inevitable step is for GE or another enterprising manufacturer to crossbreed the programmable clock radio with a scanning programmable portable of the Sony ICF-2001 class for digital bedside shortwave and ham-band listening and wake-up. That step surely isn't far away. In the meantime, one can have a great deal of pleasure playing with GE's flexible and functional programmable, available at discount-stores for under \$90. The radio will also make an excellent gift for the inveterate gadgeteer or BCB DXer, since the radio lets him both start and end his day with his favorite hobby.

Only one problem remains: How do I convince my wife to study the not-too-complex instruction manual and remove her wind-up alarm clock from atop the radio? After all, I've offered her the use of the Number 2 "hers" alarm. ■

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- ASCII 110 & 300 baud.
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- RECORDER INTERFACE for "BRAG-TAPE" or recording off-the-air.
- CODE CONVERTED Printer output in Baudot or ASCII.
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**INPUTS:** Receiver audio right off the speaker terminals, TTL levels, or hand key.

**OUTPUTS TO TRANSCEIVER:** Positive & negative switching for CW or FSK keying, AFSK & SSTV tones at mic compatible levels, T/R (PTT) control.

**PRINTER OUTPUT:** Serial TTL selectable Baudot or ASCII (Code converted, regardless of on-the-air mode). Keyboard command on/off.

**PRINTER FORMAT:** Keyboard programmable from 40 to 140 characters per line.

**VIDEO OUTPUT:** Standard 1 Volt P-P to monitor or video modulator for use with your television.

**SCOPE OUTPUT:** Vert. & Horiz. to scope for RTTY tuning aid.

**BRAG TAPE:** Allows recording off-the-air or for making a long pre-recorded message for later transmission. Keyboard control record/play.

**MEMORIES:** TEN, 40 character user programmable. Can be stacked for longer than 40 char message. Can be loaded at any time.

**TEXT BUFFER:** Allows you to "Type-Ahead" up to 1400 characters while receiving (Text entered into the buffer is visible above the SPLIT-SCREEN line for correction).

**AUTO-START:** Inhibits the display of non-RTTY data.

**VIDEO DISPLAY VARIATIONS:** Black letters on white background or reversed white on black. NORMAL/ZOOM (twice normal char. size). All keyboard selectable. 40 Characters - 24 Lines.

**TUNING INDICATORS:** Scope output for RTTY, Audio (pitch) reference tone for CW & RTTY. LED for both.

**SSTV TRANSMIT:** Outputs standard tones for sending character and computer graphics. Compose full screen and XMT just as in RTTY.

**SSTV FORMAT:** Three rows of six letters white on black, or black on white.

**W R U (who are you?):** Automatically responds with call sign whenever a user programmable sequence up to 15 characters is received.

**FULL SPEED OPERATION:** Morse - 5 to 199 WPM, Baudot - 60, 66, 75, 100, 132 WPM, STD ASCII - 110 & 300 baud, NON-STD ASCII - from 10 to 200 baud.

**MORSE SPEED TRACKING:** Automatic or speed lock.

**SELCAL:** Two, 15 character user programmable sequences. Receipt of SELCAL #1 enables the printer and outputs a TTL level. Receipt of SELCAL #2 disables the printer and drops the TTL level for unattended message store (mailbox).

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

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

**T/R (PTT):** Fully automatic control of your XMTR via the Push-to-Talk line in both RTTY & Morse.

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

**OUTPUT MODES:** CHAR. - outputs each character as typed. WORD - outputs full word when spacebar is typed. LINE - outputs full line when carriage return is typed. BUFFER - outputs full buffer (up to 1400 char) On command.

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

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

**DETECTION CIRCUIT - MORSE:** Single tone Phase Correlation detector AGC, and 100 Hz wide bandpass filter tuned to 800 Hz center frequency.

**DEMODULATOR - RTTY:** Dual tone computer enhanced circuit. Keyboard selectable tone pair, HI - 2125/2295 Hz. LO - 800/970 Hz. (Can be preset 500 to 3000 Hz.) Directly compatible with Bell 103 tone pairs for access to remote time sharing computers.

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

**KEYBOARD DIMENSIONS:** 17.8 x 3 x 9.5 inches; weight, 7 lbs.

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

**CW ID & Normal ID:** Two independent 16 character memories for either 2 calls or one normal and one with AUTO-CW ID for RTTY.

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# MICROLOG

# Propagation Prophecy

## — you, too, can calculate the MUF

Keith Greiner AK0Q  
421 N. Pleasant Hill Blvd.  
Des Moines IA 50317

One of the most fascinating attractions of HF communication is the idea that a movement of miniature electrons which we never see produces an invisible signal which travels up into the sky,

bounces off some atoms at a height most of us could never hope to reach in an airplane, and then returns to a friendly ear in a distant land. Our voices, our messages, can arrive almost instantaneously, at almost any place in this giant world. Indeed, if conditions are right, it is possible that they could make their way to many distant and exotic

lands at the same instant. Then, the real fascination comes when we receive a return message.

This radio skip is a natural and yet unseen wonder of our world which has been the backbone of our worldwide communications. Without it, all frequencies would act much like VHF. The long-distance communications which have saved millions of lives in various world catastrophies never would have been possible. Who knows, satellites might have been invented sooner, and maybe even eleven meters might be a little more subdued.

But try to predict where your signal is going to land, and what shape it's going to be in when it gets there, and you have a fascinating problem.

When I first became interested in this propagation of our radio waves, I sought some practical knowledge I could use to make a reasonable prediction, based on all the information available on a given day. That was about 15 years ago. Then, as now, the major source of information, *The Radio Amateur's Handbook*, advised you to listen to the ARRL's predictions and explained that the topic is so complex that it cannot be covered in just a few pages. I found out that that just isn't so and will show you what I discovered in the next few pages.

One of the major pieces of advice one gets from reading the *Handbook* is that propagation is dependent on the daily solar flux indexes broadcast by WWV. Unfortunately, after they tell you that you should watch the flux, they

Recommended Amateur Band	Calculated MUF in MHz	Signal Destination
40	10	New Orleans
20	17	Merida, Mexico, Guatemala, or British Honduras
15	25	Panama
15	25	Maranon River, northern Peru
10	32	Lima, Peru
10	30	Caldera, Chile
10	33	Buenos Aires, Argentina
10	29	Straits of Magellan
15	22	Antarctica
15	21	Antarctica (a little deeper into the continent)

Table 1. MUFs for a southern path from Des Moines IA, September, 0000 UTC, solar flux 154.6.

don't tell you how you can use that value to substantially improve the monthly predictions published in QST and other magazines.

Perhaps you have wondered, as I have, just what it means when the WWV announcers say that today's solar flux is 210, and yesterday they said it was an even 200. Can I use this figure to improve my estimate of the day and hour 10 meters will become useless? Can I use this to help aim my beam in the right direction to add excitement to an evening at the dial? Can I use it to help me find the best circuit to talk to that YL in Moscow, Idaho?

As you've probably guessed by now, I intend to show that predictions of communications circuits to almost any place in the world, short distance or long distance, are about as complex as getting a solid contact with the ham down the street when you both are using a kilowatt. Frankly, if you can tune your transceiver, you can predict a communications circuit MUF (maximum usable frequency) from your shack to any place in the world, for any day and any hour of any year.

The first step you'll want to take, besides reading this article, will be to go back to the Handbook to review some of the basic terminology. You'll want to know that the D layer of the ionosphere is the primary absorber of energy, while the E and F layers provide the skip. The E layer, which is the lower of the two "skippers," provides communication links over short hops, while the higher F layer provides the major long-distance skip opportunities.

During the day, the F layer splits into the F<sub>1</sub> and F<sub>2</sub> layers, and the F<sub>2</sub> layer becomes the primary provider of long-distance com-

	Month	Predicted Sun Spots	Predicted Solar Flux	Actual Maximum Flux	Actual Upper Quartile Solar Flux	Actual Median Solar Flux	Actual Lower Quartile Solar Flux	Actual Minimum Solar Flux	Pct. Deviation of Actual Maximum to Predicted	Pct. Deviation of Actual Minimum to Predicted
1980	Jan	157	200	231.7	217.9	200.5	174.4	153.4	15.6%	23.5%
	Feb	159	202	201.2	175.2	169.5	161.9	139.3	18.7	17.8
	Mar	160	203	249.9	237.3	187.2	162.5	137.3	33.5	26.7
	Apr	156	199	223.1	211.1	201.4	191.9	185.9	10.8	7.7
	May	152	195	292.8	264.6	200.6	181.4	165.7	46.0	17.4
	Jun	145	190	251.5	223.1	188.8	155.1	146.7	33.3	22.3
	Jul	142	187	258.0	235.2	188.4	142.8	130.9	36.9	30.5
	Aug	143	188	232.1	207.6	191.9	173.0	153.8	20.9	19.9
	Sep	142	187	253.3	205.4	182.9	167.7	153.8	38.5	15.9
	Oct	144	189	273.9	255.4	214.9	196.1	177.2	44.9	6.7
	Nov	143	188	253.2	206.1	185.9	172.4	161.6	34.7	16.3
	Dec	146	190	273.0	231.5	209.9	164.6	153.9	43.7	23.5

0000 UTC WWV

Solar flux,

September, 1980,

including all

but seven days of

numbers reported: 269

157

44.0%

16.0%

Calculated estimate of

September, 1980, sunspots:

222

113

Table 2. Comparison of actual vs. predicted solar flux. Predictions are from the Institute for Telecommunication Sciences, as quoted in QST. Actual data are for 2,800 MHz solar flux reported by the Solar Geophysical Data Bulletin, National Oceanic and Atmospheric Administration, Environmental Research Laboratories. Monthly data are from the 15th of the month shown to the 14th of the following month.

munication. There are two excellent references on the subject. First, there is the National Bureau of Standards' Monograph 80 on *Ionospheric Propagation*. Unfortunately, it is no longer available through the US Government Printing Office. I discovered my copy buried among some old technical books I bought in 1965. You may be able to obtain a copy at your local library through the interlibrary loan program.

A second reference is the four-volume set called *Telecommunications Research and Engineering Report 13, Ionospheric Predictions*. Sadly, this set is also no longer available through the US Government Print-

MUF PREDICTION SHEET

Signal Destination Antarctica Date Sept Time 00 UT

Solar Flux ( ) WWV (X) 160 ( ) 110 ( ) 110 = 203 Sun Spot Number 160

Great Circle Onionskin File Number 10 Total Distance 13,500 km

Distance ÷ 4000 km = 3.38 rounded up = 4 \* 2 = 8 (A)

Total Distance ÷ A = 1,688 = up or down distance per hop

1	2	3	4	5	6	7	8	9
Notes	Hop Number	MUF <sub>3000</sub> F <sub>2</sub>	MUF <sub>3000</sub> F <sub>2</sub> 4000	Derived MUF F <sub>2</sub>	MUF <sub>3000</sub> F <sub>2</sub> 2000	Derived MUF F <sub>2</sub>	Greater of Col. 7 or 9	Minimum in Column 8
	1	11	34	22	11	11	22	
	2	13	29	21	10	10	21	
	3	12	34	21	8	8	21	
	4	8	24	16	7	7	16	16

Additional Notes:

Map references: OT/PREA #13  
volume 4, pages 290, 291, 314

Fig. 1. This is the work sheet I use to calculate a multiple-hop maximum usable frequency (MUF). When you wish to make an estimate for a day with other than 160 sun spots, you can use separate pages for 110 sun spots, 160 sun spots, and the final estimated maximum usable frequency.

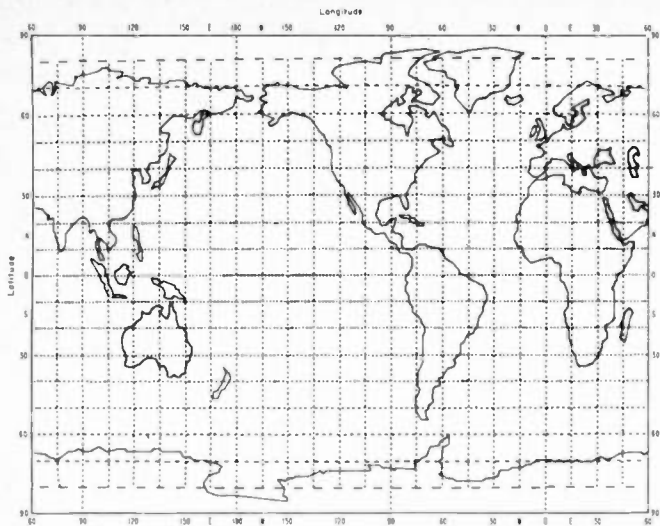


Fig. 2. Modified cylindrical projection of a world map. Use this chart to determine your location and the location of your expected contact. Source: Office of Telecommunications' Telecommunications Research and Engineering Report 13 (OT/TRER 13).

ing Office. However, there is hope. You can buy a copy of all 1,330 pages for just \$12 from the Solar Terrestrial Data Center A in Boulder, Colorado. Unfortunately, the copy is on microfiche, and you'll need to find a microfiche reader at your library or at a friend's business, or perhaps you'll want to purchase your own reader for about \$150.

Don't let all those dollars worry you, because included with this article are most of the materials you'll need to get started. In fact, of those 1,330 pages, I found that the whole subject is so simple that everything is explained in the first 18 pages. The other 1,312 pages are simply maps like the ones in Figs. 5 through 7 and 10 through 12. That's 18 pages

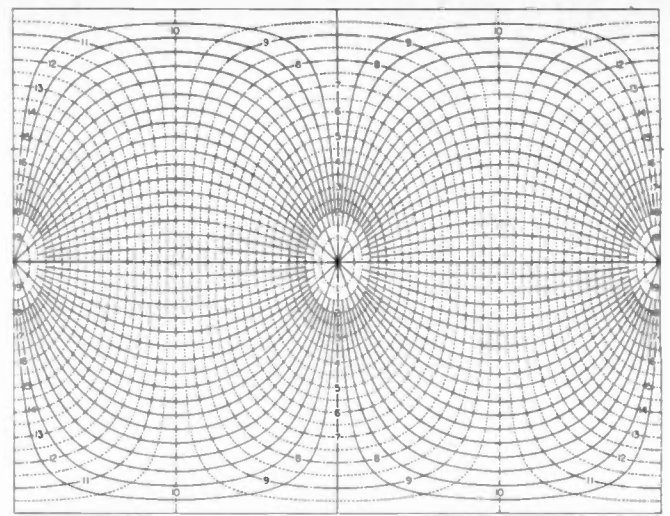


Fig. 3. Great-circle chart centered on the equator for use with Fig. 2. The solid lines represent great circles, while the numbered "dot-dash" lines indicate distances in thousands of kilometers. Use this chart to determine the great-circle distance between two points by using your onionskin paper and drawings like those in Fig. 4. Source: OT/TRER 13.

of material I'll reduce to just a few pages here.

Most discussions of propagation predictions center on predictions of MUF because that is the frequency at which your signal bounces off the highest possible portion of the ionosphere and, therefore, gets you the longest dis-

tance with the fewest number of hops. But since amateur frequencies very rarely fall on the MUF, what value is there in knowing the MUF?

The reason for our interest is that the MUF for any given circuit may change as much as 14 to 15 MHz in a very short time. Also, since most of us have only a limited amount of time to spend on the air, the primary question can be that of what stations can I expect tonight if I point the antenna south rather than what time do I need to be on the air to make it to Panama? Table 1 shows an example of this: A midwestern station in the US points his antenna south at 0000 UTC on a September evening.

The table shows ten steps of approximately equal distance between here and Antarctica. Step 1 shows that if I tune up the rig on any frequency less than 10 MHz, I should be able to make a contact in Louisiana. Better try 40 meters for that one. The closest available frequency to the MUF of 17 MHz should allow an opening into Guatemala, or the

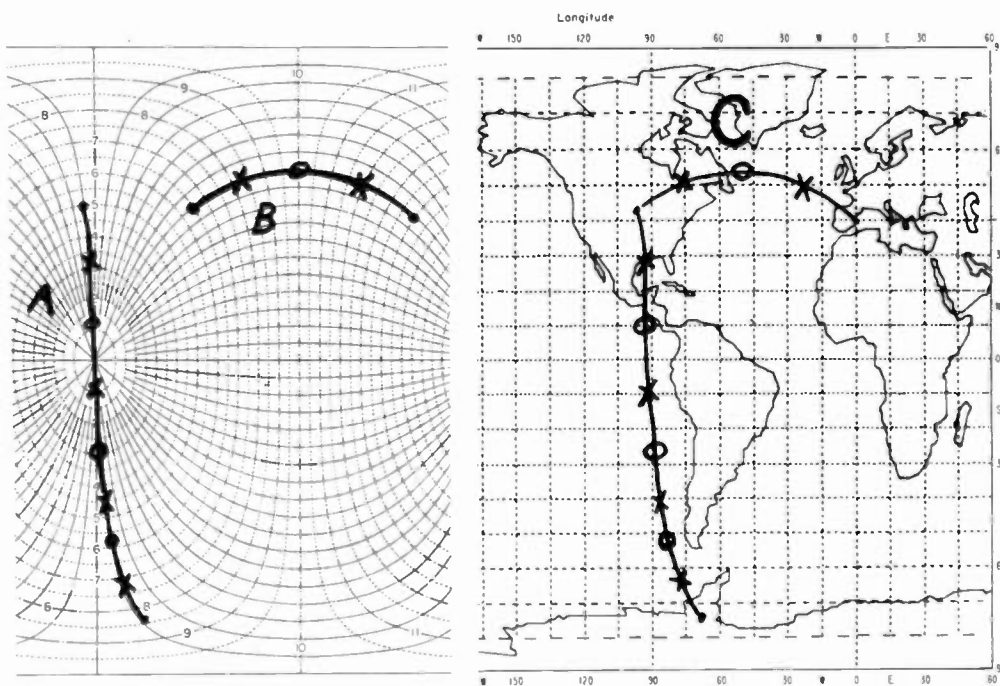


Fig. 4. Lines A and B show the great-circle projections of two paths from Des Moines, Iowa. A is a four-hop path to Antarctica, while B is a two-hop path to eastern Spain. C shows how the paths in A and B appear on a cylindrical-projection map. Source: OT/TRER 13.



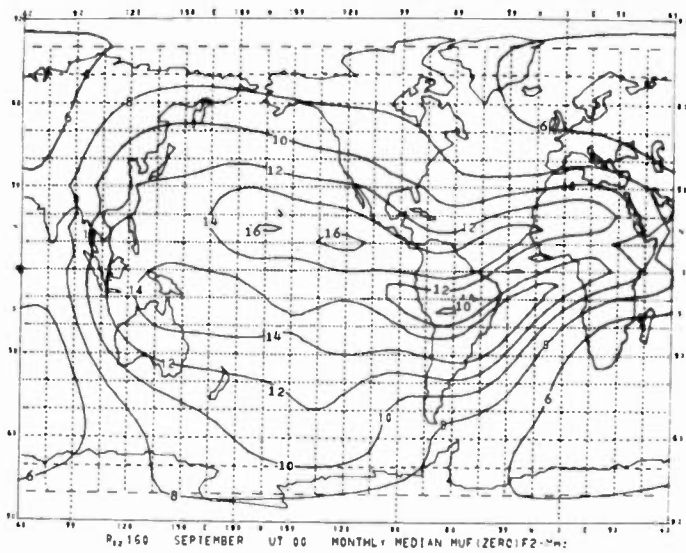


Fig. 5. Monthly median maximum usable frequencies for a signal to reach "zero" kilometers distance from the transmitter via the  $F_2$  layer. This chart is for 0000 UTC, September, and a sunspot number of 160; a solar flux day of 203. Source: OT/TRER 13.

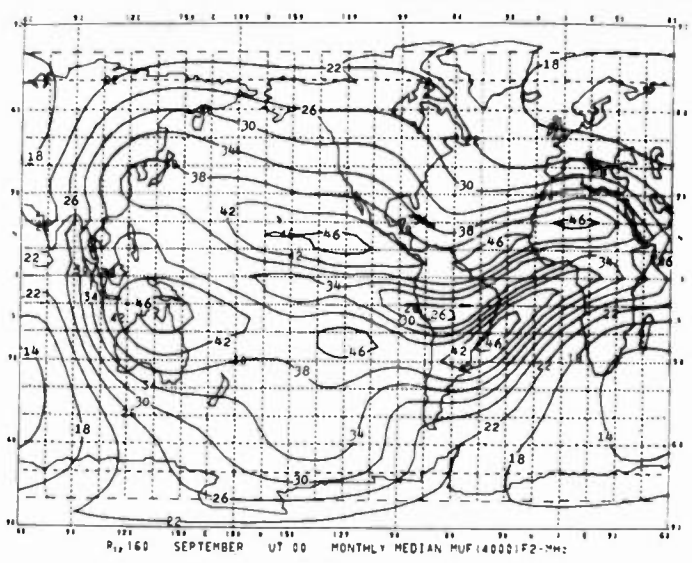


Fig. 6. Monthly median maximum usable frequencies for a signal to reach 4,000 kilometers distance from the transmitter via the  $F_2$  layer. This chart is for 0000 UTC, September, and a sunspot number of 160; a solar flux day of 203. Use this figure along with Fig. 8. Source: OT/TRER 13.

city of Merida, Mexico. If there's a ham operator available in the mountains near Caldera, Chile, I actually might be able to make a contact on 10 meters—might be worth a try. Then, on 15 meters, I could possibly pick up the Marañon River of northern Peru or someone on the continent of Antarctica. That's a pretty good choice of contacts for a single antenna direction and a single hour of the day.

Checking the predictions over several hours would show about how long you can use each frequency to the area shown. Note that it is possible to be extremely specific about the location you may reach. At this point, you have overcome the limitation of most published predictions which show only the general area of the world you can reach and overlook many of the domestic circuits you'll want to use when trying for the closer distances, such as that YL in Moscow, Idaho, we mentioned earlier.

Another limitation of published reports is their inability to allow for an ad-

justment due to today's solar flux value broadcast by WWV. This can be a rather significant factor. For example, the September, 1980, predictions published in QST were based on a predicted median solar flux of 187. In actuality, during the period of time covered by the predictions, WWV reported daily solar flux as high as 269 and as low as 157 at 0000 UTC. This amounts to a maximum of 44% greater than the predicted median and a minimum which was 16% less than the prediction.

Table 2 shows the actual vs. predicted solar flux values sent to me by the Environmental Research Laboratories in Boulder. These daily averages also show some variation from the most currently broadcast figures you will hear on WWV. Even so, for the months shown, the flux varied upwardly about 46% and downward 30.5%. That's a considerable amount of variation from the predicted value and could have a substantial effect on some HF circuits. The procedures I'll outline will show you how to adjust for that variation.

First, there is one more concept we must briefly cover. At any given time, for any given communication link, there may be several MUF values which apply, depending on the ionospheric path you wish to use. These include a MUF for the E layer and F layers for each instance when the signal bounces off the ionosphere. You want to find the lowest MUF for F propagation and the high-

est of either the F or E MUFs. In the calculations shown in Table 1, the maximum number of hops on the signal's trip to Antarctica was four reflections off the ionosphere, and the  $F_2$  region dominated in all cases.

The 13 steps which follow take you through the estimation process. I suggest that you may wish to read through the steps first and then go back and fol-

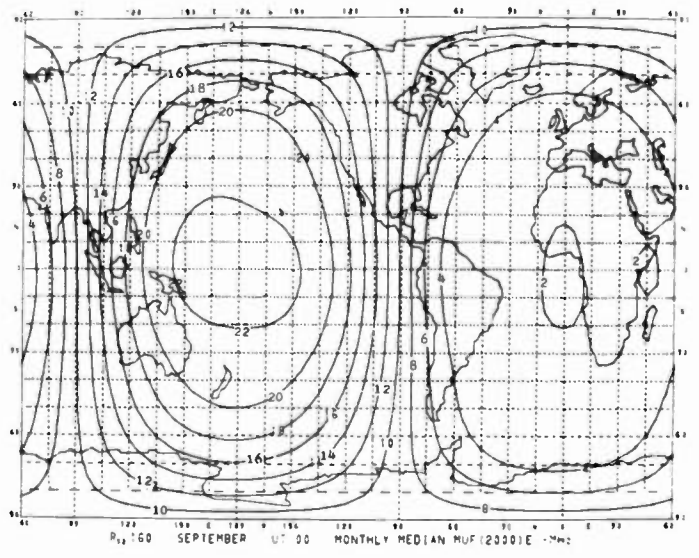


Fig. 7. Monthly median maximum usable frequency for a signal to reflect via the E layer. The chart is for 0000 UTC, September, and a sunspot number of 160; a solar flux day of 203. Use this figure with Fig. 9. Source: OT/TRER 13.

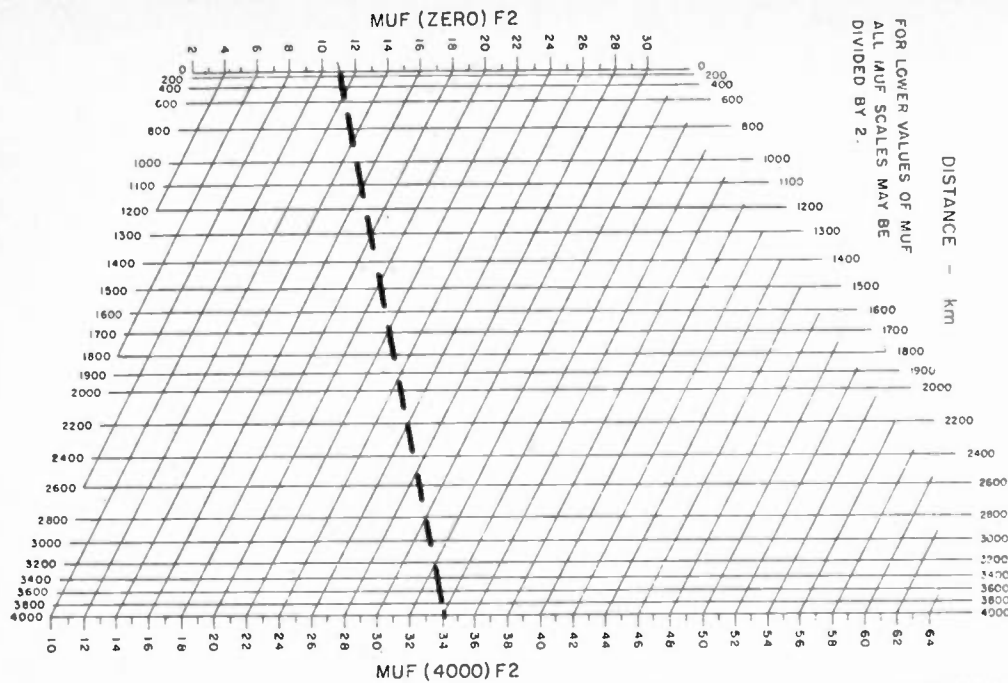


Fig. 8. Nomogram for interpolating between an  $MUF(0) F_2$  (from Fig. 5), and an  $MUF(4,000)F_2$  (from Fig. 6) to determine maximum usable frequencies at intermediate distances. The dashed line shows an example of a situation when the  $MUF(0)$  is 11, and the  $MUF(4,000)$  is 34. Following the line, we can see the MUF for a distance of 1,700 kilometers is 22 MHz. Use this nomogram to find MUFs for column five of the work sheet in Fig. 1. Source: OT/TRER 13.

low along step by step. You'll be amazed at how fast you can arrive at a very

accurate MUF for your communications circuit for the maps shown.

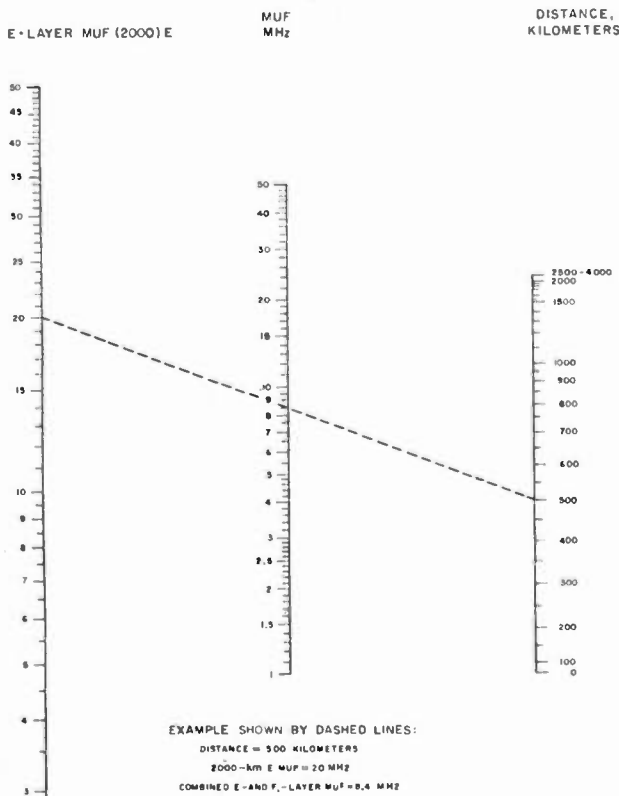


Fig. 9. Nomogram for converting the  $MUF(2,000)E$  from Fig. 7 to maximum usable frequencies at other distances. Use this nomogram to find the MUF of E-layer signals for column seven of the work sheet in Fig. 1. Source: OT/TRER 13.

al maps being offered to hams in this step. It can provide an easier way to calculate distances, but may provide a problem when trying to determine the actual MUF on maps shown with this article.

4) In Fig. 3, you will notice some dashed lines and numbers. These tell you how many kilometers your dots are from the center of the chart. To find the distance between your two dots, simply count the number of dashed lines between the two dots. The lines are 500 kilometers apart, and the numbers are 1,000 kilometers apart.

5) Now you need to identify the number of reflections your signal will make off the ionosphere. I use a code here, where an "X" means the signal is reflected off the ionosphere, and an "O" shows where the signal is reflected off the Earth. To find the number of reflections, first divide the total distance by 4,000 kilometers. Then round that number up to the next largest whole number, multiply by two, and finally divide your result into the total distance. This gives you the distance traveled in either an upward path or a downward path. Mark off the upward and downward path lengths on your onionskin, beginning with an X (because your first signal must bounce off the ionosphere) and alternating Xs with Os until all reflection points are found. Note that the first and the last reflection points must always be Xs. For short hops of under 4,000 km, there is only one X at the very center of the path between the two points. Now, you can begin to fill in Fig. 1.

6) Lay your onionskin paper over Fig. 5 to find the MUF at zero kilometers for each point marked with an X. To help you through the first example, I've written the north-south values in on

1) Gather some materials together: a piece of onion-skin paper or similar paper that you can see through, a ruler, a copy of the work sheet shown in Fig. 1 (I just sketch out my own sheet), and this hour's WWV solar flux value. You'll find the WWV solar flux broadcast at 18 minutes after every hour.

2) Locate your QTH and the city you wish to reach by laying the onionskin paper over the map in Fig. 2 and placing a dot on the two locations. Also draw in the equator line.

3) Move the onionskin paper down to Fig. 3 and line up the equator with the equator in the figure. Slide the onionskin paper to the left or right along the equator, until the two dots lie on the same great-circle line, similar to the east-west route in Fig. 4(B) or similar great-circle lines like the north-south route in Fig. 4(A). Now, draw in the great-circle paths as shown in Fig. 4(C). If you wish, you can use one of the azimuth-

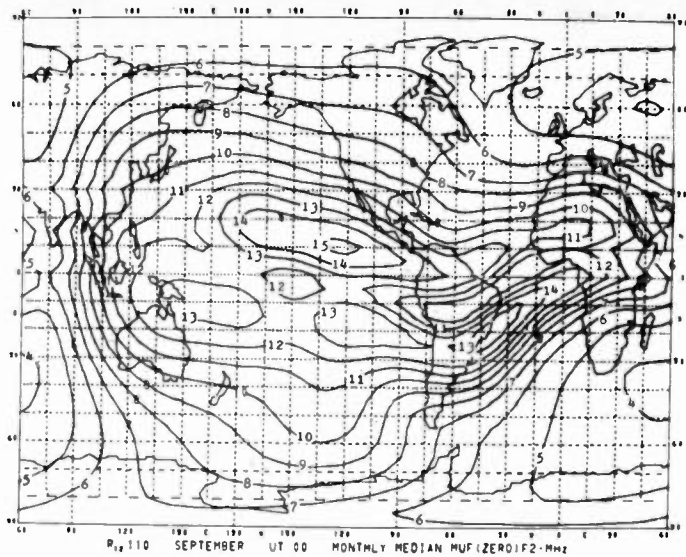


Fig. 10. Monthly median maximum usable frequencies for a signal to reach "zero" kilometers distance from the transmitter via the  $F_2$  layer. This chart is for 0000 UTC, September, and a sunspot number of 110; a solar flux of 154.6. Source: OT/TRER 13.

the table in Fig. 1 under the heading, "MUF  $\emptyset$ "

7) Using the onionskin and Fig. 6, identify the  $F_2$  MUF values for each hop and enter them in the table in Fig. 1 under the heading, "MUF 4000."

8) Using the distance between each reflection point, go to Fig. 8 and interpolate the actual MUF you can expect on that particular hop. This interpolation between the MUF  $\emptyset$

and the MUF 4000 adjusts for the angle at which your signal travels to reach each of those hop points. Every reflection point in every path has a different reflection angle.

9) Finally, in your last use of the onionskin paper, lay your paper across Fig. 7 and determine the E layer MUF at each point for a 2,000-kilometer hop. Enter this value into Fig. 1. Then find

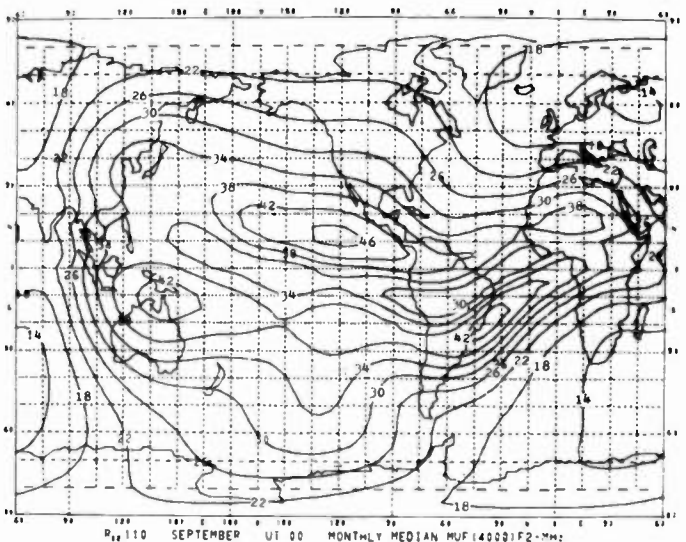


Fig. 11. Monthly median maximum usable frequencies for a signal to reach 4,000 kilometers distance from the transmitter via the  $F_2$  layer. This chart is for 0000 UTC, September, and a sunspot number of 110; a solar flux day of 154.6. Source: OT/TRER 13.

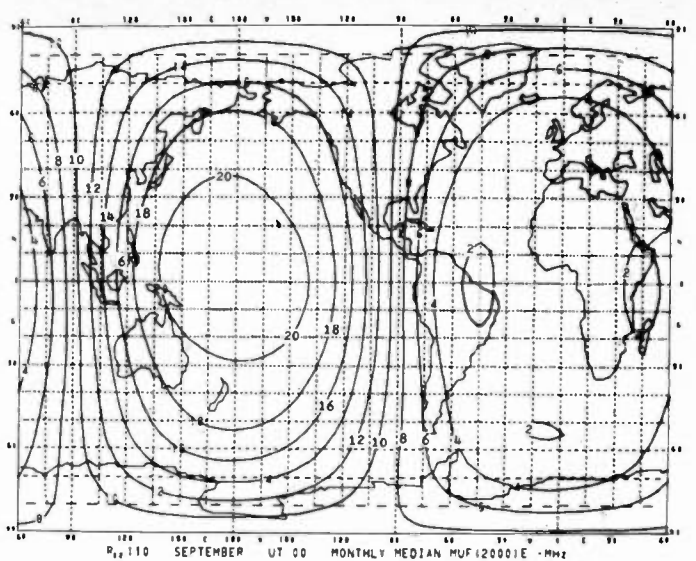


Fig. 12. Monthly median maximum usable frequency for a signal to reflect via the E layer. The chart is for 0000 UTC, September, and a sunspot number of 110; a solar flux day of 154.6. Source: OT/TRER 13.

the actual E layer MUF by using the nomograph in Fig. 9. Note your results in Fig. 1.

10) Now simply compare the F layer MUF value for each hop in column five of Fig. 1 with the E layer MUF in column seven of the same figure for each hop. Select the larger of the two values and put it in column eight. Then select the smallest number in column

eight. Congratulations! You have just found the maximum usable frequency for a day on which there are 160 sunspots, or a solar flux of 203. Call this "MUF<sub>160</sub>."

11) To interpolate the MUF values for days when sunspots are something other than 160, you first go back and do steps six through ten, using the maps for a sunspot number of 110

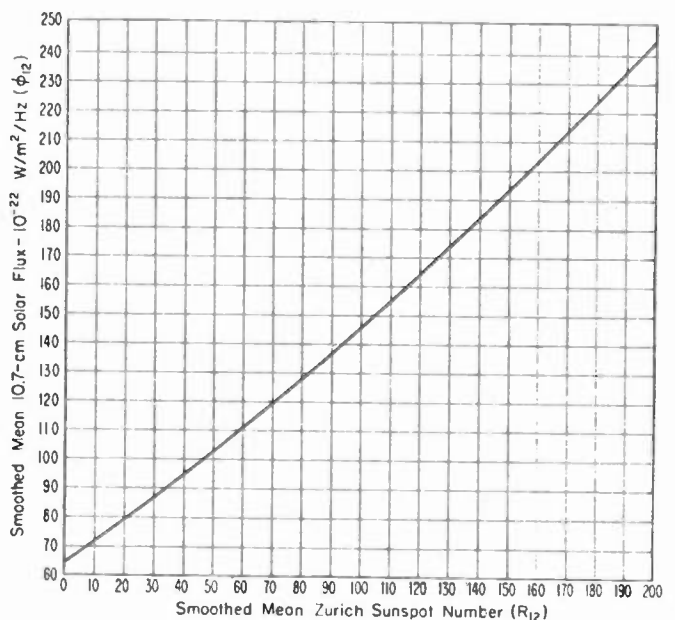


Fig. 13. Relationship between smoothed mean Zurich sunspot number and smoothed mean 10.7cm solar flux. Use this graph to convert WWV's solar flux to the daily sunspot number for use in the formula for adjusting the MUF to today's solar flux.

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in Figs. 10 through 12. Call these "MUF<sub>110</sub>."

12) Take today's reported WWV solar flux value and use Fig. 13 to find today's sunspot number.

13) Plug the sunspot number and your MUF values into the following formula and let your calculator or computer finish the job for you. This little calculation finally gives you the sunspot number for this hour of this day of this month, and for this part of the 11-year solar cycle.  $MUF = MUF_{110} + 0.02(MUF_{160} - MUF_{110})(\text{today's sunspot number} - 110)$ .

Note: For days when the sunspot number falls below 110, you would also use maps for a sunspot number of 10, and the formula:

$$MUF = MUF_{10} + 0.01(MUF_{110} - MUF_{10})(\text{sunspot number} - 10)$$

While it takes 13 complete steps to go through

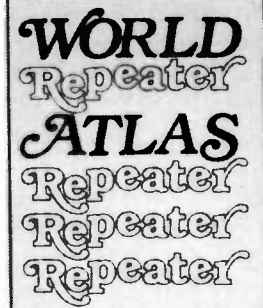
the process, you'll find that after two or three times, you are taking little short cuts here and there which have no effect on the outcome but make the procedure go a lot faster. It's like tuning up your radio. The first time, it goes pretty slow, while the third or fourth time takes just a short while. A good estimate with this procedure can be made within two to three minutes for a multiple-hop situation and about a minute for a single-hop situation. The maps here will get you through the month of September.

### Acknowledgement

Figs. 2, 3, and 5 through 13 are from the US Government publication *Telecommunications Research and Engineering Report 13, OT/TRER 13*, by M. Leftin, William Roberts, and Rayner Roisch, volumes 1, 2, 3, and 4. ■

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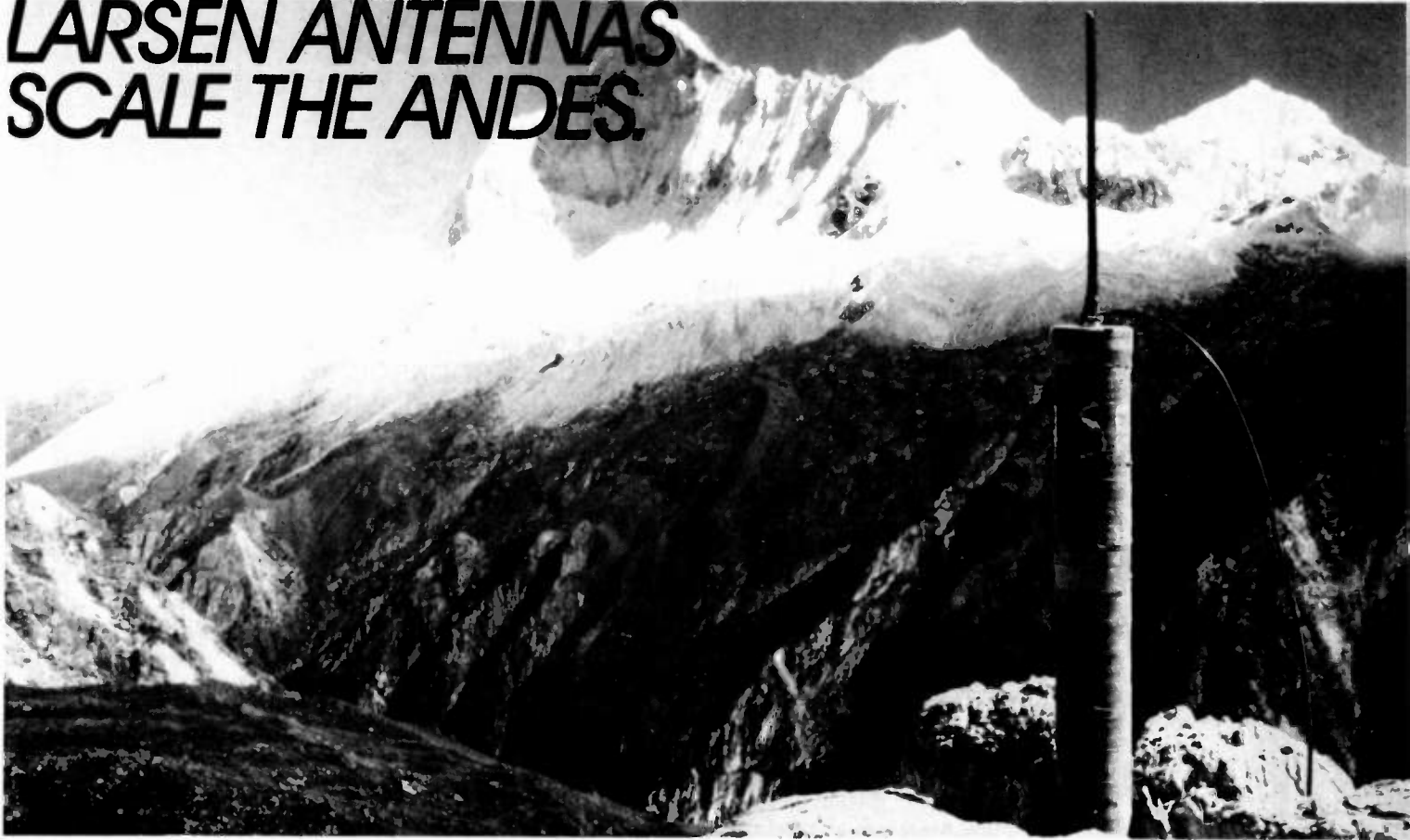
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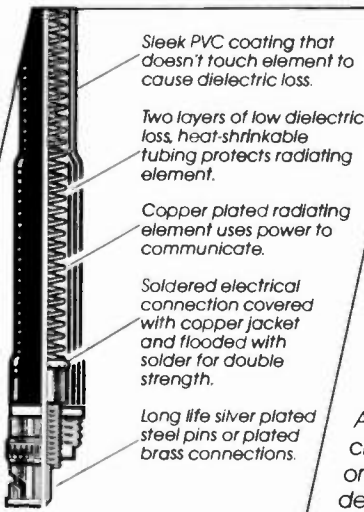
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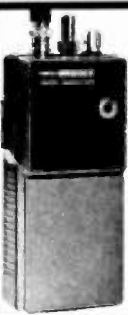


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100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
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# Keyer Magic

## —unravel the mystery of TTL circuits

In the fall of 1979, I took a course in digital electronics at the University of Arkansas at Little Rock, where I am studying for a degree in engineering technology. During the month-

long Christmas break that followed, I decided to see if I could apply what I had learned. An iambic keyer seemed like an ideal project, since the circuit would be sufficiently complicated

to be a genuine challenge. Besides, it so happened that my station did not already include a keyer.

You may wonder why anyone would go to the trouble of designing a keyer

circuit from scratch, when it would be far easier to build a keyer based on a single IC such as the Curtis 8044. The answer is that designing a circuit based on common, general-purpose

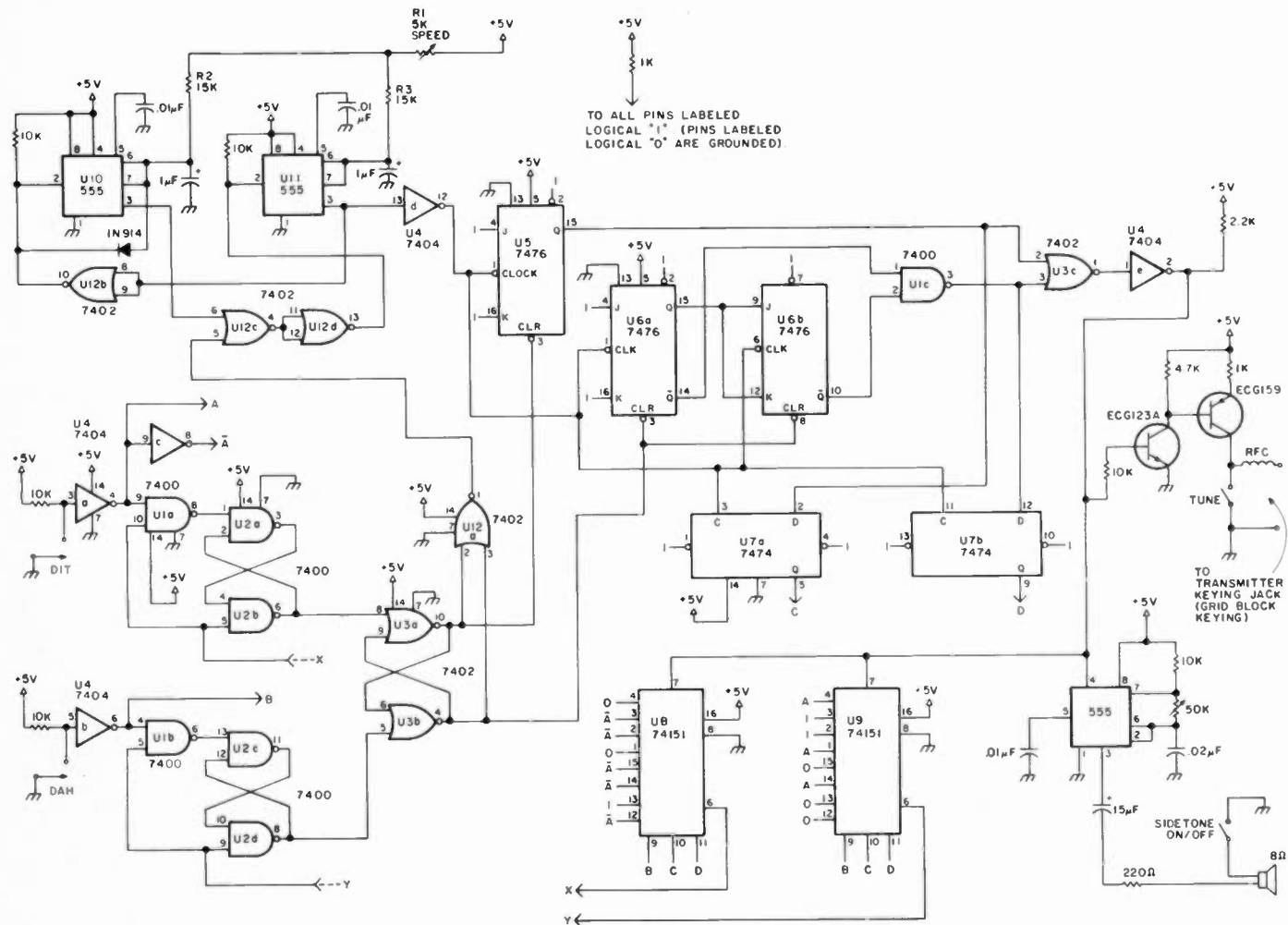


Fig. 1. Complete schematic diagram of the N5DY keyer. Pin numbers not shown are left unconnected.



digital ICs (TTL in this case) is a valuable educational experience for those who are just starting to learn something about digital electronics. I certainly don't claim that my circuit is the ultimate state-of-the-art design, but it works well. Readers who like to experiment with digital circuits may find it interesting.

### Design Considerations

Let's begin by defining iambic operation in terms of what the circuit must do. At the end of each code character, a control circuit, or "decision" circuit, as I have chosen to call it, must check several circuit conditions and issue a command as follows:

- 1) If the dit paddle is on and the dah paddle is off, send a dit.
- 2) If the dit paddle is off and the dah paddle is on, send a dah.
- 3) If neither paddle is on, stop sending and reset parts of the circuit where necessary.
- 4) If both paddles are on, send a character opposite to the one just sent. For example, if the previous character sent was a dit, the keyer would then send a dah.

It is this fourth requirement, of course, that makes iambic keyer circuitry more complex than the circuitry required for a single-paddle keyer. The iambic keyer needs a memory circuit to record the last character sent, as well as control circuitry which can take command of the paddle at certain times.

In addition to the above requirements, there should be no initial startup delay between the time a paddle is depressed and the time a code character is started (other than the extremely small propagation delays in the ICs themselves), and code characters should be self-completing.

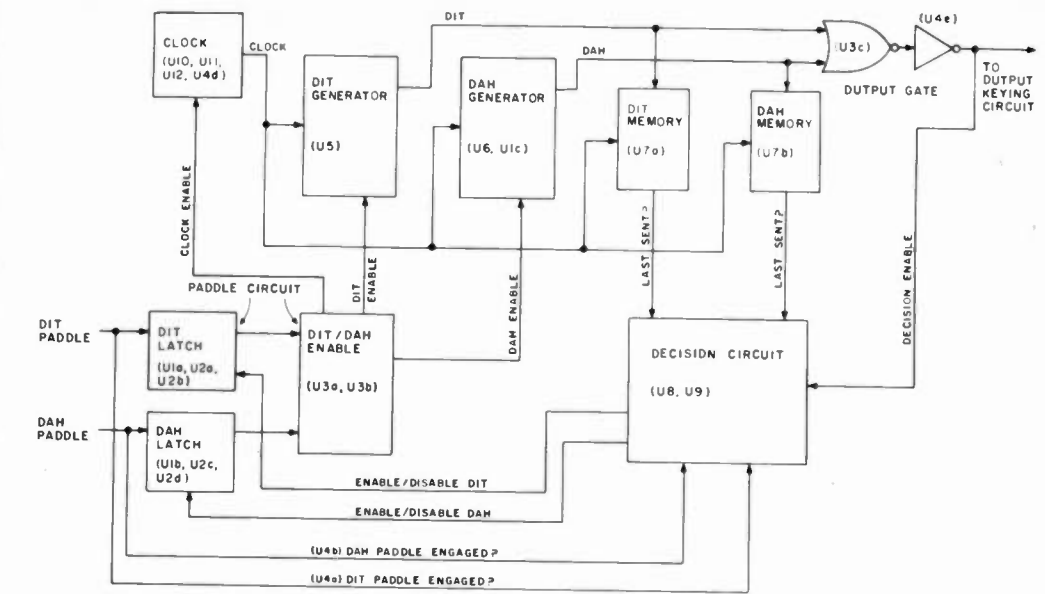


Fig. 2. Keyer block diagram.

The complete schematic diagram of the keyer is shown in Fig. 1. Fig. 2 shows the keyer in simplified block diagram form. (IC pins in the schematic diagram shown connected to "1" are actually connected to +5 volts, and pins shown connected to "0" are connected to ground. The labels "1" and "0" signify that these are logical "high" and "low" connections instead of ordinary power-supply connections. Some texts suggest that these logical "1s" should be connected to +5 V through a 1k resistor, with as many as 25 such connections sharing the same resistor; this is the procedure I have followed.)

### Character Generation and Memory

There are many possible ways of generating dits and dahs. An article in the November, 1979, issue of 73 ("Son of Keycoder" by W4RNL) prompted me to start thinking about ways it could be done. In the end I chose a method that is perhaps the easiest to understand.

Let's first consider the dit generator and memory. Dits are formed by feeding a clock signal to a J-K flip-flop wired as a simple divide-by-two counter. When

wired as shown in Fig. 3, the J-K flip-flop toggles whenever the clock signal goes from high to low. The output of the dit generator is monitored by a D flip-flop, which is activated by a positive-going clock pulse. Fig. 3 shows the circuit and the resulting waveforms.

Notice that the dit memory persists for half a clock cycle after each dit. The same relationship holds for a dah and the dah memory. The time between the end of a character and the subsequent clearing of its memory is the decision time, labeled  $t_d$  in Fig. 3. As will be explained in more detail later, the decision circuit will be activated whenever the keyer output goes low, such as at the end of one of the dits in Fig. 3. However, the final decision (that is, whether to send another character or stop sending) will be based on the conditions that prevail immediately before the character memory is cleared, or in other words, at the end of the decision time. The significance of this is that it gives the operator an extra half-space to get off the paddle before the keyer is committed to sending another character.

The dah generator is

based on a synchronous divide-by-four counter. Two of the resulting waveforms are combined with a NAND gate to form the dah waveform, as shown in Fig. 4. (It should be noted here that in the original version of this circuit, the two J-K flip-flops were connected as a ripple counter instead of a synchronous counter, with the result that the keyer wouldn't work properly because a glitch in the dah waveform was activating the decision circuit at the wrong time. I don't intend to go into the details, but it is something that should be pointed out to those who may want to experiment with this circuit.)

The enable lines in Figs. 3 and 4 will enable the generator when high and disable it when low. The paddle circuit controls these enable lines. Whenever one of these enable lines goes high, the clock will also be enabled.

Referring to the complete schematic diagram, note that the outputs of the two generators are combined through U3c and U4e, which act as a simple OR gate.

### The Clock Circuit

The clock circuit consists of two 555 monostable mul-

**Definition of A, B, C, and D:**

- A: Dit Paddle (U4a)
- B: Dah Paddle (U4b)
- C: Dit Memory (U7a)
- D: Dah Memory (U7b)

**Initial Standby States:**

A	B	C	D	X	Y
0	0	0	0	1	1

Dit Latch	Dah Latch
1	1

Dit Enable	Dah Enable
0	0

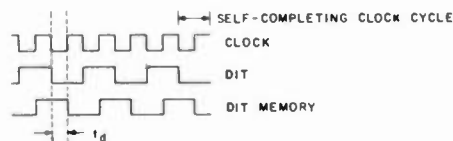
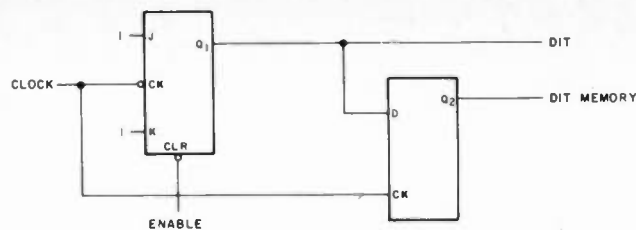


Fig. 3. DIT generator/memory circuit and waveforms.

**Dit Latch (U1a, U2a, U2b)**

A	X	Dit Latch Output (U2b)
0	0	1
0	1	previous state
1	0	1
1	1	0

**Dah Latch (U1b, U2c, U2d)**

B	Y	Dah Latch Output (U2d)
0	0	1
0	1	previous state
1	0	1
1	1	0

**DIT/Dah Enable (U3a, U3b)**

Dit Latch	Dah Latch	Dit Enable	Dah Enable
0	0	previous state	
0	1	1	0
1	0	0	1
1	1	0	0

Note that it is impossible for both dah and dit to be enabled at the same time.

**Decision Circuit (U8, U9)**

Keyer Output	A	B	C	D	X	Y	BCD Address Corresponds to Input on Pin Number:
0	0	0	0	0	1	1	4
0	0	0	0	1	0	0	3
0	0	0	1	0	0	0	2
0	0	0	1	1	1	1	1
0	0	1	0	0	0	1	15
0	0	1	0	1	0	1	14
0	0	1	1	0	0	1	13
0	0	1	1	1	0	1	12
0	1	0	0	0	1	0	4
0	1	0	0	1	1	0	3
0	1	0	1	0	1	0	2
0	1	0	1	1	1	0	1
0	1	1	0	0	1	1	15
0	1	1	0	1	1	0	14
0	1	1	1	0	0	1	13
0	1	1	1	1	1	1	12
1	X	X	X	X	1	1	X

Note: X = don't care. Outputs from pin 6 are inverted data inputs.

Table 1. Truth tables.

tivibrators, wired back-to-back. It is basically an adaptation of a single-paddle, 555-timer-based keyer circuit described in *Solid State Design for the Radio Amateur* by Hayward and DeMaw, published by the ARRL. I experimented with several versions of a single 555 astable multivibrator clock circuit, but was not satisfied with any of them. With a single 555 clock circuit, the first clock pulse of a series of pulses will be longer than the pulses that follow. This is an unacceptable characteristic for my keyer circuit, since the clock is enabled and disabled along with the character generators. The twin

555 circuit described here eliminates the problem.

The complete clock circuit consists of U10, U11, U12, and U4d (see Fig. 1). Notice that the dit and dah enable lines are inputs to gate U12a. Initially, both 555 outputs (pin 3) are low, and both timing capacitors are discharged. A high signal on either enable line will trigger U11, which in turn triggers U10 through gate U12b. However, the diode in the circuit prevents the timing capacitor of U10 from starting to charge until after U11 has finished timing out. The clock circuit cannot be retrIGGERED until after the output from U10 has returned to the low

state. The result is a waveform that is entirely self-completing, with a duty cycle of approximately 50 percent with the component values shown in Fig. 1. At the end of one complete cycle, another cycle will be generated if an enable line is still high.

Readers who are unfamiliar with the 555 timer should consult *The 555 Timer Applications Sourcebook, with Experiments* by Howard M. Berlin.

The resistor and capacitor values shown will allow for code speed adjustments from approximately 15 to 35 words per minute. Readers who decide to experiment with different values should remember that the timing capacitors must be able to charge to two-thirds of the supply voltage in order to reset the timer. The safest bet would be to make R2 and R3 at least three times larger than the maximum value of R1.

The actual clock output is the inverted waveform of pin 3 of U11, which means that the clock waveform will begin with a high-to-low transition whenever an enable line goes high. This is necessary to meet the design requirement that there should be no initial startup delay between the time a paddle is depressed and the time a code character is started.

The fact that the clock waveform is self-completing means that two code

characters cannot be separated by less than one space, regardless of how the paddles are manipulated. (See Figs. 3 and 4.)

**Decision Circuit**

The decision circuit is based on two 74151 1-of-8 data selectors (U8 and U9 in Fig. 1). Each chip has eight data-input pins and three address pins; three address pins allow for eight possible address combinations (000 to 111). There are two output pins: a data output and an inverted data output. In addition, there is a chip-enable pin (pin 7) which must be held low for normal operation.

One of the eight data inputs is selected to appear as the data output according to the address on the address pins. In Fig. 1, the data inputs to the 74151s are shown on the left side of each IC. They are arranged in order from top to bottom, starting with number 0 (for address 000) and ending with number 7 (for address 111). Note that the IC pin numbers do not correspond to this order. In this keyer circuit, the inverted data output (pin 6) is used. Pin 6 is driven high whenever pin 7 goes high, regardless of the condition of the address pins.

When the output of the keyer goes low, the decision circuit examines the following four circuit conditions, labeled A, B, C, and D:

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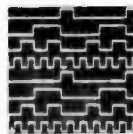
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- TV synchronization TV sync-separator circuit
- Internal Over 1 div (V sync-signal)
- External Over 1 Vp-p (V sync-signal)

Frequency	Internal	External
20Hz — 2MHz	0.5div	200mV
2 — 15MHz	1.5div	800mV

- Trigger slope 0.2µs/div — 0.2s/div ± 5%, 19 calibrated steps
- Sweep time 10 times (± 7%)
- Sweep-time magnifier 100ns/div
- Max. sweep rate
- Amplitude calibrator 1kHz ± 10% Typ. Square wave
- Waveform 0.5V ± 3%
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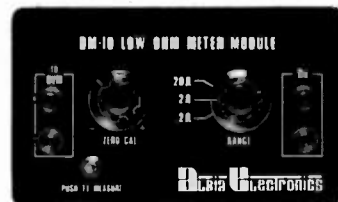
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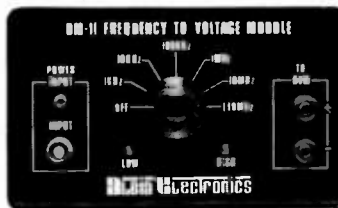


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A: Dit paddle. High if the paddle is on, low if off (from U4a).

B: Dah paddle. High if the paddle is on, low if off (from U4b).

C: Dit memory. High if the last character sent was a dit (from U7a).

D: Dah memory. High if the last character sent was a dah (from U7b).

There are sixteen possible combinations of A, B, C, and D. Four of these conditions (where C and D are both high) will not occur in normal circuit operation, but since they might turn up when power is first applied to the circuit, we must account for them to make sure the circuit doesn't get locked out when the power is applied.

Conditions B, C, and D are used to form the data-select address. Condition A, along with its complement, acts as a variable input to some of the data-input pins. There are two decision-circuit outputs, labeled X and Y, which determine what the keyer will do next. X and Y affect the state of the dit and dah latch circuits, respectively. The complete truth table for the decision circuit is included in Table 1.

The reader should refer to Don Lancaster's *TTL Cookbook* for an excellent discussion of how to design logic circuits with the 74151 IC.

### Dit and Dah Latch and Enable Circuits (Paddle Circuit)

The state of the dit and dah paddles is sensed by separate dit and dah latch circuits, which also sense the state of X and Y, respectively. The dit latch consists of U1a, U2a, and U2b, with an output from pin 6 of U2b. The dah latch consists of U1b, U2c, and U2d, with an output from pin 8 of U2d (see Fig. 1). The truth table for these latches is included in Table 1.

The outputs of the dit

and dah latches serve as inputs to the dit/dah enable circuit, which consists of U3a and U3b. This circuit controls the dit and dah generator enable lines; the truth table is included in Table 1. The most important feature of the dit/dah enable circuit is that it is impossible for both enable outputs to be high at the same time.

Basically, I designed the paddle circuit to allow the X and Y decision signals to override the paddles and force the dit (or dah) latch high at critical times. When the operator is off the paddle, the X and Y signals will reset the latches to their standby states (see Table 1), which, in turn, forces both dit and dah enable lines low.

### An Example of Circuit Operation

Fig. 5 shows the various logic waveforms that result when the dit and dah paddles are manipulated to create the waveforms shown for A and B. The resulting code output is the letter "F". (It should be noted that this is by no means the only way to form the letter "F".) Hopefully, Fig. 5 is a picture worth a thousand words. Table 2 is a step-by-step analysis of the waveforms at various critical times. All of the action described in Fig. 5 and Table 2 is based on the complete truth table selection of Table 1. The notes in Table 3 on the critical times noted in Fig. 5 and Table 2 should be of some help.

### Additional Circuit Notes

The keyer output circuit shown in Fig. 1 is based on the circuit shown in the *Radio Amateur's Handbook* (1980 edition) for the Accu-Keyer. It is intended for use with transmitters with grid-block keying. Many variations of this circuit have appeared in ham magazines. Take your pick! The choice of transistors was dictated

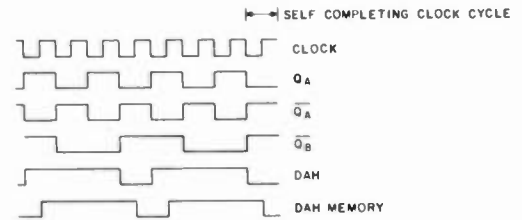
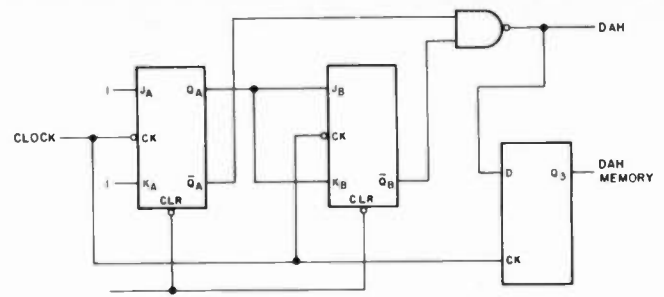


Fig. 4. Dah generator/memory circuit and waveforms.

by what was in my junk box, but I checked the voltage rating of the PNP output transistor before I used it. My transmitter has a grid-block voltage of -55 V. The ECG159 transistor is rated for a maximum collector-to-emitter voltage of 80 V, and a maximum collector-to-base voltage of 80 V. Your transmitter may have a grid-block voltage that is too large for this transistor to handle. The safest bet would be to use a 2N5401 or equivalent. The tune switch in the output circuit is actually my old straight key.

The sidetone oscillator is a standard 555 timer circuit which has appeared in ham

magazines many times. Once again, component values were dictated by my junk box. Two improvements could be made: (1) Substitute a 1k potentiometer for the 220-Ohm resistor in series with the speaker to provide for volume control, and (2) change the 50k tone control to a 100k potentiometer to provide for a greater range of tone control.

I am using a Radio Shack variable dc power supply to power the keyer, which draws nearly 200 mA of current. If I decide to build a fixed 5-V power supply for the keyer, I will make it at least a 1-Amp supply so it can power additional proj-

Time	Circuit Conditions				Results				
	Keyer Output	A	B	C D	X Y	Dit Latch	Dah Latch	Dit Enable	Dah Enable
initial setup	0	0	0	0 0	1 1	1	1	0	0
t <sub>1</sub>	0	1	0	0 0	1 0	0	1	1	0
immediately after t <sub>1</sub>	1	1	0	0 0	1 1	0	1	1	0
t <sub>2</sub>	0	1	0	1 0	1 0	0	1	1	0
t <sub>3</sub>	0	1	0	0 0	1 0	0	1	0	1
t <sub>4</sub>	1	1	0	0 0	1 1	0	1	1	0
t <sub>5</sub>	1	1	1	1 0	1 1	0	0	1	0
t <sub>6</sub>	0	1	1	1 0	0 1	1	0	0	1
t <sub>7</sub>	0	1	1	0 0	1 1	0	0	0	1
t <sub>8</sub>	0	1	1	0 1	1 0	0	1	1	0
t <sub>9</sub>	0	1	1	0 0	1 1	0	0	1	0
t <sub>10</sub>	1	1	0	1 0	1 1	0	0	1	0
t <sub>11</sub>	0	1	0	1 0	1 0	0	1	1	0
t <sub>12</sub>	0	0	0	1 0	0 0	1	1	0	0
t <sub>13</sub>	0	0	0	0 0	1 1	1	1	0	0

Table 2. An aid in interpreting Fig. 5.

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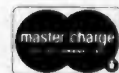
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- $t_1$ : X and Y will always be forced high when the keyer output goes high.
- $t_2$ : End of first dit.
- $t_3$ : Clear dit memory.
- $t_4$ : See note for  $t_1$ .
- $t_5$ : Operator presses dah paddle. B = 1 and Y = 1 will force the dah latch low, but since both latches are low, there will be no change in the enable lines.
- $t_6$ : Output goes low; decision circuit enabled. The decision circuit sees A = 1, B = 1, C = 1, and D = 0, resulting in X = 0 and Y = 1. This causes the dit latch to go high and the dah latch to go low. This, in turn, forces the dit enable low and the dah enable high.
- $t_7$ : Clear dit memory.
- $t_8$ : Analysis similar to that of  $t_6$ , except that this time the dit enable goes high and the dah enable goes low.
- $t_9$ : Clear dah memory.
- $t_{10}$ : Operator releases dah paddle.
- $t_{11}$ : Output goes low. Initially, the operator is still on the dit paddle, so the circuit prepares to send another dit. However, the operator has until  $t_{13}$  to get off both paddles to stop any further character generation.
- $t_{12}$ : Operator gets off the dit paddle in time to stop the keyer. The decision circuit now sees A = 0, B = 0, C = 1, and D = 0, which ends up forcing both enable lines low.
- $t_{13}$ : Clear dit memory. The circuit will now be reset to initial standby states.

Table 3. Notes on critical times.

ects. The power supply for a TTL circuit must be well-regulated, of course.

This is a good place to mention that the +5-V line in any TTL project should be bypassed to ground with small despiking capacitors distributed uniformly around the circuit board. About five 0.01-uF disc capacitors is about right for this project. Some experts recommend more stringent measures. The *TTL Cookbook* is a good source of information about this aspect of building TTL circuits.

I assembled most of the keyer on a perforated circuit board using wire-wrapping, but I designed a layout for an etched circuit board for the clock circuit.

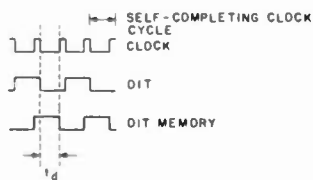


Fig. 6. Decreasing the duty cycle of the clock waveform will increase the decision time. Compare these waveforms to those of Fig. 3.

The best way to build a circuit like this one depends on your personal preference, of course. As of this writing, I have still not decided exactly what type of cabinet the keyer should be housed in. In the meantime, the assembled but exposed circuit has been set up on my operating table and connected to my Bencher paddle. I have used the keyer for many hours of off-the-air practice and am completely satisfied with its operation.

The final test was to connect the keyer to my transmitter to see if it would actually do the job. With the transmitter operating into a dummy load, the keyer worked flawlessly. With the transmitter operating into an antenna, however, the keyer would sometimes act up. Subsequent tests with a dip meter revealed that my rf-in-the-shack problem was worse than I had thought. The dip meter reacted strongly when brought near the coaxial transmission line, the rotator cable, equipment ac line cords, and the cable connecting the keyer to the transmitter.

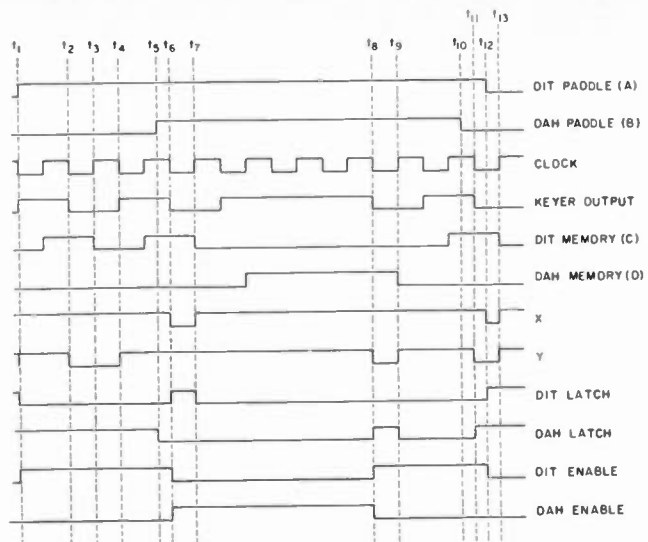


Fig. 5. An example of circuit operation.

Part of the solution to this problem was to add a small rf choke in series with the output from the keying transistor, as shown in Fig. 1. I also wrapped the power supply ac line cord around a ferrite rod from an old AM broadcast band receiver. These measures cured the problem as far as the keyer is concerned, and I am now able to use it on the air with no problems. Housing the keyer in a grounded metal cabinet might provide all the necessary shielding. Obviously, I will have to investigate my rf-in-the-shack problem further. The amount of rf-proofing you would need for this keyer circuit—or any other keyer depend on how much rf is in your shack.

### Final Comments

There are two books that you should definitely consider obtaining if you intend to do any experimenting with TTL ICs. The first one is the *TTL Cookbook* by Don Lancaster, which I have referred to in this article. The second one is *The TTL Data Book* by Texas Instruments. It is easy for a mistake to appear in a published circuit despite all efforts to avoid it, so anyone who intends to build such a circuit based on TTL ICs will find it

helpful to have a copy of *The TTL Data Book* to check pin numbers and truth tables.

Experimenting with digital circuits such as this keyer can be a lot of fun, in addition to being educational. You ought to give it a try, if you haven't already. If this article encourages someone to get started, it has served its main purpose.

There is one more thing I would like to mention, which could probably come under the heading of second thoughts. A close look at the waveforms in Fig. 3 shows that the decision time could be increased or decreased by adjusting the duty cycle of the clock waveform. For example, Fig. 6 shows how a 25-percent duty cycle would increase  $t_d$  from half of a space to three-fourths of a space. The duty cycle can be reduced by increasing the RC time constant of U11, decreasing the RC time constant of U10, or a combination of both. Of course, these changes will also affect the speed range. I have not made any changes in my clock circuit, but since some keyer buffs may feel that a longer decision time is desirable, I thought I should point out how it could be accomplished. ■

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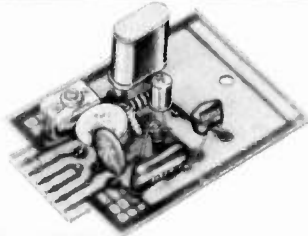
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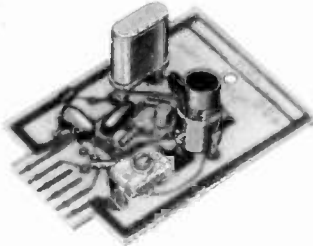


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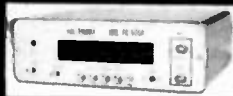
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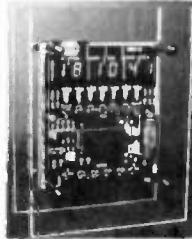
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## — basic strategy and tactics

A contest QSO differs from a regular QSO in that it is short and in that a particular message must be exchanged. The techniques of getting into a contest QSO are similar to those used to initiate a regular QSO or, especially, a DX QSO, but they are generally performed at a higher rate of speed. Thus it is not all that difficult for any active operator to join in the contest fray *once he has read and understood the contest rules*. However, to do well in a contest (and this can mean anything from surpassing your own previous best score to actually winning the contest) takes some knowledge, experience, and work.

This article will attempt to add to your knowledge by suggesting strategies and techniques which have worked for successful testers in the past. More important, though, through your own experience you will come to know: (1) yourself (your capabilities and limitations as a contest operator); (2) your station (its capabilities and limitations in any particular contest situation), and (3) propagation (both the basic patterns in your particular geographical location and the recent fluctuations in this pattern). According to W3ZZ and others, this combination of

experience and knowledge plus *practice, practice, and more practice* will make you the best tester you can be.

### The Basic Goal of Contesting

Enough of the philosophy—though it is tried and true and should not be neglected, it makes dull reading! Let's look at the basic goals of a typical contest operator. Besides having fun, he usually tries to make the best possible score in the time available. To do this, he must make as many contacts as he can. Many contests are scored by multiplying total contacts by a "multiplier" factor (multipliers will be discussed elsewhere in this article). For now, let's focus on making contacts, the most basic goal in contesting.

Each contact consists of an exchange of some standardized message, and only a limited amount of time is available in which to make these contacts. Therefore, a basic strategy for achieving a better score is to speed up the rate of message exchange or, in other words, to improve your ability to transmit and receive rapid communications through (typically) heavy QRM. Another basic strategy is to minimize the time between contacts, to maximize the

rate at which contacts are made.

### The Exchange

Very little can be said here about improving the receiving end of the exchange other than to urge practice. Upgrading your station equipment may also help, but don't underestimate your own ability to compensate for less than ideal gear. Believe it or not, the combination of the human ear and brain is the best audio filter available today, and it is extremely sensitive as well. Practice will maximize your own amazing capabilities.

On the topic of sending, more may be said. Let's take a simple example that is known to almost everyone who has dabbled in contesting: the ARRL Field Day exchange. All one needs to get across in a Field Day contact is his call, class, and ARRL section. To do this as rapidly as possible, send each piece of information once:

CW: "W6XYZ/6 1C EB de WB6CEP/6 K."

PH: "W6XYZ portable 6, 1C East Bay from WB6CEP mobile 6, over."

Notice how clear but brief the above message is. Repeat calls or parts of the message on the first ex-

change only if the station you are working is very weak or if its operator does not sound as though he knows what he is doing. For most contacts, though, send each piece of information just once, and you'll be surprised how often that is all that is needed. If someone does ask for a repeat, be sure to repeat only what he is missing. In other words, if you are asked "What's your section?", just give the section (in the above example: "East Bay"). If that still doesn't get through, then repeat the section several times—plus your call sign to assure the other operator that he is listening to the correct signal. On phone, it really does help to use phonetics. The standard ICAO phonetics, or other commonly used phonetics, are highly recommended. "Whiskey 2 Fuzzy Wuzzy Gorilla" (or whatever) is an attention-getting crack-up only if W2FWG has a good signal; otherwise it's usually a waste of time.

The above method is not always best, and as you become a more experienced tester, you will gain the ability to sense how much of the exchange should be sent and how often, in any given situation. The point is that the shorter you make your messages, the more

contacts you are likely to make.

The other major comment regarding the sending of exchanges is pretty straightforward. Improve your sending ability so that you can send your exchange as fast as the person you are working can copy. Estimating just how fast the other operator can copy is a skill that comes only with experience—but if you cannot send that fast, such an estimate will be less helpful. Practice!

### **Improving the Contact Rate: CQ vs. Search-and-Pounce**

Now let's look at the concept of improving score by increasing rate. The easiest way to "keep the rate up" is to call CQ and get others to answer you. To accomplish this effectively, a loud signal is normally required. A powerful transmitter plus fancy, high-gain antennas on big towers will give you a loud signal, but this is a prohibitively expensive solution for many. However, even a so-called "little gun" can be a big signal at certain times, on certain bands, and into certain geographical areas. When any of these conditions holds and people are there to work, by all means call CQ regardless of what kind of signal you have at your command.

At the beginning of the typical contest, "big guns" will call CQ and be answered by those with weaker signals. An exception is where some types of stations are rarer than others; for example, an operator in a rare country may have success calling CQ with a relatively weak signal. For the majority of stateside contesters in most contests, however, the big guns will be the initial CQers. As the contest wears on, the weaker signals will have worked the big guns and will be looking for new stations to

contact. At this point, the successful little gun will search the band for a relatively clear frequency that still has some contest activity near it and try a few CQs there. If it works, he should continue to call CQ; if not, he should go back to calling others. Towards the end of the contest, the big guns will have run their pileups dry. If a little gun calls CQ then, he is very likely to attract big guns hungrily searching for that one additional contact.

As the contest progresses, band conditions will fluctuate. If the little gun who is calling others suddenly finds that he is getting answers on the first call to the stations he is working, this indicates good propagation conditions, though often to only a particular part of the US or the world (depending on what type of contest it is). If that particular part is at all heavily populated with contest-oriented amateurs, he should shift to a clear frequency and try some CQs.

Certain bands tend to be better for weak-signal CQs than others. The higher bands—fifteen and ten meters—are very good when they are open. Little guns should keep a close watch on these bands for good openings which will allow them to call CQ—and get answers!

Finally, even a little gun will be quite loud locally in a domestic contest, especially on 40 and 80 meters. An occasional CQ will often produce short "runs" or "strings" of contacts with local operators, especially when the little gun is a fresh signal on the band.

When calling CQ fails, one must answer the CQs of others or suffer a drastic drop in his contact rate. This method of making contacts is commonly referred to as "searching-and-pouncing" (S & P). One searches the band for a station he

hasn't worked yet, then pounces on that station and gives a call. Very skilled operators can make QSOs almost as rapidly by searching-and-pouncing as by calling CQ, but it is a more difficult technique to master and requires greater operator effort. Again, practice is important.

Let's first consider the "search" portion of the search-and-pounce method. You want to find a station that you have not yet worked, preferably one that is just finishing a "CQ Contest" or "QRZ Contest" as you tune across it. A loud station will be easier for you to copy—but it may have more search-and-pounce types calling it, so take your choice. A fast, smooth operator will probably work you sooner than a slow and/or unsure one.

While searching, be sure to tune across the entire portion of the band in which there is contest activity. Stations on the fringes may be easier to work because the competition is less. The bug guns tend to congregate near the low end of the band in major CW contests and DX phone contests, while during major domestic phone contests, the action is heaviest near the bottom end of the General class phone band. Once you have worked some of the big guns, search more carefully up towards the higher end of the band (or in the Advanced class phone band during domestic contests) for weaker (and often slower) CQs. Constantly sweep and re-sweep across the band, as new stations will appear (and disappear) at a surprising rate.

When your search unearths a juicy new station to work, several "pounce" considerations must be examined critically. First, how heavy is your competition? If many stations are calling, or if a number of bigger sta-

tions are calling, try only 1-3 calls and move on—unless the new station is a multiplier (see the next section for a discussion of multipliers). Under most conditions, your rate will tend to drop drastically if you sit on any one station's frequency for more than a couple of minutes. A superior alternative is to try your luck elsewhere and then come back later to check if the competition has lessened and/or propagation into that area has improved for you.

Second, exactly what is the new station working? If local stations with signal strengths comparable to your own are getting answered, the chances are very good that you can get through, too. If only stations considerably louder than yours are being worked or if the stations being worked are mostly located in other geographical regions, your chances are not so hot. With experience, you will develop a feel for the probability of contacting a given station under a certain set of band and competition conditions.

Third, as was mentioned earlier, the faster, smoother operator will usually work you sooner than a poorer operator if the size of their respective pileups is about the same.

When actually answering a contest CQ, keep it short. The preferred method is to send: "de K6PU." Then send his call as part of your exchange if and when you actually do work him. If this technique causes confusion, send both his call and your call, possibly repeating your call once.

With light competition on CW, or in most instances when operating phone (the exception is split-frequency operation with a DX station), zero-beat the desired station as you would in any regular QSO. With heavy competition, more

finesse is required to break through. Time your call for a lull in average signal strength on the frequency, or try shifting slightly to either side of the desired station's frequency if operating CW.

Finally, there will be times when both calling CQ and high-rate searching-and-pouncing will no longer work. You then have three choices: change bands, take a break, or search-and-pounce at a low rate. Band changes and rest pauses will be covered in succeeding sections. Low-rate search-and-pounce requires much patience and the conviction that each new contact is worthwhile because it improves your score. The "doldrums" are among those challenges of contesting which separate the good contester from the also-ran, so hang in there—and pray for better conditions soon!

### Multipliers

Scoring in a few contests is based entirely on total contacts. Field Day is a good example of this type of contest, though it does contain certain bonus factors for portable stations which we will ignore for the moment. However, most contests complicate the scoring procedure—and thereby alter contest strategy significantly—by throwing in a multiplying factor. The "multiplier" is usually the sum of the number of distinct geographical areas contacted (with the definition of what is a "distinct geographical area" varying from contest to contest).

Some examples will probably illustrate the multiplier concept most readily. In the Sweepstakes Contest, the multiplier is the sum of ARRL sections contacted. If you work a station in each of the 74 sections, your score will be:  
SS Score = Total Number of QSOs  $\times$  2  $\times$  74 sections.

In the CQ Worldwide DX Contest, the multiplier is the sum of the countries and zones worked on every band. For example:  
CQ WW Multiplier = 20 countries plus 10 zones on 40 meters and 50 countries and 20 zones on 20 meters =  $(20 + 10) + (50 + 20) = 100$  (if one operated only on 20 and 40 meters in that particular contest).

In the California QSO Party, the multiplier for non-California stations is the number of California counties worked.

So much for what a multiplier is—now let's take a look at what effects a multiplying factor has on contest strategy. In a typical contest, your contact total will be significantly larger than your multiplier factor. Thus, each additional multiplier contact is worth a lot more than each additional non-multiplier contact—often five times as much, sometimes ten times as much, and possibly twenty times as much! However, finding an additional multiplier to work, or breaking through a pileup of twenty other stations who also need him for a multiplier, may take even more time than contacting an additional five or ten "ordinary" stations. Herein lies another major challenge of contesting: to balance contact rate and multiplier total in such a way as to maximize your score.

There is no simple answer to this dilemma. The best compromise depends upon a host of factors: the contest in which you are operating, your signal strength, your operating ability (especially your ability to search-and-pounce rapidly), band conditions, your geographical location, etc. Multipliers are generally easier to come by naturally in the course of making contacts in domestic, as opposed to DX, contests. In Sweepstakes, for example,

the first fifty to sixty multipliers are almost automatic for the active participant, while the remainder of the seventy-four possible multipliers become progressively tougher to accumulate.

Experience in any given contest will teach you which multipliers are relatively rare; if you hear one of these, spend a little more time trying to work him than you would on a normal contact. Beware, though, of sitting on a rare multiplier's frequency for long periods of time. Unless contacts are really coming slowly, call a multiplier several times, note his frequency if you miss him, and try again every five to ten minutes. As his pileup (and rare multipliers usually do have pileups!) dies down, and as band conditions improve, your chances of working him become better. On the other hand, if band conditions become poorer, you may never get another chance to work him.

It is difficult, at the basic level, to provide any further solid tips on multipliers which will hold for all or even most contests. This is something one really needs to develop a feel for through experience.

### Changing Bands

It is clear by now that there are two major goals in most contests: making a high contact rate and collecting multipliers. Simply stated, you should change bands only when by doing so you will improve your rate and/or add some new multipliers to your total.

In contests where you may work a station once on each different band (CQ Worldwide, ARRL DX, Field Day, etc.), the best general strategy is to operate on the highest band that is open. If the opening is not a particularly good one, your rate will suffer. In that case, it may be best to grab what multipliers you can quickly

and then QSY to the next band down (for example, from fifteen to twenty).

Sweepstakes is a good example of a contest in which you may contact each station only once, regardless of band. In such contests you should strive to be on the band which will produce the highest rate, and pay less attention to marginal openings on the higher bands. However, a good high-band (15 and 10) opening can really boost a score (especially a little gun's, as noted earlier), so it is important to monitor other bands for possible openings. This involves interrupting your operating whenever your rate slows, switching your receiver to any other bands which might be open, and quickly turning across the band.

If a given band appears to be active, listen more carefully to see if the activity level there is higher than that of the band on which you have been operating—and/or check for multipliers you still need. Choose the band likely to be the most productive for you in terms of contacts or multipliers, and either stay put or QSY. The importance of monitoring other bands is even greater when you may work the same station on each band, so by all means do it and your score will almost surely improve.

A cost of such monitoring is the time lost in adjusting your receiver to listen on each different band plus the time required to tune around the band. The technique of tuning around the band rapidly has already been discussed. Receiver adjustment—or the even more time-consuming task of tweaking both transmitter and receiver—is something which can be speeded up tremendously through practice and one simple trick.

Place some white stick-on labels (masking tape will

also work OK) on your transmitter, receiver, amplifier, etc., panels just above all controls which must be adjusted when a band change is made. Pick out a band—eighty meters, for example—and tune up. Directly opposite the pointer line or dot on each tuning knob, make a mark on the label or tape and write "80" next to it. Do the same thing for every other band you will use in the upcoming contest. Now all you have to do to change bands is turn the bandswitch and rotate each control knob until it lines up with the appropriate marker. Very few controls are so touchy that if you are off by a fraction, performance will degrade sharply; if one or two are particularly touchy, spend an extra second or two to tweak them up after the basic changes have been made. There is seldom anything to be gained by being perfectly tuned in a contest; a few Watts more or less are unlikely to make much difference. The time you save by using this technique often does make a difference, though, as band changing now can be accomplished in ten seconds or less!

A final basic consideration when changing bands is your antenna system. If some of your antennas perform better than others, a sensible strategy is to spend more time using those antennas! For example, with a collection of dipoles and a four-element 20-meter beam, you probably would do better to spend much more time on the beam than you would on the one of the dipoles. However, this may not always be the best strategy. To continue with the beam-plus-dipoles example, it is highly likely that if your station happens to be located in the Northeast and you are operating in the Sweepstakes Contest, the 80-meter dipole would

be your "best" antenna. Thus it is critical to determine through actual on-the-air tests which of your antennas performs best in which directions and in which types of contests (local, domestic, DX, etc.). In other words, know your station.

### Rest Periods

As was the case with changing bands, the basic underlying philosophy in determining when to take a break is quite simple: Rest when your rate will be low and when you will be unlikely to collect many multipliers. Unfortunately, as was also the case with changing bands, deciding more concretely at which specific time periods such conditions will hold is not so easy. The question of when to rest is further complicated by your own physical endurance limitations, which will often supersede rate and multiplier considerations.


Propagation is a key factor in determining when to rest. When one or more bands are open to an area where other contest participants are available to be worked, it is usually best to be on the air—especially if the areas concerned are highly-populated ones. Propagation is such a complex function of type of contest, geographical locations, time of day, year, sunspot cycle, etc., that few generalizations can be made about it which will hold more-or-less true for all US contesters. However, one generalization is that propagation peaks occur at sunrise and sunset, while midday is a low point. This is particularly true in DX contests, so the middle of the day is a time when many top contesters take a several hour nap (if they need it) in a DX contest.

Most DX contests do not have required rest pauses; you may operate the entire

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forty-eight hours (or whatever) if you have the stamina. If you do not and require more than a nap in the middle of each day, the next best approach is to take a short break when your efficiency drops off and operating is pretty much a waste of time anyway (e.g., in the wee hours of the morning). Since the excitement of a good opening will tend to wake you up, while low levels of activity will usually have the opposite effect, this is not too bad a system for most operators. Of course, if you know from experience (or from conversations with knowledgeable locals) when to expect good openings to various parts of the world, you will do even better if you take your breaks between predicted openings.

The rest-pause strategy for domestic contests is a bit different than for DX contests. Here, everyone's

day and night very nearly coincide, and the contests are generally shorter (20-30 hours). The best time to take a nap in a domestic contest is during the wee hours of the morning. A common strategy is to operate on forty and eighty until the rate drops off noticeably, then sack out until dawn. If rest pauses are required—you must, for example, operate no more than twenty-four hours out of thirty in Sweepstakes—the additional breaks are best taken in short bursts of fifteen to twenty minutes any time the rate drops off.

In any contest, if at all possible, it is not wise to take long breaks. As propagation prediction is not an exact science, the successful contesteer must constantly monitor any band which might be open. Most people have difficulty doing this while they are asleep! ■

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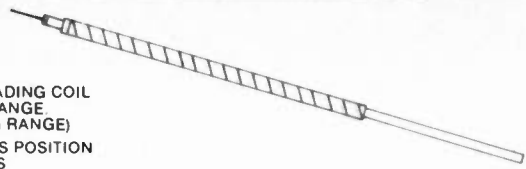
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ulated by an external signal and adjusted in amplitude from six volts peak-to-peak down to millivolts. The sine, triangle, and square waves may be swept in frequency by a built-in linear sweep circuit or by an external signal. The cost is in the \$50.00 range if you have a moderately stocked junk box. The majority of the parts are stocked by Radio Shack. About half of the cost is in the digital frequency display, which may be easily replaced with a frequency counter or an analog scale.

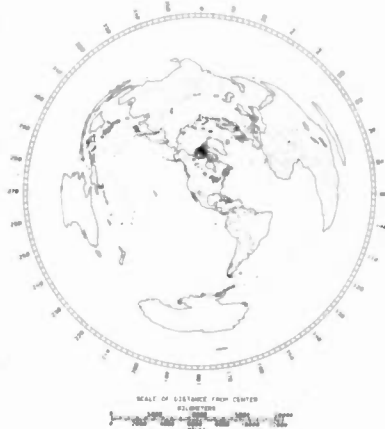
The entire unit consists of the function generator circuits, the sweep circuits, the digital display circuits, and the power supply. The function generator circuits actually contain two function generators, designated the primary and secondary, and labeled F1 and F2 in the picture of the front panel (Photo A). The two generators may be set independently of each other and it is possible to shift between the two merely by changing the logic level at the FSK jack. The amplitude of the



Photo A. The completed swept function generator. The knob labeled F1 is the primary frequency control and is mounted on a 3:1 gear drive. The SIN/TRI output jack also provides a ramp function. All unlabeled jacks are grounds, except the jack, far left, which is the variable dc output.

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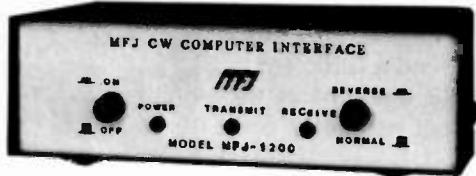
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output is absolutely constant from the lowest frequency up to 300 kHz with a usable signal generated up to about 1 MHz. Distortion of the sine wave is adjustable and quite good at approximately .5% THD.

### Construction

The heart of the function generator is an XR 2206 IC. I purchased my chip from Jameco Electronics, 1021 Howard Ave., San Carlos CA 94070. Be sure to ask for the spec sheet; the additional 25 cents is well worth the price. I used the manufacturer's recommendations on wiring the 2206 except for several modifications that are peculiar to my function generator. If you do not want to build the sweep circuit, then just leave those components off of the circuit board; there are no components that are used for both the function generator and the sweep circuits.

I used 1/4-Watt, 5% resistors except for R12, which is not critical but should be at least 1 Watt. Capacitors C1 through C5 are frequency-determining components and should be 5% or better, and for best results should be made of some stable material such as polystyrene. Other types of capacitors could be substituted, but the generator will be slightly less stable. Whenever possible, I have tried to provide large pads on the circuit board to accommodate capacitors of different sizes.

Trimmer pots R1, R2, R3, R6, R7, and R8 all are mounted on the PC board. I have provided space on the circuit board so that either the stand-up or the lay-down type of trimmer may be used. It seems that I always have the wrong type when building a project on someone else's circuit board, so I have allowed for both types (prospective authors please take note). Front-panel pots R4 and R5

are the other frequency-determining components. During normal use, R4 is the main frequency control, and I have mounted mine using a 3:1 gear drive so that the frequency can be varied in small increments. Potentiometer R5 is used to set the frequency of the secondary function generator and to adjust the shape of the pulse and ramp functions. I found it sufficient to mount R5 directly on the front panel without a gear drive.

The function generator may be swept in frequency by applying a varying voltage to R5. For maximum frequency sweep, 1000:1 or better, this voltage should vary from 0 V to +3 V, with the highest frequency being generated at 0 V. I have arranged the front-panel

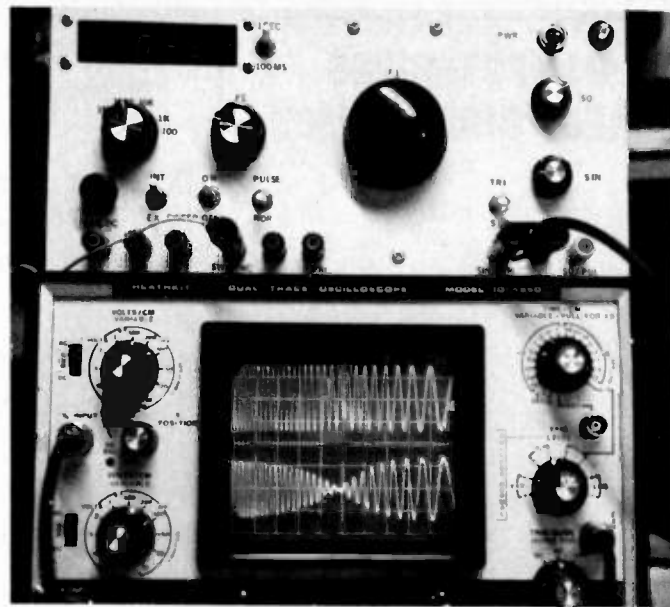


Photo B. The swept function generator in operation. The top trace is the output of the generator in the sweep mode. The bottom trace is the same signal after processing in a home-brew notch filter. The notch filter has a design frequency of 1100 Hz which will correspond to the center of the scope face. The actual sweep here is about 20 Hz to 2200 Hz.

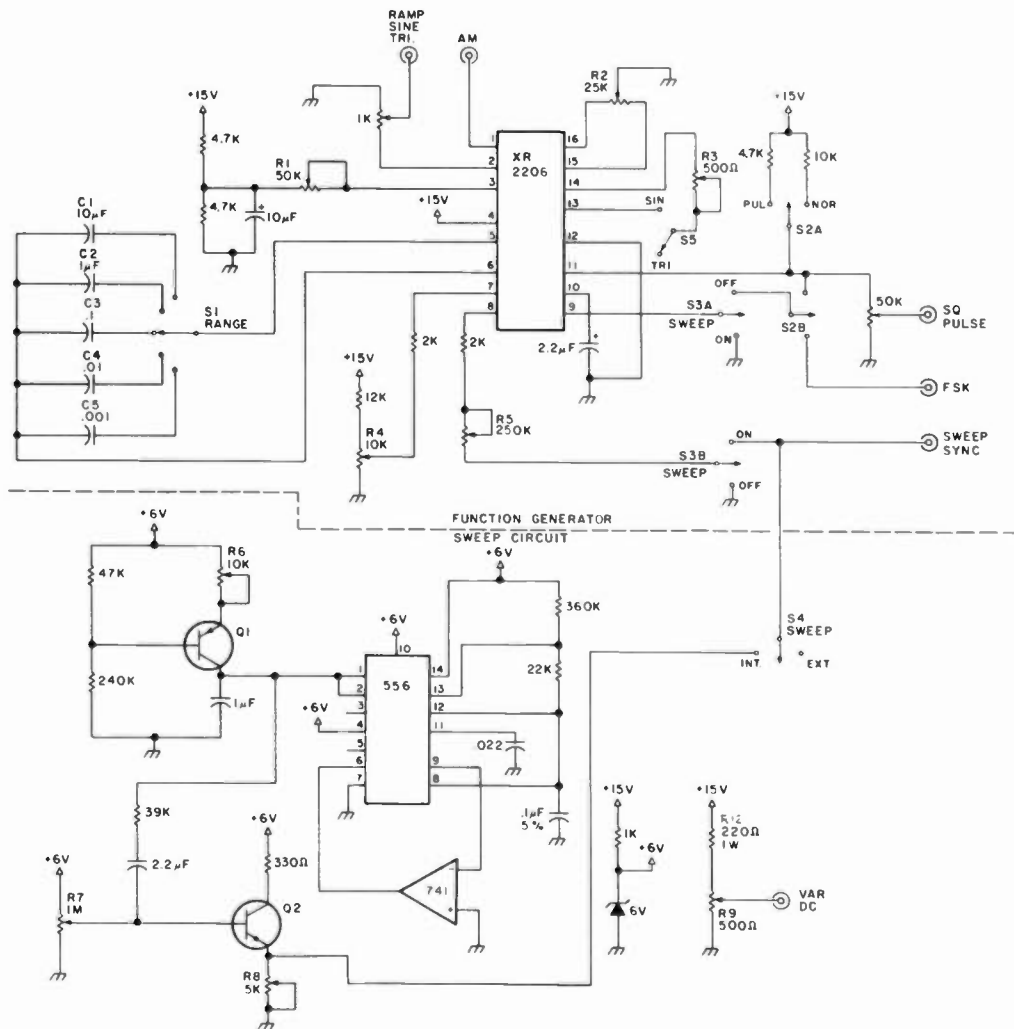


Fig. 1. Schematic of function generator and sweep generator.



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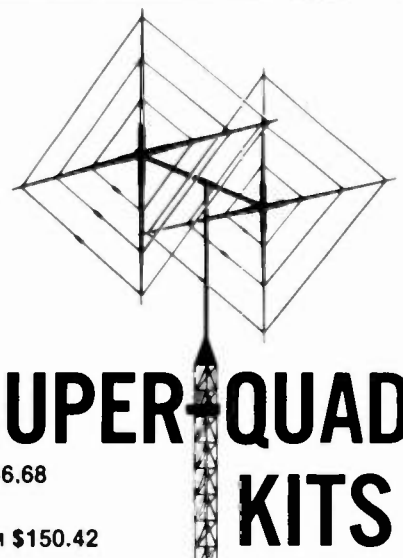
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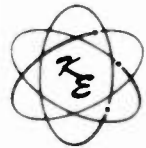
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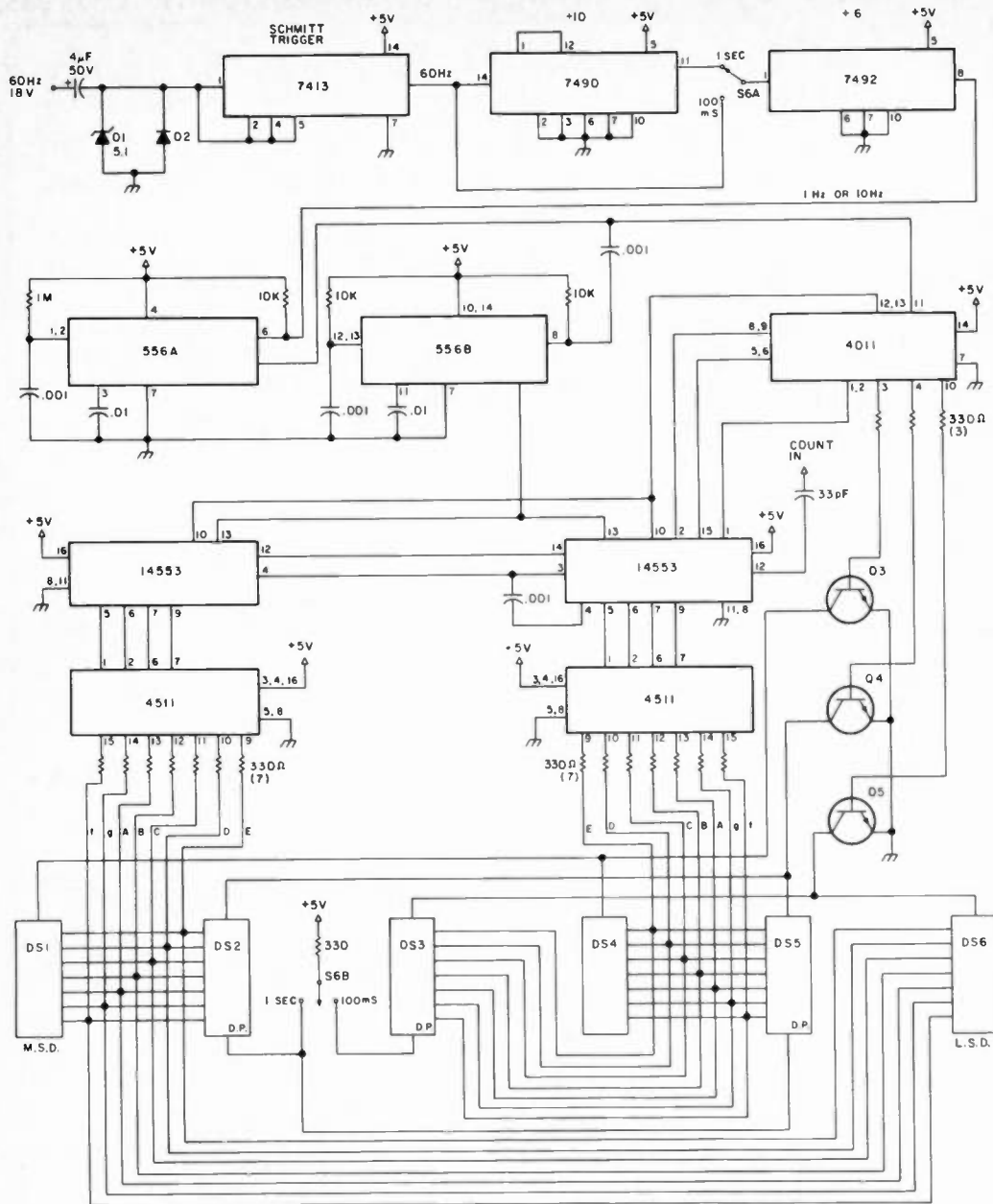


Fig. 2. Schematic of digital frequency display.

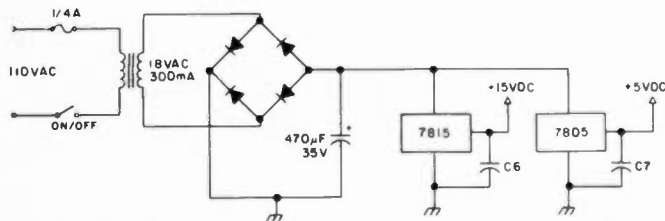


Fig. 3. Power supply. C6 and C7 are 2.2-µF tantalum and are mounted on the circuit board. All other components are mounted on the chassis.

switches so that the function generator may be swept or frequency-modulated by applying a varying voltage to the sweep/sync jack from an external source or from internal circuitry. The internal sweep

circuit is a linear ramp generator which provides a 3-V ramp at a frequency which allows one sweep to fill my scope screen when set to 2 ms/cm. When the internal sweep circuit is used, the ramp signal is applied

linearly. The other half of the 556 timer acts as a switch which grounds the positive side of C6, when triggered by the op amp. The voltage across C6 almost instantly goes to zero and then begins to recharge. Transistor Q2 (a 2N2222) is a buffer amplifier. By adjusting the dc bias on this transistor, the amplitude and position of the ramp relative to ground may be precisely set. The output of this emitter-follower type circuit is the final sweep signal.

The digital frequency display is a multiplexed unit and is based on the Radio Shack three-digit BCD counter IC, part 276-2489. The entire display was point-to-point wired on a multipurpose 22-pin edge connector circuit board which will just accommodate the 9 ICs and three 2N2222 transistors. The timebase is derived from the 60-cycle line. I have found the accuracy to be quite good at audio frequencies, often showing the same frequency as my lab grade counter, up through 50 kHz or so. Even at much higher frequencies, the difference is usually under 100 Hz and the error will always be on the low side. The frequency generated by the function generator is sampled at pin 11 of the XR 2206 and is coupled to the digital display through a 33 pF capacitor. This signal is then counted and displayed by the two sets of 14553 counter and 4511 driver ICs.

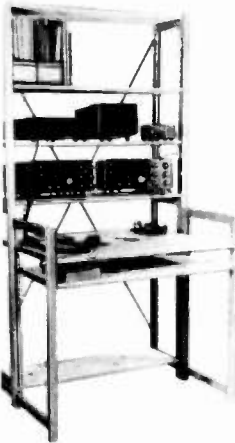
The wiring of the LED displays is a little unusual and requires an explanation. If the counter is placed in the 100-ms timebase position, it will count and display 1/10 of the actual frequency being generated, so that 4552 Hz would appear as 455. I found this to be distracting, so I added another LED display in the "ones" position and set it to display a

to the sweep/sync jack so that it may be used to trigger your scope.

Operation of the sweep circuit is not overly complex. One half of the 556 dual timer is wired as a monostable multivibrator which is used for a timebase. The 741 op amp inverts the output of the multivibrator to provide a good trigger signal. The actual ramp is generated by the other half of the 556 and the two transistors. Transistor Q1 is a 2N4250 or similar and provides a constant current source to capacitor C6. This constant current allows C6 to charge



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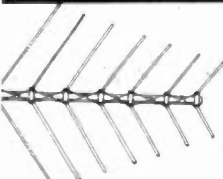
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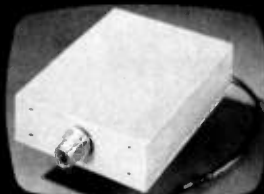


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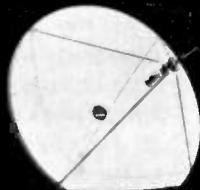
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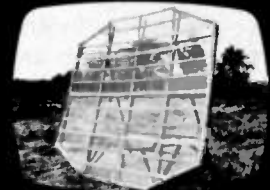
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"0". Now the frequency display would appear as 4550. In order to get the newly-added display to have the same brightness as the other digits, I wired it as if it were in the "millionth" position. There is no leading-zero blanking, so the new digit will always show a zero unless a frequency of one MHz or higher is counted. In the one-second timebase mode, this newly-added digit will appear in the "tenths" position and will be zero unless a frequency of 100 kHz or higher is counted. In this timebase, the display would appear as 4,552.0. The decimal points are wired to the timebase switch so they will always correctly separate the hundredths and thousandths digits.

The digital display circuit is set up for common-cathode displays with right-hand decimal points. Maximum current should be limited to about 25 mA per segment. I used Radio Shack 276-1644 displays but would recommend some of the multiple-digit, multiplexed units such as those sold by Digi-Key, Inc.

The timebase and control circuits for the display are fairly straightforward. A 60-cycle signal is taken off the low voltage side of the power transformer. Diode D2 and zener D1 limit the voltage excursions to  $-0.7$  V and  $\pm 5.1$  V. This 60-cycle signal is applied to a Schmitt trigger to produce an accurate square wave, and then passes through the 7492 IC wired to divide by six. The resulting 10-Hz square wave triggers the two one-shot multivibrators which form the latch and counter reset pulses. In the one-second timebase, the 60-Hz signal is divided by ten in the 7490 IC before going through the 7492, so that a 1-Hz square wave is applied to the one-shots. Again, this is a surprisingly accurate system, and I have

been very pleased with the results.

The power supply is fairly conventional, using an 18- or 24-V ac transformer, a bridge rectifier, and two regulators, a 15-volt and a 5-volt. If you use a 24-V ac transformer, be sure you do not exceed the maximum voltage which may be applied to the regulators;

mine were rated for 35 V dc. All of the power supply components were mounted on the chassis. Note that a 2-wire power cord is used so that the chassis ground is floating and is not connected to the house wiring ground. This allows the function generator ground to be floating and set in relation to other pieces of

test gear.

### Calibration and Operation

Calibration is not difficult, but does require a dc-coupled oscilloscope. The function generator circuit has three adjustments. Trimmer R1 adjusts the amplitude of the signal with a maximum of six volts for

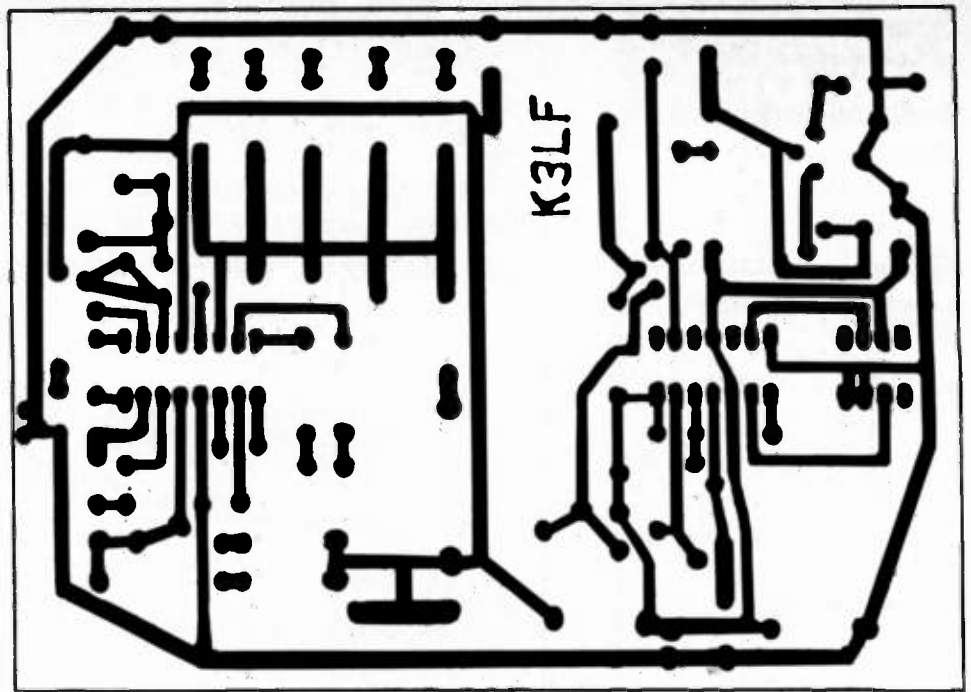


Fig. 4. PC board layout.

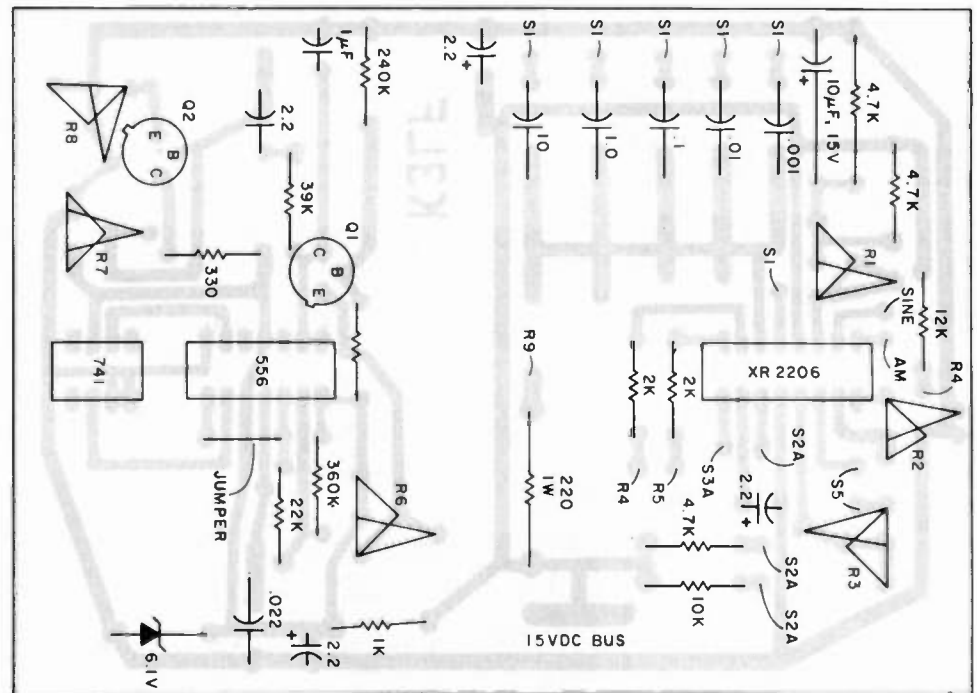
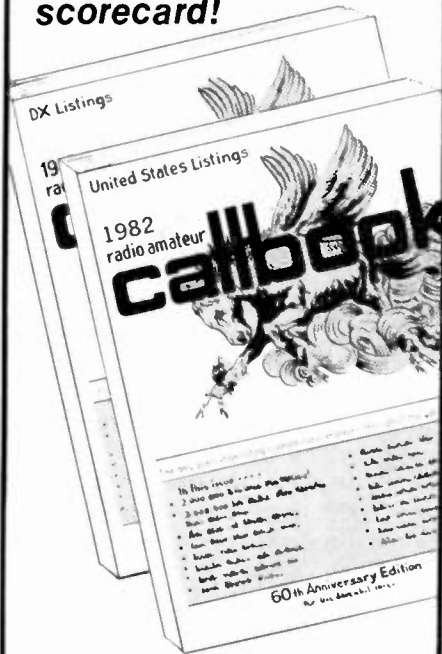


Fig. 5. PC board component location.

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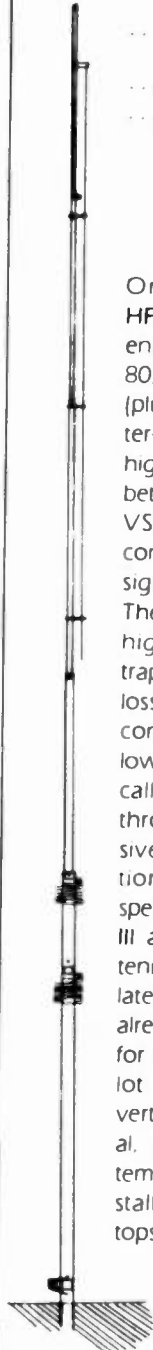
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the triangle waveform. Symmetry is adjusted by R2, and R3 adjusts distortion of the sine wave and may be replaced with a 200-Ohm resistor with fairly good results. The three adjustments will interact to some degree; the object is to maximize amplitude and minimize distortion. The sweep circuit is adjusted using R6, R7, and R8. The collector of Q1 should be monitored while adjusting R6, which should be set to a position giving the longest ramp. Too little resistance here will make the ramp generator operate at twice the trigger frequency. With an oscilloscope connected to the output of the sweep circuit, adjust R7 so that the ramp just touches the 0-volt baseline. The amplitude of the ramp is adjusted by R8 to a value of three volts p-p. There is some interaction between R7 and R8, and these adjustments are

somewhat critical—so be patient.

Operation of the swept function generator should be fairly obvious, but here are some helpful hints. When operating in the sweep mode, S3 should be placed in the ON position and S4 placed in INT. This will apply the ramp signal from the sweep circuit to the function generator and to the sweep/sync output jack for synchronizing or triggering your oscilloscope. You will find the signal appears to sweep from right to left as the lower frequencies are to the right. If S4 is placed in the EXT position, then an external device may be used to sweep or frequency-modulate the function generator. Whenever S3 is ON, the average frequency will be controlled by R5 and the range switch.

To determine the range of frequencies actually be-

ing swept, place the digital frequency display in the one-second timebase mode. The displayed frequency will be very close to half of the peak frequency and 500 times the lowest frequency. I have found this to be a very handy phenomenon. If I am looking at the response of a notch filter and want to know at what frequency the notch occurs, I can adjust R5 until the notch is at the center of my scope. At that point, the frequency displayed on the digital readout will be the frequency of the notch. If I want to apply a swept signal of 10 Hz to 10,000 Hz to some piece of equipment, then I merely adjust R5 until the display shows 5,000 Hz and I will be right on target.

When operating the generator with the sweep turned off and S2 in the NOR (normal) position, the secondary function gener-

ator may be activated by grounding the FSK jack. The frequency of the secondary generator is controlled by R5 (the primary generator is controlled by R4).

One last item: Any amplitude-modulating signal must have the same dc bias as the output. Potentiometer R9 has been included to provide an adjustable dc reference voltage. The 220-Ohm resistor, R12, limits the current if the VAR dc jack is grounded.

I have had my function generator in use for about a year and have been very happy with its performance. In the future, I hope to build an interface device so that the function generator can be controlled by my KIM-1 micro via the sweep and FSK inputs. This would probably open the door to all sorts of neat applications. I hope you enjoy this versatile instrument as much as I have. ■



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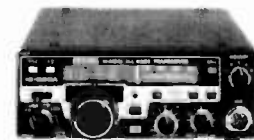
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**TEN-TEC Model 580 DELTA** All solid-state, 200 watt SSB/CW HF Transceiver. 9 HF bands, 160-10m including 10, 18 & 24.5 Mhz & 10 MHz WWV; 40 KHz VFO overrun. Instant band change, no tune-up. 100% duty cycle, 20 minutes. Digital readout, six 0.3" LEDs - reads to 100 Hz. Sensitivity 0.3 uV for 10 db S + N/N ratio, 85 dB or better dynamic range. 8-pole 2.4 KHz SSB filter & audio active filters. Select the standard SSB filter, standard SSB filter with one section of audio filter, optional 250 Hz or 500 Hz CW filter or CW filter with four audio active filter sections. 50 dB notch,  $\pm 1$  KHz offset tuning, QSK instant break-in, VOX or PTT, adj. AGC & drive, 20 dB atten. S/SWR meter, extra receiver jack, sidetone, Hi-Z mic. input, built-in spkr. 12-14 VDC @ 18A. 4 $\frac{1}{2}$ "h x 11 $\frac{1}{2}$ "w x 15"d, 12 $\frac{1}{2}$  lbs.

**Regular \$869 - Sale Price \$769<sup>95</sup>**

**DELTA Accessories:**

- 280 18A power supply (Regular \$169).... SALE \$152<sup>95</sup>
- 255 Deluxe ps w/speaker (Reg. \$199).... SALE 179<sup>95</sup>
- 282 250 Hz 6-pole CW filter..... 50<sup>00</sup>
- 285 500 Hz 6 pole CW filter..... 45<sup>00</sup>
- 283 Remote VFO (Regular \$189)..... SALE 169<sup>95</sup>
- 289 Noise blanker..... 39<sup>00</sup>
- 1140 DC circuit breaker..... 10<sup>00</sup>



**TEN-TEC Model 515 ARGONAUT** All solid-state, 5 watt (QRPp) SSB/CW HF Transceiver. 5 HF bands, 80-10m plus 10 & 15 MHz WWV. No tune, broadbanded final - instant band change. Analog dial, 4-pole 2.4 KHz crystal SSB filter. Typical receiver sensitivity 0.35 uV for 10 db S + N/N ratio. Built-in SWR/S meter. QSK instant CW break-in and PTT on SSB.  $\pm 4$  KHz offset tuning, adjustable sidetone, built-in speaker, Hi-Z mic input, LED output and offset indicator. 12-14 VDC @ 1A. 4 $\frac{1}{2}$ " x 13" w x 7 $\frac{1}{2}$ "d, 6 lbs.

**Regular \$469 - Sale Price \$399<sup>95</sup>**

**ARGONAUT Accessories:**

- 210 Power supply..... \$34<sup>00</sup>
- 210/E 110/230v - 13v/1A power supply..... 39<sup>00</sup>
- 206A External 25 KHz calibrator..... 39<sup>00</sup>
- 208A External Notch & 150 Hz CW filter..... 59<sup>00</sup>
- 212 29-29.5 MHz crystal..... 5<sup>00</sup>
- 213 29.5-30 MHz crystal..... 5<sup>00</sup>



**TEN-TEC Model 525 ARGOSY** All solid-state, 10/100 watt SSB/CW HF Transceiver 6 HF bands 80-10m, including the new 30m-band & 10 MHz WWV; 40 KHz VFO overrun on each band edge. Switchable, 10 watts or 100 watts input. 100% duty cycle, 20 minutes. Instant band change, broadbanded, no receiver front end or final tuning. Analog dial accurate to  $\pm 2$  KHz. 4-pole 2.5 KHz crystal SSB filter, sensitivity 0.3 uV for 10 db S + N/N ratio. Meter shows forward/reverse power, SWR and received signal strength. Offset tuning  $\pm 3$  KHz, notch filter, QSK instant CW break-in and PTT on SSB, sidetone, adjustable ALC. 12-14 VDC @ 9A. 4" h x 9 $\frac{1}{2}$ " w x 12" d, 8 lbs.

**Regular \$549 - Sale Price \$499<sup>95</sup>**

**ARGOSY Accessories:**

- 225 9A power supply (Regular \$129).... SALE \$119<sup>95</sup>
- 217 500 Hz 8 pole CW filt (Reg. \$55)..... SALE 49<sup>95</sup>
- 218 1.8 KHz 6-pole SSB filter (Reg. \$55).... SALE 49<sup>95</sup>
- 219 500 Hz 8 pole CW filter (Reg. \$55).... SALE 49<sup>95</sup>
- 220 2.4 KHz 8 pole SSB filt. (Reg. \$55).... SALE 49<sup>95</sup>
- 222 Mobile mount..... 25<sup>00</sup>
- 223 Noise blanker..... 34<sup>00</sup>
- 224 Audio CW filter..... 34<sup>00</sup>
- 226 25 KHz crystal calibrator..... 39<sup>00</sup>
- 1125 DC circuit breaker..... 15<sup>00</sup>
- 1126 Linear amplifier switching kit..... 15<sup>00</sup>

**Other Accessories:**

- 234 Speech processor (Reg. \$139)..... SALE \$124<sup>95</sup>
- 214 Electret microphone for 234..... 39<sup>00</sup>
- 209 300 watt dry dummy load..... 26<sup>00</sup>
- 215 Ceramic microphone with plug..... 29<sup>90</sup>
- 215PC Ceramic mic. w/plug & coil cord..... 34<sup>90</sup>
- 227 1.8-30 Mhz, 200w tuner (Reg. \$79).... SALE 72<sup>95</sup>
- 228 Tuner, as abv w/SWR (Reg. \$95).... SALE 85<sup>95</sup>
- 645 Dual paddle keyer (Reg. \$85)..... SALE 79<sup>95</sup>
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# New Horizons for the HW-8 Transceiver

## — a dandy mod to expand frequency coverage

Roger C. Amundsen W1PQ  
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**W**ould you like to increase the tuning range of your Heathkit HW-8 to add 3750 to 4000 kHz, 7250 to 7500 kHz, 14250 to 14500 kHz, and 21250 to 21500 kHz? I did

and I found it very easy to do. I wanted to listen to some of my friends on 75 and 40 and also be able to receive CHU just above 7300 kHz.

To make this modification, only two parts are required: a capacitor to pad the vfo tuning and a toggle switch to add it or leave it out of the circuit. I used a trimmer, but if you are not

too fussy, a fixed capacitor of 12 pF will do.

I located a miniature toggle switch on the rear panel (as shown in the sketch) so that no injuries were inflicted on the front panel. One side of my trimmer (mounted above the toggle switch) is grounded, so it was simple to run the other lead to one side of the toggle and then tie the other terminal of the switch via a piece of tinned bus wire to the lug on the vfo tuning capacitor, C302B.

One adjustment and you are in business. With the new capacitor switched out of the circuit, open up (reduce) the mica trimmer (C362A) on the vfo tuning capacitor to offset the stray

capacity of the added circuitry. Adjust the vfo to 3500 kHz when the dial reads 0 (3.5 MHz band position). If in doubt, adjust it so that W1AW broadcasts are on 3580 kHz. No adjustments are required for the other bands. Throw the toggle switch and adjust the new trimmer for 3750 kHz for 0. The dial will now read 250 kHz higher on all bands or tune from about 3750 kHz to 4000 kHz on 80 meters. *Do not operate the transmitter function outside of authorized bands.*

Results: The HW-8 is no superhet, but for a direct-conversion receiver it is not bad. Also, if you desire to remove the mod, a couple of small hole plugs cover up the surgery. See you on 3540 kHz. ■

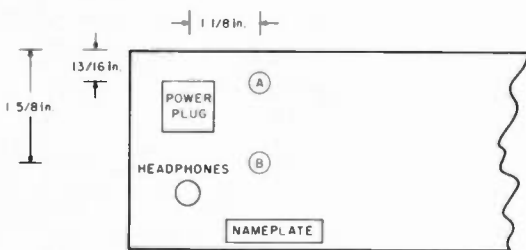


Fig. 1. HW-8 rear panel. A = 3/16" hole for 15-pF trimmer if used. B = 1/4" hole for miniature SPST toggle switch.

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# New Frequencies for the IC-2

## — for MARS members only

**M**ARS members will be happy to know that the no-compromise, synthesized, Icom IC-2 handie-talkie can be modified easily to transceive out of band. And, best of all, the cost of this modification is a total of zero!

Tuning this HT is done by setting three miniature thumbwheel switches—one each for MHz, 100 kHz, and 10 kHz. A slide switch beside the thumbwheels adds 5 kHz to the frequency. Although the MHz thumbwheel turns throughout its full 0-9 range, the synthesizer confines the actual frequency to the amateur band, as shown in Table 1.

After inspection of the circuit boards, thumbwheel switches, and schematic, it became apparent that this HT was manufactured for usage throughout the range of 140.000-149.995 MHz. By the placement of jumpers, it can be configured to the different band plans for Europe, England, and the USA.

After making this modification, the IC-2 will tune from 140.000 through

149.995 MHz in 5-kHz steps following the exact thumbwheel setting. All other functions remain the same.

**Step 1.** Remove the battery pack. Remove the four screws that hold the battery retaining plate on the bottom. (Note the position of the plate to assist in reassembly.)

**Step 2.** Turn the HT face down. Remove the two case retaining screws.

**Warning:** A paper-thin, flexible, printed circuit board connects between the touchtone™ pad and chassis on the IC-2AT model. Be extremely careful if you remove the front half of the HT case.

**Step 3.** Remove the back half of the HT case.

**Step 4.** Using the picture of the HT on page 20 of the Icom manual and Fig. 1, here, find the programmable divider chip, IC1, and the flexible circuit-board tape soldered to it. Run solder across the non-conductive gap in the line designated C4. Use a small, low-wattage iron so as not

to damage the flexible circuit board.

**Step 5.** Remove the two retaining screws on the side of the chassis and hinge open the two circuit boards.

**Step 6.** Find the brown-colored jumper wire that connects two solder pads together on the underside of the MHz thumbwheel switch. Snip this jumper and tape the ends.

**Step 7.** Carefully reassemble the HT. Make

changes in the Icom manual and on the schematic.

Navy-Marine Corps MARS in Tennessee is currently using a 600-kHz split in the 148-MHz range. If you require a non-standard split, the MARS modification article for the Tempo S1, written by Dorsey "Diz" Price K5EDS in the April, 1980, issue of 73 should be reviewed. A similar modification could be made to the IC-2. I'll let someone else write that one! ■

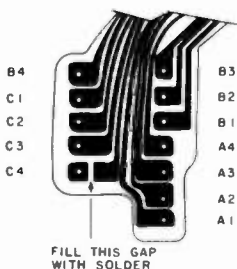


Fig. 1.

MHz Thumbwheel	Actual Frequency
0	144.XXX
1	145
2	146
3	147
4	144
5	145
6	146
7	147
8	144
9	145

Table 1.



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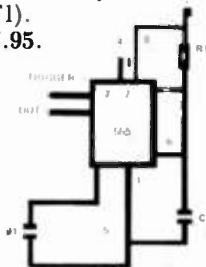
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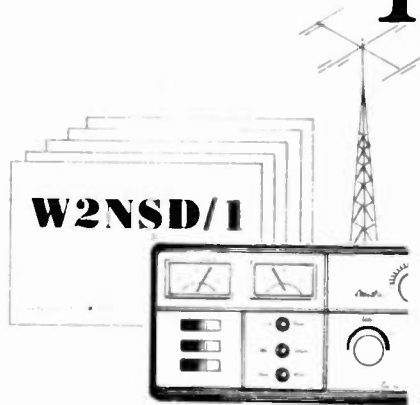
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## — computerized ham shack security

**P**rotecting personal property, be it ham shack or home, is big business these days. Even traditional department stores have started to stock systems which blast you with bells, whistles, or horns when activated. None of those systems has the flexibility to cover

several possible installation situations and provide complete protection. This system probably won't either, but it comes a lot closer.

### Requirements

Requirements for this system are that it be inexpensive, flexible, easily in-

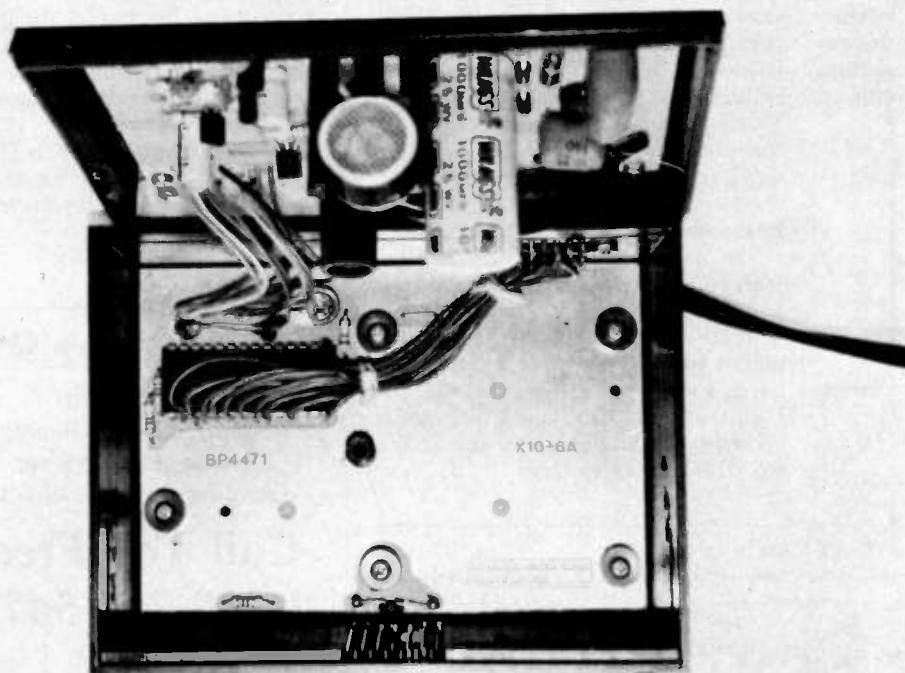
stalled, and as foolproof as possible. The sensors must be easily installed and repairable. They should sense breakage, smoke, fire, and when someone is about to enter a protected area. Warnings should be audible and visual. The system should have built-in self-

test features along with power-fail battery backup. And, as a final touch, it should have the capability of controlling lights or appliances.

To fulfill these requirements is no small task and is difficult without the use of some external intelligence. By now probably you have guessed that a microcomputer might be the intelligence. Well, it is, and the total cost of this system is well below that of most of today's allband transceivers. The system described here was developed on a Heath H8 with parallel I/O, but is easily adaptable to any system or single-board micro having an 8-bit parallel I/O port and about 8K of memory.

### System Planning

To find out the best way to protect yourself or your property, ask a burglar. The next best way is to ask the police. Since this system is to provide for fire and smoke detection also, a stop by the fire station for a few pointers would be advisable. With these ideas in mind, on to the planning.



*This photo shows the internal wiring of the Sears control unit. Be sure to route wiring as close to the circuit board as possible and away from the ac power wires.*

One of the best ways to plan and install a detection system is to draw a scale floor plan of the area to be protected. Figs. 1, 2, and 3 assume that it is a house that is to be protected. It is a good idea to show fire-/smoke-detector locations as well as alarm sensors. Divide the total area to be protected into smaller, well-defined zones, keeping in mind how sensor wires can be installed. Once one has a general idea of how the sensor installation might be done, the next step is to define system operating conditions.

The fire-/smoke-alarm section of the system should function even though the micro may have failed or is being used for other purposes. If ac power has failed, the automatic lighting will not function, but the alarm will since the system has battery backup. For safety reasons, the complete system (except for micro power) operates at +18 volts or less. All voltages are derived from the same source so that if the battery fails, no false alarm will sound. This may or may not be an advantage depending on system usage.

No system yet devised is completely foolproof. Several techniques are used in software (see Software Description) to avoid false alarms caused by spurious noise spikes, power outages, lightning strikes, and ham radio transmissions. Murphy's Law is still in effect, however.

One additional feature is a time-of-day clock. It is not listed under requirements because it applies only to the Heath H8 system. It is a software-generated clock and utilizes the H8 front panel for readout. This same function (minus the H8 front panel) is used for timing in the software (lines

200-245) to control the rest of the sequence. This clock function is derived from the internal tick counter of the computer and is described in the software section below. Along with the clock, facilities were built into the software to record when (time of day) an entry was made. An automatic self-test feature also was included.

### System Design

For purposes of system description and layout, the Fig. 4 block diagram is included to help avoid confusion. The system is divided into three basic parts. Part (C) is the H8-2 Heath I/O and is shown for clarity. Parts (A) and (B) can be combined into one unit or board even though they are shown as being separate. The reason for separation is that I chose to build two units using .1 X .1 inch, 22-pin, two-sided, plug-in vectorboards. Circuit-Stik copper strip and pads are used to mount components, and wire-wrap sockets are used for the IC sockets. The two boards are connected together by a 16-pin DIP jumper (U10).

Early in the design stage, a decision was made to allow for several types of simple sensors. The simplest of these is the open/closed circuit. A decision also was made to provide all signal conditioning and detector logic outside the computer enclosure. As a result, parts (A) and (B) are external to the computer and all inputs and outputs are external to the detector enclosure.

### Power Source

To overcome the power problem, a backup source of power is used. Fig. 5 is a block diagram of one method of doing this. This particular method is not as efficient as a more complex battery and regulator circuit, but it is simpler. Also

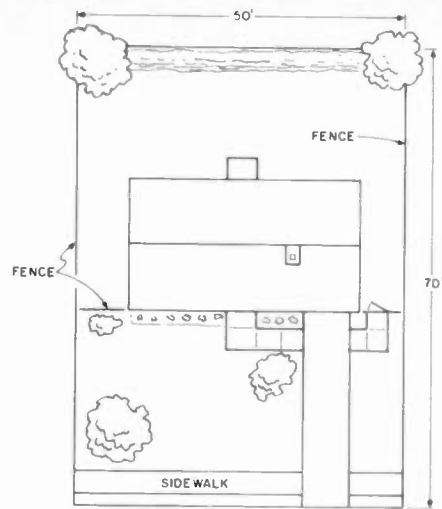


Fig. 1. Plat.

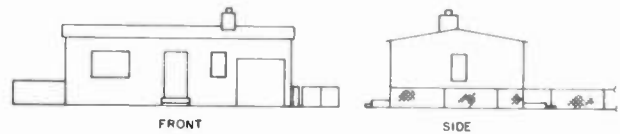


Fig. 2. Wall views.

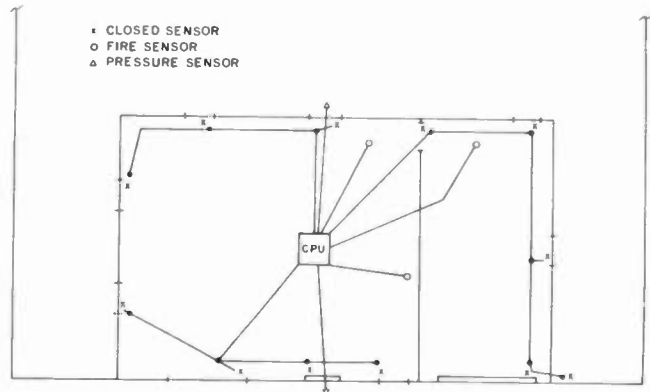


Fig. 3. Floor plan.

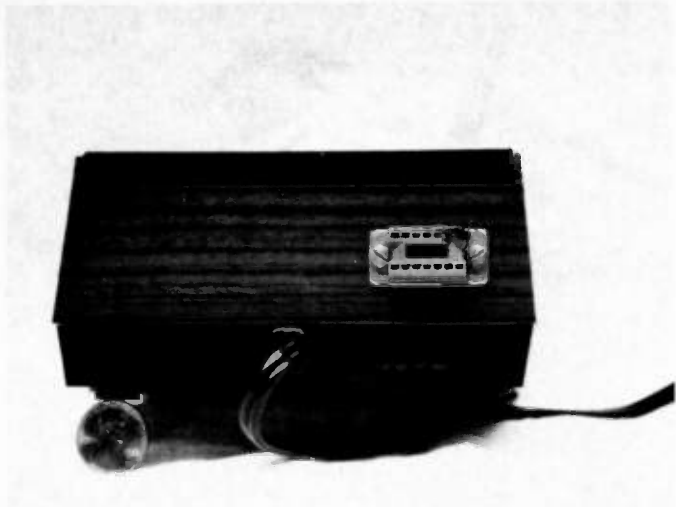
shown in Fig. 5 is the method of connecting both the charger and inverter to the battery. The inverter will run about ten hours on a fully-charged 12-volt automobile battery. The charger is set for 14 volts so that as soon as line power is restored, the battery is automatically recharged. Additional filtering was added to the charger to reduce the feedthrough ripple. A device called "Mayday," manufactured by Sun Technology, Inc., New Durham NH 03855, is purported to prevent loss of memory when brownouts or blackouts occur. In any case, a 200-Watt

power source will be sufficient for a fully-loaded H8.

### Sensors

All of the detector logic—part (A)—uses positive true logic, i.e., a 1, or high, level indicates a fault. Reverse logic can be used also and will be explained later. Both the burglar and/or fire alarms are designed to operate with positive or negative logic.

All sensors with the exception of the smoke alarms are made of small-gauge copper- or enamel-covered copper wire and are shown in Fig. 12. These are the least expensive and



This shows the position of the I/O connector on the Sears control unit.

easiest to install. No relays or magnets are used although they are easily substituted.

Fire detectors are manufactured from a short piece of rosin core (Multicore) .028" (.71mm) solder. This solder melts at approximately 450 to 550 degrees F. This is below the flash point of paper and is great around a fireplace or flue. The output from a standard smoke detector is used to trigger the fire-/smoke-alarm input. Most smoke alarms use a transistor to turn on the alarm device, so the sensor lines (input and ground of U8) are connected at the switching-transistor input. Some schematic checking may be required for your particular smoke alarm.

Two additional sensors are provided; these are pressure types. They are manufactured from two galvanized sheet-metal plates separated by a 4- or 6-mil plastic sheet. The plates are approximately 2 x 3 feet and are covered by indoor/outdoor carpet. The carpet is used partly for protection from rain and partly for concealment on an outside step.

#### Part (A)—Alarm Logic

The schematic diagram of Fig. 6 is the detection board. U1 and U8 along with signal conditioning form the inputs to the system. U1 is the burglar-alarm section and U8 is the fire-alarm section. R15 through R28 (10k) form pull-up levels for each input line.

Diodes CR1 through CR12 (10-V zeners) have two functions. The main function is to limit the positive input voltage via R1 through R12 (1k) to 10 volts. In normal operation, the input lines are shorted to ground through the sensor and go high only when the sensor is tripped. The second function of the diodes is to provide a method of checking operation of the system by software. U1 and U8 are CMOS non-inverting buffers. If it is desired to have a closure to ground when a sensor is tripped, U1 and/or U8 can be changed to a 4049B inverter. The diodes must be reversed along with ground and +5 volts on RL.

U2 and U3 form an 8-bit latch which stores whatever input changed. U4 is connected in parallel with U2 and U3 and is an 8-input NOR gate. No matter which input line goes high, the output of U4 (pin 13) goes low. This line is used to tell the computer I/O that valid data is ready to be sent. Pins 5 of U2 and U3 are tied together and to the SEND DATA line of the computer. The software will toggle this line several times to be sure that the data is constant and available for the correct length of time, thus preventing static discharges from triggering the alarm. These two lines form the major handshaking with the computer.

U9 is connected via the board interconnect, U10 to U16. The software randomly checks the system to determine if it is still functional. RL forces +5 volts on all inputs simultaneously and the computer reads the results. If the value read is not correct, a notice is printed out and the program continues. S1 is provided to allow a local check of the system. The software monitors this function and will inform the operator if all is well.

U5 and U6a form the code logic. The logic is nothing more than an eight-line-to-binary conversion. This method allows 16 input lines to use only four of the eight data-output lines to the computer. Data-output line D4 is used only to record the fact that a fire/smoke sensor was triggered and to turn on all lights. The alarm is set off without computer intervention.

U7 is used in the same manner as U4 except that its output drives the input of U6b which is used as an inverter. As in the case of U1, if an input to U8 should open, pin 13 of U6b would go high, indicating an alarm condition. Two additional lines into U7 are provided as shown in Fig. 6. They are used to connect to the smoke alarms. If they are not used, they should be grounded.

U13/U11 and U14/U12 form the pressure sensors.

U9 and Q1 form the self-

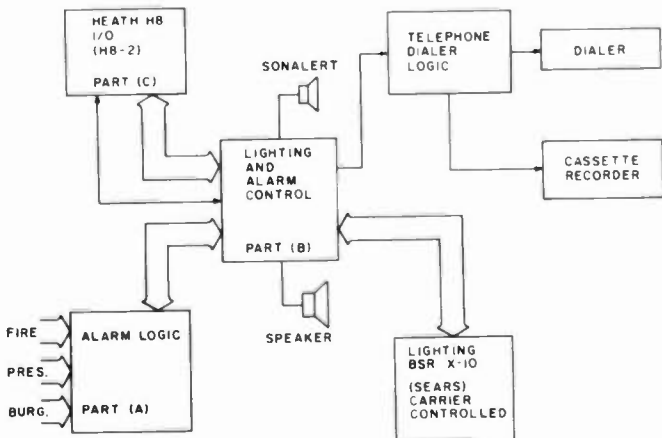


Fig. 4. Block diagram.

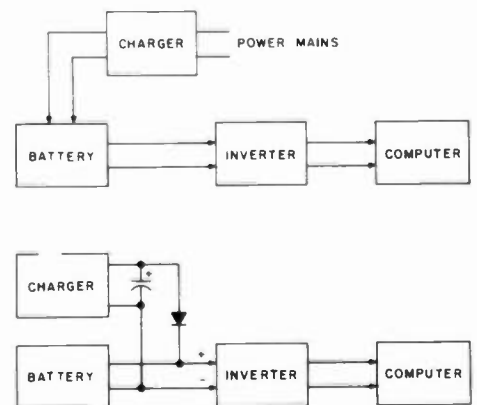


Fig. 5. Power source.

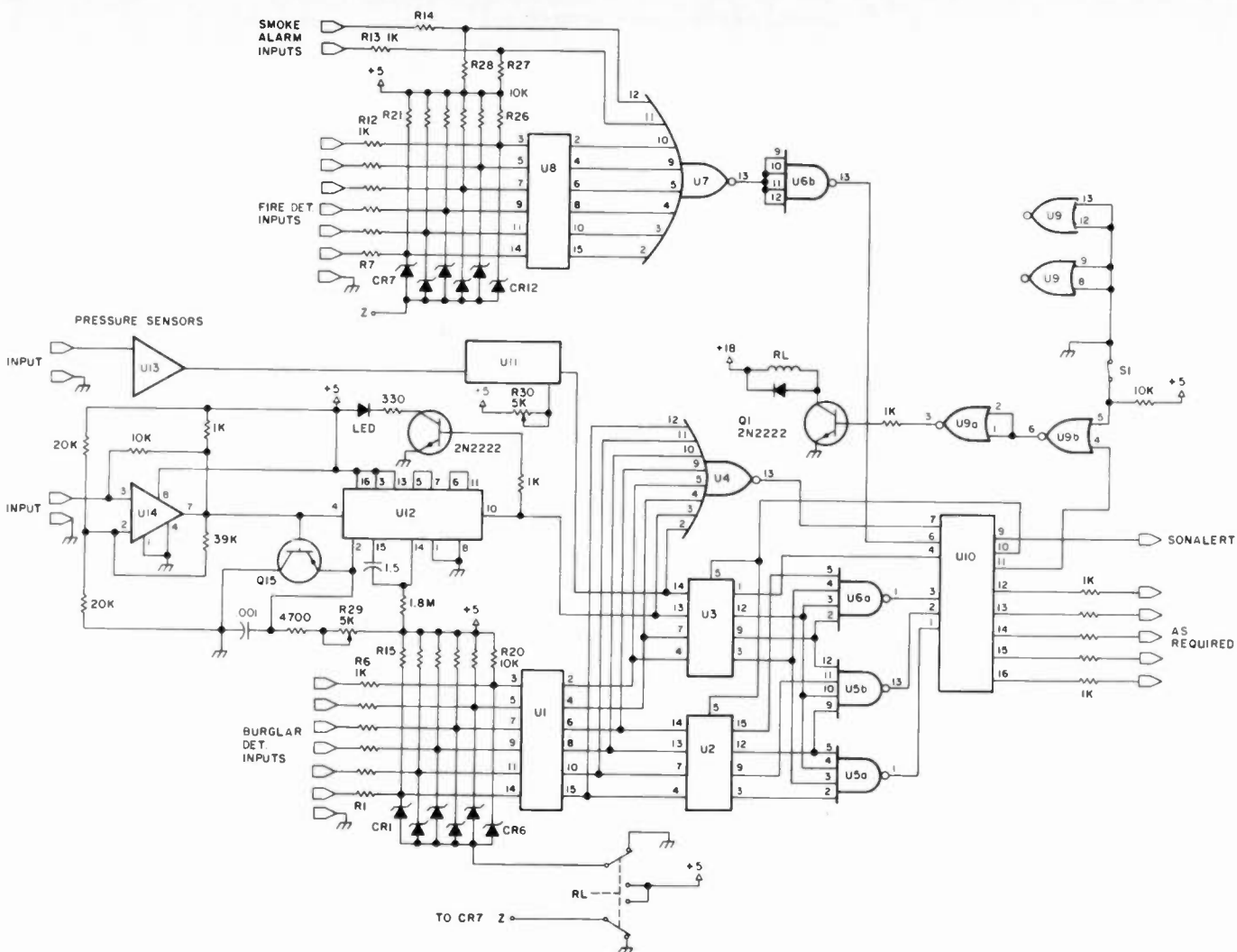


Fig. 6. Part (A), alarm logic.

Since the function of each is the same, only one set will be described. U14 is an LM311 that is connected as a multivibrator which runs at approximately 1 MHz with no input. When a fifty-foot length of Belden 8401 microphone cable and the two galvanized plates are attached, it runs at about 50 kHz. U12 is a CMOS dual one-shot. The first section along with Q15 forms a missing-pulse detector. When pressure (stepping on the plates) is applied to the plates, the frequency goes down and the one-shot times out and triggers the second section of U12. The second one-shot is retriggerable and the output goes high for approximately 3 seconds. The LED is used only for visual aid. R29 and R30 provide adjustment of

the missing-pulse detector to allow for various cable lengths and plate sizes. A fixed resistor in series with R29 and R30 provides additional range if required.

**Part (B)—Lighting and Alarm Control**

The Fig. 7, part (B), schematic is perhaps the heart of the system. The function of this part is to provide a path for data to and from the computer I/O. Handshaking information is passed through this card and onto the part (A) card. Incoming data from the part (A) card is passed through this card and into the computer I/O.

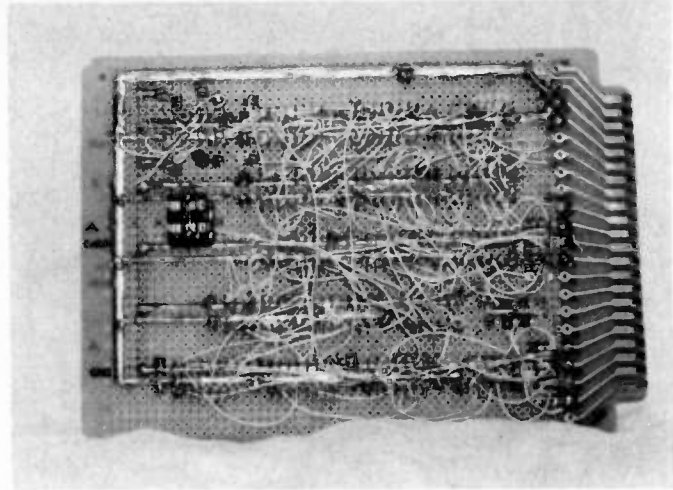
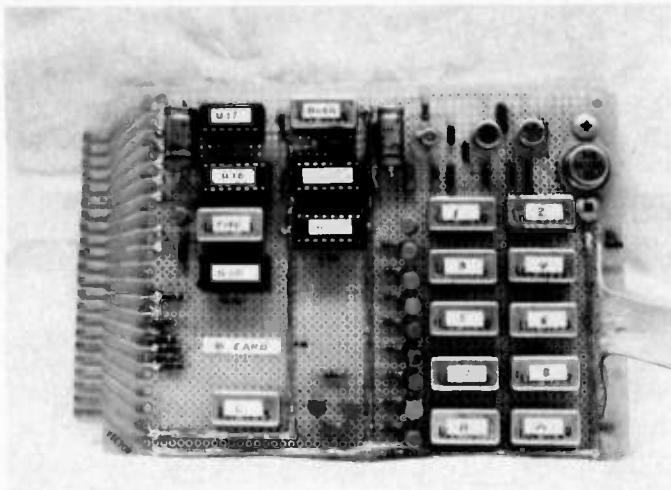
U15 and U16 form a 4-line-to-16-line decimal decoder. The output lines, 1 through 9, are connected directly to the inputs of

nine driver transistors (Q3 through Q13) which, in turn, are connected to relays labeled 1 through 8. Line 9 is connected to the same type of transistor driver/relay (Fig. 8) as well as to the fire-alarm circuit. The line-9 relay controls the external alarm simultaneously with the internal fire-alarm circuit. This combination alerts anyone inside or outside the house. The remaining lines from U16 are returned via the U10 interconnect to the part (A) board.

U18 is a two-bit decoder which is used in combination with U15 and U16. The output of U18 is connected to three driver transistors which, in turn, are connected to relays. These relays are labeled A, B, and C. These relays, along with

those labeled 1 through 8, are the control relays for the operation of one of the neatest devices to come along in a long time. This device is a BSR X-10 (Sears) carrier-controlled lighting system. This little gem will control home or office lighting or appliances with just a push of a button. It uses existing power wiring, is inexpensive, and provides an ideal solution to a complex problem. (It is beyond the scope of this article to describe the BSR X-10, but a good description of it can be found in the January, 1980, issue of *Byte*, "Computerize a Home.")

The BSR X-10 is modified slightly to allow the control lines to be brought out to the relays. Relays must be used to control the device because the control unit is



These photos show the front (left) and back (right) views of the "A" board. Note the use of "Circuit-Stik" copper strip for power and ground. The IC sockets are soldered to the copper strip to hold them in place before the wire-wrap is installed.

connected directly to the power line and is powered by -20 volts. Fig. 9 defines the pin numbers to be brought out and their functions. The method used to modify the BSR X-10 will be described later.

Q3 through Q14 are all 2N2222-type transistors, but they could be any NPN device. Power ratings are minimal because they are on for only about 35 ms. Relays are +12-volt SPST DIP types. RL must be a DPDT type as shown. Any small relay can be used.

### Alarms

Not counting lighting control, this system has only two alarms. The burglar alarm is a "warble" type

and will drive a 30- or 40-Watt speaker. The speaker is mounted in a weatherproof housing. The fire alarm is a Sonalert which is mounted directly on the hot air ducting of the furnace. The ducting makes a good sound pipe and the alarm is easily heard throughout a medium-sized building. Fig. 8 is the schematic of the warble alarm. It is a modified version of the one found in H.W. Sams' *Solid State Electronic Projects*, 1972, page 52.

### Telephone Dialer

An output for a telephone dialer (see Fig. 4) is included for special usage. This line is connected to a small amount of logic

which controls an autodialer. The dialer is sold by Radio Shack and is connected so that an audio cassette with prerecorded messages is played over the phone.

Care should be used when operating the dialer. Most states do not allow automatic dialers controlled by computers to dial police and fire services. A friend or relative would be a better choice. No circuit description is included here because of regulations that city, county, and telephone companies have instituted.

### BSR X-10 Modifications

The BSR X-10 is modified by first removing a single screw in the bottom of the

unit. It will come apart in two sections. The LSI chip and push-buttons are in the top section while the transmitter is in the bottom section. The push-buttons will not fall out since they are mounted on the reverse of the PC board. There is room on the top section to cut a hole large enough to install a 14-pin DIP socket. The pins of the socket are wired to the control pins of the LSI chip using small-gauge stranded wire soldered directly to the pin.

Fig. 9 defines the pins and their functions. It is necessary only to tack-solder this connection. The BSR X-10 will function manually as well as from computer control.

### Unused Outputs

Several spare outputs are provided for other devices. A word of caution when using these outputs: All are capable of driving one TTL load and it is advisable to include a 1k series resistor when using any of them for additional functions.

### Software Design—Overview

The major function of the software is to generate a clock for reference and to help control all other activities of the alarm system. The clock routine is a modified version of an H8 alarm-clock program written by

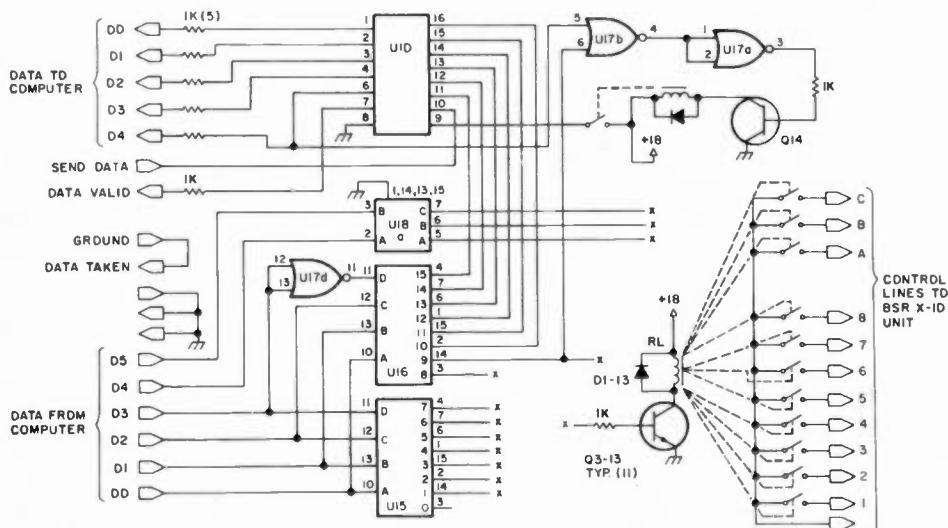
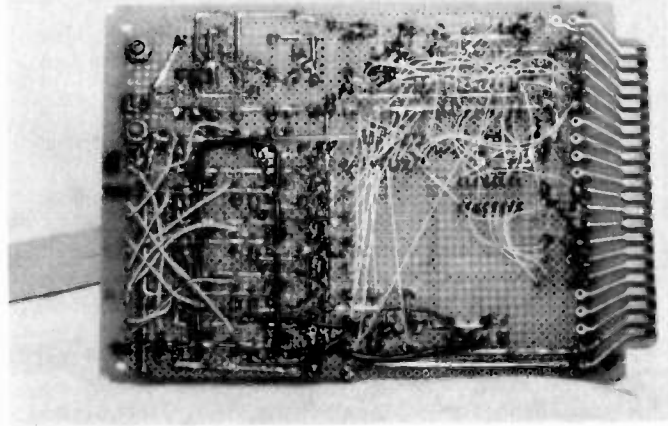
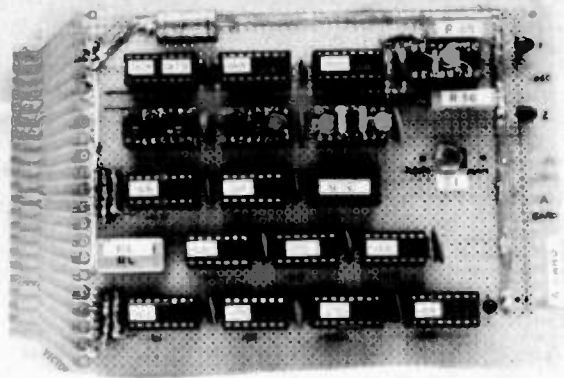


Fig. 7. Part (B), control.







These photos show the IC layout (left) and wire-wrap (right) of board "B". The same techniques are used on this board as were used on the "A" board. The relays are wired using copper strip since they are the PC variety. IC-type relays would use sockets and therefore could be wire-wrapped like the ICs.

(see box). It is written in BASIC, which is an advantage in that there are no speed requirements and modifica-

tions are easy to make. The only requirement is that any routine other than the time/tick-counter routine

(lines 200 to 260) must be executed in at least 500 ms. If the general format of the program is maintained, the clock accuracy will not be altered.

Several possibilities or methods could be used in the case of fire. It is assumed here that it is night and you are asleep. If a fire starts, the first thing that happens is that the fire alarm goes off. The next is

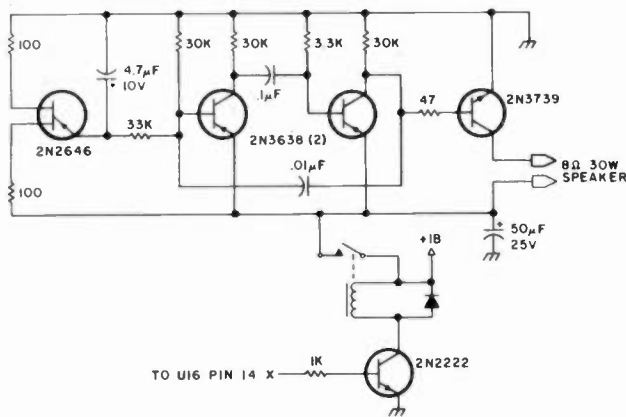


Fig. 8. Warble alarm.

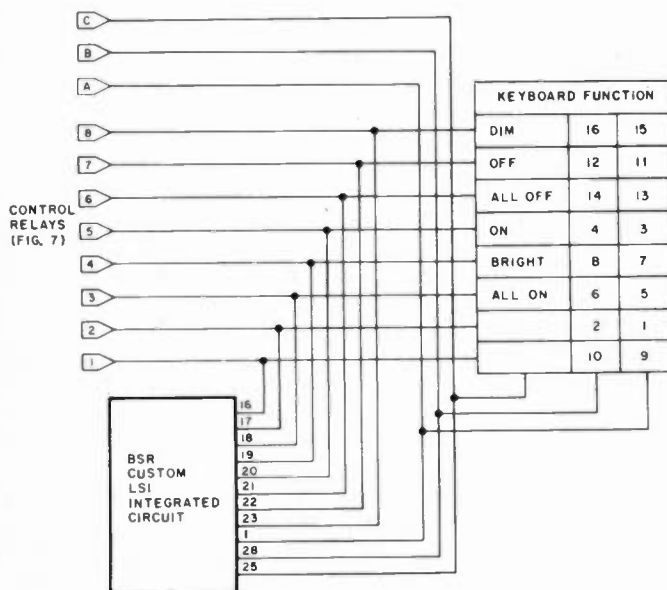


Fig. 9. BSR X-10 control.

#### SOFTWARE VARIABLES

- A Tick counter
- A(1) Preset light selection
- thru
- A(8)
- A9 Random number used to determine various selected functions
- B Hi-byte counter
- B1 False alarm counter (When count = 8, alarm is set off.)
- C Value read from I/O (alarm system)
- C1 Temporary variable used to turn lights off
- D Zone storage element
- D1 Hour storage
- D2 Minutes storage
- D3 Seconds storage
- D4 Days storage (24 max.)
- L Relay bounce timing
- P Temporary clock storage
- T1 Hours (front panel)
- T2 Minutes (front panel)
- T3 Seconds (front panel)
- T4 Days (internal counter)
- X Temporary clock storage
- Y9 Alarm check (1 = on, 0 = off)
- Z(1) Light check (1 = on, 0 = off)
- thru
- Z(8) (All random)
- Z(9) Front porch light status (1 = on, 0 = off)
- 0\$ Set spacing for titles
- K\$ Same
- X\$ Same
- T\$ Variable titles
- T1\$ Same
- T2\$ Same
- T3\$ Same

that the lights come on (smoke-filled room), then a call (if selected) is made for you.

In lines 100 through 135, the value of "C" is used to determine what will happen next. If the value of "C" equals 8, then the front-porch light is turned on, but only if it is after six in the evening. If the value of "C" is equal to 16, the fire alarm is set off. If the value is 23, then the self-check message is printed. Any value suitable to your system installation can be used here.

Lines 200 through 265 should not be changed unless you are familiar with the operation of the internal tick counter. A complete description of the clock routine can be found in the original article referred to earlier.

**Random Timing**

Line 520 plays an important part in determining when and if a light will be turned on. The object of this and the following lines is to make the house look lived in. A value for A9 of less than .001 will occur about 6 times in a 24-hour period. If a value less than .001 is generated, line 525 resets A9 to a random integer and then lines 600 through 616 provide the actual control. These values can be changed to suit individual living patterns.

Line 505 is the line that determines when the system will self-check. As now set, the system will check itself about 6 to 10 times a day. Line 585 does the actual checking via OUT 2,15.

Decimal Input	C	B	A	8	7	6	5	4	3	2	1	Binary Code	Function
0												000000	Normal state
17			X								X	010001	
18			X							X		010010	
19			X						X			010011	
20			X					X				010100	
21			X				X					010101	
22			X		X							010110	
23			X	X								010111	
24			X	X	X							011000	
33	X										X	100001	
34	X									X		100010	
35	X								X			100011	
36	X							X				100100	
37	X						X					100101	
38	X				X							100110	
39	X			X								100111	
40	X			X	X							101000	
49	X										X	110001	Not used
50	X									X		110010	Not used
51	X								X			110011	All on
52	X							X				110100	Bright
53	X					X						110101	On
54	X				X							110110	All off
55	X			X								110111	Off
56	X			X	X							111000	Dim

Fig. 11. BSR X-10 function chart.

**Control-B**

The function of the control-B is twofold. The first thing that happens is that the alarm is shut off. The next thing is that memory is searched for data. If no data is found, then line 1025 is printed. If some data is found, it is then read out via lines 1030 through 1045. It should be noted that some time will be lost when a control-B is used and there are several different items to list. This is a small problem because the services of the burglar alarm are usually over when this function is required.

Figs. 10 and 11 are the required input codes for the

various output functions. Fig. 10 shows the values of part (A), and Fig. 11 gives the values required to control the relays attached to the BSR X-10 control system.

**Sensor Installation**

Sensor installation will depend on several factors, including the types of materials used in the building. Fig. 12 gives examples of the major types of sensors used in this system. Installing the door sensor is about the easiest. Sensor contact

is made by attaching small wires to nails or screws which are mounted in the hinge side of the door jamb. A small metal plate attached by nails or two-sided tape is mounted on the door. When the door is closed, the plate shorts across the nail (screw) heads, closing the circuit. Wires from the nails (screws) are run along the floor, rug, or, if necessary, through a small hole drilled in the doorstop. Caulking and paint will easily cover this small wire on the outside of the building.

Decimal Input	U10 Interconnect Pin	Binary Code	Remarks
	16 15 14 13 12 11		
0		000000	Normal state
9		001001	Sounds alarm
10	HI	001010	
11	HI HI	001011	Phone dialer
12	HI HI HI	001100	
13	HI HI HI HI	001101	
14	HI HI HI HI HI	001110	
15	HI HI HI HI HI HI	001111	System test

Fig. 10. Control functions.

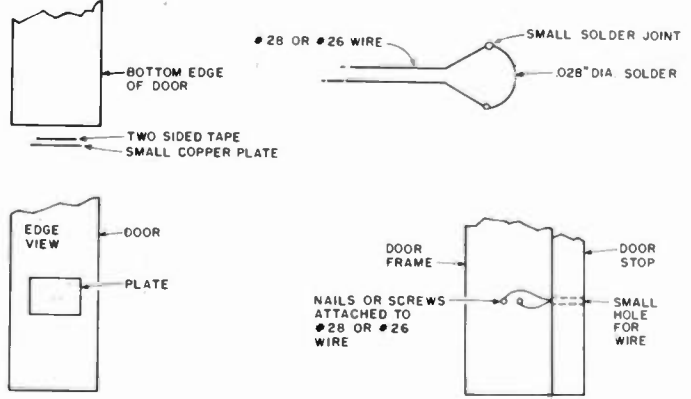


Fig. 12. Fire sensor design (upper right) and sensor-mounting tricks.

Aluminum frame windows and doors are the hardest to wire. If the window or door has an aluminum frame but a wood casing, the same method as used above can be used except that in this case the aluminum frame takes the place of the small plate. If both the frame and casing are aluminum, the best method seems to be mounting the screws on a small insulated block. Careful attention should be given to mounting so that an occasional open or always short circuit will not develop. Conductive tape can be used on windows if necessary. This tape is available from Radio Shack. In any case, use care to conceal the wire. A single wire can be used to loop around one side (zone) of the building with the return being brought directly back to the source (detector enclosure). The galvanized plates

are laid on a plastic mat to prevent current leakage through concrete or wet wood. The entire plate assembly is then covered with indoor/outdoor carpet. The carpet is glued down to prevent slippage.

### Summary

This alarm system has been in operation for about one year. Various forms and layouts have been used and as yet only two false alarms were sounded. Both of these were caused by poor solder joints. Power for this alarm is taken directly from the H8 +18- and +8-volt bus. Any source which will provide approximately 500 mA (alarm on) will work. The system is built with CMOS devices and requires less than 1 mA for normal operation.

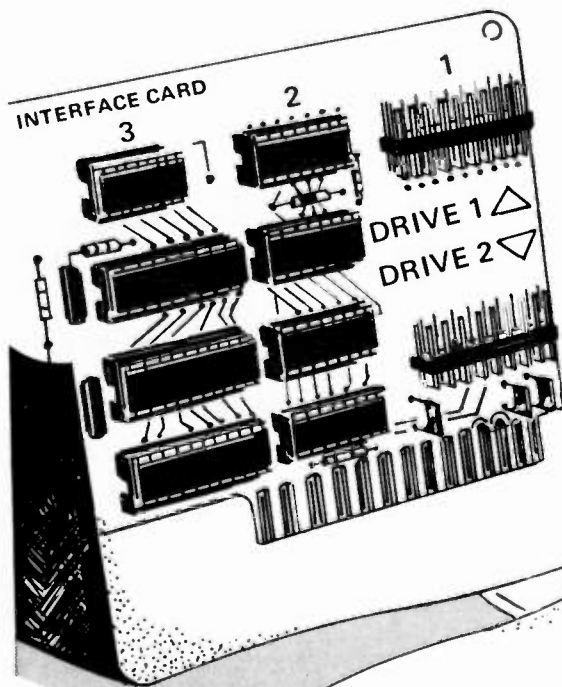
I hope you enjoy the same peace of mind that I do, should you try this system. ■

### Parts List

Qty.	Type	Used For	Remarks
<b>ICs</b>			
2	4050B	U1 and U8	
2	4042B	U2 and U3	Pin 6 and 8 to Vss
2	4078B	U4 and U7	
2	4068B	U5 and U6	
2	4001B	U9 and U17	Unused inputs to Vss
2	4028B	U15 and U16	1 4514B substitute
1	4555B	U18	Unused inputs to Vss
2	4098B	U11 and U12	
<b>Transistors</b>			
2	PNP	Q15 and Q16	Any PNP type for Q16; not shown in Fig. 6
13	NPN	Q1 through Q14	2N2222 or equivalent
<b>Opamps</b>			
2	LM311	U13 and U14	Voltage comparator
<b>Diodes</b>			
11	1N914	Voltage suppressors across relays	
12	10 V	CR1 through CR12 100-mW zeners	
<b>Relays</b>			
10	SPST	+ 12-volt DIP	
1	DPDT	+ 12-volt DIP	

### Miscellaneous

All resistors are 1/4 Watt. Capacitors are in uF and electrolytics are marked with a +. Circuit-Stik products are available in most parts houses or directly from Circuit-Stik, PO Box 3396, Torrance CA 90510. All components can be purchased from Godbout or James or from other advertisers in this magazine.



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- ... you're not a BIG GUN (yet)
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The Idiot's Guide pulls no punches and doesn't 'snow' you with nonessentials, but it does unlock some DXers' secrets; for example: How to QSL, What to say, Where to place your antenna, How much power to use, Whose awards can you get, Why and When to use SSB or CW, and much more. . . things that you need to know, and information that Honor Roll members had to learn the hard way.

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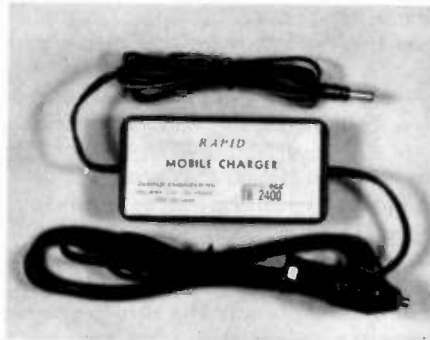
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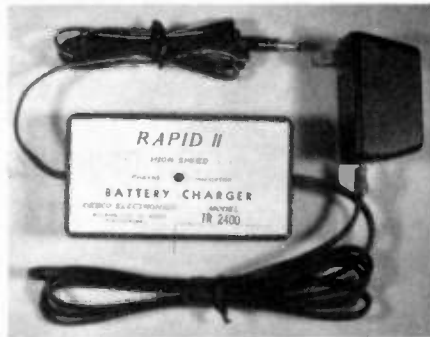
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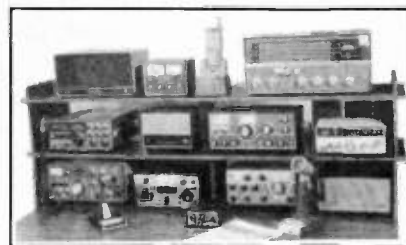
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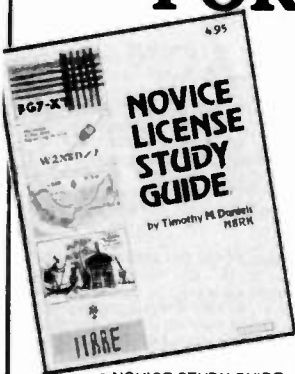
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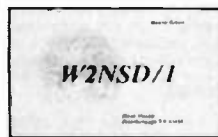
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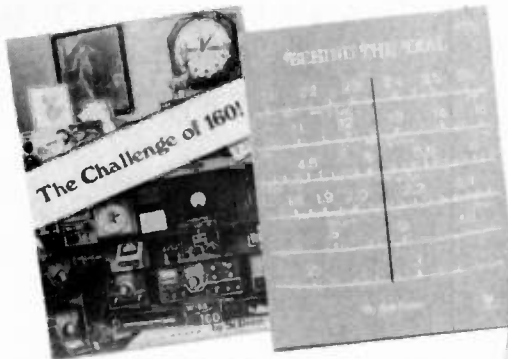
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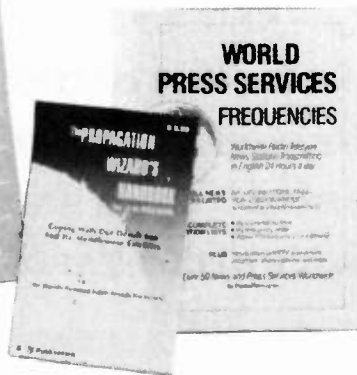
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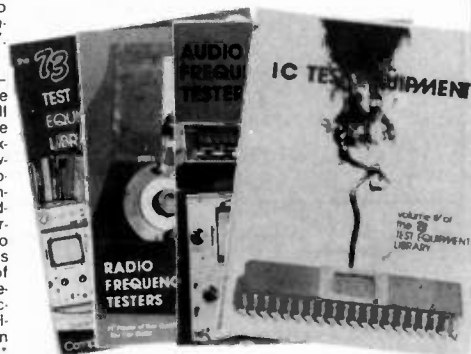
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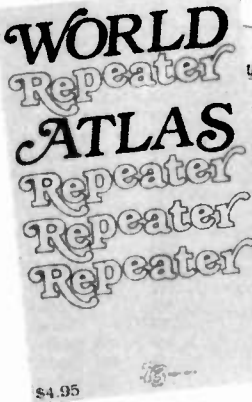
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# Diode Doctor

## — the P-N diagnoses

Paul M. Danzer N111  
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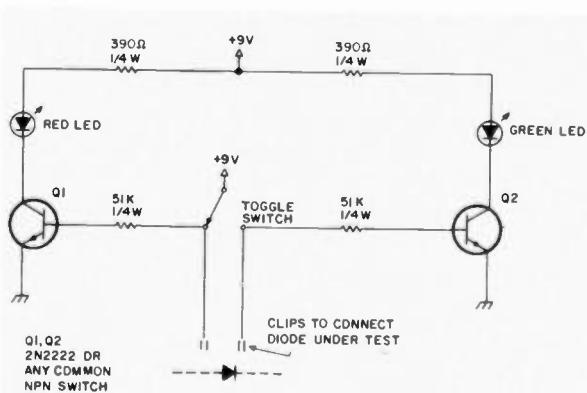


Fig. 1. Diode-tester schematic.

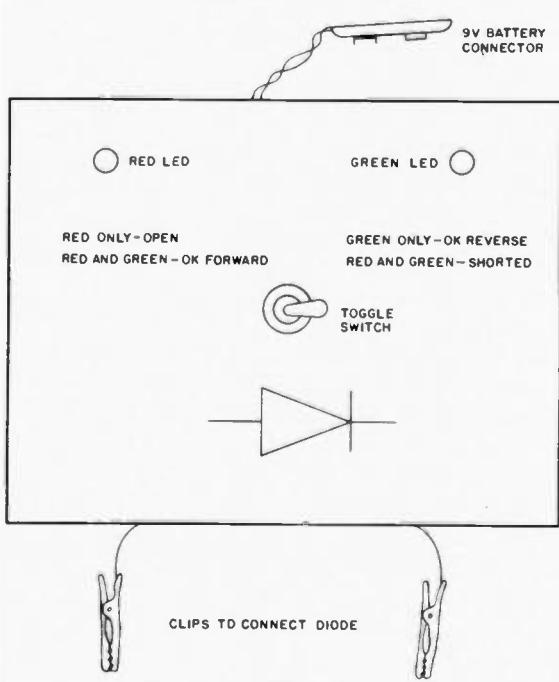


Fig. 2. Front-panel layout.

For many years I have used my ohmmeter to test diodes. The usual technique was to set the meter on  $R \times 10$ , fumble with the test leads to get a "low" reading (OK in the forward direction), reset the meter to  $R \times 100$  or  $R \times 1000$ , re-fumble to reverse the diode, and check for a "high" reading (OK in the reverse direction). Usually, around the second fumble I would lose track as to whether I actually reversed the diode and would have to fumble a few more times to recheck.

Recently, I purchased a bag of 100 untested switching diodes, and anticipating a long evening of lead switching, testing, and re-testing, I decided to build a simple diode tester. Construction time was about 15 minutes, a good investment if you occasionally or more than occasionally test diodes.

The circuit shown (Fig. 1) was built in a  $3" \times 4" \times 1"$  plastic box. Three holes are drilled: one for each LED and one for the toggle switch. The "instruction plate" was written on a self-stick label and mounted just above the switch. Two test leads with clips are brought out to connect with the diode as shown by the symbol drawn just below the switch. Fig. 2 shows the physical arrangement of the front panel.

A standard 9-volt battery connector is brought out the back to power the circuit. I recently have standardized all of my small test instruments on 9 volts and bring out the connectors. When I want to use an instrument, I simply connect a 9-volt battery, thus saving on power supplies and multiple batteries for instruments I only occasionally use.

Operation of the tester follows the "instruction plate." Connect the diode, throw the toggle switch to the left, and check that both the red and green LEDs are on. If only the red LED fires, the diode is open. Now throw the toggle to the right; only the green LED should be on. If both the red and green LEDs fire, the diode is shorted. Note: If the diode fails both tests, you probably have connected it backwards. Thus, the tester also can be used to find the polarity of unmarked diodes.

Caution: Many toggle switches connect the center terminal to the end terminal opposite the direction of the toggle handle. When the toggle handle is to the left, the center and right rear contact (as viewed from the front) are connected. Check yours out with an ohmmeter before wiring it in accordance with the schematic. ■

# In Profile: Lloyd and Iris Colvin, The DXpeditioners

**L**loyd and Iris Colvin are living a dream that all DX-oriented amateurs have envisioned at least once. It's a dream of unlimited travel toward receding horizons, of financial security and international celebrity status. It's a dream of going to the sun, setting up

a shack, and, for once, operating as the hunted rather than the hunter. It's a dream of being DX.

For the past 16 years, the Colvins have been on the move. The statistics listed on their Yasme Foundation QSL card tell the story: traveled to 142 countries,

worked over half the active amateurs in the world, achieved DXCC 56 times under various callsigns, received over 350,000 QSL cards, worked 354 countries, won 400 awards including the first *CQ Magazine* WPX Certificate.

Tanned and healthy, the Colvins approach retirement age with energy and enthusiasm instead of dread. Part of the reason is their lifestyle. Financially secure and unfettered by family or business constraints, they are free to roam the world together in an ongoing DX odyssey.

Under the auspices of a tax-exempt foundation called Yasme, they have made a career of amateur radio DXpeditioning. With an affinity for travel gained during a 23-year military career and a love of radio communications spawned in the early days of amateur radio, the Colvins are uniquely equipped to meet the demands of their gypsy lifestyle. Operating from seldom-heard coral atolls, newly-established African countries, or lavish Caribbean island playgrounds, the Colvins have long fascinated those less-fortunate souls on the opposite end of the circuit.

But what does it take to globe-trot constantly, to be without home and family much of the year? How is it

possible to be so dedicated to amateur radio that, no matter how unusual or exotic the locale, rarely a day goes by without time spent at mike or key?

And what of Yasme? Where does the family stop and the Foundation begin? How does this tax-exempt corporation function? Is it a building or a box in the Castro Valley, California, post office? How are the donations used and what degree of financial support does Yasme sponsorship entail?

These questions are just a few of many asked during an afternoon spent with Lloyd and Iris Colvin—the DXpeditioners.

*73: Lloyd, what is Yasme all about?*

*Lloyd: Actually, it all started in 1954. A young fellow named Danny Weil built a 19-foot boat with his own two hands. Danny was an Englishman, and he hoped to sail around the world in the little boat that he had built.*

When he got to the US Virgin Islands, he met Dick Spenceley KV4AA. Dick said to Danny, "Why don't you become a radio ham? Then, as you go around the world, people who enjoy speaking with exotic countries would have the chance to do so. They might even help you financially in pursuing your trip around the world."



Lloyd Colvin.

73: So Danny Weil wasn't licensed when he began the trip?

Lloyd: No. He was not a radio ham and he didn't know the code. But Danny accomplished something about only one man in 100,000 could. He learned the code, got his license, and was on the air working pileups at 20 words per minute within one month after starting from scratch. He then proceeded to go out to many exotic places with a rig and give many people new countries.

Well, Danny never quite made it around the world, but he did sail over 25,000 miles. His boat was called Yasme—that's a Japanese word meaning "good luck."

In 1961, the Yasme Foundation was formed. Its main goal was the collection of money to keep Danny going. This worked out well until 1964, when Danny met a young lady on one of his stops and they got married. They went out on a few more voyages together and almost lost their lives in mishaps at sea.

There were five Yasme boats from the beginning of Danny's odyssey to the end. All now rest on the ocean floor.

73: Is Danny Weil still alive?

Lloyd: Yes, he's still alive. He is living in Texas now and he's about fifty years of age. He gets on CW frequently, but he does not hold a call of his own in the US.

73: So, in 1964 the Yasme DXpedition torch was passed to you?

Iris: Yes. We had always thought about going out on a DXpedition, and in 1964 I said to Lloyd, "Why don't we go?" We contacted Yasme because we knew it was still active, although no one was out at the time. We asked if they'd sponsor us, and they said yes.

73: What did Yasme sponsorship entail?

Iris: They had no money in the Foundation at that time, but we paid our own way, anyhow, so it didn't matter. They provide a big service for us in the way of QSLs. The donations they receive help with that. They also helped with licensing in countries where we had trouble.

73: So you're operating as independent hams under the umbrella of the Yasme organization?

Iris: Yes, that would describe it well.

73: Are there other people in the same situation in Yasme or are you two the only active DXpeditioners?

Lloyd: There have been others in the past. One of the most noteworthy is George Mc Kercher W0MLY. He is now a director of Yasme. He made a Yasme-sponsored trip to many of the countries of Africa in the 60s. There have been a couple of other people who have gone out under the sponsorship of Yasme, also.

We are finally approaching the activity of Danny Weil. He was out continuously for nine years, you know. We have been out actively from 1965... 16 years in all. We frequently take a few months off and go back to California for a rest. We still have a business there that we're connected with.

73: I see. Is Yasme headquartered in California?

Lloyd: It is, but it is incorporated as a nonprofit corporation in Florida.

73: Does Yasme have an office and phone, or is it just a mail drop?

Lloyd: Well, for nearly 16 years now we have had the same PO Box—2025, Castro Valley, California—that's been a help because people always know that they can get a card from us at that address.

73: So, no full-time, paid office staff?

Lloyd: No.



Iris Colvin.

73: You must receive thousands of QSLs each month. How and by whom are they handled?

Lloyd: We have had a number of Yasme people who have helped with the QSLs.

Today, Iris and I have the largest QSL collection in the world. I don't think there is anyone else who has more cards than we do. All of them are arranged in alphabetical order and stored in a huge metal cabinet. Our files number in excess of a third of a million cards at present.

73: That's amazing!

Lloyd: There are some other amazing statistics about our QSL collection. For one, the weight. We're a little worried about the structure of our home which, incidentally, we built. It was designed to carry a good load, but the QSLs we have amassed weigh over a ton!

Also, putting this collection in the state it's in now has taken lots of work. For example, if it takes a minute and a half to answer a card, file it, etc., when we receive one, it would take one person working forty hours a week three years just to file the cards we have received to date.

73: How do you confirm a contact for a new country? Do you check back against the log?

Lloyd: Yes, we do. We use a log system that Yasme has

used ever since we've been connected with it. We can thank the infamous Mr. Don Miller W9WNV for designing it. In fact, he gave us the first copy of the log we use. It's a good system and we have used it for as long as we've been operating.

It consists of a small form with attached carbon, about five by seven inches in size. Each sheet holds 100 entries and when a sheet is full, we send the carbon to Yasme for filing and verification.

73: And the folks at Yasme verify the contact and then QSL?

Lloyd: Yes, and Yasme has had over 100 people help with this over the years.

73: Are all these people volunteers, or are they paid?

Lloyd: They are all volunteers. Nobody gets a cent. Nobody has ever received any money in the headquarters of Yasme, either. Right now, we have one lady who is single-handedly answering all of our cards. She is Carolyn Brand WA6AKK.

#### SOME OF THE COLVIN CALLS

W6KG (Lloyd)—W6QL (Iris)—  
FA8JD—J2AIH—J2USA—  
DL4ZC—KG6SV—KC6SZ—  
VR1Z—GD5ACH—ZB2AX—  
GC5ACI—CT3AU—CT2YA—  
6W8CD—5T5KG—ZD3I—  
9L1KG—5L2KG—9G1KG—  
TU2CA—5V1KG—TY2KG—  
VR8B—3D2KG—C21NI—  
FK0KG—YJ8KG—ZF2CI—  
W6KG/—AJ3/TI5/6Y5/NP2A

We've just returned from four months of operating during which time we made over 55,000 contacts. This poor lady is receiving over 25,000 QSLs from that trip alone.

*Iris:* Lloyd, we should also give credit to W6RGC—Bob Vallio. He was our first secretary and he did all of our cards in years gone by.

*73:* How did you folks acquire the DXpedition lifestyle, the constant going?

*Lloyd:* We started our world travels while I was in the service. I've had one career in the military and a second afterwards. I was in the Army Signal Corps before World War II. I was a radio ham when I was 12 years old and have been one for 52 years now. Iris became a ham as soon as we got married, so she's been a ham for 37 years.

Actually, I got into the Signal Corps through ham radio. In fact, almost everything we've done in our lives has been directly connected with ham radio. I guess I found my military life interesting because much of it was similar to running ham stations.

*73:* And I imagine you did a fair amount of traveling during your military years?

*Lloyd:* That got us started traveling, yes. We've now been to 142 countries, and about half of those were visited while I was in the military service. I spent 23 years in the military and retired in 1961 with the rank of Lieutenant Colonel.

*73:* How did you get into DXpeditioning?

*Iris:* When we decided to go on our first DXpedition, in 1965, we sold our house, closed out the five construction contracts we had going, advertised for and found a good home for our dog, and then left. Our intention was to go out indefinitely.

Well, after three and a half years we got tired and went back to California for a rest.

Now we have a different house; it's a place we can go back to as a home base and it even has a permanent amateur radio station.

*73:* You said that you had a business in California. What type of business is it that allows you to be away so much?

*Lloyd:* Well, when I left the military, we went immediately into the construction business. We started out building homes and then went on to larger projects like apartment houses, hospitals, and office buildings. Today, I'm the president of Drake Builders of California and Iris is the vice president.

**“Almost everything we've done in our lives has been directly connected with ham radio.”**

*73:* I see. Since you're away so much, I imagine you must have a reliable manager working for you.

*Iris:* We're no longer in the construction business. Today we own several apartment buildings which require occasional looking after but not daily attention. My daughter and her husband look after the day-to-day cares of the business. In fact, she's a ham, or was. Her call was W4ZEW, but it has expired. It hasn't been reissued though, so maybe she could get it back.

*73:* Ham radio seems like the ideal way for her to keep in touch with you when you are in hard-to-reach places, places, say... like China. I assume you folks are interested in China?

*Iris:* Yes. We've been working on it, but we don't know how to break the permission barrier.

*73:* Have you personally made any overtures to the Chinese government?

*Lloyd:* Yes. In fact, we had a rather interesting experi-

ence while making an effort to gain permission to go.

Back in the last days of the Nixon administration, I read that Secretary of State Kissinger was going to China. I sat down and wrote a letter, giving him the full story on ham radio. I told him that Iris and I would dearly like to go to China and asked him to please do something to help us get into Red China with an amateur station.

We never knew for sure whether he read our letter, but eventually we got a letter from a fellow in the State Department saying that Secretary Kissinger had directed him to respond to

us. He provided us with the names and addresses of the four Chinese that they thought were most likely to be in a position to help us.

We wrote to these four people and after many months received an answer from one of them. It was a very short letter, written in Chinese, about a third of a page long.

Not being able to read Chinese, we assumed that it said no, simply because of its length. We took it to an interpreter and, after it was translated, the third of a page became two full pages. One Chinese character can have the same meaning as a full English sentence.

It was a rather interesting answer, and it went something like this: It said that our letter had been received, and they wished to tell us that when our country saw fit to fulfill all the promises made by President Nixon on his recent trip to China, it was possible that favorable action would be taken on our request to operate.

*73:* We know what happened to Mr. Nixon after that. How do you assess the political situation there today? Do you sense an easing of tensions?

*Lloyd:* Right now, the Chinese are operating low-powered transmitters in the 80-meter band, so they know what ham radio is. Though they are not permitted to contact the outside world yet, it is my opinion that the day is coming.

*73:* Do we need some ping-pong diplomacy in ham radio?

*Lloyd:* Yes. I think a group of hams going over there the way the ping-pong people did could make great strides in furthering the amateur cause.

*Iris:* The Chinese don't seem to want their people to contact the outside world. That's the stumbling block. If there were some way we could overcome that... we might get somewhere. Right now, they are just afraid to have their people have any contact with the rest of the world.

*73:* In all such matters I imagine you've got to be part politician to make any progress. You both must be quite adept at working your way through bureaucracies after all your dealings with foreign governments.

*Iris:* That's one thing that you've got to do. I remember an instance in Africa back in 1971 when many of the countries were being formed. In one place we visited, we felt that they were willing to let us operate but we sensed that there was another problem.

They simply didn't know how to go about granting an amateur license. They had never had to do it before, having had no amateur service of their own. They didn't even know what a ham license should look like.

We told them that we had licenses from many

other countries that we'd be happy to let them inspect. We did so, and the next day were granted a license that looked much like some of the ones we had left with them.

*Lloyd:* We sensed that they didn't know how to issue a ham license but we couldn't just say, "Hey, don't you guys even know how to issue an amateur license?" Instead, we said, "Why don't we leave these other licenses with you overnight?" When we finally got our license we saw that they had copied almost word for word from our other licenses. Diplomatically speaking, we came in the back door.

*73:* It's hard to envision a country without an amateur service, but I suppose they exist, don't they?

*Iris:* They do, and it's a problem for them to issue licenses to people like us.

*73:* I'm curious about the scenario of a Colvin DXpedition. What happens when you arrive at a new place? Do you have a tech crew that gets everything up and running for you?

*Iris:* Sometimes yes, sometimes no. One of the things that we do differently than some smaller operations is that we take a full kilowatt station and a directional antenna along wherever we go. We take a three-element beam, a rotator, a linear, and a transceiver. The whole package weighs about 400 pounds.

It's been a lot of trouble to carry around, and a big expense, too. But, as a result, wherever we have gone we have put out a very good signal and given anybody who wants to work us the opportunity. That's our criterion of operation and that's what we've been doing.

*73:* Do you ship all this gear ahead or do you travel with it?

*Lloyd:* We have tried many different ways of doing it.

When we can, we ship it ahead, but that isn't always possible. When we put the new country of Tuvalu Island on the air under the call of VR8B, we shipped the gear ahead and, fortunately, it was there when we arrived.

*Iris:* We prefer to take the gear with us instead of shipping it; that's the ideal way. On the other hand, if you don't have a license when you go in, you may have a problem getting it through customs.

*Lloyd:* In that connection, we have changed some of our ways of carrying gear. During the first ten years of our operation, we always

**"We've been forced into being the good guys by Don Miller."**

carried it in the manufacturer's packing material—bulky boxes, Styrofoam® packing, etc.

About two years ago, we found a better way to move the main part of our station. Now, I take the transceiver aboard the plane as carry-on baggage. I don't wrap it up at all, so everyone can see what it is. Iris does the same with the linear.

There are some real advantages to this. First, nobody can ever accuse us of sneaking anything into a country because the gear is right out where everyone can see it. Second, all the large, bulky packing material is eliminated. And most important of all, the gear doesn't get lost. Our personal bags and clothes may, but even if they do, we still have the ham station and, to me, that's most important. You can operate in your underwear, but you can't operate without the rig!

*Iris:* The hippies have helped us out in this regard.

*73:* The hippies?

*Iris:* Yes. It's the "in thing" today to carry one of those

great big radios around with music blaring. In the streets of San Francisco these days, there are so many that they interfere with each other. As a result, we have had very little trouble carrying our transceiver around. Everyone assumes it's a radio.

*73:* Speaking of equipment, what type of gear are you using?

*Lloyd:* We use an old Heath SB-230 linear that weighs 30 pounds. With all the advanced technology we have today, we still can't find anything that will run a kilowatt and weighs 30 pounds.

When we started, years ago, we were using a Collins. Later we switched to

Kenwood, and today we are using a Yaesu. All these rigs worked very well for us, especially when you consider that we have had something in the neighborhood of 400,000 QSOs, all with very little technical trouble. We really take our hats off to the manufacturers.

*73:* Lately, many DXpeditioners seem to be having a large number of power-line-related problems. On your trips, do you take any precautions to limit power-line variations?

*Lloyd:* No. In fact, we're astounded at how well the equipment we've used has held up under considerable variations of input power.

On our very first trip, we took a Variac with us. Soon thereafter, we eliminated it because we found that the commercial equipment we were using worked well with a variation of input voltages in excess of 15 percent. We don't carry a Variac with us now or take any special measures to protect the rigs.

Everywhere we go we are looking for new, lightweight equipment—anything to

improve our ability to carry a station with us. Some of the advances have not been as great as we'd have liked.

For example, we are still using the same antenna that we carried with us 15 years ago because we can't find one that is smaller or better. When an antenna comes along that is lighter and better than the Hy-Gain TH-3, we'll buy it immediately!

*73:* I've always been mystified by the DXpedition that goes to an exotic place, whose members then lock themselves in a room with a rig for a week. They see very little, if anything, of the country. When you are on a DXpedition, do you get around the country and meet the people?

*Iris:* We sure do. That's the reason that we usually try to stay at least a month in a place. It gives us an opportunity to rent a house or apartment and get out and around. We more or less live with the people wherever we go.

We do like to contact as many people as possible and, in a month's time, most of those who wish to, contact us. We still have time for sightseeing, though, even when we operate 12 hours a day.

*Lloyd:* And, when we've left a country, our memories are of the people we've met there, not of the actual on-the-air operation. When we look back on it afterwards, it's the people we've met that seem to be the outstanding thing about the visit.

*73:* You two have been referred to as the premier ambassadors of amateur radio. How do you feel about that?

*Lloyd:* Well, we have been forced into being the good guys by Don Miller. When he was out he frequently ran into trouble with both the local authorities and his fellow hams. He was occasionally not licensed for, or even located in, some of

# There has never been a better time to subscribe to 73. Ever.

See page 147

the places he claimed to operate from.

We once spent two and a half months in a rare country, with our gear, and couldn't get a license. In spite of that, we never fell for the temptation of getting on the air illegally. We've always had legitimate licenses on all our trips. We also have made it a special point not to commit any type of minor crime in any country we visit, such as operating without proper permission or not paying all our bills.

*73: I imagine it's hard to keep up with all the different rules of these countries with regard to frequencies available.*

*Lloyd: It's not so much keeping up but rather dealing with the annoyance of being in a country where you can't operate on a frequency that you did the previous month in another country. For instance, there*

are some countries now that allow their amateurs only a 100-kHz segment of 80 meters. During our operations, it is a great temptation to try to go where the Americans are operating on 80 meters, but often we are unable to do this—and we don't.

*73: Strictly by the rules then?*

*Lloyd: Only where the local government says you're supposed to operate, yes.*

*73: I'd like to hear your views on the bogus DX QSL card incident. Dave Gardner's claim that the scam was merely an effort to demonstrate to the ARRL the shortcomings of its own DXCC program met with little sympathy in most circles.*

*Lloyd: I have no sympathy for him, I'll tell you that.*

*73: Were you at the 1980 Fresno DX Convention where the plot was supposedly hatched in a secret meeting?*

*Lloyd: I was at the Fresno convention, but I heard nothing about a secret meeting, much less bogus QSL operation. If I had, I'd have probably gone to the League myself. What Dr. Dave Gardner did was just plain cheating, and you can quote me on that.*

*73: In a statement to HR Report, Gardner implied that a large number of DXers and DXpeditioners were involved. Do you think this is the case?*

*Lloyd: I doubt it. I think this was his idea and his operation. The sad thing is that as a result of all of this, people are going to lose faith in DXing and also in amateur radio. The impact of this will be terrible for amateur radio.*

*73: How do you feel about the no-code license?*

*Lloyd: We are not in favor of it. It seems to me that we must not lower the standards of amateur radio to those of CB. We have a little something special with the code requirement. Though many say CW is a thing of the past and we don't need it, it never seems to disappear completely.*

*73: Do you feel that in this era of liberalization it is difficult to maintain standards in amateur radio?*

*Lloyd: To a degree. However, I don't go along with those who say that the con-*

ditions on the bands today are worse than in years gone by. As I look back at my early days in the hobby, and I started in 1929, I'd have to say that it was just as bad or worse back then. People have just forgotten.

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*73: So, as you look down the road, you see more of the same: the travel, the DX operations, the going?*

*Lloyd: That's right, yes. ■*

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**"We must not lower the standards of amateur radio."**

ditions on the bands today are worse than in years gone by. As I look back at my early days in the hobby, and I started in 1929, I'd have to say that it was just as bad or worse back then. People have just forgotten.

In 1929, when two people in the same city got on the air they QRMed each other so badly that neither could hear anything, even if they were on opposite ends of

everyone we meet that we hope to operate from every country in the world. We know this is an impossibility, but it is a goal that we can keep in front of us—something to make life and ham radio more exciting.

*73: So, as you look down the road, you see more of the same: the travel, the DX operations, the going?*

*Lloyd: That's right, yes. ■*



# Ringo Ranger Redux

## — add those radials for better performance

After reading the very excellent article by Robert Glorioso W1IS in the May issue of 73, and having a Ringo Ranger, my interest was stimulated to experiment with adding ground-plane radials.

I cut six pieces of aluminum wire to lengths of 20 inches (50.8 cm). As an aid

to spacing them around the base mounting of the antenna equally, I placed a strip of 1" masking tape around the base, brought the ends together, and marked them as shown in Fig. 1(a).

Using a marking pencil, I made a line to indicate where one radial was to be placed. Removing the tape,

I then made lines equally subdividing the distance between the two original marks—see Fig. 1(b). The marked tape was then placed on the base mount of the antenna as shown in Photo A.

Next, I placed a 2" hose clamp above the marked tape, but did not tighten it. I slid the aluminum rods under it one by one at the marks, holding each in

place with a piece of masking tape. When all six rods were in place and aligned, I secured them by tightening the hose clamp, as shown in Photo B.

Using the handle of an adjustable square which had a designed angle of 45°, I bent each rod to a 45° angle as shown in Photo C.

My findings on adding radials to the Ringo Ranger were the same as those of W1IS. There is an improvement in received signals from repeaters and considerable improvement when working simplex. ■

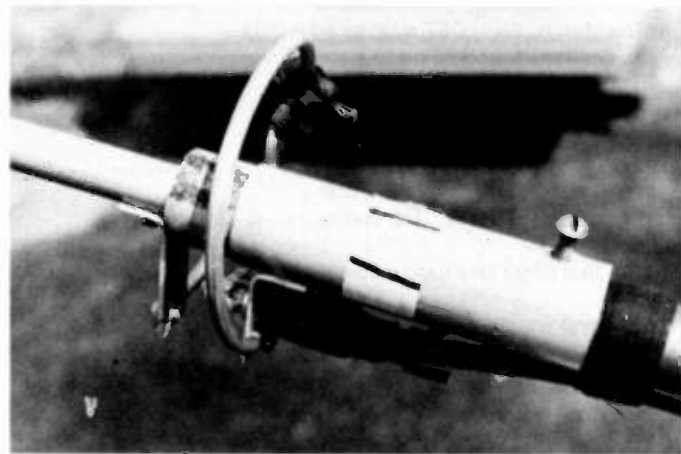


Photo A.

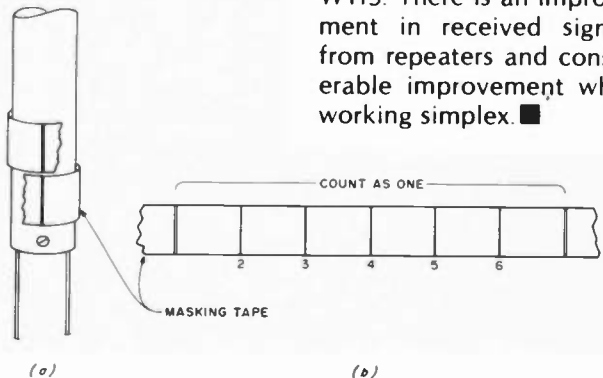


Fig. 1.

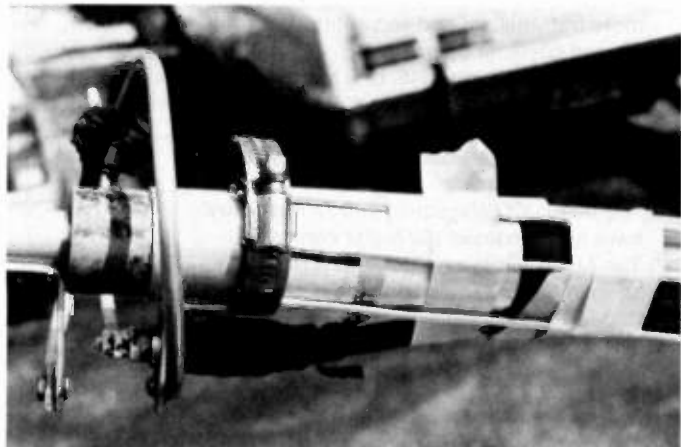


Photo B.

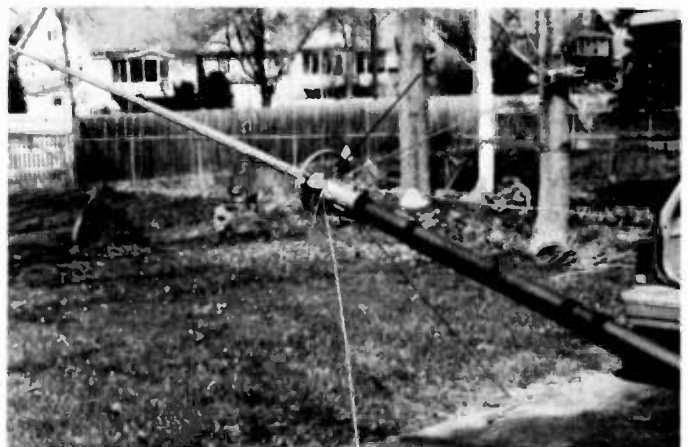


Photo C.

# FUN!



John Edwards KI2U  
78-56 86th Street  
Glendale NY 11385

## CONTESTING

Ahhh, the weekend. Two solid days to ignore work and tune the airwaves. What? The XYL has chores? Too bad. Today's the day to have some long anticipated rag-chews. Anyway, it looks like rain.

But one flick of the power switch finishes all those pleasant thoughts. No rag-chews today—it's *another contest weekend!* A spectrum full of anxious amateurs, eager to give anything that talks a 59 signal report.

Not since the incentive licensing debacle have feelings run so high. Contesting is one of those searing issues that immediately crystalizes amateur radio into two opposing camps. The only middle ground is here, in FUN!, where both lovers and haters can prove their contesting knowledge.

### ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

#### Across

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| 1) Contest bonuses               | 34) Popular antenna               |
| 7) Unhardy contester             | 17) Night (abbr.)                 |
| 10) 1970s U.S. prefix            | 18) Civil defense (abbr.)         |
| 11) Popular contest starting day | 20) Call-oriented test (2 words)  |
| 12) Pacific prefix               | 21) Preliminary result: ___ score |

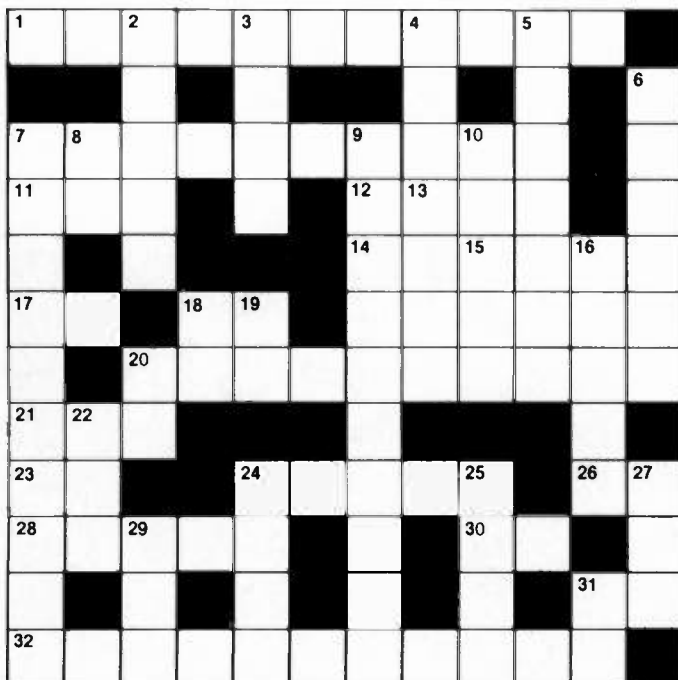


Illustration 1.

- |                              |  |
|------------------------------|--|
| 23) Guatemala prefix         | 7) Informal contests (2 words)               |
| 24) Twice-worked stations    | 8) A Soviet prefix                           |
| 26) Soviet satellite (abbr.) | 9) Summer contest                            |
| 28) Between nations          | 13) CW chuckle                               |
| 30) Home power type          | 15) Gone to ruin                             |
| 31) HF wavelength (abbr.)    | 16) Mr. Last Place                           |
| 32) November contest         | 18) Bolivia prefix                           |
|                              | 19) ARRL contest                             |
|                              | 20) CQ contest (abbr.)                       |
|                              | 22) Repeat (abbr.)                           |
|                              | 24) To fall in standing                      |
|                              | 25) Contesters can't wait to hit this at end |
|                              | 27) ___ up first place                       |
|                              | 29) Two winners                              |
|                              | 31) 32 across (abbr.)                        |

#### Down

- |                                  |  |
|----------------------------------|--|
| 2) The non-initiated             | 7) Informal contests (2 words)               |
| 3) Infinitesimal                 | 8) A Soviet prefix                           |
| 4) Identification (abbr.)        | 9) Summer contest                            |
| 5) Electromagnetic communication | 13) CW chuckle                               |
| 6) System of communication       | 15) Gone to ruin                             |
|                                  | 16) Mr. Last Place                           |
|                                  | 18) Bolivia prefix                           |
|                                  | 19) ARRL contest                             |
|                                  | 20) CQ contest (abbr.)                       |
|                                  | 22) Repeat (abbr.)                           |
|                                  | 24) To fall in standing                      |
|                                  | 25) Contesters can't wait to hit this at end |
|                                  | 27) ___ up first place                       |
|                                  | 29) Two winners                              |
|                                  | 31) 32 across (abbr.)                        |

### ELEMENT 2—TRUE-FALSE

- |  | True  | False |
|--|-------|-------|
| 1) It's quite legal for contest organizers to offer prizes.  | _____ | _____ |
| 2) A Novice won the 1954 ARRL CW Sweepstakes.  | _____ | _____ |
| 3) Most contest organizations disqualify entrants submitting logs with errors totaling more than 2%.   | _____ | _____ |
| 4) The North American Sprint is sponsored by the <i>National Contest Journal</i> .   | _____ | _____ |
| 5) It's possible to enter many contests without even transmitting.   | _____ | _____ |
| 6) The March, 1921, <i>QST</i> suggested a CQ party. On April 1, according to a specific schedule, all amateurs in a given call district would send CQ.    | _____ | _____ |
| 7) The first ARRL Sweepstakes was held in January, 1930.   | _____ | _____ |
| 8) The winning operator in the first Sweepstakes worked 153 stations in 43 sections.   | _____ | _____ |
| 9) The first Field Day took place in January, 1933.  | _____ | _____ |
| 10) The first winning Field Day station had six operators and accumulated a grand total of 60 contacts.  | _____ | _____ |
| 11) The Radio Society of Great Britain and the ARRL once cosponsored a contest.  | _____ | _____ |
| 12) The 1952 Novice Roundup had 100% greater participation than the previous year.   | _____ | _____ |
| 13) In November, 1931, the ARRL sponsored a "Crossband Get-Acquainted Party" to "promote fraternalism and versatility" between 40- and 80-meter operators. | _____ | _____ |
| 14) From 1942 through 1945, U.S. hams were forbidden to have contest QSOs with German and Japanese stations.   | _____ | _____ |
| 15) The 1977 Novice Roundup was the first to include Technicians.  | _____ | _____ |
| 16) The ARRL, <i>CQ Magazine</i> , and <i>73 Magazine</i> have all sponsored 160-meter contests.   | _____ | _____ |
| 17) The ARRL "Copying Bee" was a receiving contest that specialized in tricky text and code combinations.  | _____ | _____ |
| 18) The VHF Marathon was a 1946 contest that lasted eight months.  | _____ | _____ |
| 19) The Southpaw Fist Contest is devoted entirely to left-handed brasspounders.  | _____ | _____ |
| 20) The NBVM Sweepstakes is a contest for narrow-band voice modulation devotees.   | _____ | _____ |

**ELEMENT 3—SCRAMBLED WORDS**

Unscramble these words associated with contest operating.

- |        |            |          |
|--------|------------|----------|
| foceef | olg        | mutrecop |
| coclk  | phrocmenoi | eyerk    |
| linpce | peadenohsh | tations  |
|        | neatnan    |          |

**ELEMENT 4—MATCHING**

Match the contests listed below with the month in which they take place.

**Column A**

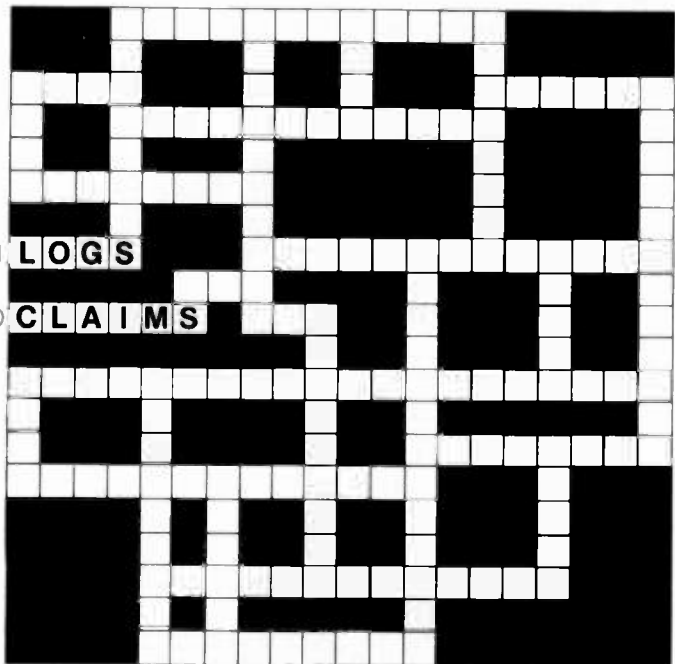
**Column B**

- |                                |              |
|--------------------------------|--------------|
| 1) Field Day                   | A) January   |
| 2) IARU Radiosport             | B) February  |
| 3) CQ WPX (Phone)              | C) March     |
| 4) ARRL Novice Roundup         | D) April     |
| 5) CQ Worldwide (CW)           | E) May       |
| 6) CAN-AM Contest (CW)         | F) June      |
| 7) ARRL VHF Sweepstakes        | G) July      |
| 8) Straight Key Night          | H) September |
| 9) CQ Worldwide (Phone)        | I) October   |
| 10) County Hunters SSB Contest | J) November  |
|                                | K) December  |

**ELEMENT 5—HAMAZE**

Here's a new type of maze geared specifically to hams. The object is to start at the circle and trace your way to the square by filling in the answers to the clues given below. To help you on the way, we've already given you the first and last clue answers. All words read either vertically downward or from left to right. Each new word is on a *perpendicular* angle to the previous word. Words join on a common letter. Good luck.

- |                                  |  |
|----------------------------------|--|
| 1) Contest records (given)       | 12) Top ticket                           |
| 2) Sometime domestic multipliers | 13) Topside metal                        |
| 3) Specialized mode              | 14) Beam reckoning                       |
| 4) West coast contesters (abbr.) | 15) Total                                |
| 5) Station timepiece             | 16) Ham letter words                     |
| 6) Automatic key                 | 17) DX encounter                         |
| 7) Station's heart               | 18) Contest sleep                        |
| 8) To make advances              | 19) What you're reading                  |
| 9) Novice contester's speed      | 20) Output (abbr.)                       |
| 10) European award (abbr.)       | 21) QSOs ____ minute                     |
| 11) Contest QSO                  | 22) Postscript (abbr.)                   |
|                                  | 23) Sources of assertion (abbr.) (given) |



**SCORING**

**Element 1:**

Twenty points for the completed puzzle, or 1/2 point for each question correctly answered.

**Element 2:**

One point for each correct answer.

**Element 3:**

Two points for each word unscrambled.

**Element 4:**

Two points for each contest matched to its correct month.

**Element 5:**

Twenty points for the completed puzzle, or one point for each word.

How did you do in this contest?

- 1-20 points—"Why is the League wasting my dues on these contests?"
- 21-40 points—"Contests? I can take 'em or leave 'em."
- 41-60 points—Third place—Manitoba QSO Party.
- 61-80 points—"Mr. Clean Sweep."
- 81-100+ points—"They won't let you enter any more contests—you're too good."

**FUN! MAILBOX**

I think Dave Mann's shot at you in the July "Leaky Lines" was uncalled for. To me, your column will always have taste.

**Jonathan Bird KA0BYW  
Hopkins MN**

*As my nephew, Paul David Mann (no kidding) always says: "With a little MSG, it'll even taste better."—J.E.*

**THE ANSWERS**

**Element 1:**

See illustration 1A.

**Element 2:**

1—False Not in the United States. Actually, small prizes such as plaques and cups are okay, but the FCC tends to frown on anything more substantial.



Illustration 1A.

- 2—False But it would have been something.
- 3—True Be careful.
- 4—True Great contest and a great group.
- 5—True Sure. Haven't you ever heard of SWLs?
- 6—True We think it was meant as a joke.
- 7—True It was designed as an exercise in traffic handling.
- 8—True Today, even I do better than that.
- 9—False No, June, 1933. January's too nippy.
- 10—True Portable work was tough in those days.
- 11—True In 1934, a 10-meter contest.
- 12—True Since 1952 was the Roundup's first year. . .
- 13—True Could we make that up?
- 14—True And because of World War II, anyone else, too.
- 15—True Techs got their low-band privileges the summer before.
- 16—True And W1BB has worked them all.
- 17—True Fifty years ago—sounds like fun.
- 18—True I wonder when they slept?
- 19—False Gee, I could enter that one.
- 20—False It would have to be an ARRL contest.

**Element 3:**

(Reading from left to right) coffee, log, computer; clock, microphone, keyer; pencil, headphones, station; antenna.

**Element 4:**

1—F, 2—G, 3—C, 4—B, 5—J, 6—H, 7—A, 8—K, 9—I, 10—E.

**Element 5:**

See Illustration 2A.



Illustration 2A.

# AWARDS

Bill Gosney KE7C  
Micro-80, Inc.  
2665 North Busby Road  
Oak Harbor WA 98277

**WORLDWIDE AWARDS DIRECTORY**

Award hunting may have become the most favorite pastime of radio amateurs, and the need for a consolidated source of information is apparent. To date, I know of three major sources in which such information is avail-

able.

*The Worldwide Awards Directory*, Volume 1, is now available. It lists over 100 awards, and more will be featured in consecutive volumes to be published at later dates. Its cost, \$9.95, should be sent to its publisher, KB0ZP, at 736—39th Street, West Des Moines IA 50265.

**INTERNATIONAL DIRECTORY OF AWARDS**

This manual features various

award programs throughout the world, and segments its contents by continents of the world. Updates to the manual will be issued in the form of a newsletter and may be inserted within the manual. The basic directory is \$8.00 or 32 IRCs while the newsletters (published twice annually) will be \$4.00 per year. For additional information, contact the directory's publisher, Vance LePierre W5LJU, 2618 McGregor Blvd., Fernandina Beach FL 32034.

**THE DX AWARDS GUIDE**

The third and probably the most complete source of information is a series of volumes made available by Chuck Ellis of

Ames, Iowa. This directory not only details each award program in detail but also provides a very fine facsimile of the award applications. I've utilized its contents numerous times while filing for various parchments and believe me, the work that Chuck put in his publication has cut processing time dramatically. I am positive that the various award sponsors, as well, are appreciative of the effort of providing a uniform application. There is nothing more cumbersome than trying to sort through various application formats all submitted for the same award.

*The DX Awards Guide* is featured in great detail on page 128 of the July, 1981, edition of this



**ISLAND DX AWARD**

Of all the DX awards being offered these days, one of the newest and fastest-growing awards programs is that of the Island DX Award: Sponsored by the Whidbey Island DX Club, available to licensed amateurs and shortwave listening stations worldwide, awards are issued for 2 x SSB, 2 x CW, 2 x RTTY, and 2 x SSTV, as well as mixed and single-band accomplishments.

Fifty (50) IDX islands as they appear in the IDX Island listing are required for the basic award. Recognition is given for contacts made in increments of 50 islands, up to and including the maximum number of islands possible. All DXCC countries which are bona-fide "islands" are the only qualifying contacts. See the IDX listing in this column.

To apply for the IDX Award, prepare a list of contacts in *prefix order*. Include the call of the station worked, IDX island name, band, mode, date, and GMT. Please *number your contacts* 1 through 50, etc. *Do not send QSL cards!* Have your list of islands verified by at least two amateurs or a local radio club official. Confirmation of each contact must be in the applicant's possession and confirmed by verifying signatures.

Send your verified list of contacts with \$4.00 (US funds only) and a large self-addressed, stamped envelope (3 1/2" x 9") to the following address. (Foreign stations may substitute the fee by enclosing twelve IRCs.) Whidbey Island DX Club, 2665 North Busby Road, Oak Harbor WA 98277. Rules governing this awards program are reviewed annually in September. Please enclose an SASE with any inquiries regarding the IDX Awards program.

**THE CERTIFICATE HUNTERS CLUB**

Thanks to Scott Douglas KB7SB, who is the Western States County Award Manager for CHC, we are able to bring to you an extravagant series of operating awards which will obviously win the approval of every county hunter in the world!

**Washington State Award**

Class D requires 10 to 15

A3	HK0 (Bajo)	S9,CR5	VS6
A9X	HK0 (Malp)	SV (Crete)	VS9 (See 8Q)
BV	HK0 (San An)	SV (Dodecanese)	VS9K
C2	IS	T2,VR8	VU7 (Andaman)
C6	J3,VP2G	TF	VU7 (Laccadive)
CE0A	JA-JR-KA	TI9	XF4
CE0X	JD,KA1 (Mina)	UA1,UK1 (Franz Jo)	XP
CE0Z	JD,KA1 (Ogasa)	VE1 (Sable)	YB,YC,YD
CO,CM,KG4	JD,7J1 (Okino)	VE1 (St. Paul)	YJ
CT2	JW	VK (Lord Howe)	YV0
CT3	JX	VK9 (Willis)	ZD7
D4	KG4 (See CO)	VK9 (Christmas)	ZD8
D6	KH1,KB (Baker)	VK9 (Cocos)	ZD9
DU	KH2,KG6 (Guam)	VK9 (Mellish)	ZF
EA6	KH3,KJ	VK9 (Norfolk)	ZK1 (North)
EA8	KH4,KM	VK9 (Heard)	ZK1 (South)
EI, GI	KH5K, KP6 (King)	VK9 (Macquarie)	ZK2
FB8W	KH5, KP6 (Palmy)	VP2A	ZL
FB8X	KH6,WH6,AH6,NH6	VP2D	ZL (Auck-Camp)
FB8Z	KH6,KH7 (Kure)	VP2E	ZL (Chatham)
FC	KH8,KS6	VP2G (See J3)	ZL (Kermadec)
FG (Gaud)	KH9,KW	VP2K	ZM7
FG,FS	KH0,KH2,KG6 (Mari)	VP2L	ZS2 (Marion)
FH8	KC6 (West)	VP2M	1S
FK	KC6 (East)	VP2S	3B6,3B7
FM	KP (Desoth)	VP2V	3B8
FO (Clip)	KP1 (Navassa)	VP5	3B9
FO	KP2,KV	VP8 (Falkland)	3C0
FP	KP3,KS4, HK0 (Ran-Ser)	VP8,LU (Ork)	3D2
FR (Glor)	KP4, NP4	VP8,LU (Geo)	3Y
FR (Juan)	KX	VP8,LU (Shet)	4S
FR (Reun)	OH0	VP8,LU (Sand)	5B,ZC
FR (Trom)	OJ0	VP9	5R
FW	OX,XP	VQ9	5W
G,GM,GW	OY	VR1 (Br. Phoenix)	6Y
GC,GU	P29	VR1 (Gilbert)	8P
GC,GJ	PJ (Neth Ant)	VR3	8Q,VS9
GD	PJ (St. Martin)	VR4 (See H4)	9H
GI,EI	PY0 (Fernando)	VR6	9M6,9M8 (See VS5)
H4,VR4	PY0 (Peter & Paul)	VR7	9V
HC8	PY0 (Trinidad)	VR8 (See T2)	9Y
HH,HI	S7	VS5,9M6,9M8	

*Island DX Listing. The IDX Award program depicts DXCC countries which are bona-fide "islands" as recognized by the National Geographic Society. First criterion, however: They must be a DXCC country as stated on the ARRL DX Countries List. Any qualifying DXCC countries either omitted from this list by error or those which have been recognized for DXCC after the release of this listing will be added to the IDX List when it is printed next.*

counties; Class C requires 15 to 20 counties; Class B requires 20 to 30 counties; Class A requires 30 to 43 counties; Class AA requires all 44 counties to be worked.

**Oregon State Award**

Class C requires 10 to 15 counties; Class B requires 20 to 25 counties; Class A requires 30 to 35 counties; Class AA requires all 36 counties to be worked.

**California State Award**

Class D requires 20 to 28 counties; Class C requires 30 to 38 counties; Class B requires 40

International  
Certificate Hunters' Club

CHC Chapter No. 15  
OPERATING ACHIEVEMENT AWARD

**OREGON**

AWARD CLASS

- AA - 7/30 DE
- A - 30/30 US/IR
- B - 15/30 US/IR
- C - 15/10 US/IR
- AGM-M

This is to Certify

has submitted GER proof of having contacted  
COUNTIES in number and with  
CLASS as indicated

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

## IDX AWARD RECIPIENTS

Over the months, many letters have been received requesting a published list of those stations that have qualified for the IDX Award. In callsign order, here are the IDX recipients. Is your call on this honor roll?

### US Stations

W1AGA	KA4LXZ
N1AHN	WA4QZX
WB1BVQ	WB4UBD
WB1DQC	N4XC
WA1GTQ	KB5AC
W1HR	KA5ACC
WA1SMI	WD5CDR
W1TEE	N5CID
K1TH	KA5CTZ
W1WKP	KO5D
N2AWM	K5HT
N2BQL	KB5OU
KA2EAO	WB5TZO
WB2FFY	KB5WQ
N2GG	AD5X
W2KI	N6AFN
AF2L	WD6AQJ
KE2M	WD6BNH
KF2O	WB6CDM/7
WB2QLO	WA6CUP
WA2SRM	WD6FDN
KB2TY	WA6FDX
WA2VJL	W6JGT
KJ2W	W6ORD
W2XQ	WA6PJR
WA2YEX	WA6QDR
W2-6893 (SWL)	WA6SLO
N3AKX	WA6VJP
K3FN	WB7AEX
W3HRD	N7AKQ
K3LUE	WB7BFB
WA3PMI/7	K7CU
AC3Q	WDX7DER (SWL)
K3VY	K7EFB
N4AKO	WA7GVM
WD4DVZ	NL7J
KE4E	KL7JC
KS4G	WA7JUJ
WD4IHV	W7KTI
KB4JA	W7KVV
K4JYD	WB7QEP
K4LQ	WB7RFB
	WB7ROE

WB7RUV
W7ULC
WB7VHA
WA7YBN
K7YY
K7ZR
KB8CU
K8EJN
K8IQB
WD8IXV
KD8M
WD8MOV
W8NK
WD8QEO
WD8QOM
N9AII
N9BA
N9BAF
K9BIL
W9BM
K9BQL
WD9HWY
WB9JBH
KB9JJ
WB9NOV
KB9QZ
WB9RNF
K9TI
KB9TO
WB9UIA
WB9UKS
K9UR
WB9VGJ
WB9WFZ
WA9WGJ
AE9X
N0AMI
N0BKY
K0DEQ
KB0OE
WB0OMY/6
K0SI
KB0SY

K0UKO  
W0YBV

### DX Stations

DA1MP
DA1MV
DF7QD
DF9ZP
DJ2UU
DJ0SL
EA6DE
F6DUK
GU5CIA
HC2RG
IC8OGS
I2GXS
I8INW
I8KDB
I8KNT
I8YRK
I8XTX
I0MWI
JA1SXH
JH1XUP
J11NOY
JR1EBL
JA4ESR
KH6JWK
KP4AE
LU1BAR/W3
OE1WPA
S83T
VE1BWP
VE3BXV
VE3JGT
VE3-9094 (SWL)
VE5ADA
VK2NHV
VK4FS
VK6YL
VP2MO
6Y5DA
9V1UK

### Rules:

- 1) Awards are available to licensed amateurs and SWLs (on a heard basis).
- 2) Do not send QSL cards. A list showing full details of the contacts, signed by your local club official or two licensed amateurs, should be submitted.
- 3) Certificates will be endorsed for various bands and modes as requested, providing such request accompanies application and necessary listings are made.
- 4) Award Fee is \$3.00 worldwide.
- 5) Endorsements after original application are \$1.00.
- 6) Send application to Awards Manager, Scott R. Douglas, Jr. KB7SB, PO Box 46032, Los Angeles CA 90046, USA.

### CHC AWARD SERIES

#### Worked USA Award

Districts: Issued for contact with all US call districts 1 through 0.

States: Issued for the total states worked.

Capitals: Issued for the total of capitals of states worked.

Prefixes: Issued for the total number of US prefixes worked.

There is no fee for these awards and they are available to licensed amateurs and SWLs worldwide. A USA SASE is required; worldwide, 3 IRCs are required along with an SAE.

#### Presidents Award

Issued for the total number of cities worked bearing the last names of past presidents. There is no fee. Same rules as Worked USA Award.

#### State Cities

Issued for the total number of cities worked. Awards are issued by state (all 6th & 7th district callsigns). There is no fee for this award but same rules as USA Award.

These awards are being issued for a limited time only. Should further information be desired, please contact Awards Manager, Scott R. Douglas, Jr. KB7SB, PO Box 46032, Los Angeles CA 90046, USA.

### WORK THE CARIBBEAN AWARD

This basic award is issued for confirmed contact with 20 of the island countries listed below. Endorsement seals are issued

to 48 counties; Class A requires 48 to 57 counties; Class AA requires all 58 counties to be worked.

#### Arizona State Award

Class C requires 5 counties; Class B requires 8 counties; Class A requires 10 counties; Class AA requires 13 counties to be worked.

#### Nevada State Award

Class C requires 8 to 10 counties; Class B requires 10 to 15 counties; Class A requires 15 to 17 counties to be worked.

#### Utah State

Class C requires 7 to 10 counties; Class B requires 18 to 24 counties; Class A requires 22 to 29 counties to be worked.

#### Wyoming State

Class C requires 7 to 10 counties; Class B requires 15 to 20 counties; Class A requires 20 to 23 counties to be worked.

#### Idaho State

Class C requires 15 to 20 counties; Class B requires 20 to 30 counties; Class A requires 30 to 43 counties; Class AA requires 44 counties to be worked.

#### Montana State

Class D requires 15 to 20 counties; Class C requires 20 to 30 counties; Class B requires 30 to 40 counties; Class A requires 40 to 55 counties; Class AA requires 56 counties to be worked.

#### Alaska State

Issued by actual counties contacted, this award may be obtained for two or more counties confirmed.

#### Hawaii State

Issued by actual counties contacted, this award may be obtained for two or more counties confirmed.

# Directory of Certificate and Awards



OPERATING ACHIEVEMENT AWARD

**C D C A** 

*This is to Certify that*

has submitted GCR proof of having contacted CALIFORNIA (DOUBLE) COUNTIES in numbers and with CLASS as indicated below, and with endorsements for AOMB M as separately shown

**AWARD CLASS**



AOMB M endorsements

CALIFORNIA  
152 Counties

# NEVADA

Counties

OPERATING ACHIEVEMENT AWARD

BY

**International County Hunters'  
CHC Chapter No. 40**

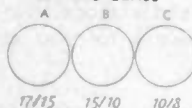
*This is to Certify that*

has submitted GCR proof of having contacted

NEVADA

COUNTIES in numbers and with  
CLASS as indicated

**AWARD CLASS**



\_\_\_\_\_  
Custodian

No. \_\_\_\_\_  
Date \_\_\_\_\_

in increments of 5 countries each. A Gold Seal plaque can be issued for 30 or more confirmations at a cost of \$18.95 in US funds or 95 IRCs. SWLs may apply on a heard basis.

Send your verified application and \$3.50 or 18 IRCs to the Awards Manager. Do not forward QSL cards because you may have your QSL cards and claimed contacts verified by two amateurs or a local radio club official.

Endorsements will be issued for any mode, band, or power level requested as long as the request is made at the time of initial application. Future endorsements will cost \$1.00 US funds plus an SASE.

Forward your application to Scott Douglas KB7SB, PO Box 46032, Los Angeles CA 90046.

### Caribbean Country Prefixes

C6, CO/CM, CO4, FG, FS, FM, HH, HI, HK0 (Bajo Nuevo), HK0 (San Andreas), HK0 (Serrana Bank), HR0, J3/VP2G, J6/VP2L, J7/VP2L, KC4/KP1, KG4, KP4/NP4/WP4, KP4 (Desecheo Island), KP3, KP2/KV4, PJ (Netherlands Antilles), PJ (St. Maarten, Saba, St. Eustatius), VP2A, VP2K, VP2E, VP2M, VP2S, VP2V, VP5, VP9, YV (Margarita Island),

YV0 (Aves Island), ZF, 6Y, 8P, and 9Y.

### WORK THE PACIFIC AWARD

This award should not be mistaken for the famous WAP award which has been offered for years out of New Zealand. This particular award featured this month is sponsored by the Certificate Hunters Club (CHC) and its Manager, Scott Douglas KB7SB.

The basic Worked All Pacific Award is issued for 30 confirmed country contacts and is available to any licensed amateur operator or shortwave listener. Endorsement seals are offered in increments of 5 countries. A Gold Seal Plaque can be issued for 50 or more countries worked in the Pacific region if desired. Cost of the plaque will be \$18 US dollars or 95 IRCs.

Endorsements for any band, mode, or power will be recognized if such recognition is requested at the time of application.

To apply, have your list of confirmed contacts verified by at least two amateurs and have it sent with \$3.50 in US funds or 18 IRCs to the Awards Manager, Scott Douglas KB7SB, PO Box 46032, Los Angeles CA 90046.

### Pacific Country Prefixes

A3, BV, C2, CE0A, CE0X, CE0Z, DU, FK, FO (Clipperton),

FO (French Polynesia), FW, H44/VR4, HC8, HK0 (Malpelo Island), JD1/KA1 (Minami Tori-

# UTAH

Counties Award



OPERATING ACHIEVEMENT AWARD

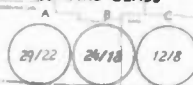
BY

**International County Hunters'  
CHC Chapter No. 40**

*This is to Certify that*

has submitted GCR proof of having contacted  
COUNTIES in numbers and with  
CLASS as indicated

**AWARD CLASS**



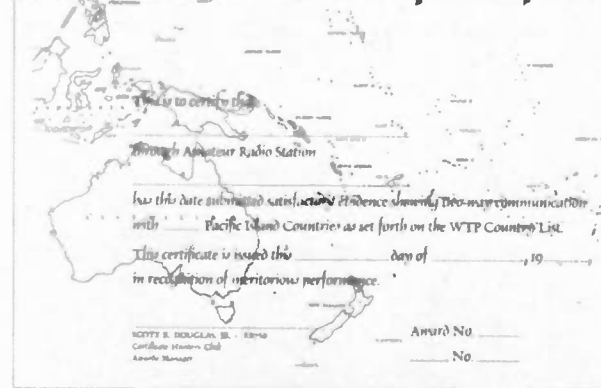
\_\_\_\_\_  
Custodian

No. \_\_\_\_\_  
Date \_\_\_\_\_

# WTC work the CARIBBEAN



# WTP work the PACIFIC



shima), JD1/KA1 (Ogasawara), KB1/KH1, KC6 (Eastern Caroline Islands), KC6 (Western Caroline Islands), KC6 (Valu), KH2, KH0, KH6, KH7, KH3, KH4, KH5K, KH5, KH8, P2, T2/VR8, T3/VR1 (Central, West, and East Kiribati separately), TI9, VK7, VK, VK2, VK9 (Willis), VK9 (Christmas), VK9 (Cocos Keeling), VK9 (Melish), VK9 (Norfolk), VK0 (Herald), VK0 (Macquarie), VR6, VS5, XF4, BY/YC, YJ, ZK1 (North Cook), ZK1 (South Cook), ZK2, ZL, ZL (Auckland Island), ZL (Campbell), ZL (Chatham), ZL (Kermadec), ZM7, 3D2 and 5W, 9M2, and 9M6.

### SPRUCE KNOB

The Parkersburg Amateur Radio Klub of West Virginia will be holding an in-state DXpedition from the top of Spruce Knob, West Virginia. Spruce

Knob is the highest mountain point in West Virginia. Elevation is 4862' and it is located in Randolph county, for you county hunters.

The expedition will be on October 3 and 4, starting at 1500 universal time. Station call will be N8CDD. Planned frequencies are:  $\pm$  3.935, 7.235, 14.335, 21.360, and 28.535; on 2 meters: 144.200, 144.190, SSB, 144.110, CW; on 6 meters: frequencies are 52.150, SSB, 52.525, FM; for CW on HF bands, 10 kHz up on all Novice bands. For special QSL, send an SASE to N8CDD, 902 23rd Street, Vienna W VA 26105.

### POPULATION CENTER

The population center of the US as determined by the 1980

census will be commemorated by special event station KA0IAR from 1700 GMT October 10 until 1700 GMT October 11, by the Jefferson County ARC in De Soto, Missouri. Approximate frequencies used will be 25 kHz up from bottom edge of the General portions of 10, 15, 20, and 40, as well as the center of the Novice portions. For a certificate, send QSL and a large SASE to KA0IAR, 3009 High Ridge Blvd., High Ridge MO 63049.

### SUNBELT EXPOSITION

The Colquitt County Ham Radio Society will be operating club station WD4KOW from the site of the fourth annual Sunbelt Agricultural Exposition on October 13-15, 1981. The hours of operation will be 0900 to 1600 EDST each day.

This annual Sunbelt Expo is held each year at Spence Field Air Base, located near Moultrie, Georgia, and is the largest agricultural show in the South. This event draws over 200,000 visitors from all over the United States and foreign countries.

Operations will be mostly on 40 and 20 meters around 7.250 and 14.300 MHz, with some operations in the other HF bands. The members also will be listening for visiting hams on the local repeater, 146.19/.79. Visiting hams are invited to visit the amateur booth at the Expo and operate the station.

A special QSL card is available for those making contact during this event. Contact Joel Goings AA4P, Secretary, Colquitt County Ham Radio Society, PO Box 813, Moultrie GA 31768, for more information.

## 73 MAGAZINE AWARDS PROGRAM

### Work The World Award

76 VP2MO	83 W6JQT	90 WB5TZO
77 HK0EHM	84 WB2TKD	91 WB7VHA
78 WA2SRM	85 W9BM	92 VK2DEJ
79 KA5CTZ	86 WD6EEQ	93 WB1BVQ
80 DF7QD	87 KB7SC	94 KF2X
81 WA2YEX	88 KA2EAO	95 OE1-109976
82 N5BBO	89 K8IQB	96 OE8MOK

### North American Award

114 WD4BLU	128 WD6EEQ	142 WB2YMW
115 WB0OMY/6	129 N7AHQ	143 AK1H
116 VK4FS	130 W0OLL	144 WB1BVQ
117 DJ0SL	131 KA9HRI	145 VK2DEJ
118 VE3DIJ	132 WB7VHA	146 DA1PN
119 HK0EHM	133 WB5LBR	147 KF2X
120 VP2MO	134 KA9ERX	148 OE1-109976
121 DF7QD	135 KB7SC	149 W1SIX
122 KA3DBN	136 WA2MCE	150 KA3GGP

123 W6JQT	137 K7DBV	151 KJ0WQ
124 WB0BWY	138 K8IQB	152 OE8MOK
125 N5BBO	139 8P6OV	153 VE1BWP
126 WB2TKD	140 KA1CLV	
127 W9BM	141 WB5TZO	

### South American Award

103 DF7QD	115 WB7VHA	127 KC4YY
104 VP2MO	116 WB5LBR	128 WB1BVQ
105 HK0EHM	117 KA9ERX	129 VK2DEJ
106 DJ0SL	118 N7AHQ	130 DK5WJ
107 KA3DBN	119 KB7SC	131 DA1PN
108 N5BBO	120 KB8WJ	132 KF2X
109 WB0BWY	121 VE3DIJ	133 OE1-109976
110 W6JQT	122 8P6OV	134 DJ0WQ
111 ZE2KA	123 K8IQB	135 OE8MOK
112 WB2TKD	124 AK1H	136 VE1BWP
113 W9BM	125 WB2YMW	
114 W0OLL	126 WB5TZO	



**European Award**

131 SV1GJ	146 KA7COI	161 WB5TZO
132 DJ0SL	147 WB5LBR	162 WB7VHA
133 VE3DIJ	148 KA8RD	163 WB6SZZ
134 HK0EHM	149 W0CJG	164 K7DBV
135 VP2MO	150 WA2SHW	165 N0ASV
136 DF7QD	151 8P6OV	166 WB1BVQ
137 KA1CFQ	152 KB7SC	167 VK2DEJ
138 XE2KA	153 WA2MCE	168 DA1PN
139 N5BBO	154 K8IQB	169 DU1EFZ
140 WB0BWY	155 KA2EAO	170 KF2X
141 W6JQT	156 W1SIX	171 OE1-109976
142 W9BM	157 KA1CLV	172 DJ0WQ
143 WB2TKD	158 KB8WJ	173 KA7GFI
144 WD6EEQ	159 AK1H	174 OE8MOK
145 WB9JBH	160 WB2YMW	175 VE1BWF

**Oceanic Award**

85 WA2SRM	93 WB2TKD	101 WB5TZO
86 DF7QD	94 ZL2BAO	102 WB1BVQ
87 VP2MO	95 W9BM	103 VK2DEJ
88 HK0EHM	96 WB7VHA	104 DU1EFZ
89 VK4FS	97 WA2LYF	105 KF2X
90 WA2YEX	98 KB7SC	106 OE1-109976
91 N5BBO	99 KA2EAO	107 OE8MOK
92 W6JQT	100 K8IQB	

**African Award**

89 DJ0SL	100 WB5LBR	111 VK2DEJ
90 HK0EHM	101 WA2LYF	112 WB1BVQ
91 VP2MO	102 W9BM	113 DA1PN
92 DF7QD	103 KB7SC	114 DU1EFZ
93 KA3DBN	104 DK5WJ	115 KF2X
94 W6JQT	105 K8IQB	116 DJ0WQ
95 N5BBO	106 KA2EAO	117 OE1-109976
96 WB0BWY	107 AK1H	118 OE8MOK
97 WB2TKD	108 WB2YMW	119 VE1BWP
98 WD6EEQ	109 WB5TZO	
99 KA9ERX	110 WBVHA	

**Asian Award**

84 DF7QD	93 W9BM	102 DU1EFZ
85 VP2MO	94 KB7SC	103 KF2X
86 HK0EHM	95 KA2EAO	104 OE1-109976
87 DJ0SL	96 K8IQB	105 DJ0WQ
88 KA5CTZ	97 WB5TZO	106 OE8MOK
89 W6JQT	98 WB7VHA	107 VE1BWP
90 N5BBO	99 DA1PN	108 SV1GJ
91 WB2TKD	100 WB1BVQ	
92 WD6EEQ	101 VK2DEJ	

**Worked All USA***6 Meters*

1 WB0ZKG	4 KA5DDE	6 K3HFV
2 K6PHE	5 WB5SND	7 N4QH
3 N4BJJ		

*10 Meters*

1 KL7IEN	4 JH8DSC	6 VE1BWP
2 W5ZKJ	5 VK7NBT	7 N4QH
3 VE1BVD		

*15 Meters*

1 WD5DRB	4 WB6CDM	6 WB9UKS
2 WA0CEL	5 KA4IFF	7 N4QH
3 KA6ACO		

*20 Meters*

1 WA9BBX	5 WD0EPE	9 N4QH
2 WA9WJG	6 WB9UKS	10 KA0INF
3 K1TH	7 VK6YL	
4 KB8JF	8 N8BDI	

*40 Meters*

1 WA2SRM	3 WD4DBJ	5 N5AHZ
2 N8AZD	4 WD0BOS	6 N4QH

*80 Meters*

1 KA0AZQ	4 KS4B	7 WA0RVK
2 WD0BOS	5 WB9UKS	8 N4QH
3 KA5AOP	6 KB5FN	

*160 Meters*

1 KC8P

**Worked All USA***All Band*

42 N4CXX	46 W9BM	50 N5ACU
43 KA8GXN	47 KA7HPP	51 NL7J
44 N6BXT	48 WD6EEQ	52 KA4ITQ
45 WA4ZLZ	49 W0CJG	53 WB9UIA

**73 DX Country Club***2 x SSB*

54 W5SGT	61 KF2X	68 AK1H
55 W9BM	62 VK4FS	69 WD4DVZ
56 DF7QD	63 K9PSN	70 DA1PN
57 WB7RUV	64 K3KJZ	71 VK2DEJ
58 N7AKQ	65 K3LUE	72 VK2BQN
59 WB5LBR	66 WB1BVQ	73 VE1BWP
60 VK6YL	67 WB2YMW	74 OE8MOK

*Mixed Mode*

22 WB5LBR	23 WD6EEQ	24 NL7J
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*2 x CW*

9 WB9UIA	10 WB9UIA	11 VE1BWP
12 KA2EAO		

**Century Cities Award**

19 W9BM	20 K7DBV	21 VK6YL
22 WB9UIA		

**Q5 Award of Excellence**

44 KA2GTT	50 W9BM	56 N5AUB
45 KA4JVN	51 ZL2LQ	57 WB6SZZ
46 KA4KST	52 KA2GMT	58 KA0KCM
47 VK3VEU	53 KA0FVG	59 KB9PN
48 KA1CFQ	54 KA0INE	60 KA6AHL
49 KA9CWW	55 KA0INF	

More award winners will be listed next month. Full details of the 73 Awards Program can be found in the September, 1981, issue of this magazine. Why not become part of the fastest-growing awards program around!

# SOCIAL EVENTS

## HOUSTON TX OCT 2-4

The Houston ComVention 81 will be held on October 2-4, 1981, at the Astrodome, Houston TX. Features will include an indoor flea market, a Friday night equipment auction, computer exhibits and forums, technical sessions, and DX/Contest meetings with Father Moran 9N1MM. Family activities are planned and the ladies will have a full schedule. Registration is \$7.00, the banquet is \$18.00, the Johnson Space Center tour is \$6.00, and flea market spaces are \$6.00 each. For full details, contact HHC, Inc., Box 79252, Houston TX 77024, or phone (713)-481-4586.

## CLEARWATER FL OCT 3-4

The Florida Gulf Coast Amateur Radio Council will hold its annual convention in conjunction with the ARRL South Florida Section Convention on October 3-4, 1981, at the Sheraton Sand Key, Clearwater FL. Registration is \$4.00 and children under 12 years old will be admitted free. There will be a QCWA-sponsored luncheon at noon on Saturday, a poolside luau Saturday night, and a fashion show and luncheon on Sunday. Swap tables are \$10.00 for the weekend, luncheon tickets are \$6.00, and luau tickets are \$12.00. Features will include forums, demonstrations, meetings, exhibits for the amateur as well as for

XYLs, and a limited swap area. Talk-in on 146.37/97. For further information or reservations, write FGCARC, PO Box 157, Clearwater FL 33517, or phone Jan KA4ELA at (813)-544-6734.

## ROCK HILL SC OCT 4

The York County Amateur Radio Society will hold its 30th annual hamfest on Sunday, October 4, 1981, at Joslin Park in Rock Hill SC. For additional information and pre-registration, write YCARS, PO Box 4141 CRS, Rock Hill SC 29730.

## REVERE MA OCT 4

The 19-79 Repeater Association of Chelsea MA will hold its annual flea market on Sunday, October 4, 1981, from 11:00 am to 4:00 pm (sellers will be admitted at 10:00 am) at the Beaumont VFW Post, 150 Bennington Street, Revere MA. Admission is \$1.00. Sellers' tables are \$6.00 in advance and \$8.00 at the door, if still available. Talk-in on .19/79 and .52. For table reservations, send a check to 19-79 Repeater Association, PO Box 171, Chelsea MA 02150.

## YONKERS NY OCT 4

The Yonkers Amateur Radio Club will hold its electronics flea market on Sunday, October 4, 9:00 am to 4:00 pm, at the parking lots of Loral Electronics on

Fullerton Avenue in Yonkers, NY. Activities include prizes, an auction, and live demonstrations of computers, satellite TV, hi-fi equipment, and more. Admission is \$2.00; sellers' space is \$5.00 (bring your own tables). Talk-in on 146.865, 146.910, and CB channel 4. For advanced registration, contact Otto Supliski WB2SLQ, 52 Hayward Street, Yonkers NY 10704. For more info, call (914)-969-1053.

## ROME GA OCT 4

The Coosa Valley Amateur Radio Club will host the annual Rome, Georgia, Hamfest on Sunday, October 4, 1981, at the Rome Fairgrounds. Gates open at 7:00 am, with the main prize drawing at 3:00 pm. Admission is \$1.00 and additional prize tickets will be available. Activities include dealer displays, boneyard and flea market, ladies' bingo, and hot, homemade barbecue and Brunswick stew. Top prizes are an Icom IC-260A 2-meter SSB/FM/CW mobile transceiver, an IC-2A 2-meter handie-talkie, and a Trionix full-range frequency counter. You do not have to be present to win the first prize. There will be hourly door-prize drawings plus prizes for the ladies and children. Talk-in on 147.30/90. For more information, call Cathy Strickland WA4YSV at (404)-235-2311.

## SCOTTSDALE AZ OCT 9-11

The Scottsdale Amateur Radio Club will hold the 1981 Southwestern Division ARRL Regional Convention on October 9-11, 1981, in Scottsdale AZ. There will be major exhibitors and thousands of dollars in

prizes. On Saturday, October 10th, a western-style steak dinner will be served and Senator Barry M. Goldwater K7UGA will be the special dinner speaker. Tours of the Senator's "shack" will be conducted also on Saturday. For more information, contact SARC Convention Committee, PO Box 3073, Scottsdale AZ 85257.

## MEMPHIS TN OCT 10-11

The Mid-South Amateur Radio Association, the Memphis VHF Club, the Raleigh ARA, and the Delta ARC will hold the Memphis Hamfest on October 10-11, 1981, in the Youth Building at the Memphis Fairgrounds, Memphis TN. Admission is \$3.00 and children under 14 will be admitted free. The hours will be from 8:00 am to 4:00 pm on Saturday and 8:00 am to 2:30 pm on Sunday. Features will include a large indoor and outdoor flea market, on-site trailer hookups, ladies' activities, many forums, and (on Saturday night) a party/dance with snacks. Deadline for Friday night setups for dealers and the flea market is 9:00 pm. Talk-in on .34/94 and .52. For advance reservations and further details, write Memphis Hamfest, 28 North Cooper, Memphis TN 38104, or phone Clayton Elam K4FZJ at (901)-274-4418 (days) or (901)-743-6714 (nights), or Howard Smith WD5DVB at (901)-372-9618.

## ASHEVILLE NC OCT 10

The Western Carolina Amateur Radio Society, Inc., will hold its 6th annual Asheville Autumnfest on Saturday, October 10,

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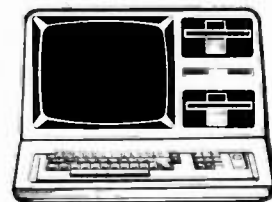
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When sideband got started, it was moved along by the many pioneering articles in 73. In the 60s it was solid state, with several times as many articles on the subject than in all the other magazines combined. When repeaters and FM got going about ten years ago there were over five times as many articles on the subject published in 73 as in all other ham magazines combined . . . and you can see what changes that brought to hamming. Now we're looking at exciting developments such as narrow band sideband for repeaters . . . which might give us six times as many repeaters in our present bands. We're looking at automatic identification systems which may make it possible for us to read out the call letters of any station tuned in . . . and even the development of self-tuning receivers.

Will stereo double sideband techniques make it possible to have up to 30 times as many stations within a given HF band as is now possible? Hams will be experimenting and reporting on these developments in 73. 73 is an encyclopedia of hamming . . . present and future . . . and just a bit of the past, too.

Without the endless fillers on station activities and club news, 73 is able to publish far more information . . . valuable information . . . on hamming and ham equipment.

You may or may not be a pioneer, but you certainly will want to keep up with what is happening and what the new rigs are going to be like. And, frankly, your support of 73 is needed to keep this type of information coming.

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1981, at the Asheville Civic Center, Asheville NC. Admission is \$3.00 in advance and \$3.50 at the door. Featured will be dealers, an ARRL booth, and a McElroy memorial CW competition. Prizes include an HF transceiver, a 2-meter transceiver, and many other prizes and door prizes. Talk-in on .31/.91, .16/.76, and .52. For more information, contact WCARS, Box 1488, Asheville NC 28802.

**WAUKESHA WI  
OCT 11**

The KMRA Hamfest '81 will be held on Sunday, October 11, at the Waukesha Exposition Center, Hwy. FT, Waukesha WI. Tickets are \$2.00 in advance; \$3.00 at the gate. Talk-in on .52. For more info, or advance tickets, write KMRA Hamfest '81, 315 Morey Street, Waukesha WI 53186.

**BEDFORD IN  
OCT 11**

The Hoosier Hills Ham Club W9QYQ will hold its annual hamfest on Sunday, October 11, 1981, at the Lawrence County 4-H fairgrounds, located just

south of Bedford IN. Admission is \$3.00. There will be refreshments, a free flea market, vendor displays/sales, free camping, and prizes (including a grand prize of an Azden PCS-3000 and a raffle prize of a TRS-80 Model III 4K L1 computer). Talk-in on 146.13/.73. For advance registrations and further information, contact HHC, PO Box 891, Bedford IN 47421.

**PARAMUS NJ  
OCT 11**

The Bergen ARA will hold a ham Swap 'n Sell on October 11, 1981, at Bergen Community College, Paramus NJ. Seller's admission is \$3.00. There will be tailgating only; bring your own table. There will be thousands of spaces available. Buyers will be admitted free. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

**BALTIMORE MD  
OCT 11**

The Columbia Amateur Radio Association will hold its 5th an-

nual hamfest at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Rt. 144, 1 mile west of Rt. 144, 1 mile west of Rt. 32) on Sunday, October 11, 1981, at 8:00 am. Admission is \$3.00 and tailgating and tables are \$6.00. Food and prizes will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and information, write Dennis Parra, 6955 Spinning Seed, Columbia MD 21045.

**BIG RAPIDS MI  
OCT 17**

The Big Rapids Area Amateur Radio Club will hold a fox hunt on Saturday, October 17, 1981, starting at Hemlock Park in Big Rapids MI. Registration is from 8:00 am to 10:00 am. Hunt starts at 10:00 am sharp, rain or shine, on on 146.64. Families, picnics, trunk-sale horsetraders, welcome. \$3.50 registration per carload. Information packets sent to advance registrants. Prizes will be awarded and food will be available. Talk-in on .52. For further information, contact Bruce L. Werner WB8TVD, Box 1073, Big Rapids MI 49307.

**KALAMAZOO MI  
OCT 17**

The 27th annual VHF Conference will be held on Saturday, October 17, 1981, at Kohrman Hall, at Western Michigan University, Kalamazoo MI, from 8:30 am through the awards dinner at 6:30 pm. VHF topics will include Design of Low Noise GaAs FET Preamps, An Overview of Packet Networking, and five others. For more information, write Dr. Glade Wilcox W9UHF, VHF Conference Chairman, Western Michigan University, Kalamazoo MI 49008.

**IRWIN PA  
OCT 17**

The Irwin Area Amateur Radio Association will hold its swap and shop on Saturday, October 17, 1981, at the Circleville VFD, Robbin's Station Road, in Irwin PA, just off US 30, 3 miles west of the Pennsylvania Turnpike (exit 7). There will be plenty of indoor and outdoor space available. Features include a flea market, prizes, vendors, and food. Talk-in on 146.925/.325 and .52. For more information, write



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**KENNER LA  
OCT 17-18**

The Jefferson Amateur Radio Club will hold Amacon '81 on October 17-18, 1981, at the Airport Hilton Inn, 901 Alrline Highway, Kenner LA. The FCC will conduct tests for all but the Novice level at Our Lady of Perpetual Help School, 530 Minor Street, Kenner LA starting at noon on Saturday, October 17, 1981. Applicants should bring copies of their licenses to the test. Other features will include an indoor flea market, a full schedule of women's events, and FCC, ARRL, and Army and Navy MARS meetings. Talk-in on 147.69/.09. For more details, call W. D. "Bill" Bushnell, chairman, at (504)-887-5022.

**GROTON CT  
OCT 24**

The SCRAMS and the Tri-City Amateur Radio Clubs of Groton CT will hold an auction on Saturday, October 24, 1981, from 10:00 am to 4:00 pm at St. Mary's Parish Hall, at the intersection of Rtes. 1 and 215, Groton CT. Admission is free. Talk-in on 071.67 or .34/.94. For further information, write Anne Hibbert WB1GVL, 64 Giant's Neck Road, Niantic CT 06357, or phone (203)-739-4970.

**CHATTANOOGA TN  
OCT 24-25**

Hamfest Chattanooga will be held on October 24-25, 1981, at Chattanooga State Technical Community College, Chattanooga TN. Admission is free. Flea market spaces are \$2.00 for one day or \$3.00 for both days; prize ticket donations are \$1.00 each. Events will include dealer exhibits, a flea market, forums, contests, and ladies' programs. Talk-in on .19/.79 and 3980. For dealer information, write Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or call (404)-398-3358.

**NEWARK NJ  
OCT 24-25**

The second annual NJ Micro-computer Show and Flea Market will be held on Saturday and Sunday, October 24-25, 1981, at the Holiday Inn North, Newark Airport, Exit 14 of the NJ Turn-

pike. Admission to the flea market is \$5.00 for sellers and \$3.00 for buyers. Admission to both the flea market and the show is \$5.00. Saturday hours are 10:00 am to 5:30 pm and Sunday hours are 10:00 am to 3:00 pm. User groups will meet each day and there will be many microcomputer exhibits indoors. For additional information, contact Ken Gordon W2TGH, 3001 Route 27, Franklin Park NJ 08823, or phone (201)-297-2526.

**FRAMINGHAM MA  
OCT 25**

The Framingham Amateur Radio Association will hold its 6th annual fall flea market on Sunday, October 25, at the Framingham police station drill shed. This is the largest indoor ham flea market in New England! Doors open at 10:00 am (sellers may begin setup at 8:00 am). Admission is \$1.00; sellers' cost is \$8/table (prior to October 15, \$10/table after October 15). Talk-in on .75/.15 and .52 direct. There will be a consignment ta-

ble (for small items), food, and bargains. For more info, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701; (617)-877-4520.

**MARION OH  
OCT 25**

The Marion Amateur Radio Club will hold its 7th annual Heart of Ohio Ham Fiesta on Sunday, October 25, 1981, from 0800 to 1600 hours at the Marion County Fairgrounds Coliseum, Marion OH. Featured will be many prizes. Food and a large parking lot will be available. Tickets are \$2.00 in advance or \$3.00 at the door. Tables are \$4.00. Talk-in on 146.52, 147.90/.30, or 223.34/224.94. For additional information, tickets, or tables, contact Paul Kiltzer W8GAX, 393 Pole Lane Road, Marion OH 43302.

**WHITESTONE NY  
OCT 25**

The Tu Boro ARC will hold a mini flea market and auction on

Sunday, October 25, 1981, from 9:00 am to 4:00 pm at the Odd Fellows Hall, 149-14 14th Avenue, Whitestone NY. Admission is a \$1.00 donation. Talk-in on 145.62. For table space and other information, contact either Marty WA2APT at (212)-359-6923, or Ed WB2IBQ at (212)-746-4082 after 7:00 pm.

**DORCHESTER ONT CAN  
OCT 25**

The London Amateur Radio Club will hold its 4th annual Swap 'n Shop flea market on Sunday, October 25, 1981, from 9:00 am to 4:00 pm at Lord Dorchester Secondary School, Dorchester, Ontario. Admission is \$2.00 per person with children under 12 admitted free. Tables are \$1.00 per table (plus admission) and must be reserved and paid for in advance. Talk-in on 147.78/.18 or 146.52. For additional information, write to Dick Reiber VE3IBV, 417 Regal Drive, London, Ontario N5Y 1J8, Canada.

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I have frequently been savaged as a result of my implacable refusal to go along with the fashionable new attitude of detente that has developed between hams and CB operators. Largely inspired by persons who hold both tickets, and aided and abetted by certain business interests in both electronics manufacturing and in the magazine publishing field, this phony and hypocritical fraternalism poses naught but disadvantage for us. We have little to gain, but a great deal to lose.

Why the unnatural alliance? Who needs it?

Don't get me wrong. Our ranks have been strengthened by many who were first exposed to communications as CBers. They worked hard to achieve their qualifications and deserve all the credit in the world, for they had much to overcome. In point of fact, many of these converts to amateur radio came in as a result of their disgust with CB and their realization that nothing could ever change it and make it a viable service; it had been allowed to retrogress for such a long period that it was too far gone. Despite all the best efforts of the few constructive elements within CB ranks, they have never been able to "clean up their act." CB remains, almost 25 years after its inception, an undisciplined, rowdy service, incapable of self-policing. And the licensing authority, the FCC, is apparently unwilling and unable to do anything about the mess.

Typical of what's been going on is an incident reported in the press on the 23rd of June. Three fishermen whose boat capsized

in rough seas off Fire Island, N.Y., may have lost their lives because chit-chatting CBers weekendend there refused to relinquish an emergency channel. A Coast Guard search for the missing men was abandoned after 21 hours. The proprietor of the marina where the ill-fated *Water Rat* had been berthed said, "It was outrageous! They begged the people to get off the channel, but the idiots went right on talking." A Coast Guard officer said that the problem of people chatting on reserved channels occurs all the time on Citizens Band.

This points up the obvious: If it weren't for the long-term failure of the FCC to insist not only upon mere possession of the applicable regulations, but also upon familiarity with their provisions, there would be greater compliance. How can users be expected to follow rules that they are not required to be conversant with? And how can there be any assurance that they know the rules unless they are required to take an examination which tests their knowledge?

At the very least, the license grant should have been contingent upon a grasp of the radio regulations applicable to the particular service.

But since the FCC has not seen fit to impose such obligations as a prerequisite to licensing, then we, as a conscientious group faced with the necessity of preserving the traditional character of amateur radio as a self-policing service, must oppose all measures which would water down "entrance requirements" and make the acquisition of a ham radio license easy.

I happen to believe that those who are in the forefront of all movements toward detente between the two services have but one purpose in mind: to establish easy ways for unqualified persons to acquire the ham license—code-free licenses, etc. And among the more insidious methods of accomplishing such a sinister goal is the constant effort to legitimize CB in the public mind so that the vast majority of the people will

no longer regard the two services as distinct and apart. And I do not believe that there is any doubt that this tactic has succeeded, at least partially.

We had a cookout here recently, and one of our friends brought a lady along. During the course of the afternoon, she glanced at my antenna installation and said to me, "My, you must be a ham operator. My son is also a ham... his numbers are..." And she rattled off one of those Citizens Band call-signs. When I explained that there is a marked difference, her reaction made it abundantly clear that she hadn't any idea that her youngster was not an amateur operator; this was the first she'd heard of it.

I've just learned that Kayla Hale W1EMV/TI5 passed on recently. A former editor of this magazine, Kayla was a very dear friend of long standing and was directly responsible for my association with 73. A constant member of the 3999 gang, she was highly respected and will be greatly missed by all who knew her.

Mentioning Kayla reminds me that just a few months ago she wrote a letter that was published in the correspondence section in which she complained about deliberate interference during her attempt to resolve a medical emergency. Her husband suddenly took ill, and her efforts to get a phone patch were marred by intentional QRM. I cite this in order to acknowledge that in ham radio we also have our problems and are not free from our own incorrigibles. But I think it is fair to say that such idiots are in the negligible minority and are roundly condemned by the vast majority.

The DX fraternity is divided into two distinct groupings—those who have succeeded in working XZ5A, and those who haven't made contact. Of course there is that little coterie of fortunate persons who are already credited with Burma, and among them there are those who worked Don Miller W9WNV some sixteen years or so ago.

There is great discussion going on concerning the legitimacy of the present operation. Documentation was not issued by the Rangoon government, apparently, but by the State of Kawthoolei. Speculation is run-

ning rife and there is great uncertainty about whether the DXCC office in Newington will accept the operation as valid. Those who are holding the QSL are advancing all sorts of arguments in favor of okaying the operation, while those who haven't worked the station tend to express doubts about it. Since I happen to be one of the former, I hope that Newington will accept it as valid.

The problem is that Rangoon seems immovable in its unwillingness to permit amateur activity now and for the foreseeable future. Because of this intransigence, it is impossible to anticipate that there will ever be any operation which might have official sanction of the Burmese central government. Apparently an insurgent group is in control of the State of Kawthoolei where the present operation is based, and if documents issued by such a provincial government are not going to be deemed valid by the League, there is no chance that anyone who still needs Burma will be able to make it.

But what of the last operator from Burma? Did Don Miller submit documentation? And was such documentation scrutinized carefully in order to establish validity beyond any question? These are questions that are being asked and deserve answers. Because of repeated irregularities in his various DXpeditions, Miller's operations though accepted at the time, are now widely suspect. My point is simply that unless Don Miller's Burma operation was properly documented, it is grossly hypocritical for the League to void the legitimacy of the present XZ5A/XZ9A operation. How can DXCC refuse to accept Kawthoolei licensing while it accepts the validity of an operation in which the documentation is widely regarded as spurious?

I think that at the very least the League should examine the records in order to establish beyond question that the documentation offered by Miller was in order and not fraudulent. I think that the League owes this to the thousands of amateurs all over the world who have exerted their efforts to work the present operation in good faith. Cavalier dismissal on a technical point is acceptable only if the technicality is applied across the board.

and with equal weight. Any other course is inequitable and fosters some of us an unfair advantage at the expense of the rest. An advantage, I might add, that can never be overcome as long as the present Rangoon government maintains its adamant opposition toward any and all amateur radio activity. That, I submit, is the intention of the Burmese authorities, and for this reason an examination of the continued inclusion of Burma on the DXCC countries list now becomes appropriate, in my view.

I would also express the view that if it is found that the Rangoon government is not now

in a position of administrative control of the State of Kawthoolei, and if it can be shown that all civil, military, political, and economic administrative rule is in the hands of a provincial government, then the ARRL should accept radio licensing documentation issued by Kawthoolei as valid and legitimate.

After all, at the time of the writing of our own Declaration of Independence, our colonies had not yet won their freedom from Britain, yet that document's legitimacy and validity has never been regarded questionable; indeed, it represents a milestone in the fight for human freedom and dignity. We have

recognized and continue currently to recognize the validity of insurgent governments which succeed in overthrowing despotic, tyrannical regimes throughout the world. Why should Kawthoolei be an exception? Or, more important still, is it the function of DXCC to grant or withhold recognition when there is a *de facto* government in actual power and control? These are not questions which should be decided arbitrarily by a single individual or group acting on the basis of private initiative.

The major problem is that it is the central government in Rangoon which is the main culprit. It

is in Rangoon that the small oligarchy wields the oppressive power which denies our Burmese colleagues the right to operate their stations. In the very act of recognizing the validity of the Kawthoolei documentation, we can demonstrate a strong endorsement of our national commitment to human rights, and at the same time we can reinforce our solidarity with our ham colleagues all over the globe. If we deny the validity of the Kawthoolei operation, we serve notice to restrictive governments that they can limit or outlaw amateur radio without running the risk of the slightest objection.

## DX



Yuri Blannarovich VE3BMV  
Box 292  
Don Mills  
Ontario M3C 2S2  
Canada

### DX CONTESTS

In the months of October and November we have the major contest, what we can call the Olympics of amateur radio: the CQ WW DX Contest. It is unquestionably the biggest and best attended contest of them all. The contestants know what to do; they are trying to get the most contacts with the maximum possible number of countries and zones as possible. The DXers usually show up and tune the bands to find the juicy ones or those that they are still missing on their "most-wanted" lists, because there is an opportunity to work something like 150 countries on the weekend.

A number of Contestpeditions show up from the rare spots. For them, this is a clear advantage, because they have a chance to operate from a good geographical location with good

propagation, usually around the equator, and possibly from a country that is relatively rare. The more rare the country, the better the chance to get more people to call them and make more contacts.

To illustrate some of the rates achieved in the contest, the VP2KC operator had runs of about 340 QSOs an hour working JAs. Some stations work around 150 countries on the higher bands. So, wouldn't it be easier to work that BY or ZA under circumstances like that?

Where do the lists stand? Down in the mud. So, all in all, it is a great opportunity to improve your operating skills and also watch those big guns to see how they operate. Also, when you have a big gun locally, you can compare what he is hearing and what you are. Maybe you will discover that that antenna can be better (and bigger) than it is.

It is becoming more common to have some "spectators," that is, operators tuning around the contest turmoil and observing the propagation, signals, techniques, etc. One thing that they also do is give a call to a contestant or DXer and help him with a point or two. It is a nice gesture, especially to those who are sitting in the not-so-rare countries such as W or VE. Maybe he was the one who gave you that Spratley or Market Reef contact. So, say thank you.

The multi-multi stations are like beacons on the band. They even call when the bands are seemingly dead, because they are stuck on that band anyway. Some interesting things can be observed.

So, all in all, it is a great opportunity to get that rare one, especially for those who are starting up and need to get there quickly. Watch out for the QSL routes—most of the operations have a QSL manager.

### QSLING

What is a QSL card? It is a confirmation of an established contact and it is proof and a record of that event (or, better to say, it is supposed to be). There are always the good and bad, and we have that in our hobby, too. Some DXers figured why bother working the guy if they can maybe get that card anyway, or they would do anything to get the card so they can add it to their total and eventually show up on the Honor Roll. Makes one wonder what honor is if the only desire and drive behind all of this is to get a card, even if the game must be played dirty.

There is a bit of that going on. This was the reason why some DXers were disgusted and tried to get something done about it. Apparently, the ARRL wouldn't do much about it so they decided to do something. What they did? QSL scam! Remember Abscam? Similar thing. They went ahead and printed copies of many rare QSL cards and made them available to those who wanted them. You would think that those who wanted to

get on the Honor Roll would not go for it? Well, some did. It is best described in the letter by Dave Gardner K6LPL, well-known DXer and DXpeditioner. This letter was sent to *The DX Bulletin*, which broke the news on the whole affair. Here it is:

*Approximately one year ago, a group of fourteen amateur radio operators both in the western United States and in Europe involving six countries got together and were discussing the sorry state into which DXing has fallen. It seemed to the group that the original purpose of DXing, the spreading of international goodwill and fellowship, etc., had degenerated into a new form of the hobby which we called "QSLing." At that time, our group, which includes ten members of the Honor Roll, attempted to figure out a way to make an impact on amateur radio, the ARRL, and DXing in general.*

*Our group has never been anti-League or anti-DXCC. What we are against is QSLing at any price, lack of concern for others, and the virtual disintegration of the generally good-natured camaraderie and willingness to help others that had characterized DXing in the past. The characteristics of DXing have become greed, avarice, and unconcern for others in search of the almighty QSL. Witness the plight of the poor, rare DX operator who gets on the air, and is totally smothered by stations in quest of the almighty QSL. This forces stations to resort to lists so that the poor guy can make a contact. This phenomenon has spread*

throughout the world and is not just an American problem, as witnessed by the problems that the most polite of amateurs, the Japanese, had in the demonstration two years ago in China.

It was unbelievable to us how many "straight" amateurs accepted blank QSL cards and submitted them to the League. This is only the tip of the iceberg, as it is a well-known fact that working stations for friends while they are out of town or unable to work rare DX, and even phone-patching those stations through has become a commonplace, everyday habit.

No QSLs were sent out by our group for contacts during this sunspot cycle. Many members of our group have gone on numerous DXpeditions and it was decided that all of our respective QSL managers would be kept completely in the dark about this so as not to endanger their fine reputations. As far as we are concerned, this "operation" is over as we feel we have made our point. No further distribution of cards will be coming from our group. We estimate that between twenty and twenty-five thousand [emphasis added] QSL cards have been sent and accepted by amateurs throughout the world in every continent except Antarctica.

We must stop this insane QSL chasing and go back to DXing for the sake of DXing and not just for the sake of a QSL card.

David G. Gardner, M.D. K6LPL

As a result of this, a number of DXers were already disqualified. I think it would be only fair in order to preserve the credibility of the DXCC and the Honor Roll to ask those who are on it or fall in the time frame of the QSL scam to submit their cards for verification. It may be a lot of work, but perhaps there might be some volunteers that can help.

Another questionable way of obtaining QSLs is the operation list. Quite often, the two stations do not hear each other and the report and call signs get passed by a "third party," the net control. This is definitely not the way to do it and you should stay away from it as much as you can. Don't forget: The whole world is listening and they hear you. What would they think about you? Stay clean! Back in the old country, they used to say

that honor is worth more than anything else.

#### HOW TO QSL?

Generally, I would say QSL to those that you really need. There are some types that QSL anything that moves. For example, you work him in the contest three times on the same band, and you get three QSL cards. You probably already have about ten of them in your collection. This is just an unnecessary burden for the post office, your QSL bureau, your friend, and your pocket, too.

The best thing to do is to keep some kind of records. This is usually done when you are brand new and eager to get a QSL card for each contact you made. I used to have a very nice tracking system, with a book, divided by countries. I used different colors for different bands and modes and then an overall table showing which country was worked, confirmed, and on what band and mode. So, you always know where you stand. Then I gave up after over 40,000 contacts were made; it is just impossible to do that and have the time to operate. The contest logs are nuisance enough.

It is also advisable to keep a record of cards sent out directly and to which QSL manager, so you can try again if for some reason you don't get a reply. As they say: The QSL is the final courtesy of the QSO. It is polite to answer all the requests for your cards. There is no legal right to obtain a card; you can't sue anyone because he did not send you one. You can feel miserable about him, and perhaps "won't hear" him when you fire up from China, but that is about it.

I have experienced a number of threatening letters with exclamation marks just because a guy did not get his card within 24 hours. Well, sometimes there might be reasons for a delay: Cards are not printed, logs are not in the hands of the QSL manager, the boat is going there only once a year, etc.

The contesters are sometimes in a special situation. Usually, the typical multi-multi station can easily make 10,000 contacts on a weekend and this happens about 4 to 6 times a year. It is difficult to QSL everyone contacted. Gentlemen will at least answer all requests.

It might take a little longer, but they usually do. This is where those younger and eager hams can perhaps offer to help a con-tester by volunteering his QSL services. It will give them a chance to get involved in a super-station, learn something, and be of help to many others.

Generally we can divide the QSL types into three groups: regular, rare, and special.

*Regulars* would be the ones that are around a lot and if you did not get this one to reply, there is always another one. Those we usually QSL via the bureau. Don't waste your money on postage. Put them in a bundle, nicely sorted in alphabetical order by countries and prefixes, and send them to your QSL bureau. Then wait (and wait), especially if it is Box 88, Moscow. Things are slow there. Find out what your local bureau situation is. The ARRL now is running the QSL bureau for outgoing cards. See QST for details. Incoming cards are going through the ARRL and local call area volunteers.

It is necessary to have a sufficient number of SASEs with them. Otherwise, cards will be destroyed after a certain period of time. Most of the other countries have their QSL bureaus run by their national amateur radio organizations and they handle all incoming and outgoing cards. Caution: Some hams are not members of the organizations and the bureau is not handling cards for them—cards usually get returned.

It is safe to say that for all the eastern European countries, the bureau is the safe and sure way of getting the cards. When there is a big bundle of cards to be sent out to, let's say, Japan, you will probably be better off to send directly to Japan rather than through your bureau. The cost difference will be small and they can go via slow boat rather than airmail.

*Rare* ones are those who are rare: There is maybe only one ham in the country, the activity is very sporadic, or the mail service occurs only once a year (like ZD7 or VE with all the postal strikes, hi). Then it is worth it to find out what the best QSL route is. Many times the rare ones have a QSL manager, and if it is a good one, it is easy to get the card. You send the card directly to him. Just remember, he is

probably handling over 50,000 cards a year (W3HMK), so make the job easy for him. Make sure that you include an SASE, with the correct postage affixed.

Remember, Canada is not a part of the US and, therefore, it has its own stamps; don't put US stamps on the envelope. If you are desperate, maybe include unglued stamps. They can be used by the manager for his SASEs. But the best thing to do is always to use the stamps of the country that the manager is in, and the correct amount. If you don't have them or cannot obtain them (some philatelic stores have unused stamps of almost all countries in the world), then use IRC coupons. Those are the coupons that you can obtain at your local post office. So, it is a good idea to drop a note to him and ask how many and how much.

One IRC is usually worth the postage of one unit of postal weight in the country at regular, surface mail. Air mail is more and the *Callbook* lists some of the rates to various countries. Usually, three IRCs are sufficient for airmail from most of the countries.

Some countries (most of east Europeans) have 100% censorship at their post offices, so be careful what you are writing so you do not put a ham in jail. Remember, not all countries have the freedom that we in the West enjoy. Some of them prohibit foreign currency and it simply gets removed and put in the State fund. Box 88 apparently even removes the IRCs. Some countries are looking for call signs on the envelopes and that tells them that there is meat in the envelope—they take it. Or, sometimes there is an unscrupulous postmaster who does that. So, generally, even if you are proud of your call sign, it is better not to put it on envelopes, especially those going to the East or to Africa. This is why the QSL managers are doing their thankless job and serving DXers.

Always make sure that all the information on the QSL card is correct and spend some time doing that. A manager might have lots of work to do with your sloppy card if you did not put your time, date, or band correctly on the card. Remember, he might have 340 QSOs for one hour in his log and he has,



perhaps, 5000 QSOs on one band from that contest station. Double-check your info, and don't make him search through 10,000 QSOs for that one you made. Make sure that your date and time are always in GMT (or UTC, as they call it now). Your QSL card is like your picture, so try to look nice.

Special ones would be all those who are either extremely rare or very difficult to get cards from; it is advisable to find out the QSL info right away. This happens when an amateur is assigned to work there or is passing by the country and is active for a very short period of time. A number of DXpeditions fall here, too. You must QSL as soon as possible, before the logs get lost, the QSL manager gives up, etc. Excellent help is provided in the various bulletins and QSL manager lists. To mention two, there is the very sizable W6GO/K6HHD list (Box 700, Rio Linda CA 95673) and the QSL Report by QSL Management Association, c/o JH1HWN. Those have the latest, up-to-date information in them, usually taken from the DX bulletins and nicely sorted out and summarized. There is, of course, the Callbook, which lists all the hams in the world, and it is almost a must for those who are just starting their QSLing.

I hope that this will shed some light on the art of QSLing. It is always advisable to consult your local big gun if you are not sure. Good luck and may your returns be 100%.

## HAM HELP

I need any info on a Packard Bell oscilloscope, model 5mc 2P— schematic, manual, etc. I will pay copying and postage or will copy and return original. Thanks.

Harl Goodsell W7LTH  
70 S. 2nd East  
Hyrum UT 84319

I need a March, 1975, issue of 73 Magazine. I also need help in obtaining a Hewlett-Packard HP-46 with the optional LED display and a Fisher HC-10 Stereo reverberator.

Ham Help is my last resort in

**DX NEWS**  
XZ Burma is getting better and better. Apparently, the station was improved by the installation of a beam and amplifier and operators are starting to work on their own, without the lists. QSL via JA8BMK for XZ5A and XZ9A.

HH0N Navassa operation by a number of operators from Haiti. Operators are trying to do their best and, apparently, Haiti is claiming the island. If Navassa is part of Haiti, then most likely it will lose its separate country status. QSL via WD4JNS.

YO0WUG and other calls with the YO0 prefix are being used to commemorate the world University Games, or Universiade as it is also known.

9Q5VT Zaire is quite active by Len and also shortly by W5VR. QSL via W5VR.

KH6IJ is recovering nicely from his stroke. Worked him recently on CW and he still has a problem with coordination, but it is great to hear that famous call on the air again. One of world's best operators ever. Speedy recovery, Katashi.

Africa. A number of expeditions are wandering around; watch out for the announcements. Most of them are very sporadic, waiting for the licenses.

A7XE operating around 21025, QSL via DF4NW.

AX Australia. Special prefix was used for Prince Charles' wedding commemoration. AX9NL was quite active. QSL cards to their respective VK callsigns.

attempting to find these items. Please send information you may have toward my obtaining these items.

George E. Weinbender  
PO Box 747  
Lake Havasu City AZ 86403

I would like to correspond with anyone who has converted the ARC-21 or ARC-65 surplus rigs. I have the ARC-65 tech manual and an extra control head.

Mark Meltzer  
335 Prentiss St.  
San Francisco CA 94110

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# CONTESTS



Robert Baker WB2GFE  
15 Windsor Dr.  
Atco NJ 08004

## CALIFORNIA QSO PARTY

Starts: 1800 GMT October 3  
Ends: 2359 GMT October 4

This event is sponsored by the Northern California Contest

Club, with strong efforts being made to have all 58 counties in California on for the contest duration.

Single-operator stations may operate only 24 hours of the contest period; off-times must be clearly marked in the log. Multi-operator stations may operate the full 30 hours. Stations may be worked only once per mode per band. All contacts must be simplex. All CW contacts must be made in the CW subband. California stations that change counties are considered to be new stations and may be contacted again for points credit.

# RESULTS

## BRITISH AMATEUR RADIO TELEPRINTER GROUP 1981 SPRING CONTEST RESULTS Single Operator

Callsign	Points	Total QSOs	Countries
W3EKT	598000	364	37
I5FZI	577720	296	46
EA8RU	537544	346	36
W3FV	466334	271	39
K7BV	445760	281	37
G3HJC	436028	247	34
WB3CCZ	380820	232	37
W4CQI	377936	249	35
GM3ZXL	377140	226	38
SM6ASD	373430	233	32

### Multiple-Operator

LZ1KDP	489464	296	39
LZ2KRR	465052	277	37
HA5KBM	403300	254	35
I5NUT	328388	197	38
HG6V	273734	216	33
OK1KPU	133952	120	28
OK3RJB	110770	130	30
SP1PBW	51192	103	19
HA6KVD	34074	47	16
SK6DG	18942	31	12

### Shortwave Listener

Name/Call	Points	QSOs	Countries Heard
OK1 11857 (Czech)	350200	224	43
H. Ballenberger (DL)	284068	195	37
OK3 27010 (Czech)	249916	224	34
Y2-5724/C (DM)	173128	137	33
K. Wustner (DL)	165240	139	28
Y2-6992/F (DM)	145542	145	26
A. Schneifer (DL)	65800	68	27
Y2-8861/O (DM)	60080	51	28
Werner Ludwig (DL)	14460	19	5

## EXCHANGE:

California stations send QSO number and county. Others send QSO number and state, province, or ARRL country.

## FREQUENCIES:

Novice—3725, 7125, 21125, 28125.  
CW—1805, 3560, 7060, 14060, 21060, 28060.  
SSB—1815, 3895, 7230, 14280, 21355, 28560.  
Try CW on the half hour and 16 meters at 0500.

## SCORING:

Each completed phone contact is worth 2 QSO points. Each completed CW contact is worth 3 QSO points. For multiplier, California stations use the number of states, VOVE 1-7, and VY1/VE8, for a possible of 58. Others use the number of California counties worked for a possible total of 58. The final score is the number of QSO points multiplied by the total number of multipliers.

## AWARDS:

Certificates for highest-scoring station in each California county, each state/province, and each country. Trophies to the highest-scoring out-of-state single-op, highest-scoring California single-op, and highest-scoring DXpedition to a California county.

## ENTRIES:

All logs and summary sheets must be sent by November 1st to: NCCC, c/o Dennis Egan N6QW, 811 Byerley Avenue, San Jose CA 95125. Please include an SASE with your entry.

## NINE-LAND QSO PARTY

Starts: 1800 GMT October 10  
Ends: 2359 GMT October 11

A maximum of 24 hours of the 30-hour period may be worked. The same station may be worked once per band and mode. If any stations change counties, they may be worked again.

## EXCHANGE:

Nine-land stations send RS(T), county, and state. Others send RS(T) and state, province, or ARRL country.

## FREQUENCIES:

Novice—3725, 7125, 21125, 28125.  
SSB—1815, 3895, 7230, 14280, 21355, 28600, plus VHF.  
CW—1805, 3560, 7060, 14060, 21060, 28060, plus VHF.

## SCORING:

Each QSO is worth 2 points. Nine-land stations compute final score as: total QSO points times the total number of states, provinces, ARRL countries, and nine-land counties. Others multiply QSO points by total number of nine-land counties.

## AWARDS:

Certificate to top score in each state, province, and ARRL country; 2nd and 3rd places if justified. Also, awards for top mobile, portable, multi-single, multi-multi, club, and Novice.

## ENTRIES:

Submit summary sheet and log. Each new multiplier shall be clearly indicated. Send logs and a large SASE to Ill Wind Contesters, c/o John W. Sikora WB9IWN, 8747 Northcote, Munster IN 46321.

# RESULTS

## 160-METER PHONE CONTEST CLAIMED SCORES Top Six, 1981

### Single Operator:

Callsign	State	Score
W8LRL	WV	383,625
K0RF	CO	333,660
WB0CMM	CO	256,880
W9RE	IN	224,960
W3YOZ	MD	217,500

### Multi-Operators:

W4CN	KY	198,645
WA9EYY	IL	193,475
WD0BNC	KS	176,985
WD0BRD	NE	169,750
W9ZX	IL	170,725
KA9F	IL	97,500

Final results to be published in November or December 73.

## JAMBOREE ON-THE-AIR

Starts: 0001 GMT October 17  
Ends: 2400 GMT October 18

It's Jamboree time again! Time for Scouts, former Scouts, and anyone interested to meet on-the-air for a weekend of good Scout talk. It gives amateurs and Scouts worldwide a chance to listen to or talk with other scouts and in some cases where

Equipment is available for slow-scan television, to see them, also. By the way, this also includes Girl Scouts, Guides, and all Scout leaders.

Hams invite Scout groups to their shacks for the occasion, or Scouts seek out hams. Amateur radio clubs have lists of their members, and a list of such clubs is available from the ARRL, Attn: Sally O'Dell, Director Youth Activities, 225 Main Street, Newington CT 06111. Send an SASE with your request. Hams may contact local Scout offices for names of Scout leaders in their neighborhoods. Look for stations operating at camporees and other Scout events, K2BSA, the national headquarters amateur radio club station, and HB9S, the world Scout Bureau station.

Most operations will occur during the period of 0001 GMT Saturday to 2400 GMT Sunday, but since this is not a contest, operations may start Friday and go into Monday. There is no required contact format, no specific exchange, just Scouting fun. All operations must, however, adhere to FCC rules and regulations.

**FREQUENCIES:**  
Scout frequencies published

by the World Bureau are as follows:  
Phone—3740, 7090, 7230, 14290, 21360, 28990.  
CW—3590, 3750, 7030, 7130, 14070, 21140, 28190.  
SSTV and RTTY on usual frequencies.

Since the 3740 and 7090 phone frequencies are outside the USA phone bands, overseas stations using those frequencies may listen inside adjacent USA phone bands or respond to CW calls.

Postcard-size certificates designed by an Australian Scouter and issued by the World Bureau are available from JOTA Coordinator Harry Harchar W2GND, 216 Maxwell Avenue, Hightstown NJ 08520, for anyone participating. Send an SASE with sufficient postage for their return, one ounce per eight cards. They may be requested before the JOTA weekend for distribution then, or for award at Scout Courts of Honor or other meetings.

Logs or lists of participants are not required, but reports of activity and photos are welcome for inclusion in the BSA report to the World Bureau and possible use in Scout publications. Send them to the JOTA Coordinator mentioned above.

# CALENDAR

- Oct 3-4 California QSO Party
- Oct 10-11 Nine-land QSO Party
- Oct 17-18 Minnesota QSO Party
- Oct 17-18 Scout Jamboree On-the-Air
- Oct 17-18 Pennsylvania QSO Party
- Oct 17-18 QRP ARC International CW QSO Party
- Oct 24-25 CQ World Wide DX Contest—Phone
- Nov 7-8 Antigua and Barbuda Independence QSL Party
- Nov 7-8 IPA Contest
- Nov 8 DARC Corona—1-meter RTTY
- Nov 8 OK DX Contest
- Nov 14-15 European DX Contest—RTTY
- Nov 28-29 CQ World Wide DX Contest—CW
- Dec 26-31 G-QRP-Club Winter Sports
- Jan 9 73's 40-Meter Phone Contest
- Jan 10 73's 80-Meter Phone Contest
- Jan 16-17 73's International 16-Meter Phone Contest
- Jan 16-17 International SSTV Contest

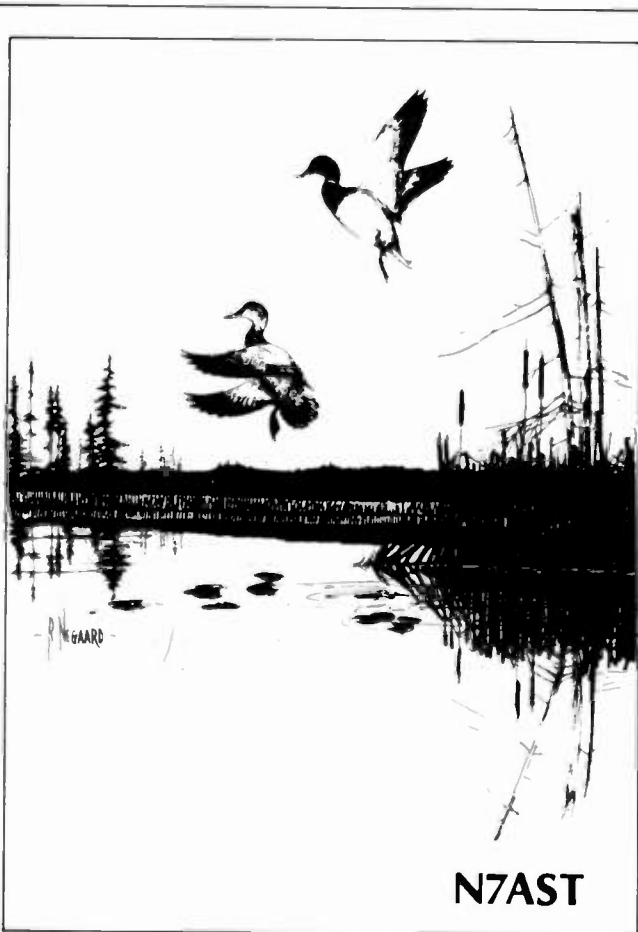
# RESULTS

## 10TH ANNUAL COUNTY HUNTERS SSB CONTEST

Plaques to be awarded to the highest-scoring fixed US or Canadian station, DX station and mobile station, and second highest-scoring mobile station. Certificates to the top 10 fixed and mobile stations in the US and Canada and to the highest-scoring station in each DX country.

Fixed Station		Mobile Station	
N7TT	5,680,752	N4UF	1,049,489
AG9S	3,204,720	WA5DTK	1,034,150
WB3CFD	1,481,063	WB0CQO	131,500
VE1RQ	1,292,988	W0QWS	127,655
W1CHA	638,768		(check log)
W9CA/4	414,630	W1EXZ	67,130
W3ARK	275,850	AC8Y	49,410
K9GDF	165,750	K3LHD	23,655
WB6GMM	137,000	KS0AQS	14,300
WB3IET	46,464	W2PDM	6,720

DX Station			
WB5KEA/KP4	2,801,568	SM0CHA	111,650
I2PHN	514,400	CT1TZ	81,900
SM5CAK	241,380	CT1UA	78,240
CT7SL	173,679	G4HBI	53,060
GW3CDH	140,400	SM4DHF	36,938



**N7AST**

### QSL OF THE MONTH

This month's winner was submitted by Andy Schaefer N7AST of Hackensack MN and Mesa AZ.

If you would like to enter the contest, put your QSL in an envelope and mail it along with your choice of a book from 73's Radio Bookshop to 73 Magazine, Pine Street, Peterborough NH 03458. Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does occasionally damage cards) and do not specify book choice will not be considered. Sorry.

### QRP ARCI CW QSO PARTY

Starts: 1200 GMT October 17  
Ends: 2400 GMT October 18

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band for QSO and multiplier credits. Participants must be off the air at least 12 hours in not less than 6-hour periods.

#### EXCHANGE:

Members—RST, state-province-country, and QRP number. Nonmembers—RST, state-province-country, and power output. Novices and Technicians add /N or /T after the QRP number or power.

#### SCORING:

Each member QSO counts 5 points regardless of location. Nonmembers' QSOs are 2 points with US and Canadian stations; others are 4 points each. Non-member Novice and Technician contacts count 3 points. Multipliers are as follows: 4-5 Watts—x 2; 3-4 Watts—x 4; 2-3 Watts—x 6; 1-2 Watts—x 8; less than 1 Watt—x 10. Stations are eligible for the follow-

ing bonus multipliers: if 100% natural power (solar, wind, etc.) with no storage, x 2; if 100% battery power, x 1.5. Final score is total QSO points times total number of states-province-countries per band times the power multiplier and times the bonus multiplier (if any).

#### FREQUENCIES:

1810, 3560, 7040, 14060, 21060, 28060, 50360.  
Novice/Tech—3710, 7110, 21110, 28110.

All frequencies plus/minus to clear QRM.

Note: VHF/UHF contacts must be direct—no repeater contacts are allowed.

#### AWARDS:

Certificates to the highest scoring station in each state, province, or country with 2 or more entries. One certificate to highest-scoring Novice/Technician overall.

#### LOGS AND ENTRIES:

Send full log data, including full name, address, and bands used, plus work sheet showing details and time(s) off the air. No

log copies will be returned. Please indicate if you are a Novice or Technician. All entries desiring results and scores please enclose a business-size envelope with return postage. It is a condition of entry that the decision of the QRP ARCI Contest Chairman is final in case of dispute. Logs must be received by November 20th to qualify. Send all logs and data to: QRP ARCI Contest Chairman William W. Dickerson WA2JOC, 352 Crampton Drive, Monroe MI 48161.

### PENNSYLVANIA QSO PARTY

1700 GMT October 17 to 0400 GMT October 18  
1300 GMT October 18 to 2200 GMT October 18

Sponsored by the Nittany Amateur Radio Club, this is the 24th annual event. Stations may be worked once on each band on each mode. Mobiles may be reworked as they change counties. Repeater contacts do not count.

#### EXCHANGE:

RS(T), 3-digit sequential serial number, and ARRL section or Pennsylvania county.

#### FREQUENCIES:

SSB—3980, 7280, 14280, 21380, 28580.

CW—40 kHz up from bottom of CW bands.

#### SCORING:

Count 1 point for SSB QSOs, 1.5 points for CW QSOs, and 2 points for 80-meter CW QSOs. Pennsylvania stations multiply QSO points by the total number of ARRL sections, plus the total number of Pennsylvania counties, plus a maximum of one DX country. Others multiply QSO points by the total number of Pennsylvania counties worked. Mobiles in Pennsylvania calculate their total for each county and then add these county totals together for the final score.

#### AWARDS:

Handsome plaques will be awarded to the top Pennsylvania and out-of-state entrants. Certificates for section winners and the 10 top Pennsylvania entrants with a minimum of 10 QSOs. Special club award: An engraved gavel will be awarded to the Pennsylvania club whose members score the highest aggregate scores in the contest.

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7800P7G01 2.6-4.2GHz  
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R.D.2 ROUTE 21 HILLSDALE, NY 12529  
518-325-3911

Be sure to indicate club affiliation on your logs!

**ENTRIES:**

Dupe sheets are required for entries with 100 QSOs or more. Mail logs, dupe sheets, comments, and an SASE (for results) by November 15th to: Douglas R. Maddox W3HDH, 1187 S. Garner Street, State College PA 16801.

**MINNESOTA QSO PARTY**

**Starts: 1700 GMT October 17**  
**Ends: 2259 GMT October 18**

This year's contest is sponsored by a newly-formed club in the Brainerd, Minnesota, area, the Paul Bunyan Wireless Association. There are no mode or time restrictions, but only one transmitter is allowed in operation at one time. No crossband contacts are allowed. Novices compete with Novices, Technicians with other Technicians. Phone and CW are considered the same contest—please score as such. Net QSOs are not valid!

**EXCHANGE:**

RS(T) and ARRL section/country or Minnesota county.

**FREQUENCIES:**

Phone—3933, 7233, 14300, 21433, 28633.

CW—3633, 3733, 7033, 7133, 14033, 21033, 21133, 28033, 28133.

**SCORING:**

Minnesota stations multiply total number of contacts times the number of sections and DX countries. Others multiply number of QSOs by the number of Minnesota counties worked. Score one point for phone QSOs and two points for CW QSOs. Any contact with ADØS counts 10 points per QSO on each band, 80 through 10 meters. If you contact ADØS on 3 or more bands, add 25 points bonus!

**ENTRIES:**

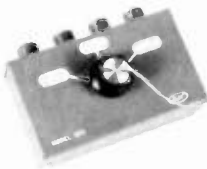
Logs must include date/time in GMT, bands, modes, and exchanges. Logs must be post-marked no later than November 20th and addressed to: Paul Bunyan Wireless Association, c/o Steven Scott WDØEPE, 801 6th Street North, Staples MN 56479. Include a business-size SASE for returns. Usual disqualification and awards procedures.

*Continued*

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# 1st ANNUAL 40- AND 80-METER PHONE CONTEST

## SPONSORS:

73 Magazine, Peterborough, New Hampshire 03458

## CONTEST PERIODS:

40-Meter Event—0000Z to 2400Z January 9, 1982

80-Meter Event—0000Z to 2400Z January 10, 1982

## MISCELLANEOUS RULES:

Work as many stations as possible on 40- and/or 80-meter phone during the specified times of allowable operation. The same station may be worked once on each band. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours on each band. All multi-operator stations may operate the entire 24-hour period on each band. Off periods must be noted in your logs and on your summary sheet. Off periods are no less than 30 minutes each.

## OPERATOR CLASSES:

(A) Single-operator, single transmitter, phone only

(B) Multi-operator, single transmitter, phone only

## ENTRY CATEGORIES:

(1) 40-meter band only

(2) 80-meter band only

(3) 40- and 80-meter bands

## EXCHANGE:

Stations within the continental US and Canada transmit an RS report and state, province or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

## POINTS:

A station may be worked once on each band. US/VE stations earn 1 QSO point per contact with the 48 states and Canada, 2 points for all others. DX stations (including Alaska and Hawaii) earn 1 QSO point per contact within your own coun-

try, 2 points for all others. Contacts made between 1000 and 1400 local time score twice the normal points per contact. Indicate points per contact on your log sheet.

## MULTIPLIERS:

1 multiplier point is earned for each US state (48 max.), each Canadian province or territory (12 max.), or each DX country worked on each band.

## FINAL SCORE:

Total QSO points times total multiplier points equals claimed score.

## CONTEST ENTRIES:

Each contest entry must include a log for each band in your entry category, a dupe sheet for each band, a contest summary, and a multiplier checklist for each band. We recommend that contestants send for a copy of the contest forms. Enclose an SASE to the contest address listed below.

## ENTRY DEADLINE:

All entries must be postmarked no later than February 11, 1982.

## DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification.

## AWARDS:

Contest awards will be issued in each entry category in each of the continental US states, Canadian provinces and territories, and each DX country represented. A minimum of 5 hours and 50 QSOs must be worked to be eligible for contest awards.

## CONTEST ADDRESS:

Send an SASE to: Whidbey Island DX Club  
2665 North Busby Road  
Oak Harbor, Washington 98277

## SQUELCH TALES

SAN DIEGO REPEATER ASSOCIATION

VOLUME XI

JUNE, 1981

NUMBER 6

### SANDRA HAMS SCORE IN EMERGENCY

Last week, SANDRA members via a SANDRA repeater performed an act exemplifying the public service spirit and resourcefulness of Amateur Radio.

At about 1:25 AM on June 2, NGBDC, Lenny Premselaer, preparing to make his rounds delivering milk to commercial establishments, observed the start of a fire on the second story of a small hotel at 15th and J in downtown San Diego. First on the scene, he keyed up the SANDRA net. Okay repeater 146.04/64, with his mobile rig, he immediately raised M66N2C, Joe Wilkerson, Jr., who promptly notified the fire department.

Lenny meanwhile entered the building, awakening 15 sleeping residents and assisted elderly people to safety.

The building rapidly became engulfed in flames, but the fire department arrived promptly, saving those trapped on a second story fire escape, and salvaging three fourths of the structure. The only serious injury was to a gentleman who suffered a fractured pelvis and other injuries when he jumped from the second story.

The San Diego Union headlines on this story was "Women Pulled From Flames".

Amateur radio may have saved many lives here.

#### NEXT MEETING

Our next membership meeting will be held June 19, 7:30 PM, at the North Park Recreation Center, 4044 Idaho St. All things being equal, we will be honored by the presence of William N. Grigsby, Engineer in Charge of our local FCC office, and June Alonso, our local FCC contact representative. These folks have accepted our invitation, conditional on return from traveling by Grigsby that week.

Your questions will be answered. June suggests that if you want to ask about issues that may have had recent rulings, let her know at 293-5478 in advance so that research can be made if necessary.

#### VOX POP

VOX POP. Remember your high school Latin? Vox populi, "the voice or opinion of the people", showed up on SANDRA net the other night. See our lead article for the results.

## NEWSLETTER CONTEST WINNER

Does your club want a newsletter but can't find a way to pay for it? You should consider the approach that is used in *Squelch Tales*, the monthly newsletter of the San Diego Repeater Association. By selling advertising, they are able to meet or exceed the cost of publishing their newsletter. This seems to work well for other clubs, too; about one in three of the club newsletters sent to 73 contains advertising.

The edition of *Squelch Tales* that we selected was 24 pages long—nine of those pages were ads. The club, which has almost 900 members, charges \$30 for a full page, \$15.00 for a ½ page and \$7.50 for a ¼ page or business-card-size ad. Advertisers are encouraged to submit their own layouts and artwork, but the newsletter will also provide assistance free of charge.

Advertising can be a good shot in the arm for a club budget, provided the job is done right. First and foremost, the ads won't sell themselves. The newsletter staff will need to contact prospective advertisers and then convince them of the merits of spending money to reach the club's members. Likely candidates include the local ham gear dealer, electronics parts stores, and surplus houses. After all, this is where hams spend their money.

The cost of advertising should reflect the size of your club, the quality of the newsletter, and most important of all, the additional expense that is involved when you run the ad. It

## 3rd ANNUAL INTERNATIONAL 160-METER PHONE CONTEST

### SPONSORS:

73 Magazine, Peterborough, New Hampshire 03458

### CONTEST PERIOD:

0000Z January 16, 1982, to 2400Z January 17, 1982

### OBJECT:

To work as many stations as possible on 160-meter phone in a maximum of 36 hours of allowable contest time. Multi-operator stations may operate the full 48-hour contest period. Stations may be worked only once!

### ENTRY CATEGORIES:

(1) Single operator, single transmitter, phone only (2) Multi-operator, single transmitter, phone only

### EXCHANGE:

Stations within the continental US and Canada transmit RS report and state, provinces or territory (i.e., 59 Iowa, 55 Ontario, etc.). All others transmit RS report and DX country.

### POINTS:

Five (5) points will be earned for each valid contact with stations in the continental US and Canada. DX contacts outside the continental US and Canada score ten (10) points each. This year for the first time, an additional 5 points *bonus* may be earned for each contact made during the hours of 1000-1400 local time on either day of the contest.

### MULTIPLIERS:

1 multiplier point will be earned for each of the 48 continental states, twelve (12) Canadian provinces/territories, and DX countries outside the continental US and Canada worked during the contest.

### FINAL SCORE:

Total QSO points times total multiplier points equals claimed score.

### CONTEST ENTRIES:

Each contest entry must include logsheets, dupe sheets for 100 contacts or more, a contest summary sheet and a multiplier check sheet. Please note those contacts made between 1000-1400 local time so you'll be sure to get appropriate contest credit.

### ENTRY DEADLINE:

All entries must be postmarked *no later than February 18, 1982*.

### DX WINDOW:

Stations are expected to observe the DX window from 1.825-1.830 MHz as mutually agreed by top-band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band.

### DISQUALIFICATION:

If contestant omits any required entry form, operates in excess of the legal power authorized for his/her given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which may reduce the overall score more than 2%, disqualification may result.

### AWARDS:

Contest awards will be issued in each entry category in each of the continental US states, Canadian provinces/territories, and each DX country. A minimum of 5 hours and 50 QSOs must be worked to be eligible for contest awards.

### CONTEST ADDRESS:

To obtain information, entry forms, or to submit a contest entry, forward a *self-addressed stamped envelope* to:

160-Meter Phone Contest  
Dan Murphy WA2GZB  
Post Office Box 195  
Andover NJ 07821 USA

doesn't make much sense to sell an ad for less money than it costs to print and mail.

A good rule of thumb is that the revenue from one page of advertising should pay for two or three pages of the newsletter. For example, a 10-page newsletter that costs \$80 to print and mail might have four pages of ads costing \$20 each. To keep the readers happy, you can't replace editorial material with ads. Nor can you expect advertisers to pay a small fortune to reach a handful of people.

Advertising alone does not make a good newsletter. *Squelch Tales*, like our earlier winners, has a nice mix of club news, technical tips, and humor. One nice touch is a classified section in which members can list gear. The success of this newsletter is largely the result of a hardworking staff. Editor W6GIC has been associated with the publication for ten years. Her enthusiasm is matched by that of W6UZL who, as a retiree, has plenty of time to gather the news. Rounding out the team is WA6IPW, who uses his background as a printer to ensure that each new edition looks professional yet is reasonable in cost.

If your club is suffering from newsletter blues, perhaps an injection of advertising will help. This revenue, combined with some hard work, will yield a publication that members can look forward to receiving each month. For those of you working on newsletters: Keep up the good work and make sure that your club's publication is being sent to 73.—N8RK.

## HAM HELP

I need manuals or schematic and alignment data on the Knight Star Roamer and the Hallicrafters S-38 "D" receivers. Xerox copies will be OK.

O. L. Sabetto W8ZXG  
1717 Burgess Road  
Cleveland OH 44112

I am looking for software and equipment compatible with a NorthStar Horizon computer to work RTTY. All help appreciated.

Marc Rubin  
16692 Bolero Lane  
Huntington Beach CA 92649

I am in need of manuals or any information on the following

equipment: Data Engineering, Inc., Space-Matic Electronic keyer; Kyokuto FM 144-10SXR11 2-meter FM synthesized rig; and Eblna Electronics Corp. M7505 10-kHz-30-MHz frequency counter. I will pay for copy or copy and return.

Bob Carson N8CUX  
Box 364  
Smithfield OH 43948

I would like to get in touch with amateurs interested in Esperanto, the auxiliary language, for the purpose of forming an international ham net.

Ernest Black K2REV  
1265 Reservoir Road  
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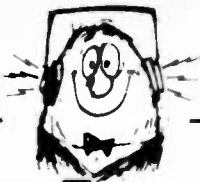
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# FCC

## INQUIRY BEGUN ON SPREAD-SPECTRUM MODULATION IN AMATEUR RADIO SERVICE (DOCKET NO. 81-414)

The Commission has begun an inquiry and rulemaking into whether to allow certain amateur radio users to use spread-spectrum modulation techniques.

In another action, the Commission is exploring the broader area of wideband technologies, including spread spectrum, and said the inquiry/rulemaking involving amateurs would provide the FCC with useful data about the performance of such techniques in the presence of other communications systems.

Wideband modulation techniques differ from conventional modulation schemes—such as amplitude modulation (AM) and frequency modulation (FM)—in that the bandwidth of the transmitted signal is much wider than the bandwidth of the information being sent. Because of the increased bandwidth, such techniques are implicitly prohibited by current rules.

Spread-spectrum techniques were originally developed for military applications concerning and/or resistance to jamming. The radio frequency signal transmitted in a spread-spectrum system occupies a very large bandwidth, perhaps many megahertz, as compared to the information signal's bandwidth. This wide bandwidth provides for a military signal that is very hard to detect or jam.

The Commission concluded

that spread spectrum might offer unique advantages to civilian communications users also. The coding techniques used in spread-spectrum systems, for example, allow message privacy, selective addressing, and code division multiple access (many users simultaneously). These last two advantages provide the user the ability to selectively access only one or a fraction of the total number of receivers sharing the same spectrum. Spreading the signal at the transmitter and collapsing it at the receiver results in a low signal power density and helps the system reject interference. These features suggest the feasibility of overlaying spread spectrum on occupied spectrum, leading to increased spectral efficiency.

In March, the Commission's Private Radio Bureau authorized the Amateur Radio Research and Development Corporation (AMRAD) to conduct limited tests using spread-spectrum modulation. When this special temporary authority expires, AMRAD must submit its findings to the Commission, which will consider them in this proceeding.

Experimenting will be limited to amateur Extra and Advanced class licensees, whose members have been tested in advanced phases of radio electronics. Because spread-spectrum systems are inherently more complex than narrowband systems, the Commission said these licensees were best qualified to build and operate the

necessary equipment so as not to interfere with other radio users. (Material covering spread-spectrum techniques will be added to future amateur Extra and Advanced class tests.)

Due to legal and technical considerations, the Commission proposes authorizing spread-spectrum modulation only in the 50-54-MHz, 144-148-MHz, and 220-225-MHz bands. However, it welcomes requests for special temporary authority to perform limited experiments in the amateur bands above 225 MHz.

The Commission will not limit system design, but only proposes that a system's authorized bandwidth be equal to or less than the width of the amateur band the system is operating in and be contained within that band. Although no interference problems are anticipated, local engineers-in-charge will be

allowed to require stations transmitting spread-spectrum signals to cease operation, if necessary, to stop interference. Provisions to facilitate monitoring by the Field Operations Bureau and by other amateurs are proposed. Commenters may address the issue of interference potential in overlaying spread spectrum on the three aforementioned bands.

The inquiry notice lists questions that might guide those wishing to comment in this proceeding. Interested persons should obtain a copy of the notice.

Action by the Commission by Notice of Inquiry and Proposed Rulemaking (FCC 81-290). Commissioners Fowler (Chairman), Lee, and Quello, with Commissioner Washburn concurring and issuing a statement. For more information, contact Mike Kennedy at (202)-632-7073.

# HAM HELP

Active or retired police amateur radio operators who are members or potential members of the International Police Association interested in forming an IPA Ham Radio Net please contact the Secretary-Treasurer of IPA, U.S. Section, Region 10, at 89 Oakridge Avenue, Nutley NJ 07110.

**Rudolph A. Deutsch WA2MAU**  
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# LOOKING WEST

Bill Pasternak WA6ITF  
c/o The Westlink Radio Network  
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## HOORAY FOR HOLLYWOOD DEPARTMENT

About a year and a half ago, my friend, Jim Davis KA6IUH, was the program director for Los Angeles radio station KMPC. Thanks to Jim, I had a chance to meet and become friends with a number of darn nice people involved in one way or another with the KMPC operation. Among them is a man named Gary Owens. For many years, Gary was the afternoon mainstay of KMPC, though I suspect he is best known to the rest of the nation as the "announcer," with his hand always to his ear, on the old Rowan and Martin "Laugh In" series. Anyhow, one afternoon while I was visiting Jim in his office, I asked if he minded my asking Gary if he would record some public service announcements about amateur radio. Jim did me one better. He suggested we both ask Gary; we did, and Gary graciously agreed to do them.

That evening, I called Lenore Jensen W6NAZ. Lenore is the ARRL's Los Angeles area public information assistant. She's also directly responsible for

99.9% of all the amateur-radio-related announcements you hear on radio and see on TV. We worked out the details of what the announcements should say, and a week later Gary, Jim, and I recorded the copy onto tape. A few days later, my organization, the Westlink Radio Network, formally donated these recordings to the American Radio Relay League for use in their ongoing campaign to foster public awareness of amateur radio. Since then, they have been heard on radio stations nationwide.

In early July, a plaque thanking Gary for his efforts on behalf of all amateur radio operators was awarded to him by the ARRL through Lloyd Sigmon W6LQ. Having Lloyd be the presenter could not have been more appropriate since he was the man in charge of KMPC when Gary came to the station 19 years ago. Also present at the awards ceremony were Lenore (W6NAZ) and Bob (W6VGQ) Jensen. After thanking Lloyd and the League for the recognition, Gary promised to hook up a code-practice oscillator to the key, and practice a bit of CW with it. No, Gary isn't a ham, at least, not yet. But if he ever decided to take the plunge, he would be a welcome addition to our service.

As the individual who instigated this whole affair, I also

would like to express my sincere gratitude to Gary. People in Gary's position are constantly bombarded with requests for similar freebies. I know a number of people who flatly reject any such request for any reason, and I cannot blame them for doing so. Remember, in the case of PSAs such as ours, virtually everything is donated including the talent. The latter is usually the most expensive part of producing a commercial of any sort. There's a Hollywood saying which goes, "Big names cost big bucks," and this is rightly so since for an entertainer or air personality, his or her voice and appearance are their livelihood.

What's nice is that a person of Gary's caliber and standing has as high a regard for our hobby service as to donate his talent in the hope that we can grow and prosper. For this, I can only say to him a simple but meaningful, thank you! I also want to thank Jim Davis KA6IUH along with Lenore Jensen W6NAZ. Putting these PSAs together was a team effort and everyone involved deserves a hand.

## A SPECIAL REPORT

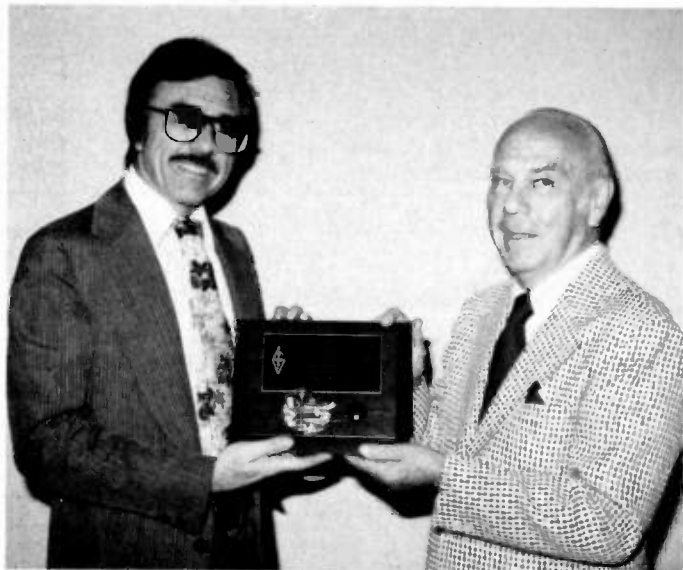
The following is excerpted and being reprinted from the Spring, 1981, Southern California Repeater Remote Base Association Newsletter. I am bringing you this information for several reasons. First, like all other bands, the 420- through 450-MHz spectrum is facing its own form of crisis in many geographic areas, and herein you will find the details of how one group of dedicated radio amateurs plans to deal with the problems that lie ahead. Second, outside of those who use the band in Southern California, little is known by the outside world. Through this input, it is my hope (and I suspect that of SCRRBA as well) that all amateurs will have a better understanding of the need for ongoing voluntary spectrum management to prevent chaotic conditions from developing within our amateur relay spectrum. The report was prepared by Gordon Schlessinger WA6LBV of SCRRBA's Technical Committee. Due to its length and scope, it will be presented in several parts. First, some background for those of you unfamiliar with the group.

Like all other voluntary spectrum management organizations in California (and perhaps nationwide) the SCRRBA was a child of the original California Amateur Relay Council. From it came such well known regional organizations as the Northern Amateur Relay Council and the Southern California Repeater Association (which in 1978 again split into two "special interest" groups now known as TASMA and 220-SMA). Over the years, this column has followed the political motivation leading to these changes toward regionalization and specialization, so I will not repeat them here. Those interested can find more detail by reading the back issues of 73 from mid-1972 through the present. I also tried to detail some of the history of California frequency coordination in my *Practical Handbook of Amateur Radio FM and Repeaters*, also available from 73. (Yet another excellent reference is "The Remote Base: An Alternative To Repeaters," authored by Gordon Schlessinger WA6LBV and Bill Kelsey WA6FVC. This article appeared in the April, 1977, issue of *Ham Radio Magazine*. While technical in nature, it did spend time explaining some of the colorful history of UHF-relay communication in this region)

## SCRRBA REPORT, PART I

For the Southern California UHF relay community, the future is now. In many respects, the future arrived yesterday. We are big; we are complex, and we have big complex problems to be faced. *Right now*. Whether or not we face them, whether or not we solve them, will entirely determine if we will continue to operate our relay systems in the future as we have in the past. Let there be absolutely no misunderstanding about this: A crisis in frequency coordination is already upon us.

In Southern California, we have developed a phenomenal number of UHF relay systems, leading to the virtually complete utilization of the 440-450-MHz region of our 70cm band. This fact alone creates unprecedented difficulties for the Technical Committee both in coordinating channel pairs for new systems and in managing the present array of coordinated relay stations.



Famed broadcaster Gary Owens (left) receives a Brass Key plaque from Lloyd Sigmon W6LQ, on behalf of the ARRL. (Photo by Bob Jensen W6VGQ.)

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## UHF Frequency Coordination In Crisis

"We begin with data. In Southern California, the 440-450 portion of the band is entirely used for 'relay station' input and output channels. The 420-431-MHz portion of the band, which previously supported some relay 'main input and output' pairs, has now been devoted entirely to link channels and a co-shared 6-MHz ATV simplex channel. The 431-440-MHz portion is utilized for 'weak signal' DX communications, satellite work, an ATV repeater input channel (output on 1250 MHz), and a few one-way link channels.

"Within the 440-450-MHz portion of the band, three channel pairs are reserved for simplex operation and associated special-purpose activities. This results in a theoretical 197 pairs for mobile relay channels available for coordination.

"At the present time, the Technical Committee frequency coordination data base shows a total of 320 systems coordinated to these 197 pairs, with several additional coordinations performed but not yet included in the latest computer printout. We therefore have, at present, an average of 1.6 coordinated systems per channel pair. Additionally, there is a backlog of applications awaiting coordination, for which supplemental data has been requested and has not yet been received. Finally, we are receiving a relatively constant number of completed applications for new UHF frequency coordinations each month. In the near future, we will exceed an average of 2.0 systems per channel.

"Compounding the channel-loading figures are some secondary considerations. The band was initially coordinated

from the 'top down,' with the earliest coordinated systems utilizing output channels in the 448-450-MHz portion of the band. (In this discussion, only the output channel frequencies will be mentioned; the input channels, 5 MHz lower in frequency, are implicitly included). Many of these early systems tend to be widely utilized, often by individuals who hold cross-membership in other groups as well. Consequently, the top end of the 440-450-MHz band is already entirely filled. Additionally, one of the ostensible benefits of our Southern California location is also a constraint on the frequency-coordination process. High performance, wide-coverage systems coordinated to our highest mountains, dominate a channel over much of the populated Southern California land area. A channel pair which is in use on Santiago Peak or other moun-

tains cannot easily be co-shared with another system anywhere else in the Southern California coastal region. Thus, to the degree that more and more systems are established on these mountains, the number of channel pairs available to be coordinated elsewhere in Southern California is reduced.

"Under these constraints, the Technical Committee must coordinate new systems onto channels which already contain at least one other operational system somewhere in Southern California. On this basis alone, there are potentially very large problems in UHF frequency coordination looming ahead. But there are additional problems that must be addressed."

Next month, we will cover these and begin to look at possible solutions as outlined by SCRRBA in its Special Report.

# RTTY LOOP

Marc I. Leavey, M.D. WA3AJR  
4006 Winlee Road  
Randallstown MD 21133

Ah, autumn! The leaves out here in the country are changing to the bright collage of red and gold, and I find myself outside, spraying WD-40 on the kids' swing set to protect the pivot from winter's rust. While I am outside, I often hear the familiar rumble of the postman's truck. Let's see what kind of goodies we can turn up in this month's mailbag.

A good starting point is this letter from Frederick C. Wood WB3JKC, here in the Baltimore area, who writes about his attempt to get on RTTY. Fred states that he is "... twelve years of age and a General class license holder." He recently acquired an old Model 19 Teletype® machine, along with an HF transmitter and receiver. A home-brew demodulator provides good receiving copy, but transmitting is his problem.

Fred installed the circuit shown in Fig. 1 in his transmitter, but has the following questions:

1) Where do I connect to from

the FSK unit to the Model 19 machine keyboard? I do not have a manual for the Model 19 machine.

2) To obtain the 170-Hz shift, which I will be using for RTTY, simply, what are the adjustment procedures for the trimmer capacitor and the 100k shift pot?

3) Why is the keyboard grounded as indicated?

Fred concludes that he has been unable to find the answers to these questions despite several months of reading, and signs himself a "frustrated 12-year-old." I know that others have found themselves in the same situation as Fred; let's look at the answers to his questions.

To begin with, the Model 19, which is really a Teletype Model 15 with tape equipment, provides the connection for the keyboard on the machine's left side, your right as you look at it, on the "30" terminal block. This screw-terminal block has six terminals on it, numbered 31 through 36, and the keyboard is brought out to 32 and 34.

Now, before you just go and hook the keyer to these terminals, there is one more item you must attend to. On an unmodified Model 15 keyboard, there is a filter, officially dubbed a "9222 Filter," which serves to suppress sparking at the keyboard contacts. Composed of a coil and a few capacitors, this is the last thing you want to put across a shift-pot circuit! The filter is normally wired across the contacts and located above the keyboard contact assembly; remove it.

We move on to your second question, regarding adjustment of the circuit. The variable capacitor is set to provide the correct degree of shift, whereas the potentiometer is used to precisely set the shift. The way I set them up is first to turn the pot to maximum, that is, the higher position above ground. This will provide the maximum shift. Now adjust the capacitor to produce an 850- or 900-Hz shift. From here on, leave the capacitor alone! The pot may be used to back down the shift to 170 Hz, or whatever, without worrying

about exceeding the 900-Hz maximum shift. I mounted the pot in a little box on top of the transmitter, with a jack in the back to receive the keyboard line coming from the printer.

Now, about those grounds. Remember that the keyboard must be isolated from the TTY loop. Also, the shift-pot circuit is constructed to work against chassis ground of the transmitter. You see, a ground by any other name is still a wire (or something like that). All those symbols mean is that the "cold" side of the keyboard, pot, and transmitter chassis are all connected together. You don't have to pound an eight-foot copper rod through your shack floor next to the Model 19!

While some are working on machines a score or more years old, others are looking at more modern devices. Such is the subject of a letter received from Robert LeMaster, Sr. WA9NZQ/5 over in Bentonville, Arkansas. Bob writes that he has searched high and wide for video RTTY systems to build that do not use

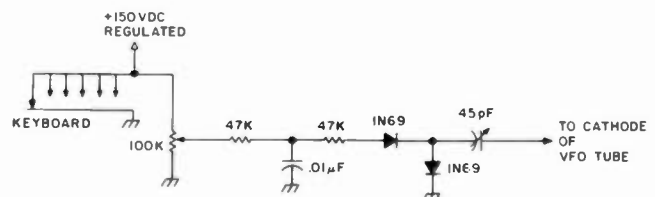


Fig. 1. One version of the "shift-pot" circuit.

a computer. He feels that he has no use for a computer and does not want to buy one just to use on RTTY.

Well, Bob, I'm not going to try to convert you to "computerism" here. We have talked at length in the past about the versatility one gains with a computer on RTTY. If you are interested in a "glass Teletype" only, several have been described in 73 in the past and are listed below:

"Build This Exciting New TVT," *73 Magazine*, March, 1976, p. 76.

"ASCII/Baudot With A Prom," *73 Magazine*, June, 1976, p. 114.

"A RTTY/Computer Display Unit," *73 Magazine*, July, 1976, p. 118.

"The XITEX Video Terminal," *73 Magazine*, December, 1978, p. 132.

I will point out, though, that by using a microprocessor-based system, you can gain a good deal of "smarts."

How about the ability to transmit and receive at several speeds, hold canned output in buffers, like a brag tape, and

have the machine clean up your typing; all this is easy with a CPU controlling the station, very hard without it. Now, I am not talking about buying a \$1000 system and tying it down to RTTY, nor am I thinking of buying a large system and using it occasionally on the air. An attractive alternative is to put together a small computer, on one board, with the program in permanent memory and a limited amount of on-board read/write memory.

Such a computer is termed a "dedicated" one, and can be put together very inexpensively. For example, a simple 6802-based system was described by Pete Stark in *Kilobaud Microcomputing* last year. The whole system fits on a small PC board. Write Pete at PO Box 209, Mt Kisco NY 10549, for details of the "Kilobaud Classroom Komputer."

Ah, but you say, what about programming? Watch closely here in 73 and you soon shall see a super program, written for the 6800 (will also run in 6802 without modifications) which provides all the features a RTTY station needs. Requiring less than 4K of memory, it is de-

signed for most 6800 systems using serial terminal interfacing via an ACIA.

Need more help? Scheduled to appear on the horizon very soon is a newly-updated edition of 73's *RTTY Handbook*. Containing all new material regarding RTTY equipment, this promises to become a new classic which belongs in every RTTY station. Among the new material will be video RTTY, both with and without a computer, along with new transmitting and receiving circuits, and a few bells and whistles. Watch for the announcement in the Radio Bookshop section of 73.

Before I close this month, let me acknowledge a letter from Cal Sondgeroth W9ZTK, who writes concerning the program published in this column last July. Cal has taken a razor to the program and honed away sixteen bytes or so to make it more compact. Among his suggestions are to store variables on the 6800's Page 0, to allow direct addressing, and storing the START and STOP bits integral to each data byte. In other words, where I used "10101000" for the numeral

"4", Cal would use "00101010." In his version, the bits are, reading from left to right, a "0" START bit, the five data bits ("01010"), a "1" STOP bit, and a "0" DON'T CARE bit. My order includes a "1" CASE bit, five data bits, and two DON'T CARE bits.

That CASE bit is needed to tell the program whether the character about to be sent is FIGS or LTRS, and to prompt the appropriate change of case, if required. I will grant that the one DON'T CARE bit could be used for the same purpose, but it seemed more general to store only the data and plaster the START and STOP bits externally.

The reason I did not use Page 0, by the way, is that this routine is part of a larger program, and most of that page is accounted for by other variables. In the practical system, however, Page 0 makes sense to use. It's just that here, as an example, I chose to use extended addressing.

Some reviews coming up in the next few months. I will try to sprinkle a few letters in here, too, maybe even a surprise or two! All for you, in RTTY Loop.

## NEW PRODUCTS

### BONE-CONDUCTION HEARING AID

Individuals with hearing impairments may soon be able to enjoy sound-oriented pastimes like ham radio by using a bone-conduction hearing aid developed by Matsushita Electric Co.

This electronic breakthrough

bypasses the eardrum by vibrating the bones near the inner ear. A small microphone, amplifier, battery, and vibrating device are built into the frames of special eyeglasses. Matsushita plans to release this new hearing aid for the US market in the near future.

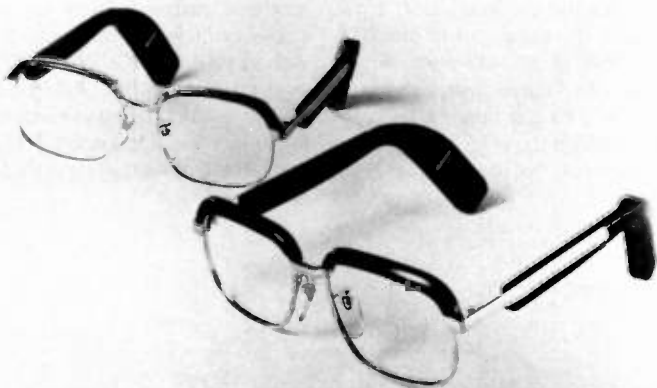
For more information, con-

tact *Ruder and Finn, Inc.*, 110 East 59th Street, New York NY 10022. Reader Service number 481.

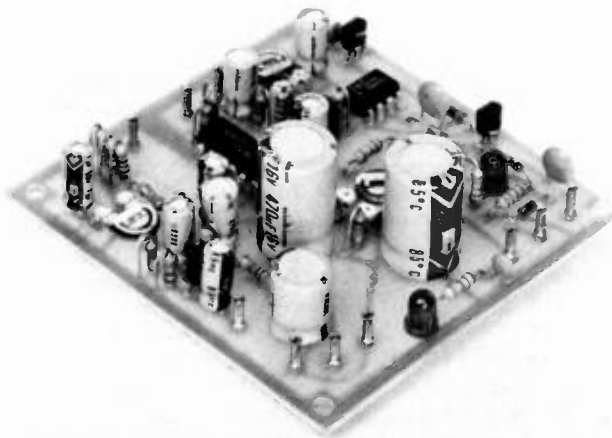
### NEW HAMTRONICS® REPEATER MODULES

Hamtronics, Inc., long noted for FM transmitters and receivers commonly used for building repeaters, has now completed their line of repeater modules by offering inexpensive COR and CWID modules.

The 3" x 3" COR module kit contains an electronic relay to actuate the transmitter when the receiver squelch opens. Adjustable tail and time-out timers are provided on the board, as well as an audio mixer to combine the ID tone with the receiver audio for application to the transmitter. Another nice feature is a separate speaker driver amplifier stage which allows a local speaker to be operated completely independent from



Bone-conduction hearing aid from Matsushita.



Hamtronics® COR module.

the repeater audio level setup control, without using hard-to-find L-pads.

The 3" x 7" CWID module kit contains a tone generator controlled by a 158-bit diode matrix. Adjustments on the board control the ID speed, tone, and time. A special output filter eliminates the key clicks found on many repeater IDers. Although many articles have appeared recently on PROM IDers, many still prefer a diode matrix because it can be easily reprogrammed at any time without further expense. The CWID module is constructed on a double-sided PC board with plated-through holes for easy assembly. The CWID and COR modules are designed to be used with Hamtronics® transmitter and receiver modules as well as most other types. For further information, contact Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468; phone (716)-392-9430. A complete 1981 catalog, which includes all Hamtronics® FM and SSB equipment, is yours for the asking. (For overseas mailing, please send \$2.00 or 5 IRCs.) Reader Service number 477.

#### BILAL ISOTRON ANTENNAS

Isotron antennas, designed and manufactured by the Bilal Company, employ a unique new embodiment of a full-size harmonic antenna which permits the radio amateur who has limited space to get on the air from an apartment, condominium, mobile home, or other space-limited environments. There are no compromises in matching or tuning Isotron antennas to your transmitter. This unique design allows direct feed with standard coaxial cable and does away with the need for radials.

How is it that an eighty-meter antenna, for example, can be only four feet tall, eighteen inches deep, sixteen inches wide, and weigh a mere eight pounds... yet perform as well as a full-size antenna? Bilal claims that the answer is in research and development. Isotron antennas were five years in development and testing, and now are available in 80-, 40-, and 20-meter models.

For more information, call or write to Bilal Company, Star Route, Florissant CO 80816; phone (303)-687-3219. Reader Service number 483.

Continued

# ETO ALPHA RF Power Amplifiers



**ALPHA 76A** Manually tuned, full coverage of 160 to 15m bands plus 1.8-2.0 and 3-22 MHz; includes new WARC bands. (2) 8874 ceramic-metal grounded grid triodes. 2.5 KW PEP-SSB input, 1 KW average, CCS - No Time Limit. Drive power nominal 60 watts carrier, 110 watts PEP SSB. 120/240 volt 1.5 KVA heavy duty transformer, quiet forced air cooling. 7½" h x 17" w x 14¾" d, 65 lb.

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**ALPHA 76PA** Identical to 76A except uses three 8874 final tubes. Recommended for FSK and SSTV operation where extended key-down time is necessary.

**Regular \$2195 - Sale Price \$1799**

**ALPHA 76CA** Same as 76PA, but uses 2.4 KVA Hipersil® extra-duty transformer for rugged, heavy duty use or tough environments; reduces weight by 10 lbs.

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**ALPHA 374A** Adds "no-tune-up" convenience to the basic 76A chassis. Provides instant bandswitching among the popular amateur bands, plus full coverage manual tuning in the 1.8-2.0 & 3-22 MHz ranges.

**Regular \$2395 - Sale Price \$1999**



**ALPHA 78** Combines the best features of all other ALPHA amplifiers. (3) 8874's, QSK, 2.4 KVA Hipersil® transformer and a bandpass no-tune-up system that fully covers the 160-15m bands with no sacrifice in efficiency compared to manual mode. 7½" h x 17" w x 14¾" d, 65 lb.

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**ALPHA 77DX** Manually tuned, full coverage of 160 to 15m plus 1.8-2.0 & 3-22 MHz; includes new WARC bands. Power output 2 KW PEP-SSB or or continuous carrier. DC plate input rating is 3 KW PEP or continuous carrier - No Time Limit. Single 8877 ceramic-metal grounded grid triode, requires 100 watts drive for 2 KW input nominal, typical efficiency better than 60%. Vacuum relay QSK-T/R system, air cooled, encapsulated 4+ KVA Hipersil® transformer, heavy duty silver plated tank coil & ceramic vacuum variable plate tuning capacitor. 120 or 240 volt primary. 11" h x 19½" w x 22" d, 103 lbs. Air Freight.

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Phone (702) 647-3114  
Pete WA8PZA & Squeak AD7K  
Outside Nev. 1-800-634-6227



*Benjamin Michael Industries' military-time clock.*

#### MILITARY-TIME CLOCK

Benjamin Michael Industries, Inc., has announced the addition of the Model 173DM to its line of professional military-time-format clocks.

The 173DM features dual, independent digital clock circuits housed in a solid walnut case. The unit is suitable for placement on any desk, communications console, briefing table, etc. Military time is displayed on the left clock face while standard 12-hour format with AM/PM indicators is used on the right. Each clock is independently set, allowing display of different time zones if desired. This arrangement makes the 173DM ideal for applications requiring the use of both Universal Coordinated Time (Zulu) and local time.

Both large displays are of the LCD type for excellent visibility and ultra-low power consumption. The 173DM features quartz-crystal accuracy and over one year of operation on a single, readily-available battery. The absence of a power cord makes the unit ideal for desk-top use

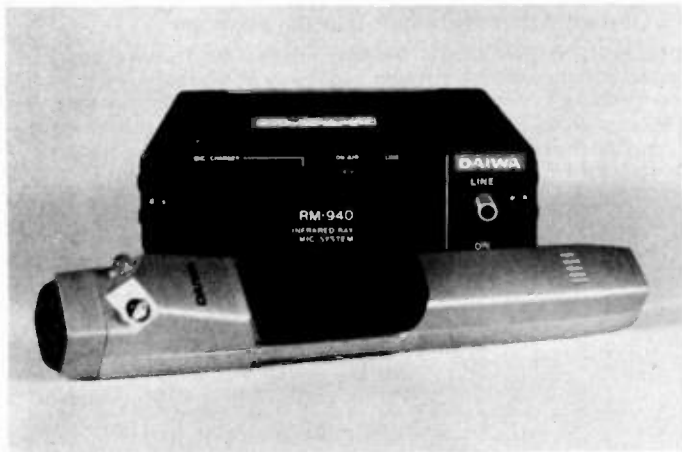
and eliminates the need for re-setting after commercial power failure.

For more information, contact *Benjamin Michael Industries, Inc.*, 65 E. Palatine Road, Prospect Heights IL 60070. Reader Service number 480.

#### UNIQUE MICROPHONE SYSTEM

Mobile operating will never be the same! Daiwa's RM-940 brings the total freedom of cordless operation with a lightweight, compact microphone, infrared sensor, and control/charger unit.

The electret condenser microphone can be hung around the neck like a pendant (cord supplied), or conveniently clipped to a shirt pocket. A latching push-button switch activates the tiny infrared transmitters on the microphone. Audio and transmit/receive switching are then transferred via infrared beam to a sensor mounted near the sun visor or the rearview mirror. The maximum usable distance is 3.5 feet. An additional sensor can be added for broader coverage.



*Infrared microphone system from MCM Communications.*



*The Heath  $\mu$ Matic Memory Keyer.*

The control/charger unit features Velcro pads for easy mounting and microphone plugs compatible with most Kenwood, Icom, or Yaesu rigs (specify when ordering). Other plugs can be installed to suit particular needs. A maximum of eight hours of charging time will provide a minimum of five hours of continuous use. The control/charger unit also provides a visual (LED) and audible (soft beep) indication whenever the microphone is switched on. Optional microphone wind screens are available. For more information, contact *MCM Communications*, 858 E. Congress Park Dr., Centerville OH 45459. Reader Service number 478.

#### HEATH'S $\mu$ MATIC MEMORY KEYS

Reports say a sneak preview of the new Heathkit® SA-5010  $\mu$ Matic Memory Keyer created much interest at the 1981 Dayton Hamvention. The keyer is now featured in the latest Heathkit Catalog from Heath Company.

Described by a Heath spokesman as compact and modern in styling, the SA-5010 uses a custom microprocessor to provide up to 10 buffers for storing up to 240 characters of text or commands. These variable-length buffers eliminate wasted memory space by letting the user store text in several buffers and then string them together in any sequence. Command strings also can select the speed, weight, spacing, and auto-repeat count for each message so selected. This feature is said to make the  $\mu$ Matic so versatile that Heath has applied for a patent on it.

The SA-5010 employs a 20-position keypad for entries, and

features easy-to-use integral capacitive "touch" paddles. A rear panel jack is provided for use of a mechanical paddle, if so desired.

A "practice" mode sends random code groups of random length and selectable types. The 100 different random sequences are repeatable, so the ham can check copy for accuracy. All 100 sequences are altered each time the keyer is turned on, to give a total of 6,400 different practice sessions. Each sequence sends approximately 3,000 characters before repeating. The user can choose any speed between 1 and 99 words per minute, and any of 11 weight settings.

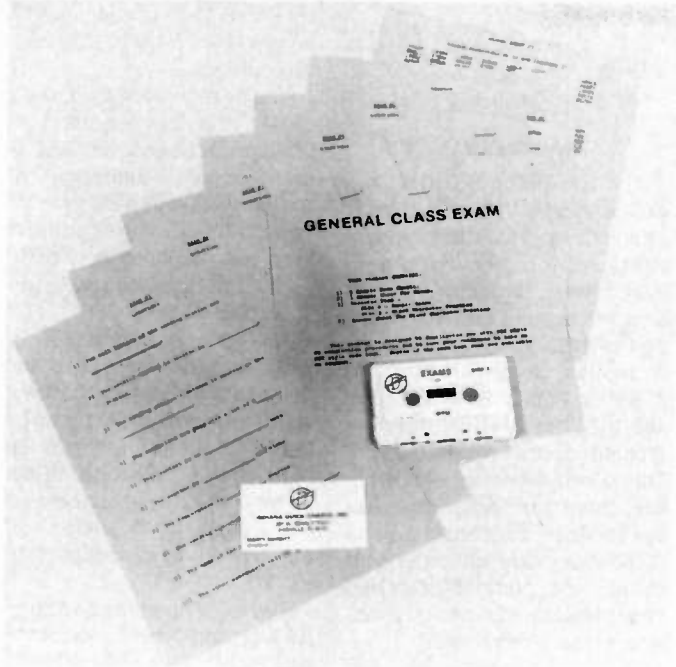
CMOS memory with battery backup is said to retain the buffer contents, as well as the last-selected speed, spacing, weight, and repeat count whenever the keyer is turned off or unplugged.

Built-in diagnostics check the microprocessor each time the keyer is turned on, and also test buffer memory whenever the  $\mu$ Matic Memory Keyer is reset. For the left-handed CW operator, a special two-key function reverses the paddles. The keyer even remembers to turn itself off if the user forgets!

The SA-5010 features built-in sidetone oscillator and speaker with variable pitch and volume controls. Phone jack and ear phone are included for private listening. A plastic case covers the die-cast zinc base, which is weighted to reduce movement during keying. The keyer requires the optional 120 V ac Heathkit PS-5012 power supply. Step-by-step instructions make this a two-evening kit.

The SA-5010  $\mu$ Matic Memory Keyer and nearly 400 other





The Indiana Quick Charge CW exam package.

build-it-yourself electronic kits are featured in the latest 104-page Heathkit Catalog. For a free copy, write *Heath Company, Dept. 350-115, Benton Harbor MI 49022*. In Canada, write *Heath Company, 1480 Dundas Street E., Mississauga, Ontario L4X 2R7*. Reader Service number 485.

**CW EXAM PACKAGE**

Indiana Quick Charge, Inc., has recently completed a Morse code practice package for the new-style FCC exams. The package consists of five completion-style exams, two answer sheets, and one cassette tape. The A side of the tape has five segments of text, each approximately five minutes long. The B side has mixed characters practice ranging from a little below the test speed and gradually working up to the speed desired. Each sample test is on a separate sheet, with an answer key for all the included sample tests. The cassette is well produced, with excellent keying characteristics. All the text and mixed characters are computer-generated, assuring evenness and accuracy.

Designed to test the user's readiness to take an FCC code exam, it should be stressed that the text included is composed, and is not a word-for-word copy of any actual FCC tests. It is similar only in style and length, and is intended to test the skill and ability of those who are pre-

paring to take the actual test. Two packages are currently available: the General class practice at 13 words per minute and the Extra class practice at 20 words per minute.

For more information, write: *Indiana Quick Charge, Inc., 367 West Main Street, Danville IN 46122*. Reader Service number 479.

**UHF ALL-MODE AMP**

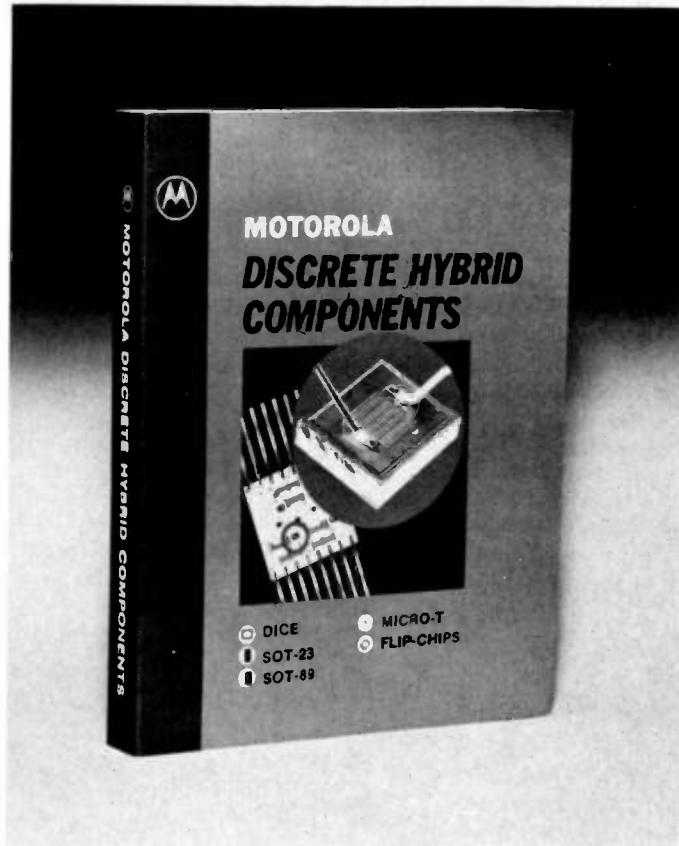
The D1010 amplifier is a solid-state all-mode amplifier designed to be used in the 430-to-450-MHz amateur band. It will amplify a 10-Watt signal to more than 100 Watts output; 2 Watts input produces 25 Watts output. The D1010 can be keyed with as little as 300 milliwatts. This makes it a versatile amplifier for all low-power transceivers and HTs. The D1010 is biased as a linear amplifier, therefore, it will amplify FM, SSB, CW, and ATV signals.

Other features include remote operation with the optional RC-1 remote head, external or internal keying circuitry, over-temperature protection, and the typical rugged packaging that is a part of all Mirage products.

The D1010 carries a 5-year warranty on all parts except the rf power transistors which are warranted for 1 year.

The D1010 will be an asset for any station, whether on OSCAR, mobile, remote base, or SSB/CW DX.

As with all Mirage products,



Motorola's Discrete Hybrid Components catalog.

they are only available through their worldwide dealer network. For further information, contact *Mirage Communications Equipment, Inc., PO Box 1393, Gilroy CA 95020*. Reader Service number 476.

**HYBRID COMPONENTS DATA BOOK**

A new data book detailing the specifications of discrete semiconductor components has been published by Motorola. The new Discrete Hybrid Components Data Book covers 10 different discrete-product categories, including a variety of transistor, diode, thyristor, and

optoelectronic lines, and includes five different packaging methods: standard chips (dice), flip-chips, Micro-T™, SOT-23, and SOT-89.

The book includes an easy-to-use cross-reference between standard discrete packaged devices and equivalent unencapsulated chips, and provides both electrical and physical data for each of the chips.

All Hybrid components described in the Data Book are available from Motorola or through authorized Motorola Hybrid Components distributors.

The Motorola Discrete Hybrid Components Data Book is avail-



Mirage's all-mode 100-Watt UHF amplifier.



M-Squared Engineering's HT receiver coverage expander.

able from *Motorola Semiconductor Products, Inc.*, PO Box 20912, Phoenix AZ 85036. Reader Service number 484.

**HANDI-CON V**

The Handi-Con V (HC-V) is a self-contained VHF-HI converter intended for use with fully-synthesized 2-meter hand-held transceivers. Multiband operation will expand receiver coverage to 2400 possible channels. A replica of either the 154-158-MHz Public Service or the 159-163-MHz Marine Band is created at the receiver input. This allows reception of fire, police, sheriff, and other emergency services or coastal/inland marine communication, coast guard, and National Oceanic and Atmospheric weather service, respectively.

Frequency selection is achieved as normal through the keyboard or thumbwheel switches of the transceiver. Connection is made by simple series insertion between radio and antenna using standard BNCs. Operation with transceivers using

threaded antenna mounts is achievable with readily-available adapters.

The passband of the HC-V includes the 2-meter band, enabling multiband as well as multi-channel monitoring with transceivers that have scanning capabilities. The combined sensitivity is much less than 1  $\mu$ V for most transceiver/converter combinations.

An internal clamp network provides protection from accidental transmitter rf to both converter and transmitter for up to 5 Watts for up to 5 seconds. The "off" position disables all converter circuitry and restores normal transceiver operation without having to disconnect the HC-V.

The HC-V operates on a single AAA battery with an estimated battery life of up to 6 months or more at a use duty-cycle of 30-40%. The case size is 2-1/4" x 1-1/2" x 1-3/8".

For more information contact *M-Squared Engineering*, 1446 Lansing Ave., San Jose CA 95118; phone (408)-266-9214. Reader Service number 482.

\$ 179.95

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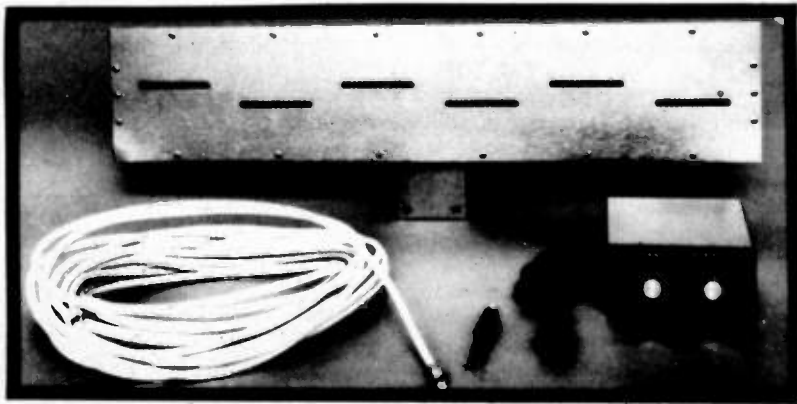
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## FILTER CASCADING WORKS!

You can get significantly better performance from your Receiver by improving its IF filtering. The most cost-effective way to do this is to place a superior 8-pole SSB filter essentially in series (or Cascade) with the original unit. The resulting increase in the number of poles of filtering to as many as 16 causes a dramatic increase in selectivity and reduction of adjacent channel QRM. The authors of the following major articles all stress the effectiveness of FOX-TANGO filters in this application and comment on its simplicity: easy soldering; no drilling, no switching, and no panel changes. As a bonus, CW performance is improved as well as SSB, at no extra cost or effort!

### Recent Magazine Articles on Filter Cascading

YAESU FT-901/902. See "73", Sept. 1981  
HEATH SB104A See "Ham Radio", April 1981  
KENWOOD TS820 See "CQ", March 1981

Read the original article or send \$1 to FoxTango for complete details of the one that interests you. To make the modification, order the appropriate cascading kit from below. Each contains the parts specified in the article, the recommended Fox-Tango filter, and complete instructions.

### FOX-TANGO Cascading Kits in Stock

YAESU FT-901/902 Series ..... \$60  
HEATH SB104A Series ..... \$60  
KENWOOD TS820 Series ..... \$65 w/mini amp.  
\*KENWOOD TS520 Series ..... \$65 w/mini amp.  
\*YAESU FT-101 Series (not ZD) \$65 w/casc bd

\*Proven mods based on articles in preparation

Shipping via Airmail: \$2 US/Canada, \$5 Elsewhere  
Florida Residents: Add 4% sales tax

FOX-TANGO stocks the widest variety of custom-made time-tested crystal filters available from any source for Yaesu, Kenwood, Heath, Drake, and Collins rigs. Cascading is only one application for these filters. Others include replacing outdated or inferior original units, filling spots provided for optional filters, or adding extra filters using diode switching boards if the "spots" are filled. However, since the degree of improvement depends upon the quality of the filter used, cheap substitutes are no bargain! FOX-TANGO has never spared expense or effort to make its filters the very BEST and guarantees satisfaction - plus fast, friendly, knowledgeable, personalized service. For information about our complete line, including SSB, CW and AM filters, phone or write for our free brochure. Specify the set you want to improve.

We welcome mail or phone orders and accept payment by VISA, MASTERCARD, M.O., Check, Cash, or C.O.D. (at your expense).

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12BY7	2.25	8875	206.00
572B	35.50	8908	12.50
811A	11.00	8950	9.95

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RF23,RF13 (RFQ)	50W	12.5V	14.00
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RF43,RF33 (RFQ)	70W	12.5V	15.00
(Premium Replacements for MRF455 & MRF455A)			
CD2545 (CTC)	50W	12.5V Flange	15.00
CD3424 (CTC)	80W	12.5V Flange	15.00
SD1451 (SSM)	80W	12.5V Flange	15.00
SD1078 (SSM)	80W	12.5V Flange	19.88
RF85 (RFQ)	80W	12.5V Flange	17.50
MRF458 (MOTO)	80W	12.5V Flange	19.88
VHF			
150-175 Mhz			
B40-12 (CTC)	40W	12.5V Stud	16.00
2N5591 (SSM)	25W	12.5V Stud	10.50
2N8063 (SSM)	25W	12.5V Stud	9.95
2N8097 (SSM)	40WPNP	12.5V Flange	15.95
MRF247 (MOTO)	75W	12.5V Flange	33.00
MR1418 (SSM)	70W	12.5V Flange	27.50
RF13,RF23	also replaces 2N8064-MRF224		14.00

UHF			
450-512MHZ			
2N5946 (SSM)	10W	12.5V Stud	12.95
MHW710-2 (MOTO)	13W	12.5V Module	19 59.00
		db Gain	
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YAESU FT-207R 2m FM Hand-held. Microprocessor controlled, 800 channels - keyboard entry 144 to 148 MHz. LED display, up/down manual or autoscans, priority channel & memory back-up. ±600 kHz offsets or any odd splits. 2½ watts or 200 mw output. With Nicad pack, wall charger, flex antenna, earphone & strap. 7¼" h × 2½" w × 2¼" d. 1¼ lbs.

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NC-1A 15-hr drop-in charger	SALE \$44 <sup>95</sup>
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NBP-9/FNB-1 Extra NiCad battery pack	23 <sup>00</sup>
NC-9B Extra 15-hr wall charger	10 <sup>00</sup>
PA-2 Mobile DC-DC adaptor & charger	39 <sup>00</sup>
YM-24A Speaker/microphone	32 <sup>00</sup>
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# LETTERS

## HOLLOW WIN

Today, I received word from Bill Gosney, your Contest Editor, that I had been disqualified from *73 Magazine's* 1981 160-Meter Phone Contest due to excessive power output from my station.

First, let me say that I was not surprised and, second, that I plead guilty! But how, you might ask, did the contest committee come up with this information? Here is how.

After recopying my log sheets, duping, and finalizing my contest results (910 QSOs/400,000 points), I came to a paragraph on the summary sheet that required my signature. I had to swear that I had abided by all rules and regulations of *73 Magazine* and the FCC. Well, I could not bring myself to sign it because during the contest I used the homebrew linear (4-1000) that I had completed the day before the contest.

I know that if I had made my own summary sheet instead of using *73's*, I could have avoided that hurdle like most of the other guys did, but I could not. Instead, I contacted Dan Murphy WA2GZB, the contest chairman, and informed him of the situation. He advised me to go ahead and send my logs into him, anyway.

I also told him that, in my opinion, everyone who had done really well in the contest also had used an rf amplifier of a power equal to mine. Dan acknowledged that he was aware of that fact and said those guys were not as honest as I in admitting to using an amplifier. I call these people hypocrites because they tell people they are using legal power and that their antennas are doing a spectacular job.

During the contest, my signals were never louder than those of some of the other big boys. Don't you find that interesting? I don't know of one contest station I have visited that did not have a 160-meter amplifier. Why all the secrecy? One has to use an amplifier on

160 during a contest to be competitive because everyone (or almost everyone) does. I would like to add that I did not use an rf amplifier before the LORAN shutdown in early January. I wonder how many other contestants can say the same thing.

I knew that I would be disqualified when I made these admissions, but I feel that about 90% of the other guys in the contest also should be disqualified or should at least have the guts to disqualify themselves.

**Willy Worth WB3GCG  
Brandywine MD**

*I admire your honesty, Willy. It's too bad you didn't let your conscience be your guide before the contest as well as after.*

*As a contester, I cannot understand what fun it is to win by violating the rules. To my mind, an operator who plays the game that way is no better than a small-town bully; he always gets his way, but so what?*

*A hollow victory is no victory at all.—Jeff DeTray WB8BTH.*

## NOISE-BRIDGE CORE

I am writing to point out a small error in your otherwise excellent article on the noise bridge ("QRM-Free Antenna Tuning, August, 1981).

The Indiana General core specified is made in a number of different ferrite "mixes" and you must specify which one you want. The commonly used one is the Q1 mix.

Also, Indiana General has changed their numbering system, so the CF-102 is now known as the F625-9. Thus, one should ask for F625-9 in Q1 mix.

If you order from Amidon, you should specify an FT-37 core with 61 mix if you want a core just like the F625-9 in Q1 mix. Are you confused by now? The T50-2 is an iron-powder core and, in my opinion, would not be as good as ferrite in this application.

Another way to get the proper core for this transformer would be to order from Palomar Engineers and ask for their F-37-Q1 core. This is exactly the same as

the Indiana General F625-9 in Q1 mix. Send 60¢ each along with \$1.50 per order shipping to Palomar Engineers, 1520-G Industrial Avenue, Escondido CA 92025.

**Jack Althouse K6NY  
Palomar Engineers**

## NOTES ON FLYING

In reference to "A Flier's Guide to the Airways," August, 73, I have been an admirer of Jim Weir and the RST Company ever since its founding—a truly outstanding and innovative operation.

I do have a couple of nit-picks, however. First, one does not become aeronautical mobile until one is outside the limits of the continental USA. Otherwise, you are air mobile or simply mobile. By the same token, one does not become maritime mobile by being in a rowboat with an HT in a local lake.

Second, the article must have been in the editor's in-basket for a number of years [Are our faces red?—Editors]. Aviation gasoline now costs about \$2 per gallon and the aircraft mentioned in the article would use at least \$15 worth of fuel per hour.

The article was very useful to me because I had never heard of the Advisory Circular 20-98.

One problem Jim did not mention involving air mobile operation is noise. Most cockpits present a very noisy environment and the average microphone just can't cope with it. Even many of the "noise canceling" mikes don't hack the program. I use a Turner "Road King 50 Trucker's CB Special" and it is so effective that most people do not realize that I am in an aircraft (a noisy Mooney). Unfortunately, this microphone has been out of production for some years. If you see a used one, grab it.

**Ken Hargrove W4OQP  
Orlando FL**

*Thanks for the clarifications, Ken. Seems inflation has caught up with the magazine business in more ways than one.—Editors.*

## A PHOTON TORPEDO

I take exception to the theory put forth by W4FD and W4ATE (July, 1981, p. 52) that photons of

light constitute the medium through which radio waves propagate. The theory sounds somewhat plausible, but has one major deficiency. Namely, if radio "waves" need some sort of medium to travel in (such as an "ocean" of light photons), then what sort of medium exists for the propagation of light "waves"?

Perhaps, the authors would suggest that since radio waves travel through light waves, then light waves must travel through X-rays and X-rays through gamma rays. In other words, perhaps there is an infinite succession of media, each having a shorter wavelength than its predecessor. But this is impossible, because the energy of photons increases as their wavelength decreases. An infinite series of media would require an impossible amount of energy.

The authors apparently would like to ignore the fact that light photons often behave like waves. Light has definite wave-like properties which easily can be demonstrated with a lens or diffraction grating. Now since a "wave" is usually interpreted as the propagation of some sort of "disturbance" through some sort of "substance," it is "logical" to assume that space is filled with some sort of "aether" which transmits "light vibrations." Of course, no such substance has ever been discovered (except for the ocean of photons proposed by the above authors).

Perhaps, the authors then might suggest that light waves are propagated merely by virtue of their particle-like properties alone. If photons are really particles, then they can travel through a vacuum without any assistance from a "medium" at all. We simply will ignore their wave-like features. But if this is true, then we don't need the authors' theory at all, because it turns out that radio waves also consist of photons and therefore would not require a "light-assist"! Radio and light are the same form of energy. The fact that radio photons have longer wavelengths has no bearing on the matter.

I also take exception to the authors' implication that a photon has a rest mass "as does any solid." The man who discovered the photon (Albert Einstein) proved that a photon cannot have a rest mass be-

cause otherwise it could not travel at the speed of light. A photon does have energy and this energy can be equated to mass by the famous  $E = mc^2$  equation. Therefore, the more energetic a photon is (i.e., shorter wavelength), the more mass it will appear to have.

This apparent mass can be observed in such phenomena as the solar wind, as the authors correctly pointed out. But photons do not exhibit mass properties such as elasticity or rigidity, which are necessary for the transmission of vibrational energy through a physical medium.

**John C. Day**  
Ormond Beach FL

*That's easy for you to say!*—Editors.

### KUDOS

I was quite pleased to see a review of *The Radio Amateur's Conversation Guide* by the two very competent Finnish linguists OH2BAD and OH1BR in your July, 1981, issue. I previously had read of this book and its authors in the NRRL magazine, *Amatorradio*. In defense of the lack of a pronunciation guide in the book, I would like to make the following comments.

Given the international scope of this book, it would be almost impossible to give pronunciation guides in agreement with everyone's language. I will agree that there is a need for such a pronunciation guide, a need which could have been answered by use of the International Phonetic Alphabet (IPA). However, not everyone is familiar with the IPA, and extra pages would have been spent to explain the numerous phonetic symbols in each of the languages represented in the book. The availability of the cassette, therefore, is a much easier and more readily accessible answer to the need for a pronunciation guide.

Realizing fully that most Americans are considered almost as linguistically ethnocentric as French Quebecois, the appearance and hoped-for acceptance of such a work as *The Radio Amateur's Conversation Guide* is heartening, to say the least.

The age-old myth of the difficulty in learning a second

language is easily dispelled by the simple truth. Each of us had learned the essentials of one of the world's most notoriously confusing languages before any of us had learned to read or write. Adding another language is a simple matter of concentration, the same concentration that we all use to learn the International Morse code.

In passing, I might also add that Jukka and Miika Heikkinen are both accomplished linguists. Miika is a scholar of ancient languages and theology, and Jukka, who studied Russian and Spanish at Helsinki University, operates a translation bureau, complete with computerized text processing equipment. Both are to be congratulated for this excellent book.

**Nils R. Bull Young WB8IJN**  
New Carisle OH

*Si Hablo dit-dit?*—Editor.

### MULTIMETERS

After reading your "73 Magazine Staff" article titled "Maximize That Multimeter" in the June issue, I feel compelled to write and give my feelings about some bad ideas expressed in this article.

First of all, a plastic meter case could render the unit worthless in the presence of typically encountered rf levels.

"Multimeters" generally do not have the need for three leads, but virtually all VTVMs do. The constant input resistance of VTVMs allows for the convenience of the important isolation resistor. A VOM, because of its input resistance change with range change, doesn't have this facility. For this reason, a VTVM is necessary for dc voltage measurements with the presence of a signal. The VOM without the isolation resistor tends to drastically affect the circuit impedance (especially video and rf circuits, but high-impedance hi-fi amp circuits are not immune). Rf getting into the VOM tends to be rectified by the commonly used meter-protection diodes, causing erroneous readings. In our studio, a Simpson 260 VOM lying on the service bench will give a half-scale reading when the leads are inserted but not connected to a circuit.

At the transmitter, we have found that a VTVM with a 100-megohm resistor in place of

the 1-megohm original has both given the scale a  $\times 10$  factor and made it entirely immune to the presence of rf around the 5-megawatt ERP transmitter.

Using a meter which has a 1.5-V cell to power the ohm-meter section may produce enough voltage at the probes to turn on a silicon device, but does not do so for all conditions. For example, the full 1.5 V occurs at the probes only for infinite resistance, but at zero Ohms the voltage is zero. The amount of voltage at the probes is between zero and the 1.5 V as measured on a linear scale having 0 V at 0 Ohms and 1.5 V at infinite Ohms. A VTVM is the best meter to first visualize this relationship on. Therefore, simply use an ohmmeter range which gives a reading with less than about 0.25 V across the probes, and silicon devices are not turned on. The accuracy of this method is good enough for 99% of your service needs.

**Franklin E. Swan W9SIA**  
Chicago IL

### TORTURE

Concurrent with the ongoing debate about dropping the code requirement for a ham license, the media recently recounted an interesting story about one of our Vietnam POWs who used code to communicate with the outside world in an unusual way. To verify that the story is true, I wrote to the Honorable Jeremiah A. Denton, Jr., now a Senator from Alabama, and he did indeed blink out "torture" with his eyelids while making a forced TV interview. A copy of his reply is attached.

Dear Mr. Crom:

*I sincerely appreciate your comments of June 24, and am glad to respond to your request for my views on the Morse code requirement in FCC licensing of ham radio operators.*

*The FCC, as you are probably aware, has 2,400 personnel with which to supervise every facet of communications in the USA, with only 450 of these in the field. Rigid rules and reliance on self-policing from other operators are both logical and necessary.*

*Requiring proficiency in Morse code is one way, a good way—an economical way—to maintain both quality and*

*discipline in what could quickly become a nightmare in amateur radio operations. In my particular case, had I not known Morse code, I would have been denied the one viable option of communication open to me while a prisoner of war, so I am definitely in favor of it.*

**Jeremiah A. Denton, Jr.**  
United States Senator  
Washington DC

It is hoped that this incident will help motivate others to put in the little extra effort that will help keep ham radio from becoming an extension of the CB mess.

**Russell C. W. Crom AG9N**  
Mt. Prospect IL

### BEING POSITIVE

After being a subscriber and reader for quite some time, I thought I would drop a note to you and tell you how much I enjoy both your editorial and also your magazine. I always read your editorial first, followed by Awards, Leaky Lines, and Looking West. Keep socking it to those Connecticut "good old boys," Wayne. At least you seem to remember from week to week where you have drawn your lines.

I don't know if you still plug dealers in your magazine but if so, please log up a couple of gold stars for the Electronic Center in Lincoln, Nebraska. I acquired a Kenwood TR-7800 from them at a recent hamfest in St. Paul. The nicads used for memory retention would not charge. I called them up on their toll-free number and they advised me to send it to them. I did so and had it back in 12 days fully operational. Their tech claimed pilot error for the malfunction, but whatever the reason, it works fine now.

**Bob Cronberg KB0XR**  
Plymouth MN

*Wayne, Bill, Dave, and Bill appreciate your pat on the back, Bob. Any fans of our other columns out there?*—Editors.

### MR. DX

I would like to express how much I enjoy the new DX column by Yuri VE3BMV. This is not the kind of DX column that I am accustomed to reading in any other monthly ham radio magazine.

His column has real information that can be used on the air, up-to-the-minute info on the rare ones, and great operating aids for the DX hunter. It is obvious that Yuri has a great deal of knowledge of DXing, and is not reluctant to share it with us.

I look forward to this valuable addition to *73 Magazine*. You fellows at the front office have really snagged a rare one by getting Yuri.

**Ron Brown WA3CEC  
Dundalk MD**

*Sh-h-h-h! We don't want Yuri to get a big head.—Editors.*

### BOHME?

In your editorial in the July issue of the magazine, you men-

tioned possible implementation of types of high-speed communication. I have had some experience in Bohme, which at the time had capability of 600 wpm. This was in 1943 when I was CO of WVNT, the hub of Signal Corps communication in the Middle East.

It is my belief that this was the first time the Signal Corps attempted to operate their own 40-kW point-to-point station outside of the USA. The location was Asmara Eriteria, elevation 7600' above the Red Sea port of Massowa, and 65 miles by road from there. The station was fitted with punched tape (Kleinschmidt, or Bohme) transmitter heads, and the receivers were located 6 miles away with triple diversity operation output back

to transmitter location where the tapes were made for retransmission via Manual Station to Cairo, the Persian Gulf, and other stations. We also handled all communication for the operations in north Africa until the invasion of Oran and Algiers, when a similar station was set up there (Algiers).

Today, with solid-state equipment (Hal) I find that 200 wpm is possible, and understand that printers are available commonly to 600 wpm. My Hal equipment will print (on monitor) 300 baud, 30 characters/second, or 1800 characters/minute, or 360 words/minute. This is not bad for starters. I have experimented personally with 100 to 150 words/minute. I am going to try to work out something with a

friend who has the same equipment I have, and will report results.

I would appreciate any feedback that can come about as a result of this work, I have a kW to a 20-meter dipole and about 600 W possible on 15 and 40 meters where, unfortunately, few RTTY stations operate. I have not tried 75 meters, where I have heard some operators.

**Henry B. Plant W6DKZ  
4160 Holly Drive  
San Jose CA 95127**

*CW at 200 wpm? It's a good start, but we can do even better. Let's get some reliable 1200-baud ASCII systems working. The FCC seems receptive to STAs right now. Don't forget to write it up for 73.—Editors.*

## KAHANER REPORT

*Larry Kahaner WB2NEL  
PO Box 39103  
Washington DC 20016*

### FOR WHOM THE BELL TOLLS

AT&T and the Bell operating companies no longer have the only wheel in town. You've seen the commercials for a company called MCI: "You haven't been talking too much, just paying too much!" MCI, a company which didn't exist until several years ago, offers a cut-rate long-distance service which pushes AT&T long lines out of the picture.

The system is ingenious but at the same time simple. You dial a local access number (5 digits); when you hear the beep, you enter a 6-digit code number (that's so they know who to bill the call to), then the area code and phone number you want.

The call is routed from the local access number through a network of microwave relays until it reaches the final destination area. Then the call connects back into the local phone network and your hookup is completed.

As I said, simple. Ma Bell is cut out of the action except for the two local calls.

AT&T tried to keep MCI from skimming the cream off the long-

distance business, wouldn't connect their network, and generally made life miserable for the company. MCI took them to court and won a whopping \$1.9 billion. AT&T is, of course, appealing the decision.

Don't get me wrong. AT&T did have reasonable grievances about the new kid on the telephone block. AT&T invested in an entire network, local and long distance, and MCI is taking the most lucrative part away. It's difficult sometimes to feel sorry for a monopoly which racked up a \$6-billion profit last year, but they do have a point.

Anyway, MCI is doing very well. 1981 fiscal year net income totalled \$21 million.

Ironically, they're still not happy. They don't want their customers pressing so many buttons. They want you to hook directly into the local phone loop without all the fingerwork.

AT&T maintains it isn't possible. MCI says it is, and they proved it. MCI cut a deal with a small independent telephone company in northwest Iowa—Northwest Iowa Telephone. NIT's 2,100 customers in three Iowa cities have an equal choice between dialing via AT&T or MCI.

If a caller dials "6," then the

10-digit long-distance phone number, he goes MCI. If he dials "1," then the 10-digit long-distance phone number, he travels AT&T. Service was expected to begin Aug. 1.

MCI President Bill McGowan told a group of reporters, "AT&T could do this for us, but they don't want to. AT&T argued that it couldn't be done, but this agreement proves otherwise."

One funny note in all of this: The agreement was broached by the small telephone company to protect its interests from MCI which was planning facilities in Sioux City, an area partially serviced by NIT. MCI would have siphoned off some of the long-distance revenue which AT&T kicks back to the local operating companies. MCI, which used to fight the big bully, was, in this case, a bully itself.

And a footnote—Why did MCI choose the number "6"? Well, because it corresponds to the letter "M" for MCI!

Okay. So MCI—and to some extent Southern Pacific which operates the SPRINT system—have installed networks to replace long-distance service. Bell still has the local loops, right? Yes, but even that's up for grabs. It began about five years ago when Xerox proposed something with the space-aged name of XTEN. It was to be a local digital network, mainly for high-speed data traffic to and from major metropolitan areas.

This was the plan: Xerox was going to install a centrally-

located microwave dish on the tallest building it could find. (The second tallest would have worked, too.) Then on your office building, you install a microwave dish which feeds data from you (by way of a network inside the building) to the central dish. The data is then sent via satellite or AT&T long lines. You bypass the local phone company, which can't carry high-speed data in most cases, anyway. Of course, you're not the only one using the system; others in your area are doing the same thing, using dishes on their buildings. Xerox envisioned a mini-network feeding into one, possibly two, central points.

Xerox convinced the FCC that this was such a good idea that the Commission authorized DTS, Digital Termination Service, in the 10-GHz range. Xerox couldn't be happier. After all, they were the only ones thinking of such a thing, and they expected to clean up.

Well, things got a little out of hand. Management appeared unstable; changes were made. In short, way behind schedule and a couple of bucks behind, Xerox dumped XTEN earlier this year.

But alas! Another company (named ISACOMM) has jumped into the scene and asked the FCC for permission to offer a similar service.

Local users, once they connect via microwaves to the central point, will have their messages transmitted by satellite to

users in other cities with the same setup. Not only is AT&T out of the long-distance action, but out of the local action as well.

ISACOMM is owned by Insurance Systems of America, a consortium of insurance companies. The reason why they backed the network seems clear. Insurance companies must move lots of high-speed data quickly and cheaply.

But ISACOMM isn't stopping there. According to the filing, the firm plans videoteleconferencing, voice, and other ser-

vices. Although the intent, at first, is clearly to serve its backers, it may, one day, expand to the consumer.

The initial plans call for the linking of 30 cities. The first central site is Atlanta.

So, what have we got here? Competition for AT&T and the local Bell operating companies for the very first time.

Don't ask for whom the bell tolls, Ma Bell. It tolls for thee.

#### JUST FOR THE RECORD

The FCC has added some new commissioners: Henry Rivera, a New Mexico lawyer, and

Mimi Dawson, a congressional aide. This complements the full commission, consisting of Chairman Mark Fowler, James Quello, Joseph Fogarty, Abbott Washburn, and Anne Jones.

In a personnel change more directly affecting hams, we learned at deadline that Carlos Roberts, chief of the private radio bureau, was planning to leave at the end of August. He was offered a job as director of land mobile development for MIA Com Labs in Gaithersburg, Maryland. You may know MIA Com as the parent of Microwave

Associates, a firm that sells microwave gear for amateur use.

His replacement will be James McKinney, now chief of the field operations bureau. McKinney is well respected and has always held ham radio in high regard. On several occasions, at FCC meetings, McKinney has called amateurs the best disciplined group that the Commission manages. Maybe he hasn't listened to 80m lately, or perhaps his 2m rig is on the blink. Or maybe, just maybe, compared to everyone else, we're tame. That's a scary thought.

# W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

right outside the back door of the room. Chuck and Tim quickly put up an antenna and were battling 'em out on 15 meters. I was able to get in edgewise and operate, but most of the time the band was open to Europe instead of the US. I didn't find the pileups that I did when operating from Turks and Caicos Islands.

The next morning we had an appointment with the Prime Minister of the country. He wanted to thank me for sending Tim down last year with the four trunks of ham gear to help them after the hurricane. That was the

worst hurricane the island had had in a hundred years or so. It wiped out most of the banana crop, demolished hundreds of buildings, and screwed things up for a long time to come.

This gave me an entry to talk about the possible development of ham clubs on St. Lucia. I got teenagers interested in amateur radio. The PM was very interested in this and I think we may be able to get that started. The idea is simple... interested hams or clubs in the US could provide the funds for club stations to be set up in youth centers in St. Lucia. Their government would provide someone to teach the fundamentals of electronics

and radio, while the students learned about operating by running the club stations. Thus, the youngsters would get the enjoyment and enthusiasm of being able to operate while they are learning the basics of radio. With this grounding, the teenagers would have a head start toward technical careers in electronics or communications. Technical people are needed desperately in small countries such as St. Lucia.

This plan is similar to the one I outlined for Jordan and which got their youngsters started in careers in electronics.

If any hams or clubs are interested in helping this project, I think we can furnish a first-rate club station for about \$1,500, buying the equipment at wholesale. Part of the bargain is an opportunity to make a visit in a year or two and see the hams which your station has devel-

oped. I would like to have as many hams as possible share the thrill I had when I visited Jordan and had a chance to meet the hundreds of young hams which my first visit had brought about.

St. Lucia has an advantage over most countries in that there is no duty on ham equipment. Canada managed to cost itself millions of dollars in lost technicians and engineers by putting a heavy duty on ham gear. Indeed, there are many countries where just the duty alone on a small rig is more than the average educated local earns in several months. I'm not talking about a sideband rig—just a simple CW transmitter. I remember talking with a ham in Egypt who had to spend four months' wages to import a ham rig sent to him by an enthusiastic American ham. It *could* have been done at less expense if the American ham



That's the Prime Minister talking with me... with Tim to the right of me and Chuck to the left side of the picture.



The small and crowded streets of Castries on St. Lucia are jammed with traffic much of the day... just like New York. The pace of life there is slower and the prices more reasonable. Note the lady with the bundle on her head. Most of the cars were Japanese... with some Russian versions of the Land Rover growing in sales.

had sent it in pieces, but even so, the duty would have been painful.

St. Lucia is a wonderful place to visit, but I discovered that a visit can be dangerous. I found several Americans living on the island. They came down just for a visit, found out about the low cost of living there and the beauty of the island...and moved down. I understand that one can rent a small house on St. Lucia for about \$100 a month. And, while most of the bananas are exported to Britain, you can live economically on local foods.

By the way, bananas grow quickly, so the devastation of 1980 was already just a memory. Each time a banana plant grows and provides its bananas, it is cut down and a new plant grows from the roots. Fresh pineapples, coconuts, mangoes, papaya, sugar apples, and so forth are growing all over the island.

The hams on St. Lucia reflect a wide area of interests. One runs the electronics store in Castries, the main town. Another is a lawyer. Another runs the yacht club (and issues the ham licenses).

We were taken on a trip around the island, all the while in touch with most of the active hams via the .34/.94 repeater. This was a beautiful trip, showing us the dry, the rainy, the mountains, and the flatlands which make up this small island. It's about 40 miles from one end to the other. I hope you'll get a chance to see my slides.

On the southern tip of the island, we went to the top of a mountain and I had the kick of working a chap who was visiting Barbados. Not bad for a 2m hand transceiver.

We enjoyed meeting the businessmen of St. Lucia at the Rotary meeting, and the hams got together for a big cocktail party, complete with marvelous snacks...and Miss St. Lucia, the recent winner of the island beauty contest.

None of the hams was into scuba diving, but they did take us to St. Lucia Divers, where Chuck, Tim, and I arranged for a dive trip. Actually, Chuck and Tim went snorkeling while the divemaster and I went down with scuba gear. I had along my camera and a new flash unit, and snapped pictures until the film was done. The dive spot was beautiful, even if it was about 20 miles down the coast

from Castries...a long, bone-jarring boat ride. The underwater scenery was great for both snorkeling and scuba, with a headwall going down sharply for the adventurous. There were plenty of gorgeous coral formations and colorful fish.

After the dive, we packed up and went a boat-banging twenty miles back to Castries. I think the ride was more exhausting than the dive. Anyone with a tendency toward seasickness should not make that trip. Sherry wisely opted to hear all about it later. She'd made a similar trip with Chuck and me at Turks and decided not to go through that again. The next trip to St. Lucia, I think we'll stay at the hotel right by the diving spot...near the town of Soufriere.

The four-day extended weekend "vacation" was over all too soon. Our hosts picked us up at around 6:00 am and drove us the hour and a quarter to the airport and we were on our way. The plane stopped for a few minutes at Guadeloupe, but they wouldn't let me off to collect one more country visited.

We soon were back in the air with the next stop St. Croix, where they have an international airport. Here, we had to get off the plane and go through US Customs. I declared the only thing I'd bought...a straw hat. On the next hop, we flew over Puerto Rico, where I was able to take a long shot of the disk at Arecibo, and then on up the islands. We went right over Providenciales, where we had visited in March, and I took a picture of the Bob Cooper estate and TV receiving dish. Soon we were in Miami and then on our way to Washington...and Boston.

Speaking of Miami, on our way down to St. Lucia we had to stop there. We were met by two good friends of Tim's, Don and Mary Johnson, who took us for a visit to N&G Electronics...and a Mexican lunch. They made the stopover between flights a fun time. I was particularly impressed by the N&G store and the amount of ham gear they have in stock. They showed me the plans for their new store, which they will be starting on soon. It will be in the same general area, not far from the airport, but will be much larger. A good deal of their business comes from Latin America.

Outside of a short DXpedi-

tion to Swaziland and Lesotho in August, I had nothing much planned for a while. Those countries were to take me over the 100 mark in countries visited. Should I start working for 200 or just settle down and take it easy? I was on the air from both of them, as well as South Africa.

### INFORMATION STATIONS

At long last, microcomputer technology is beginning to really get involved with amateur radio. There is no question in my mind but that it is going to take over and amateur radio will never be the same.

You've probably at least seen pictures of the Radio Shack pocket computer. Well, this is not a very big computer, but it is a decided development over the pocket calculators. It has a small BASIC language built in, so it can be programmed to do almost anything...and that includes some word processing.

A recent development in this line is the new Casio pocket computer (FX-702P)...a six-ounce computer with a five-pound manual. This, along with the Sinclair ZX-80, which is selling for \$150 to \$200 most places, could be mated with a ham rig to provide a sort of instant message service. Let me go into that in more detail.

Those of you who are already busy with microcomputers are aware of the growing interest in telephone bulletin boards, data services, and that sort of thing. Well, these can just as well be organized over the air. Instead of having a W1AW sending hours and hours of voice and CW messages every day, a radio bulletin board (RBB) station could sit, listening to a channel, for any inquiries. A request would bring on the sending in ASCII of a message which would be a menu of what is available from the RBB station.

The inquiring station would then select some part of the menu and ask for that information...which would be sent by the RBB station. What sort of information would be appropriate? Well, how about the latest in DX news, listing calls, QSL managers, times and frequencies, dates of expected operation? New countries then could be found easily. Or, how about Westlink news? Or other news reports? Then we could have the

latest in FCC news, with release, proposed rule changes, dockets, and the dates for comment, perhaps even some ideas on the dockets to help amateurs explore all aspects of the proposed rule changes.

There are many information broadcasts which would be of value to amateurs, once we get to thinking about them. We could have a repeater update, hamfest information, a net directory listing all active low-band nets, their frequencies, times, and special interest. Traffic nets could be listed. Satellite information. The more you think about it, the more information comes to mind which would be of interest.

Using the old 300-baud standard, which to me is about like forcing everyone to send Morse code at two words per minute, we could send about 230 words per minute. This, as I mentioned recently, is the reading speed of a very slow reader. This makes as much sense as two words-per-minute CW. I think we'll have to start out with that, but I would suggest an immediate push for 1,200 baud as quickly as possible. That brings us up to about 1,000 words per minute, which is a lot better...but nowhere near what we really want.

Since 9,600 baud is being used with success over ordinary telephone lines, I would recommend that we move in on that standard. That would give us around a 7,300 words-per-minute transfer of information. Now we're talking a second or two for each transmission and the ability of many stations to access the RBB station in a short time.

### HOW IT MIGHT WORK

Let's imagine our bulletin-board station set up on a synthesized channel. Let's further ask it to identify occasionally and send out regular pulses to hold the channel...perhaps one every second.

If I want to check on the latest DX news, I would type in "M?" on my built-in microcomputer system. Then, the next time the RBB polled the channel my rig would respond with that request for the menu. The RBB would immediately send a "bullipp" which would read out on my screen as the menu of information available. Number 7 might be my hot DX news, so I would type a "7" and a half-second



later, the RBB would poll my rig and trigger it to send the "7". The RBB would then dump the DX news, which might sound like a "beederupp" and I could then read out the hot scoop from my screen.

Obviously, we're going to have to experiment with error-correcting codes which will tell the other station how many bits of information are going to be exchanged. If the right number does not get through, the message can be repeated... or the missing part of it repeated. We're talking milliseconds, but we still may have to cope with CW jamming and other aggravations.

### TRAFFIC HANDLING

Once we have a communications system which will perk along dependably at 7300 words per minute, we obviously have made it possible for a way to handle traffic that will knock the sox off voice or CW message handling. Not only can our messages go through without error in a second or two, but we also can address them for automatic relaying on any band. Relaying stations can be set up to poll a channel for traffic going to that area, perhaps pulsing every minute or so with a quick identifier. A hundred relay stations could all use the same channel without interference.

And once we are set up for that, imagine the value of this system for emergencies. A small pocket computer plugged into our mobile rig would enable us to join such an emergency net and have our traffic sent and received... or relayed... all automatically. Voice may be a little easier to use, but the speedy, error-proof digital system would win out. Of course, they are working hard on voice-to-digital encoding systems. They may eventually get one which works well. Going from digital to voice is a lot simpler... that's even built into my pocket Talking Clock now. And I saw talking wristwatches at the Consumer show in Chicago. They were junky, but a hint of what is coming.

### EXPERIMENTING

I assume that we will have the usual number of hams who will do everything in their power to try to fight progress, complete with jamming experimental message-handling stations.

Well, you may be able to drive a few pioneers up the wall, but you really are not going to be able to stop the marriage of computers and amateur radio. If you can't help us to grow and invent new communications techniques, at least don't make it so difficult for those of us who are really trying.

I came into amateur radio not very long after the last spark transmitter had been outlawed. If you read your old magazines, you'll find that there were a bunch of old-timers hanging in there, chanting "spark forever" right up to the minute it was illegal for them to use those rigs. They fought progress as hard as they could. We had a similar situation with sideband, with old-timer AMers hanging in there, bitching and moaning and making a mess out of the bands.

Will CW finally blow away as the cost of microcomputers keeps coming down and a computerized communications system is not much more expensive than a CW rig with a keyer? Well, who needs five words per minute when the same rig can shoot out 7300? For what? For emergencies? Hell's bells, if there ever is a time when we need automated fast communications, it is during an emergency. We need to be able to hook mobile, hand-held rigs, low bands, satellites, repeaters... everything together automatically. If we have the system going on an everyday basis, we'll have it there when we need it.

With satellites tied in, we will be able to reach any amateur in the world via autocall through our traffic-handling nets. We'll have instant access to enormous amounts of information through RBB stations. And the best part of it is that we really have very little to invent. We already have most of the basics that we need, with experimentation required to find out the best way to get it all to work... and then time to get enough amateurs involved to make the system work.

### WHAT'S WAYNE DOING?

This is more of a letter to the several thousand personal friends who read 73 every month. Hello, Shep...

80 *Microcomputing*, which I started last year, is doing exceptionally well, running about 300 pages and more per month. I've

also started a monthly dump of the programs from this magazine on cassettes called Load 80... another winner. Then there is the *Encyclopedia 80*, a monthly book of material on the TRS-80... things not published anywhere else... and a cassette dump of the programs for this called *Encyclopedia Loader*. That brings the monthly publications to eight, if we include *Desktop Computing*.

There are six more publications in prospect, including one for satellite TV, one for women's health, an Apple magazine... and so on. *Desktop Computing* will be out this month, the first computer magazine written totally in plain language.

As if that isn't enough to keep track of, we are working toward starting a technical institute to teach microcomputers, electronics, and publishing. I'm hoping that something can be done to get our government to help students from Third World countries to come and get an associate degree in electronics so that they will be able to go back home and help the growth of communications... and education.

Russia and Cuba are still going strong helping emerging nations with education, but their education has that political flavor we really don't need today. I wish that the US would recognize the importance of helping smaller countries develop and not ignore them until it is too late.

The Instant Software division is in a fast-growth mode. It takes up most of the Elm Street build-

ing and has the largest micro-computer lab in the world. Over 10,000 programs have been sorted through and evaluated, with about 1,000 being okayed for mass publication. Most of these are for the TRS-80, but we're making a major effort to get these converted for use on the Apple and Atari. We're also working to get programs written or converted for the Casio computers... the 702P and their new 9000.

My recent visits to the major microcomputer firms have been encouraging. A year ago, none of them really appreciated the importance of software to the sale of their product... now only Radio Shack seems to still have its corporate head in the software sand. This could be the breakthrough that Apple needs to get ahead of Tandy. Of course, this means more and more business for Instant Software.

Our Irish plant is now running, supplying software for Europe and Africa. I was in Africa for three weeks in August. There was a microcomputer exposition in Johannesburg, and I spoke there on world microcomputer industry trends, software developments, and so on. I also had an opportunity to address the Apple dealers and bring them up to date on the world Apple situation.

Outside of that... and being the president of the Peterborough Chamber of Commerce this year, I'm loafing around. As Dorothy Parker once wrote, burning your candle at both ends makes such a pretty flame.

## HAM HELP

I'm looking for ham call license plates for my collection. I would like to swap for or buy plates from other states and provinces.

**Bryan Hastings KA1HY**  
64 Concord Street  
Peterborough NH 03458  
(603)-924-6902

Does anyone know of any CW nets that a greenhorn might be able to check into to improve his CW operating proficiency? I'm not permitted to handle third-

party traffic and even in the Novice band I get clobbered by QRM. Any suggestions would be appreciated. Many thanks.

**Ciano R.E. Strachan C6ANI**  
PO Box N4106  
Nassau NP Bahamaa

I am looking for information on the HW-12-22-32 tri-band conversion made by Dynalab.

**Jim Fyles WB0CZ1**  
820 El Paso Blvd.  
Denver CO 80221  
(303)-428-6860

# OSCAR ORBITS

Courtesy of AMSAT

## TUNING IN TO OSCAR 8

OSCAR 8 is the only amateur satellite available for everyday communications. Using the satellite for two-way contacts requires a 2-meter signal of about 100 W ERP. This can be achieved either by using a linear amplifier or by erecting a high-gain antenna which is movable in both azimuth and elevation. Such complexities are unnecessary, however, if you simply want to listen to OSCAR 8. In fact, listening to OSCAR 8's 10-meter downlink is a fairly simple procedure and an excellent introduction to the fun of satellite communications. The satellite operates in Mode A (10-meter downlink) on Monday, Tuesday, Thursday, and Friday. The only equipment required is a receiver capable of tuning the high end of the 10-meter band and an omnidirectional antenna or dipole for 10 meters. You will also need some idea of when the satellite is in range. The simple method outlined below will help you determine when to listen for OSCAR 8, and it requires nothing more than a pencil, paper, and a pocket calculator. The method works satisfactorily for all locations in the northern hemisphere.

## WHEN AND WHERE

The first step in using the data in the chart of orbital information on this page is to divide a sheet of paper into three columns labeled "Orbit No.," "Time," and "Crossing." Select a day that OSCAR 8 is scheduled to be in Mode A, and write the corresponding orbit number from the chart in your first column. Then get the time and equatorial crossing longitude from the same row of the chart and write them in the second and third columns. You should now have one row of data on your paper, the same data found in the chart for the date you have selected. At this point, you are ready to calculate the equatorial crossing time and longitude for each orbit of the selected day. A pocket calculator will be helpful for this, but even so, the process will be time consuming. We all must make sacrifices in the name of progress!

Now, add 1 to the orbit number and write the result just below the first orbit number. Add 103 minutes (1 hour, 43 minutes) to the original time in row one and write the result in column two of the second row. Finally, add 26 degrees to the longitude in row one and write the result in column three of row two. You should now have two complete rows of data in the homemade table you are constructing. Repeat this procedure, adding 1, 103, and 26 to the most recent numbers in columns one, two, and three until the total in column two exceeds 2400 hours, indicating that you have reached the end of one day's calculations. Whenever the total in column three exceeds 360, simply subtract 360 from the number before writing it into the table. There should be 14 or 15 rows of data in your completed table.

What you have just done is to develop a table showing the orbit number, crossing time, and equatorial crossing longitude for each orbit in the selected day. In essence, you have filled in the gaps in the charts printed in the magazine, which show data for only the first orbit of the day. A new table must be created for each day you plan to listen for OSCAR 8.

We are almost ready to choose a time for listening to OSCAR 8, but you must first determine your longitude. This is easily done by consulting a road map, most of which show longitude and latitude around the perimeter. Now examine your homemade table. Scan the third column, looking for crossing longitudes which are between approximately 10 degrees west of your longitude and 35 degrees east of your longitude. You should find two or three suitable longitudes in your table. When you find them, go across to column two and circle the times corresponding to these longitudes. On the day in question,

those are the best times to start listening for OSCAR 8. If you live near the equator, you will begin to hear the satellite a few minutes before the calculated time, while more northerly listeners will hear it after the calculated time.

This is a relatively crude calculation, but it should allow you to hear OSCAR 8 reliably. It is important to remember that the satellite operates on Universal Time (UTC). Thus, when we speak of Monday being a Mode A day, we are referring to Monday UTC, not Monday local time.

## WHAT YOU'LL HEAR

The OSCAR 8 10-meter downlink spans the frequency range from 29.400 to 29.500 MHz. A Morse telemetry beacon on 29.400 MHz transmits continuously at 20 wpm, sending coded information about the condition of the satellite. The telemetry consists of several groups of three digits each. Listening for the telemetry beacon is a good way to be sure you are hearing OSCAR 8 and not some other amateur activity on the same frequency.

When the satellite is in range, you will hear many QSOs in progress simultaneously in the 100 kHz that comprises the communications passband. Although satellite users tend to stick to a band plan which calls for CW at one end of the passband and SSB at the other, there is considerable mixing of the modes. OSCAR contacts tend to be short, since the satellite is in range for a maximum of only 20 minutes.

If you have 435-MHz receiving capability, try listening to OSCAR 8's Mode J transponder. Its downlink is 435.100 to 435.200 MHz. Mode J is activated on Saturday, Sunday, Tuesday, and Friday (note that OSCAR 8 is in Modes A and J simultaneously on Tuesday and Friday). The Mode J telemetry beacon can be found at 435.090 MHz.

You may have noticed that Wednesday is not mentioned as either a Mode A or Mode J day. This is because Wednesday is set aside for special experiments and the satellite is not available for normal communications use, although you are welcome to listen to the day's activities.

When listening to OSCAR, you will notice that the frequency of the transmissions from the satellite is constantly changing. This is the famous Doppler shift, caused by the high relative velocity between you and the satellite (thousands of miles per hour!). You will need one hand on the tuning knob almost continuously during an OSCAR 8 pass.

OSCAR represents an exciting opportunity to learn and perfect a new communications technique, and listening will get you started. For more information about amateur satellites, write to the Amateur Satellite Corporation (AMSAT), PO Box 27, Washington DC 20044.—WB8BTH.

## ORBITAL INFORMATION

OSCAR 8 ORBITAL INFORMATION FOR OCTOBER      OSCAR 8 ORBITAL INFORMATION FOR NOVEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)	ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
18212	1	0051:34	75.3	18645	1	0147:45	79.3
18240	2	0055:25	76.2	18659	2	0111:36	80.3
18254	4	0103:07	78.2	18673	3	0115:27	81.2
18268	5	0106:57	79.1	18687	4	0119:18	82.2
18282	6	0110:48	80.1	18701	5	0123:09	83.2
18296	7	0114:39	81.0	18715	6	0127:00	84.1
18310	8	0118:30	82.0	18729	7	0130:51	85.1
18324	9	0122:21	83.0	18743	8	0134:42	86.1
18338	10	0126:12	83.9	18757	9	0138:33	87.0
18352	11	0130:03	84.9	18771	10	0142:23	88.0
18366	12	0133:54	85.9	18784	11	003:06	63.2
18380	13	0137:45	86.8	18798	12	0006:57	64.1
18394	14	0141:36	87.8	18812	13	0010:48	65.1
18407	15	0002:19	63.0	18826	14	0014:39	66.0
18421	16	0006:10	63.9	18840	15	0018:30	67.0
18435	17	0010:01	64.9	18854	16	0022:21	68.0
18449	18	0013:52	65.8	18868	17	0026:12	68.9
18463	19	0017:43	66.8	18882	18	0030:03	69.9
18477	20	0021:34	67.8	18896	19	0033:54	70.9
18491	21	0025:25	68.7	18910	20	0037:45	71.8
18505	22	0029:15	69.7	18924	21	0041:36	72.8
18519	23	0033:06	70.7	18938	22	0045:27	73.7
18533	24	0036:57	71.6	18952	23	0049:18	74.7
18547	25	0040:48	72.6	18966	24	0053:09	75.7
18561	26	0044:39	73.5	18980	25	0057:00	76.6
18575	27	0048:30	74.5	18994	26	0100:50	77.6
18589	28	0052:21	75.5	19008	27	0104:41	78.6
18603	29	0056:12	76.4	19022	28	0108:32	79.5
18617	30	0100:03	77.4	19036	29	0112:23	80.5
18631	31	0103:54	78.4	19050	30	0116:14	81.4

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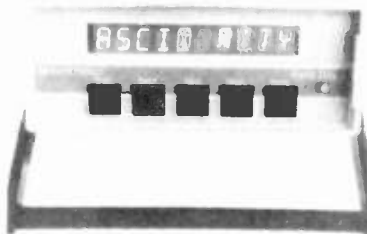
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# HAM HELP

I would like to contact anyone concerning the construction of the "Heterodyne Deviation Meter" as published in the ARRL *Radio Amateur's Handbook* and in the *FM and Repeaters Handbook*. In particular, I need to know the type of crystal used.

**Dave Harper W4NIQ**  
Route 2, Lincove  
Fayetteville TN 37334

I am looking for a schematic or manual on several pieces of equipment: (1) Sylvania Electric TV marker generator, type 501; (2) Weston model 779 Analyzer VOM; (3) Hallicrafters model S38C; (4) RCA Voltomyst #195A. I will be glad to pay for any copying costs.

**Lorin McNutt KA9BZP**  
5460 West 1200 South  
Fairmount IN 46928

I need information on a crystal filter marked as follows: Filtech Corp. Crystal Filter C.F. 7.825 MHz—model 2131 P/N 780055. I believe this unit was made for Hy-Gain equipment and will greatly appreciate any data on: (a) no. of poles; (b) bandwidth @ -6dB and @ -60dB; (c) impedance in and out; (d) insertion loss in dB; (e) present address of Filtech Corp. Thank you.

**C.A. Carhoun, WB1ACU**  
11A Harold Street  
Harwich Port MA 02646

I am looking for a source of technical information on the VHF/UHF Radio Telephone Service, i.e., IMTS, MTS, etc. Any information will be appreciated

**G.S. Wienand WD4DLY**  
312 Madison Ave.  
Cape Canaveral FL 32920

I need a manual and schematic for the following: Hammarlund HQ-170 receiver, Heath MM-1 multimeter, United Electronics Laboratory (UEL) model F 5-inch oscilloscope (schematic only for the scope).

**William N. Richmond WD4CPQ**  
122 E. Adair St.  
Louisville KY 40214

I am in need of a schematic diagram for a Heathkit Twoer, model HW-30. I will be glad to pay any reasonable duplicating and mailing costs, or I will duplicate on receipt and send back by mail.

**David Snell KA7INW**  
324 Galaxy Drive  
Butte MT 59701

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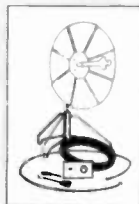
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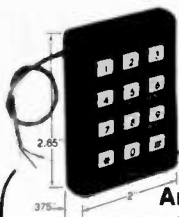
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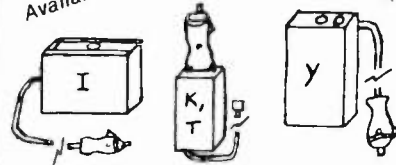
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We give you excellent service because CE distributes more scanners worldwide than anyone else. Our warehouse facilities are equipped to process thousands of scanner orders every week. We also export scanners to over 300 countries and military installations. Almost all items are in stock for quick shipment, so if you're a person who prefers fact to fantasy and who needs to know what's really happening around you, order your scanner today from CE!

## NEW! Bearcat® 350

**The Ultimate Synthesized Scanner!**

Allow 30-120 days for delivery after receipt of order due to the high demand for this product. List price \$599.95/CE price \$419.00

**7-Band, 50 Channel • Alpha-Numeric • No-crystal scanner • AM Aircraft and Public Service bands • AC/DC Bands: 30-50, 118-136 AM, 144-174, 421-512 MHz.** The new Bearcat 350 introduces an incredible breakthrough in synthesized scanning: Alpha-Numeric Display. Push a button—and the Vacuum Fluorescent Display switches from "numeric" to word descriptions of what's being monitored. 50 channels in 5 banks. Plus, Auto & Manual Search, Search Direction, Limit & Count, Direct Channel Access, Selective Scan Delay, Dual Scan Speeds, Automatic Lockout, Automatic Squelch, Non-Volatile Memory. Reserve your Bearcat 350 today!

## Bearcat® 300

List price \$549.95/CE price \$349.00

**7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands • Priority Channel • AC/DC Bands: 30-50, 118-136 AM, 144-174, 421-512 MHz.** The Bearcat 300 is the most advanced automatic scanning radio that has ever been offered to the public. The Bearcat 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The Bearcat 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.



## NEW! Bearcat® 350

## Bearcat® 250

List price \$429.95/CE price \$279.00

**6-Band, 50 Channel • Crystalline • Searches Stores • Recalls • Digital clock • AC/DC Priority Channel • Delay • Count Feature** Frequency range 32-50, 146-174, 420-512 MHz. The Bearcat 250 performs any scanning function you could possibly want. With push button ease you can program up to 50 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear. A special search feature of the Bearcat 250 actually stores 64 frequencies and recalls them, one at a time. Overseas customers should order the Bearcat 250FB at \$379.00 each. This model has 220 V AC/12 V DC power supply and 66-88 MHz low band coverage.

## NEW! Bearcat® 20/20

List price \$449.95/CE price \$289.00

**7-Band, 40 Channel • Crystalline • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay** Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz. The Bearcat 20/20 automatic scanning radio replaces the Bearcat 220 and monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

## Bearcat® 210XL

List price \$349.95/CE price \$229.00

**6-Band, 18 Channel • Crystalline • AC/DC** Frequency range: 32-50, 144-174, 421-512 MHz. The Bearcat 210XL scanning radio is the second generation scanner that replaces the popular Bearcat 210 and 211. It has almost twice the scanning capacity of the Bearcat 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more!

## Bearcat® 160

List price \$299.95/CE price \$189.00

**5-Band, 16 Channel • AC only • Priority Dual Scan Speeds • Direct Channel Access** Frequency range: 32-50, 144-174, 440-512 MHz. Would you believe...the Bearcat 160 is the least expensive Bearcat crystalline scanner.

This scanner presents a new dimension in scanning form and function. Look at the smooth keyboard. No buttons to punch. No knobs to turn. Instead, finger-tip pads provide control of all scanning operations, including On/Off, Volume and Squelch. Of course the Bearcat 160 incorporates other advanced Bearcat features such as Priority, Direct Channel Access, Dual Scan Speeds, Lockout, Scan Delay and more.

## NEW! Bearcat® 100

**The first no-crystal programmable handheld scanner.**

Allow 60-150 days for delivery after receipt of order due to the high demand for this product. List price \$449.95/CE price \$299.00

**8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC** Frequency range: 30-50, 138-174, 406-512 MHz. The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1 1/4" case more scanning power than is found in many base or mobile scanners. The Bearcat 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, plus Military and Federal Government frequencies. It has chrome-plated keys for functions that are user controlled, such as lockout, manual and automatic scan. Even search is provided, both manual and automatic. Wow...what a scanner!

The Bearcat 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. For earliest delivery from CE, reserve your Bearcat 100 today.

## Bearcat® 5

List price \$134.95/CE price \$94.00

**4-Band, 8 Crystal Channels • Lockout • AC only** Frequency range: 33-50, 146-174, 450-508 MHz. The Bearcat 5 is a value-packed crystal scanner built for the scanning professional — at a price the first-time buyer can afford. Individual lockout switches. Order one crystal certificate for each channel.

## Bearcat® Four-Six ThinScan™

List price \$189.95/CE price \$124.00

**Frequency range: 33-47, 152-164, 450-508 MHz.** The incredible, Bearcat Four-Six Thin Scan™ is like having an information center in your pocket. This four band, 6 channel crystal controlled scanner has patented Track Tuning on UHF. Scan Delay and Channel Lockout. Measures 2 3/4 x 6 1/4 x 1 1/4". Includes rubber ducky antenna. Order crystal certificate for each channel. Made in Japan.

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Test any scanner purchased from Communications Electronics™ for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in original condition with all parts in 31 days, for a prompt refund (less shipping/handling charges and rebate credits).

## Fanon Slimline 6-HLU

List price \$169.95/CE price \$109.00

**Low cost 6-channel, 4-band scanner!**

The Fanon Slimline 6-HLU gives you six channels of crystal controlled excitement. Unique Automatic Peak Tuning Circuit adjusts the receiver front end for maximum sensitivity across the entire UHF band. Individual channel lockout switches. Frequency range 30-50, 146-175 and 450-512 MHz. Size 2 3/4 x 6 1/4 x 1 1/4". Includes rubber ducky antenna. Order crystal certificates for each channel. Made in Japan.

## Fanon Slimline 6-HL

List price \$149.95/CE price \$99.00

**6-Channel performance at 4-channel cost!**

Frequency range: 30-50, 146-175 MHz.

If you don't need the UHF band, get this model and save money. Same high performance and features as the model HLU without the UHF band. Order crystal certificates for each channel. Made in Japan.

### OTHER SCANNERS & ACCESSORIES

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NEW! Regency† D300 Scanner	\$219.00
NEW! Regency† D100 Scanner	\$169.00
NEW! Regency† H604 Scanner	\$129.00
Regency† M400 Scanner	\$259.00
Regency† M100 Scanner	\$199.00
Regency† R1040 Scanner	\$149.00
SCMA-6 Fanon Mobile Adapter/Battery Charger	\$49.00
CHB-6 Fanon AC Adapter/Battery Charger	\$15.00
CAT-6 Fanon carrying case with belt clip	\$15.00
AUC-3 Fanon auto lighter adapter/Battery Charger	\$15.00
PSK-6 Base Power Supply/Bracket for SCMA-6	\$20.00
SP50 Bearcat AC Adapter	\$9.00
SP51 Bearcat Battery Charger	\$9.00
SP58 Bearcat 4-6 ThinScan™ carrying case	\$12.00
MA506 Frequency carrying case for H604	\$15.00
FB-E Frequency Directory for Eastern U.S.A.	\$12.00
FB-W Frequency Directory for Western U.S.A.	\$12.00
FFD Federal Frequency Directory for U.S.A.	\$12.00
TSG "Top Secret" Registry of U.S. Government Freq.	\$10.00
B-4 1.2 V AAA Ni-Cad batteries (set of four)	\$9.00
A-135cc Crystal certificate	\$3.00
Add \$3.00 shipping for all accessories ordered at the same time.	

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If you want the utmost in performance from your scanner, it's essential that you use an external antenna. We have six base and mobile antennas specifically designed for receiving all bands. Order #A60 is a magnet mount mobile antenna. Order #A61 is a gutter clip mobile antenna. Order #A62 is a trunk-lip mobile antenna. Order #A63 is a 3/4 inch hole mount. Order #A64 is a 3/8 inch snap-in mount, and #A70 is an all band base station antenna. All antennas are \$35.00 and \$3.00 for UPS shipping in the continental United States.

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• FM/AM/SSB/CW/wide spectrum coverage • Dual-conversion superheterodyne circuitry of AM assures high sensitivity and interference rejection • Quartz-crystal, phase-locked-loop frequency synthesis for all bands assures the utmost tuning stability, without a trace of tuning drift • Direct-access, digital tuning keyboard and LCD digital frequency readout for quick, key-touch station selection—maximum accuracy and ease of use • Manual tuning and automatic scanning for effortless signal searching, easy DXing • 6-station presets, plus 2 auxiliary presets for instant reception of memorized stations on any band-plus LDC memory indication • 5-step LED signal-strength indicator • Local/Normal/DX sensitivity selector for AM • SSB/CW compensator for low-distortion reception • Telescopic antenna, plus external antenna included • 4" speaker for full, rich sound • Slide-bar bass and treble controls • Sleep timer—with LCD readout—can be set in 10-minute increments for up to 90 minutes of play before automatic radio shut-off • Shoulder strap included • Integral stand allows tilt-up desk-top placement • Tape recorder jack allows off-the-air recording • Night-light for LCD illumination.

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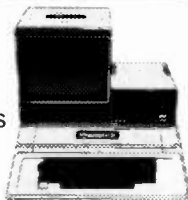


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16 Channels, 30-54 MHz; 140-180 MHz; 410-514 MHz. Digital Clock Date Display. 110 V. AC or 12-16 V. DC.  
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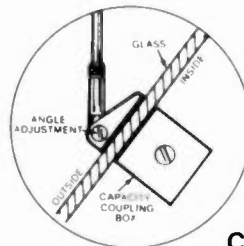
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ICOM's popular 2 meter, 800 channel, compact, handheld transceiver with Touchtone built-in. Comes standard with BP3 (250 mAh) battery, wall charger, belt clip, flexible antenna. A wide variety of batteries and accessories available.

ICOM IC-3AT Also Available

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P.C.Board with Data

1 to 5	\$15.00	6 to 11	\$13.00	12 to 26	\$11.00	27	up	\$9.00
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P.C.Board with all chip caps solder on. \$30.00

P.C.Board with all parts for assembly. \$49.99

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HMR II Downconverter with power supply , antenna (Dish) and all Cable for Instalation. 180 Day Warranty .

1 to 5	\$150.00	6 to 11	\$140.00	12 to up	\$125.00
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Yagi Downconverter with Power Supply , Antenna (Yagi) and all cables for Instalation. 90 Day Warranty.

1 to 5	\$150.00	6 to 11	\$140.00	12	up	\$125.00
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Yagi Downconverter as above but Kit. (NO CABLES) With Box.

1 to 5	\$125.00	6 to 11	\$115.00	12	up	\$100.00
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455KHz at 3.2KHz Wide.

\$15.00

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5.52-2.7/8	5.52MHz/2.7KHz wide 8 pole	
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5.595-.500/4/CW	5.595MHz/.500KHz wide 4 pole CW	
5.595-2.7/LSB	5.595MHz/2.7KHz wide 8 pole lower sideband	
5.595-2.7/USB	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.645-2.7/8	5.645MHz/2.7KHz wide 8 pole	Your Choice
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## Kokusai Electric Co. Mechanical Filter #MF-455-ZL-21H

455KHz at Center Frequency of 453.5Kc Carrier Frequency of 455Kc 2.36Kc Bandwidth

\$15.00

## Crystal Filters

Nikko	FX-07800C	7.8MHz	10.00
TEW	FEC-103-2	10.6935	10.00
Tyco/CD	001019880	10.7MHz 2 pole 15KHz Bw. Motorola #48D84396K01 Thru #48D84396K05	4.00
Motorola	4884863B01	11.7MHz 2 pole 15KHz Bandwidth	5.00
PTI	5350C	12MHz 2 pole 15KHz Bandwidth	5.00
PTI	5426C	21.4MHz 2 pole 15KHz Bandwidth	5.00
CD	A10300	45MHz 2 pole 15KHz Bandwidth (For Motorola Communications equipment)	5.00

## Ceramic Filters

Murata	BFB455B	455KHz	\$ 2.40
	CFM455E	455KHz +- 5.5KHz	6.65
	CFM455D	455KHz +- 7KHz	6.65
	CFR455E	455KHz +- 5.5KHz	8.00
	CFU455E	455KHz +- 1.5KHz	2.90
	CFU455G	455KHz +- 1KHz	2.90
	CFW455D	455KHz +- 1KHz	2.90
	CFW455H	455KHz +- 3KHz	4.35
	SFB455D	455KHz	2.40
	SFE10.7	10.7MHz	2.67
	SFG10.7MA	10.7MHz	10.00
Clevite	T0-01A	455KHz	5.00
	T0-02A	455KHz	5.00
Nippon	LF-B4/CFU455I	455KHz +- 1KHz	5.80
	LF-B6/CFU455H	455KHz +- 1KHz	5.80
	LF-C18	455KHz	10.00
Tokin	CF455A/BFU455K	455KHz +- 2KHz	4.80
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Power output 1.6mw.	Beam Dia. .75mm.	Beam Dir. 2.7mr.	8Kv starting voltage
68K ohm 1watt ballast	1000vdc +-100vdc	3.7ma.	<u>TUBES ARE NEW</u> \$59.99

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Frequency Range	30 to 200MC	200 to 400MC	450 to 800MC	500 to 1000MC
Noise Figure	1.5dB	6.5dB	7dB	2.5dB
Voltage	+15vdc	+24vdc	-6vdc @ +12vdc	+12vdc @ -12vdc
Gain	29dB	30dB	30dB	25dB
Power Output	1dB Gain +7dBm	1dB Gain +20dBm	1dB Gain -5dBm	1dB Gain +8dBm
Price	\$49.99	\$49.99	\$49.99	\$69.99

## Mini Circuits Double Balanced Mixers

### Model RAY-3

Very High Level (+23dBm LO) 70KHz to 200MHz LO,RF,DC to 200MHz IF  
 Conversion Loss,dB One Octave From Band Edge 6Typ./7.5Max. Total Range 6.5Typ./8Max.  
 Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 55Typ./45Min. Mid. Range  
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 25Min.  
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Collector Base Brakedown Voltage at Ic=100ua	35volts min.
Collector Emitter Brakedown Voltage at Ic=500ua	30volts min.
Collector Cutoff Current at Vcb=15v	100ua max.
Forward Current Transfer Ratio at Vce=15v,Ic=15ma	15min,40typ,125max
Transducer Power Gain at Vce=18v,Ice=60ma,F=2GHz.	3dBmin,4dBtyp
Maximum Available Gain at Vce=18v,Ic=60ma,F=1GHz/F=2GHz	14dB typ,8dB typ
Price	\$29.99

## Motorola RF Power Amplifier Modules

Model	MHW612A	MHW613A	MHW710	MHW720
Frequency Range	146 to 147MHz	150 to 174MHz	400 to 512MHz	400 to 470MHz
Voltage	12.5vdc	12.5vdc	12.5vdc	12.5vdc
Output Power	20watts	30watts	13watts	20watts
Minimum Gain	20dB	20dB	19.4dB	21dB
Harmonics	-30dB	-30dB	40dB	40dB
RF Input Power	400mw	500mw	250mw	250mw
Price	\$57.50	\$59.80	\$57.50	\$69.00

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WATKINS JOHNSON WJ-M62 3.7 to 4.2GHz Communication Band Double Balanced Mixer \$100.00

SSB Conversion Loss 4.9dB Typ. 6dB Max. fR 3.7 to 4.2GHz  
5.5dB Typ. 6.5dB Max. fI DC to 1125MHz fL fR

SSB Noise Figure fI 880MHz fL fR  
fR 3.7 to 4.2GHz  
4.9dB Typ. 6dB Max. fI 30 to 1125MHz fL fR  
5.5dB Typ. 6.5dB Max. fI 880MHz fL fR

Isolation  
fL at R 30dB Min. 40dB Typ. fL 2.8 to 5.35GHz  
fL at I 25dB Min. 30dB Typ. fL 4.5 to 5.35GHz  
20dB Min. 30dB Typ. fL 3.6 to 4.5GHz  
15dB Min. 25dB Typ. fL 2.8 to 3.6GHz

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Flatness .2dB Peak to Peak Over any 40MHz Segment of fR=3.7 to 4.2GHz

Third Order Input Intercept +11dBm fR1=4GHz fR2=4.01GHz Both at -5dBm fL=4.5GHz

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VSWR  
L-Port 1.25:1 Typ. 2.0:1 fL 2.8 to 5.35GHz  
R-Port 1.25:1 Typ. 2.0:1 fR 3.7 to 4.2GHz fL fR  
1.4 :1 Typ. 2.0:1 fR 3.7 to 4.2GHz fL fR  
I-Port 1.5 :1 Typ. 2.0:1 fI=100MHz  
1.3 :1 Typ. 2.0:1 fI=500MHz  
1.8 :1 Typ. 2.5:1 fI=1125MHz

## SGS/ATES RF Transistors

Type.	BFQ85	BFW92
Collector Base V	20v	25v
Collector Emitter V	15v	15v
Emitter Base V	3v	2.5v
Collector Current	40ma	25ma
Power Dissipation	200mw	190mw
HFE	40min. 200max.	20min. 150max.
FT	4GHZ min. 5GHZ max.	1.6GHZ Typ.
Noise Figure	1GHZ 3dB Max.	500MHz 4dB Typ.
Price	\$1.50	\$1.50

## Motorola RF Transistor

MRF901	2N6603
25v	25v
15v	15v
3v	3v
30ma	30ma
375mw	400mw
30min. 200max.	30min. 200max.
4.5GHZ typ.	2GHZ min.
1GHZ 2dB Typ.	2GHZ 2.9dB Typ.
\$2.00	\$10.00

## National Semiconductor Variable Voltage Regulator Sale !!!!!!!!

LM317K	LM350K	LM723G/L	LM7805/06/08/12/15/18/24
1.2 to 37vdc	1.2 to 33vdc	2 to 37vdc	5, 6, 8,12,15,18,24vdc
1.5Amps	3Amps	150ma.	1Amp
T0-3	T0-3	T0-100/T0-116	T0-220/T0-3
\$4.50	\$5.75	\$1.00 \$1.25	\$1.17 \$2.00

## P & B Solid State Relays Type ECT1DB72

5VDC Turn On 120VAC Contact 7Amps  
20Amps on 10"x10"x.062" Alum.Heatsink with  
Silicon Grease \$5.00

\*May Be Other Brand Equivalent

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# "MIXERS"

## WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	\$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz	
	8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above	
Conversion Compression	8.5dB Max. 50 to 300MHz	
	.3dB Typ.	

## NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min F=2GHz	dB 2.4 Typ.	MAG F=2GHz	dB 12 Typ.	\$5.30
F=3GHz	dB 3.4 Typ.	F=3GHz	dB 9 Typ.	
F=4GHz	dB 4.3 Typ.	F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.  
 Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

## UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufactures and described in the Motorola RF Data Book.

10pf	22pf	30pf	40pf	100pf	250pf	1 to 10pcs. .60¢ each
13pf	25pf	32pf	43pf	120pf	820pf	11 to 50pcs. .50¢ each
14pf	27pf	33pf	62pf	180pf		51 to 100pcs. .40¢ each
20pf	27.5pf	34pf	80pf	200pf		

## NIPPON ELECTRIC COMPANY TUNNEL DIODES

Peak Pt. Current ma.	Ip	MODEL 1S2199	1S2200 \$7.50
Valley Pt. Current ma.	Iv	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Peak Pt. Voltage mv.	Vp	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	95Typ. 120max.	75Typ. 90max.
Series Res. Ohms	rS	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Terminal Cap. pf.	Ct	2.5Typ. 4max.	2Typ. 3max.
Valley Pt. Voltage mv.	VV	1.7Typ. 2max.	5Typ. 8max.
		370Typ.	350Typ.

## FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ration (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.

These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE \$45.00

## MOTOROLA RF DATA BOOK

List all Motorola RF Transistors / RF Power Amplifiers, Varactor Diodes and much much more.

PRICE \$7.50

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# "SOCKETS AND CHIMNEYS"

## EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	\$ POR	SK626	Chimney	\$ 7.70
SK406	Chimney	35.00	SK630	Socket	45.00
SK416	Chimney	22.00	SK636B	Chimney	26.40
SK500	Socket	330.00	SK640	Socket	27.50
SK506	Chimney	47.00	SK646	Chimney	55.00
SK600	Socket	39.50	SK711A	Socket	192.50
SK602	Socket	56.00	SK740*	Socket	66.00
SK606	Chimney	8.80	SK770	Socket	66.00
SK607	Socket	43.00	SK800A	Socket	150.00
SK610	Socket	44.00	SK806	Chimney	30.80
SK620	Socket	45.00	SK900	Socket	253.00
SK620A	Socket	50.50	SK906	Chimney	44.00

## JOHNSON TUBE SOCKETS

124-115-2/SK620A	Socket	\$ 30.00	124-113	Bypass Cap.	\$ 10.00
124-116/SK630A	Socket	40.00	122-0275-001	Socket	10.00
			(For 4-250A, 4-400A, 3-400Z, 3-500Z)		2/\$15.00

## CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES:	1 to 10 - .99¢	101 to 1000 .60¢	* IS A SPECIAL PRICE:	10 for \$7.50
	11 to 50 - .90¢	1001 & UP .35¢		100 for \$65.00
	51 to 100 - .80¢			1000 for \$350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator \$110.00

Frequency range 3.6 to 4.2GHz, Power output, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic ( $nf_0$ ), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +/-0.05 volts @ 55mA, Max.

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# "TUBES"

TUBES	PRICE	TUBES	PRICE	TUBES	PRICE
2E26	\$ 4.69	5721	\$200.00	8462	\$100.00
2K28	100.00	5768	85.00	8505A	73.50
3B28	5.00	5836	100.00	8533W	92.00
3-500Z	102.00	5837	100.00	8560A	55.00
3-1000Z/8164	300.00	5861/EC55	110.00	8560AS	57.00
3CX1000A/8283	200.00	5876A	15.00	8608	34.00
3X2500A3	200.00	5881/6L6	5.00	8624	67.20
4-65A/8165	45.00	5894/A	45.00	8637	38.00
4-125A/4D21	58.00	5894B	55.00	8647	123.00
4-250A/5D22	68.00	6080	10.00	8737/5894B	55.10
4-400A/8438	71.00	6083/AX9909	89.00	8807	1000.00
4-400C/6775	80.00	6098/6AK6	14.00	8873	260.00
4-1000A/8166	300.00	6115/A	100.00	8874	260.00
4CS250R	69.00	6146	6.00	8875	260.00
4X150A/7034	30.00	6146A	6.50	8877	533.00
4X150D/7035	40.00	6146B/8298A	7.50	8908	12.00
4X150G	50.00	6146W	14.00	8916	1500.00
4X250B	30.00	6159	11.00	8930/X651Z	45.00
4CX250B/7203	45.00	6161	70.00	8950	10.00
4CX250F/7204	45.00	6291	125.00		
4CX250FG/8621	55.00	6293	20.00	6BK4C	5.00
4CX250K/8245	100.00	6360	4.00	6DQ5	4.00
4CX250R/7580W	69.00	6524	53.00	6FW5	5.00
4CX300A	99.00	6550	7.00	6GE5	5.00
4CX350A/8321	100.00	6562/6794A	25.00	6GJ5	5.00
4CX350FJ/8904	100.00	6693	110.00	6HS5	5.00
4X500A	100.00	6816	58.00	6JB5/6HE5	5.00
4CX600J	300.00	6832	22.00	6JB6A	5.00
4CX1000A/8168	300.00	6883/8032A/8552	7.00	6JM6	5.00
4CX1500B/8660	300.00	6884	46.00	6JN6	5.00
4CX3000A/8169	300.00	6897	110.00	6JS6B	5.00
4CX5000A/8170	400.00	6900	35.00	6JT6A	5.00
4CX10000D/8171	500.00	6907	55.00	6KD6	5.00
4CX15000A/8281	700.00	6939	15.00	6K66/EL505	5.50
4E27/A/5-123A/B	40.00	7094	75.00	6KM6	5.00
4PR60A	100.00	7117	17.00	6KN6	5.00
4PR60B/8252	175.00	7211	60.00	6LF6	6.00
KT88	15.00	7289/3CX100A5	34.00	6LQ6	6.00
DX362	35.00	7360	11.00	6LU8	5.00
DX415	35.00	7377	67.00	6LX6	5.00
572B/T160L	44.00	7486	75.00	6ME6	5.00
811	10.00	7650	250.00	12JB6A	6.00
811A	13.00	7843	58.00		
812A	15.00	7868	4.00		
813	38.00	7984	12.00		
4624	100.00	8072	55.00		
4665	350.00	8121	50.00		
5551A	100.00	8122	85.00		
5563A	77.00	8236	30.00		
5675	15.00	8295/PL172	300.00		

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# "MICROWAVE COMPONENTS"

Manufacturer	Part Number	Description	Price
AIL	70A	NOISE SOURCE	\$100.00
AIL	7010	NOISE SOURCE .2 TO 2.6GHZ	100.00
AIL	07050	NOISE SOURCE	100.00
AIL	07051	NOISE SOURCE 7.05 TO 10GHZ	150.00
ARRA	KU520A	VARIABLE ATTENUATOR	200.00
ARRA	2416-20	VARIABLE ATTENUATOR 0-20dB .5 TO 1GHZ 10W	100.00
ARRA	3614-60X	VARIABLE ATTENUATOR 0-60dB 1 TO 2GHZ 10W	50.00
ARRA	4684-20C	VARIABLE ATTENUATOR 0-20dB 3 TO 4GHZ 10W	75.00
ARRA	6684-20F	VARIABLE ATTENUATOR 0-20dB 7 TO 11GHZ	75.00
Alfred	1151	SAMPLER ATTENUATOR 1 TO 2GHZ 0 TO 50DB	200.00
Alfred	1152	SAMPLER ATTENUATOR 2 TO 4GHZ 0 TO 50DB	200.00
Alfred	1153	SAMPLER ATTENUATOR 4 TO 8GHZ 0 TO 50DB	200.00
Americon	2000-6254	ADAPTER X TO SMA 8.2 TO 12.4GHZ	75.00
Americon	2020-6600	DIRECTIONAL COUPLER .5 TO 1GHZ 6dB	75.00
Bomton	41-4B	POWER DETECTOR	75.00
Coaxial Dynamics	3023	DIRECTIONAL POWER DETECTOR 60Wfwd/15Wrev/225-400Mc	50.00
Coaxial Dynamics	3025	DIRECTIONAL POWER DETECTOR 60Wfwd/15Wrev/116-150Mc	50.00
FXR/Microlab	CW-A21	COUPLER	35.00
FXR/Microlab	XP-A39	CRYSTAL DETECTOR	35.00
FXR/Microlab	S164A	VARIABLE ATTENUATOR 0-50dB 2.6 TO 3.95GHZ	450.00
FXR/Microlab	N414A	FREQUENCY METER 3.95 TO 11GHZ	450.00
FXR/Microlab	601A07	ADAPTER	35.00
FXR/Microlab	6601B	ADAPTER	35.00
General Microwave	N402A-3	POWER DETECTOR	100.00
General Microwave	H710-20	DIRECTIONAL COUPLER 2 TO 4GHZ 20dB	75.00
General Microwave	4276-2	100:1 DIVIDER 1MC TO 250MC	35.00
Hewlett Packard	G281A	ADAPTER G TO H 3.95 TO 5.85Gc	50.00
Hewlett Packard	H281A	ADAPTER H TO N 7.05 TO 10Gc	35.00
Hewlett Packard	K281A	ADAPTER X TO N 8.2 TO 12.4Gc	35.00
Hewlett Packard	MX292B	ADAPTER 10 TO 15Gc	75.00
Hewlett Packard	NK292A	ADAPTER 15 TO 22Gc	75.00
Hewlett Packard	3458	NOISE SOURCE IF 30/60Mc	200.00
Hewlett Packard	G347A	NOISE SOURCE 3.95 TO 5.85Gc	250.00
Hewlett Packard	H347A	NOISE SOURCE 7.05 TO 10Gc	250.00
Hewlett Packard	S347A	NOISE SOURCE 2.6 TO 3.95Gc	325.00
Hewlett Packard	X347A	NOISE SOURCE 8.2 TO 12.4Gc	250.00
Hewlett Packard	349A	NOISE SOURCE 400Mc TO 4Gc	300.00
Hewlett Packard	355C	VARIABLE ATTENUATOR .5W DC TO 1Gc	150.00
Hewlett Packard	360D	LOW PASS FILTER 4100Mc	50.00
Hewlett Packard	G382A	VARIABLE ATTENUATOR 0 TO 50dB 3.95 TO 5.85Gc	500.00
Hewlett Packard	J382A	VARIABLE ATTENUATOR 0 TO 50dB 5.85 TO 8.2Gc	500.00
Hewlett Packard	P382A	VARIABLE ATTENUATOR 0 TO 50dB 12.4 TO 18Gc	350.00
Hewlett Packard	X382A	VARIABLE ATTENUATOR 0 TO 50dB 8.2 TO 12.4Gc	325.00
Hewlett Packard	411A-210	N Tee For 411A	35.00
Hewlett Packard	H421A	CRYSTAL DETECTOR 7.05 TO 10Gc	50.00
Hewlett Packard	H421A	CRYSTAL DETECTOR 7.05 TO 10Gc Matched Pair	200.00
Hewlett Packard	H424A	CRYSTAL DETECTOR 7.05 TO 10Gc Matched Pair	400.00
Hewlett Packard	477B	THERMISTOR MOUNT FOR 430 SERIES 10Mc TO 10Gc	75.00
Hewlett Packard	G485A	BARRETT MOUNT 1.95 TO 5.85Gc	85.00
Hewlett Packard	J485B	DETECTOR MOUNT 5.85 TO 8.2Gc	85.00
Hewlett Packard	J486A	THERMISTOR MOUNT 5.85 TO 8.2Gc	180.00
Hewlett Packard	H487B	THERMISTOR MOUNT 7.05 TO 10Gc	50.00
Hewlett Packard	K487C	THERMISTOR MOUNT 10 TO 26Gc	135.00
Hewlett Packard	P487B	THERMISTOR MOUNT 12.4 TO 18Gc	155.00
Hewlett Packard	X487A	THERMISTOR MOUNT 8.2 TO 12.4Gc	65.00
Hewlett Packard	X487B	THERMISTOR MOUNT 8.2 TO 12.4Gc	85.00
Hewlett Packard	G532A	THERMISTOR MOUNT 8.2 TO 12.4Gc	300.00
Hewlett Packard	H532A	FREQUENCY METER 3.95 TO 5.85Gc	500.00
Hewlett Packard	J532A	FREQUENCY METER 7.05 TO 10Gc	400.00
Hewlett Packard	M532A	FREQUENCY METER 5.3 TO 8.2Gc	500.00
Hewlett Packard	P532A	FREQUENCY METER 10 TO 15Gc	500.00
Hewlett Packard	X532A	FREQUENCY METER 12.4 TO 18Gc	400.00
Hewlett Packard	536A	FREQUENCY METER 8.2 TO 12.4Gc	350.00
Hewlett Packard	G752D	FREQUENCY METER .94 TO 4.2Gc	600.00
Hewlett Packard	X752A	DIRECTIONAL COUPLER 20dB 3.95 TO 5.85Gc	200.00
Hewlett Packard	X752C	DIRECTIONAL COUPLER 3dB 8.2 TO 12.4Gc	200.00
Hewlett Packard	X752D	DIRECTIONAL COUPLER 10dB 8.2 TO 12.4Gc	200.00
Hewlett Packard	765D	DIRECTIONAL COUPLER 20dB 8.2 TO 12.4Gc	200.00
Hewlett Packard	767D	DUAL DIRECTIONAL COUPLER .94 TO 1.975Gc 20dB	50.00
Hewlett Packard	787D	DUAL DIRECTIONAL COUPLER 1.9 TO 4Gc 20dB	50.00
Hewlett Packard	G910B	DIRECTIONAL COUPLER 1.9 TO 4.1Gc	200.00
Hewlett Packard	X914B	TERMINATION 3.95 TO 5.85Gc	75.00
Hewlett Packard	2830A	MOVING LOAD 8.2 TO 12.4Gc	100.00
Hewlett Packard	3503	SENSOR OSCILLATOR	50.00
Hewlett Packard	8431A	MICROWAVE SWITCH 500Mc TO 12.4Gc SPST	100.00
Hewlett Packard	8436A	BANDPASS FILTER 2 TO 4Gc	200.00
Hewlett Packard	8471A	BANDPASS FILTER 8 TO 12.4Gc	200.00
Hewlett Packard	8472A	RF DETECTOR	75.00
Hewlett Packard	8732A	CRYSTAL DETECTOR .01 TO 18Gc	100.00
Hewlett Packard	8733A	PIN MODULATOR 1.8 TO 4.5Gc 80dB	400.00
Hewlett Packard	10100B	PIN MODULATOR 3.7 TO 8.3Gc 35dB	350.00
Hewlett Packard	10955A	TERMINATION 50 OHMS	25.00
Hewlett Packard	11660A	PREAMP. 2 TO 1300Mc	200.00
Hewlett Packard	11693A	TRACKING GENERATOR SHUNT	50.00
Hewlett Packard	13510	LIMITER	300.00
Hewlett Packard	33001C	TRANSISTOR TEST JIG	150.00
Hewlett Packard	33102A	PIN ABSORPTIVE MODULATOR	200.00
Hewlett Packard	C79-33602A	MICROWAVE SWITCH 100Mc TO 18GHZ	100.00
Hewlett Packard	39098A	MICROWAVE SWITCH 0C TO 18Gc SPDT	75.00
Kay	30-0/4320	MICROWAVE SWITCH	100.00
Kay	NM781	0 TO 10dB VARIABLE ATTENUATOR DC TO 1Gc	100.00
Kay	7921A	NOISE SOURCE	250.00
Kay	7921A1	NOISE SOURCE 10 TO 900Mc	200.00
Lectronic	503A	NOISE SOURCE 10 TO 1000Mc	250.00
MDL	90LW26-1	TUBE Mtg./Attenuator and 2K25	50.00
MECA	715-152	9 BAND LOAD	50.00
Merrimac	AU-26A/	DIRECTIONAL COUPLER 4 TO 8Gc 20dB (Narda 3044B20)	100.00
Microtech	214972	801162 VARIABLE ATTENUATOR	75.00
Military	AT-68/UPM	MICROWAVE SWITCH	50.00
Military	UG-528/U	HORN ANTENNA 8.5 TO 9.6Gc	25.00
Narda	708	6dB ATTENUATOR	35.00
Narda	792FM	VARIABLE ATTENUATOR 0 TO 40dB	100.00
Narda	2301-20	VARIABLE ATTENUATOR 2 TO 2.5Gc 0 TO 17dB min.	250.00
Narda	2301-30	2.5 TO 12.4Gc 0 TO 20dB min.	100.00
Narda	2366	DIRECTIONAL COUPLER 2 TO 4Gc 20dB	100.00
Narda	2863	DIRECTIONAL COUPLER 2 TO 4Gc 30dB	100.00
Narda	2864	VARIABLE DIRECTIONAL COUPLER 1.2 TO 1.4Gc 7 TO 12dB	90.00
Narda	2979	BIDIRECTIONAL COUPLER 4 TO 8Gc 20dB	100.00
Narda	3002-10	DIRECTIONAL COUPLER .95 TO 2Gc 10dB	100.00
Narda	3002-20	DIRECTIONAL COUPLER .95 TO 2Gc 20dB	100.00
Narda	3003-10	DIRECTIONAL COUPLER 2 TO 4Gc 10dB	100.00
Narda	3003-30	DIRECTIONAL COUPLER 2 TO 4Gc 30dB	100.00
Narda	3004-10	DIRECTIONAL COUPLER 4 TO 10Gc 10dB	100.00

# "TEST EQUIPMENT"

TEST EQUIPMENT		MICROWAVE COMPONENTS					
Boonton	202J	AM FM Signal Generator 195 to 270MHz	450.00	Narda	3004-20	Directional Coupler 4 to 10Gc 20dB	100.00
Boonton	202J/207H	AM FM Signal Generator and Inverter 100KHz to 55Mc and 195 to 270Mc	600.00	Narda	3032	Hybrid .95 to 2Gc 3dB	150.00
CMC	931	Heterodyne Converter 200 to 1200Mc	200.00	Narda	3033	Hybrid 2 to 4Gc 3dB	150.00
Chushman	MCMS	Monitor	750.00	Narda	3039-20	Directional Coupler 125 to 250Mc 20dB	150.00
Alfred	8000/7051	Sweep Network Analyzer 100KHz to 40Gc	800.00	Narda	3040-20	Directional Coupler 240 to 500Mc 20dB	125.00
Meguro	MSG-2282A	Standard Signal Generator For CB	250.00	Narda	3043-20	Directional Coupler 2 to 4Gc 20dB	100.00
Gertsch	FM3	Frequency Meter 20 to 1000Mc	150.00	Narda	3044-20	Directional Coupler 4 to 8Gc 20dB	100.00
Systron Donner	1037/1291A	Frequency Meter 0 to 50Mc with Plug In to 500Mc	500.00	Narda	3044B20	Directional Coupler 3.7 to 8.3Gc 20dB	150.00
Singer	SPA3/25A	Spectrum Analyzer 1Kc to 25Mc and a G-6 Companion Sweep Generator 0 to 15Mc and PS-19 Power Supply	1500.00	Narda	3045C30	Directional Coupler 7 to 12.4Gc 30dB	125.00
Measurements	658	Standard Signal Generator 75Hz to 35Mc	250.00	Narda	4035	Hybrid 3dB	150.00
Measurements	140	Standard Deviation Meter 25 to 1000Mc	200.00	Narda	22006/	3043-20 Directional Coupler 1.7 to 4Gc 20dB	100.00
Polarad	MSG-2	Signal Generator 2150 to 4600Mc	500.00	Narda	22007/	3043-30 Directional Coupler 1.7 to 4Gc 30dB	100.00
E.H.	574	Microwave Swept Oscillator 8 to 12.4Gc	750.00	Narda	22011/	3003-10 Directional Coupler 2 to 4Gc 10dB	100.00
Monsanto	1107	Time Interval Plug In	50.00	Narda	22012/	3003-30 Directional Coupler 2 to 4Gc 30dB	100.00
Military	TS-1011/	UPM4 Spectrum Analyzer 10Mc to 40Gc with 1Each Filter F335/F336/F337/F338/F341/1Each Attenuator CN411/CN410/CN409 and 1Each Adapter UG1239/UG1240/UG1241/UG1242	1800.00	Narda	22377	Adapter X to N 8.2 to 12.4Gc	35.00
General Radio	805C	Standard Signal Generator 16Kc to 50Mc	300.00	Narda	22538/	4014-10 Directional Coupler 3.85 to 8Gc 10dB	75.00
Hewlett Packard	230A	Power Amplifier 10 to 500Mc 4.5watts	400.00	Narda	22539/	4015C10 Directional Coupler 7.4 to 12Gc 10dB	85.00
Hewlett Packard	230B	Power Amplifier 10 to 500Mc 4.5watts	800.00	Narda	22540A/	4013C10 Directional Coupler 2 to 4Gc 10dB	75.00
Hewlett Packard	240A	Sweep Generator 4.5 to 120Mc	400.00	Narda	22574	Directional Coupler 2 to 4Gc 10dB	100.00
Hewlett Packard	410C	VTVN to 700MHz	400.00	Narda	22689	Directional Coupler 15.8 to 17.3Gc	125.00
Hewlett Packard	415D	SWR Meter	250.00	Narda	22876/	4014C6 Directional Coupler 3.85 to 8Gc 6dB	100.00
Hewlett Packard	431B	Power Meter 10Mc to 40Gc	150.00	Narda	23105/	4015C30 Directional Coupler 7 to 12.4Gc 30dB	100.00
Hewlett Packard	606A	Signal Generator 50KHz to 65Mc	800.00	Norsal	14064-3D	Directional Coupler 6 to 10Gc 30dB	75.00
Hewlett Packard	608D	Signal Generator 10 to 420Mc	400.00	PRD	C101	Variable Attenuator 5.85 to 8.2Gc 0 to 60dB	350.00
Hewlett Packard	609C	Signal Generator 10 to 480Mc	500.00	PRD	U101	Variable Attenuator 12.4 to 18Gc 0 to 60dB	300.00
Hewlett Packard	608E	Signal Generator 10 to 480Mc	1500.00	PRD	205A	Slotted Line with Probe 4 to 10Gc	100.00
Hewlett Packard	608F	Signal Generator 10 to 455Mc	1500.00	PRD	585A	Frequency Meter 8.2 to 10Gc	125.00
Hewlett Packard	612A	Signal Generator 450 to 1230Mc	500.00	PRD	K3414	90° Twist 18 to 26.5Gc	50.00
Hewlett Packard	614A	Signal Generator 900 to 2100Mc	500.00	PRD	5815	Wave Meter 7 to 10.6Gc	75.00
Hewlett Packard	616A	Signal Generator 1.8 to 4.2Gc	400.00	PRD	N6001	Crystal Switch	50.00
Hewlett Packard	616B	Signal Generator 1.8 to 4.2Gc	500.00	PRD	X6284	Thermistor Mount 8.2 to 12.4Gc	125.00
Hewlett Packard	618A	Signal Generator 3.8 to 7.6Gc	400.00	Quantatron	S100	Rodstub Tuner	50.00
Hewlett Packard	618B	Signal Generator 3.8 to 7.6Gc	500.00	RLC	A-2610C	Variable Attenuator	50.00
Hewlett Packard	620A	Signal Generator 7 to 11Gc	400.00	Radar Design	01536	Directional Coupler	75.00
Hewlett Packard	623B	Test Set 5925 to 7750Mc	500.00	Sage	752-3	Coupler	25.00
Hewlett Packard	626A	Signal Generator 10 to 15Gc	2000.00	Sage	2503	Mixer	25.00
Hewlett Packard	628A	Signal Generator 15 to 21Gc	400.00	Sage	7753-3	Directional Coupler 4 to 6Gc 3dB	50.00
Hewlett Packard	940A	Frequency Doubler 26.5 to 40Gc	1000.00	Sperry Microline	12G1	Frequency Meter 5.84 to 8.2Gc	200.00
Hewlett Packard	3550A	Portable Test Set	1000.00	Stoddart	90515	10dB Attenuator	200.00
Hewlett Packard	5245L	Frequency Counter 0 to 50Mc	1000.00	Systron Donner	D8E319A	Tunable Detector 18 to 26.5Gc	200.00
Hewlett Packard	5251A	Plug In For above 20 to 100Mc	100.00	Tektronix	S1	Sampling Head	Call
Hewlett Packard	5252A	Plug In For above 100 to 350Mc	200.00	Tektronix	S2	Sampling Head	Call
Hewlett Packard	5253B	Plug In For above 50 to 500Mc	350.00	Tektronix	S50	Pulse Generator Head	Call
Hewlett Packard	5254B	Plug In For above 200Mc to 3Gc	750.00	Tektronix	B170A	170 ohm Variable Attenuator	50.00
Hewlett Packard	5260A	Frequency Divider to 12.4Gc For above	1000.00	Telonic	TBPA17-34-SCD2	Bandpass Filter	15.00
Hewlett Packard	5262A	Plug In For above 11Mc Interval	100.00	Texscan	5VF250-500-1AA	Tunable Bandpass Filter 250 to 500Mc	250.00
Hewlett Packard	5327B	DVM and Frequency Meter to 550Mc	1500.00	Transco	919C70100	SPOT Switch	25.00
Hewlett Packard	DV5636	H Band Generator/Test Set 7.1 to 8.5Gc	1000.00	Waveline	601	Adapter X to TNC 8.2 to 12.4Gc	35.00
Tektronix	491	Spectrum Analyzer Solid State 10Mc to 40Gc	7000.00	Waveline	9009-10	Directional Coupler 4 to 10Gc 10dB	100.00
Micro Tel	MSR903	Microwave Receiver to 40Gc Digital Readout	9000.00	Wavetek	5070	0 to 70dB Variable Attenuator	75.00
Tektronix	190B	Signal Generator 350KHz to 50Mc	150.00	Weinschel Eng.	2692	+30 to 60dB Variable Attenuator	50.00
Telonic	2003	Sweep/Signal Generator Systems		Microwave Equipment	Model	Description	Price
3305 5 to 1500Mc Autoplex.2/3323 1 to 2000Mc Variable Marker.3340 RF/Output				PRD	219/3302/3302L/1106A	20 to 1000MHz Standing Wave Detector and Matched Load	\$250.00
Attenuator 50 ohms.3350 RF Detector.3360A Rate Modulation.3370Display Processing.				Hewlett Packard	805A	Slotted Line 500MHz to 4Ghz	200.00
				Hewlett Packard	805C	Slotted Line 500MHz to 4Ghz	400.00
				Hewlett Packard	809B with	806B Slotted Line 3 to 12Ghz/810B Slotted Line 3.95 to 5.85Ghz/810B Slotted Line 5.85 to 8.2Ghz/810B Slotted Line 8.2 to 12.4Ghz/810B Slotted Line 12.4 to 18Ghz/X281A & X281A Adapter/HX292B Tapered Transition/444A Probe 2.6 to 18Ghz/and a 447B Probe/810B Slotted Line 7.05 to 10.5	900.00
				Hewlett Packard	809B with	806B Slotted Line 3 to 12Ghz/810B Slotted Line 7.05 to 10.5Ghz/810B Slotted Line 8.2 to 12.4Ghz/HX292B Tapered Transition H to X/H281A & X281A/with Probe.444A	550.00

# MHz

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### INTEGRATED CIRCUITS

7400 TTL	74100 TTL	74500 TTL	7400 CMOS
7400	74100	74500	7400
7401	74101	74501	7401
7402	74102	74502	7402
7403	74103	74503	7403
7404	74104	74504	7404
7405	74105	74505	7405
7406	74106	74506	7406
7407	74107	74507	7407
7408	74108	74508	7408
7409	74109	74509	7409
7410	74110	74510	7410
7411	74111	74511	7411
7412	74112	74512	7412
7413	74113	74513	7413
7414	74114	74514	7414
7415	74115	74515	7415
7416	74116	74516	7416
7417	74117	74517	7417
7418	74118	74518	7418
7419	74119	74519	7419
7420	74120	74520	7420
7421	74121	74521	7421
7422	74122	74522	7422
7423	74123	74523	7423
7424	74124	74524	7424
7425	74125	74525	7425
7426	74126	74526	7426
7427	74127	74527	7427
7428	74128	74528	7428
7429	74129	74529	7429
7430	74130	74530	7430
7431	74131	74531	7431
7432	74132	74532	7432
7433	74133	74533	7433
7434	74134	74534	7434
7435	74135	74535	7435
7436	74136	74536	7436
7437	74137	74537	7437
7438	74138	74538	7438
7439	74139	74539	7439
7440	74140	74540	7440
7441	74141	74541	7441
7442	74142	74542	7442
7443	74143	74543	7443
7444	74144	74544	7444
7445	74145	74545	7445
7446	74146	74546	7446
7447	74147	74547	7447
7448	74148	74548	7448
7449	74149	74549	7449
7450	74150	74550	7450
7451	74151	74551	7451
7452	74152	74552	7452
7453	74153	74553	7453
7454	74154	74554	7454
7455	74155	74555	7455
7456	74156	74556	7456
7457	74157	74557	7457
7458	74158	74558	7458
7459	74159	74559	7459
7460	74160	74560	7460
7461	74161	74561	7461
7462	74162	74562	7462
7463	74163	74563	7463
7464	74164	74564	7464
7465	74165	74565	7465
7466	74166	74566	7466
7467	74167	74567	7467
7468	74168	74568	7468
7469	74169	74569	7469
7470	74170	74570	7470
7471	74171	74571	7471
7472	74172	74572	7472
7473	74173	74573	7473
7474	74174	74574	7474
7475	74175	74575	7475
7476	74176	74576	7476
7477	74177	74577	7477
7478	74178	74578	7478
7479	74179	74579	7479
7480	74180	74580	7480
7481	74181	74581	7481
7482	74182	74582	7482
7483	74183	74583	7483
7484	74184	74584	7484
7485	74185	74585	7485
7486	74186	74586	7486
7487	74187	74587	7487
7488	74188	74588	7488
7489	74189	74589	7489
7490	74190	74590	7490
7491	74191	74591	7491
7492	74192	74592	7492
7493	74193	74593	7493
7494	74194	74594	7494
7495	74195	74595	7495
7496	74196	74596	7496
7497	74197	74597	7497
7498	74198	74598	7498
7499	74199	74599	7499

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Digital LCD Clock Module  
• Operates from a single 1.5V Battery  
• D.C. LCD display



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MA1032M MA1032M Kit: \$2.85

### PANASONIC ELECTROLYTIC CAPACITORS


Value	µF	100	1000	10000
10	100	1000	10000	100000
20	200	2000	20000	200000
30	300	3000	30000	300000
40	400	4000	40000	400000
50	500	5000	50000	500000
60	600	6000	60000	600000
70	700	7000	70000	700000
80	800	8000	80000	800000
90	900	9000	90000	900000
100	1000	10000	100000	1000000

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• HIGH DIGIT  
• HIGH DIGIT



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12 VDC - 1000 Hz  
• 12 VDC - 1000 Hz  
• 12 VDC - 1000 Hz



MA1032M Kit: \$24.95  
MA1032M Switch to MA1032M: \$2.85  
MA1032M MA1032M Kit: \$2.85

### PANASONIC METALLIZED POLYESTER CAPACITORS

Value	µF	100	1000	10000
10	100	1000	10000	100000
20	200	2000	20000	200000
30	300	3000	30000	300000
40	400	4000	40000	400000
50	500	5000	50000	500000
60	600	6000	60000	600000
70	700	7000	70000	700000
80	800	8000	80000	800000
90	900	9000	90000	900000
100	1000	10000	100000	1000000

### PLATED WIRE WRAP

Part No.	Wire	Length	Price
W100	100	100	1.00
W200	200	200	2.00
W300	300	300	3.00
W400	400	400	4.00
W500	500	500	5.00
W600	600	600	6.00
W700	700	700	7.00
W800	800	800	8.00
W900	900	900	9.00
W1000	1000	1000	10.00

### SUPER-STRIPS

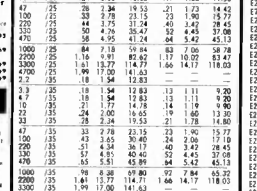
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Large Aluminum Electrolytic Capacitors



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MA1032M Switch to MA1032M: \$2.85  
MA1032M MA1032M Kit: \$2.85

### PANASONIC POLYESTER CAPACITORS

Value	µF	100	1000	10000
10	100	1000	10000	100000
20	200	2000	20000	200000
30	300	3000	30000	300000
40	400	4000	40000	400000
50	500	5000	50000	500000
60	600	6000	60000	600000
70	700	7000	70000	700000
80	800	8000	80000	800000
90	900	9000	90000	900000
100	1000	10000	100000	1000000

### 4008 CMOS

Part No.	Value	Price
4008	4008	1.00
4009	4009	1.00
4010	4010	1.00
4011	4011	1.00
4012	4012	1.00
4013	4013	1.00
4014	4014	1.00
4015	4015	1.00
4016	4016	1.00
4017	4017	1.00
4018	4018	1.00
4019	4019	1.00
4020	4020	1.00
4021	4021	1.00
4022	4022	1.00
4023	4023	1.00
4024	4024	1.00
4025	4025	1.00
4026	4026	1.00
4027	4027	1.00
4028	4028	1.00
4029	4029	1.00
4030	4030	1.00
4031	4031	1.00
4032	4032	1.00
4033	4033	1.00
4034	4034	1.00
4035	4035	1.00
4036	4036	1.00
4037	4037	1.00
4038	4038	1.00
4039	4039	1.00
4040	4040	1.00

### POWER

MA1032M Kit: \$24.95  
MA1032M Switch to MA1032M: \$2.85  
MA1032M MA1032M Kit: \$2.85

### PANASONIC KI-SERIES CAPACITORS

Standard Film Capacitors



MA1032M Kit: \$24.95  
MA1032M Switch to MA1032M: \$2.85  
MA1032M MA1032M Kit: \$2.85

### PANASONIC POLYESTER CAPACITORS

Value	µF	100	1000	10000
10	100	1000	10000	100000
20	200	2000	20000	200000
30	300	3000	30000	300000
40	400	4000	40000	400000
50	500	5000	50000	500000
60	600	6000	60000	600000
70	700	7000	70000	700000
80	800	8000	80000	800000
90	900	9000	90000	900000
100	1000	10000	100000	1000000

### A/D & D/A

Part No.	Value	Price
A100	A100	1.00
A200	A200	1.00
A300	A300	1.00
A400	A400	1.00
A500	A500	1.00
A600	A600	1.00
A700	A700	1.00
A800	A800	1.00
A900	A900	1.00
A1000	A1000	1.00

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### PANASONIC KI-SERIES CAPACITORS

Standard Film Capacitors



MA1032M Kit: \$24.95  
MA1032M Switch to MA1032M: \$2.85  
MA1032M MA1032M Kit: \$2.85

### PANASONIC POLYESTER CAPACITORS

Value	µF	100	1000	10000
10	100	1000	10000	100000
20	200	2000	20000	200000
30	300	3000	30000	300000
40	400	4000	40000	400000
50	500	5000	50000	500000
60	600	6000	60000	600000
70	700	7000	70000	700000
80	800	8000	80000	800000
90	900	9000	90000	900000
100	1000	10000	100000	1000000

### IT RECTIFIERS

Part No.	Value	Price
I100	I100	1.00
I200	I200	1.00
I300	I300	1.00
I400	I400	1.00
I500	I500	1.00
I600	I600	1.00
I700	I700	1.00
I800	I800	1.00
I900	I900	1.00
I1000	I1000	1.00

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### PANASONIC KI-SERIES CAPACITORS

Standard Film Capacitors



MA1032M Kit: \$24.95  
MA1032M Switch to MA1032M: \$2.85  
MA1032M MA1032M Kit: \$2.85

### PANASONIC POLYESTER CAPACITORS

Value	µF	100	1000	10000
10	100	1000	10000	100000
20	200	2000	20000	200000
30	300	3000	30000	300000
40	400	4000	40000	400000
50	500	5000	50000	500000
60	600	6000	60000	600000
70	700	7000	70000	700000
80	800	8000	80000	800000
90	900	9000	90000	900000
100	1000	10000	100000	1000000

### IT SILICON ZENER DIODES

Part No.	Value	
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7400N	LM320N-12	1.35	CD4027	2.50	4118 200ns	2.95
7402N	LM320N-15	1.35	CD4028	85	84116 200ns	18.40
7404N	LM320T-5	95	CD4029	85	MM2562	4.00
7405N	LM320T-12	95	CD4030	45	MM2560	3.50
7410N	LM320T-15	95	CD4035	1.00	MM5320	3.95
7414N	LM320T-15	95	CD4040	1.00	MM5320	3.95
7420N	LM320N-5	95	CD4042	85	PM411D-3	4.00
7422N	LM320N	1.00	CD4043	85	PM411D-4	5.00
7428N	LM320N-5	1.00	CD4044	85	PM5310	3.50
7442N	LM320N-5	1.35	CD4046	1.67	4200A	9.95
7445N	LM320N-6	1.35	CD4049	45	82575	2.90
7447N	LM320N-12	1.35	CD4050	60	81102A	5.00
7448N	LM320N-15	1.35	CD4051	1.13	HD0165-5	6.95
7450N	LM320N-24	1.35	CD4060	1.07	MM57100	5.00
7474N	LM320T-5	95	CD4066	71	CM178000-1	3.95
7475N	LM320T-6	95	CD4068	40	MCMM6751A	3.95
7478N	LM320T-12	95	CD4069	30	896A	5.50
7479N	LM320T-15	95	CD4070	50	4100	10.00
7480N	LM320T-18	95	CD4071	45	4116	16.00
7482N	LM320T-24	95	CD4072	45	CM178000-1	3.95
7493N	LM320T-5	95	CD4073	45	CLOCKS	
7495N	LM320T-6	95	CD4075	45	MM5311	5.50
74100N	LM320T-5	95	CD4076	1.45	MM5312	5.50
74107N	LM320N	1.00	CD4078	40	MM5314	3.90
74121N	LM320T-5	95	CD4081	35	MM5389	2.10
74123N	LM320N	1.00	CD4082	35	MM5311	5.50
74125N	LM320N	1.00	CD4083	35	MM5385	7.95
74145N	LM320T-5	95	CD4085	5.00	CT1070	8.95
74150N	LM320T-5	95	CD4086	2.85	CT1071	8.95
74151N	LM320T-6	95	CD4087	2.85	MM5375A/N	4.90
74152N	LM320T-12	95	CD4088	2.85	MM5375A/N	4.90
74153N	LM320T-15	95	CD4089	2.85	MM5375A/N	4.90
74154N	LM320T-24	95	CD4090	2.85	MM5375A/N	4.90
74155N	LM320T-5	95	CD4091	2.85	MM5375A/N	4.90
74156N	LM320T-6	95	CD4092	2.85	MM5375A/N	4.90
74157N	LM320T-12	95	CD4093	2.85	MM5375A/N	4.90
74158N	LM320T-15	95	CD4094	2.85	MM5375A/N	4.90
74159N	LM320T-24	95	CD4095	2.85	MM5375A/N	4.90
74160N	LM320T-5	95	CD4096	2.85	MM5375A/N	4.90
74161N	LM320T-6	95	CD4097	2.85	MM5375A/N	4.90
74162N	LM320T-12	95	CD4098	2.85	MM5375A/N	4.90
74163N	LM320T-15	95	CD4099	2.85	MM5375A/N	4.90
74164N	LM320T-24	95	CD4100	2.85	MM5375A/N	4.90
74174N	LM320N	1.00	CD4101	2.85	MM5375A/N	4.90
74175N	LM320N	1.00	CD4102	2.85	MM5375A/N	4.90
74180N	LM320N	1.00	CD4103	2.85	MM5375A/N	4.90
74192N	LM320N	1.00	CD4104	2.85	MM5375A/N	4.90
74193N	LM320N	1.00	CD4105	2.85	MM5375A/N	4.90
74221N	LM320N	1.00	CD4106	2.85	MM5375A/N	4.90
74268N	LM320N	1.00	CD4107	2.85	MM5375A/N	4.90
74365N	LM320N	1.00	CD4108	2.85	MM5375A/N	4.90
74366N	LM320N	1.00	CD4109	2.85	MM5375A/N	4.90
74367N	LM320N	1.00	CD4110	2.85	MM5375A/N	4.90

74368N	LM320N	1.00	CD4111	2.85	MM5375A/N	4.90
74369N	LM320N	1.00	CD4112	2.85	MM5375A/N	4.90
74370N	LM320N	1.00	CD4113	2.85	MM5375A/N	4.90
74371N	LM320N	1.00	CD4114	2.85	MM5375A/N	4.90
74372N	LM320N	1.00	CD4115	2.85	MM5375A/N	4.90
74373N	LM320N	1.00	CD4116	2.85	MM5375A/N	4.90
74374N	LM320N	1.00	CD4117	2.85	MM5375A/N	4.90
74375N	LM320N	1.00	CD4118	2.85	MM5375A/N	4.90
74376N	LM320N	1.00	CD4119	2.85	MM5375A/N	4.90
74377N	LM320N	1.00	CD4120	2.85	MM5375A/N	4.90
74378N	LM320N	1.00	CD4121	2.85	MM5375A/N	4.90
74379N	LM320N	1.00	CD4122	2.85	MM5375A/N	4.90
74380N	LM320N	1.00	CD4123	2.85	MM5375A/N	4.90
74381N	LM320N	1.00	CD4124	2.85	MM5375A/N	4.90
74382N	LM320N	1.00	CD4125	2.85	MM5375A/N	4.90
74383N	LM320N	1.00	CD4126	2.85	MM5375A/N	4.90
74384N	LM320N	1.00	CD4127	2.85	MM5375A/N	4.90
74385N	LM320N	1.00	CD4128	2.85	MM5375A/N	4.90
74386N	LM320N	1.00	CD4129	2.85	MM5375A/N	4.90
74387N	LM320N	1.00	CD4130	2.85	MM5375A/N	4.90
74388N	LM320N	1.00	CD4131	2.85	MM5375A/N	4.90
74389N	LM320N	1.00	CD4132	2.85	MM5375A/N	4.90
74390N	LM320N	1.00	CD4133	2.85	MM5375A/N	4.90
74391N	LM320N	1.00	CD4134	2.85	MM5375A/N	4.90
74392N	LM320N	1.00	CD4135	2.85	MM5375A/N	4.90
74393N	LM320N	1.00	CD4136	2.85	MM5375A/N	4.90
74394N	LM320N	1.00	CD4137	2.85	MM5375A/N	4.90
74395N	LM320N	1.00	CD4138	2.85	MM5375A/N	4.90
74396N	LM320N	1.00	CD4139	2.85	MM5375A/N	4.90
74397N	LM320N	1.00	CD4140	2.85	MM5375A/N	4.90
74398N	LM320N	1.00	CD4141	2.85	MM5375A/N	4.90
74399N	LM320N	1.00	CD4142	2.85	MM5375A/N	4.90
74400N	LM320N	1.00	CD4143	2.85	MM5375A/N	4.90

74500N TTL	LM320N	1.00	CD4144	2.85	MM5375A/N	4.90
74501N	LM320N	1.00	CD4145	2.85	MM5375A/N	4.90
74502N	LM320N	1.00	CD4146	2.85	MM5375A/N	4.90
74503N	LM320N	1.00	CD4147	2.85	MM5375A/N	4.90
74504N	LM320N	1.00	CD4148	2.85	MM5375A/N	4.90
74505N	LM320N	1.00	CD4149	2.85	MM5375A/N	4.90
74506N	LM320N	1.00	CD4150	2.85	MM5375A/N	4.90
74507N	LM320N	1.00	CD4151	2.85	MM5375A/N	4.90
74508N	LM320N	1.00	CD4152	2.85	MM5375A/N	4.90
74509N	LM320N	1.00	CD4153	2.85	MM5375A/N	4.90
74510N	LM320N	1.00	CD4154	2.85	MM5375A/N	4.90
74511N	LM320N	1.00	CD4155	2.85	MM5375A/N	4.90
74512N	LM320N	1.00	CD4156	2.85	MM5375A/N	4.90
74513N	LM320N	1.00	CD4157	2.85	MM5375A/N	4.90
74514N	LM320N	1.00	CD4158	2.85	MM5375A/N	4.90
74515N	LM320N	1.00	CD4159	2.85	MM5375A/N	4.90
74516N	LM320N	1.00	CD4160	2.85	MM5375A/N	4.90
74517N	LM320N	1.00	CD4161	2.85	MM5375A/N	4.90
74518N	LM320N	1.00	CD4162	2.85	MM5375A/N	4.90
74519N	LM320N	1.00	CD4163	2.85	MM5375A/N	4.90
74520N	LM320N	1.00	CD4164	2.85	MM5375A/N	4.90
74521N	LM320N	1.00	CD4165	2.85	MM5375A/N	4.90
74522N	LM320N	1.00	CD4166	2.85	MM5375A/N	4.90
74523N	LM320N	1.00	CD4167	2.85	MM5375A/N	4.90
74524N	LM320N	1.00	CD4168	2.85	MM5375A/N	4.90
74525N	LM320N	1.00	CD4169	2.85	MM5375A/N	4.90
74526N	LM320N	1.00	CD4170	2.85	MM5375A/N	4.90
74527N	LM320N	1.00	CD4171	2.85	MM5375A/N	4.90
74528N	LM320N	1.00	CD4172	2.85	MM5375A/N	4.90
74529N	LM320N	1.00	CD4173	2.85	MM5375A/N	4.90
74530N	LM320N	1.00	CD4174	2.85	MM5375A/N	4.90
74531N	LM320N	1.00	CD4175	2.85	MM5375A/N	4.90
74532N	LM320N	1.00	CD4176	2.85	MM5375A/N	4.90
74533N	LM320N	1.00	CD4177	2.85	MM5375A/N	4.90
74534N	LM320N	1.00	CD4178	2.85	MM5375A/N	4.90
74535N	LM320N	1.00	CD4179	2.85	MM5375A/N	4.90
74536N	LM320N	1.00	CD4180	2.85	MM5375A/N	4.90
74537N	LM320N	1.00	CD4181	2.85	MM5375A/N	4.90
74538N	LM320N	1.00	CD4182	2.85	MM5375A/N	4.90
74539N	LM320N	1.00	CD4183	2.85	MM5375A/N	4.90
74540N	LM320N	1.00	CD4184	2.85	MM5375A/N	4.90
74541N	LM320N	1.00	CD4185	2.85	MM5375A/N	4.90
74542N	LM320N	1.00	CD4186	2.85	MM5375A/N	4.90
74543N	LM320N	1.00	CD4187	2.85	MM5375A/N	4.90
74544N	LM320N	1.00	CD4188	2.85	MM5375A/N	4.90
74545N	LM320N	1.00	CD4189	2.85	MM5375A/N	4.90
74546N	LM320N	1.00	CD4190	2.85	MM5375A/N	4.90
74547N	LM320N	1.00	CD4191	2.85	MM5375A/N	4.90
74548N	LM320N	1.00	CD4192	2.85	MM5375A/N	4.90
74549N	LM320N	1.00	CD4193	2.85	MM5375A/N	4.90
74550N	LM320N	1.00	CD4194	2.85	MM5375A/N	4.90
74551N	LM320N	1.00	CD4195	2.85	MM5375A/N	4.90
74552N	LM320N	1.00	CD4196	2.85	MM5375A/N	4.90
74553N	LM320N	1.00	CD4197	2.85	MM5375A/N	4.90
74554N	LM320N	1.00	CD4198	2.85	MM5375A/N	4.90
74555N	LM320N	1.00	CD4199	2.85	MM5375A/N	4.90
74556N	LM320N	1.00	CD4200	2.85	MM5375A/N	4.90

74557N	LM320N	1.00	CD4201	2.85	MM5375A/N	4.90
74558N	LM320N	1.00	CD4202	2.85	MM5375A/N	4.90
74559N	LM320N	1.00	CD4203	2.85	MM5375A/N	4.90
74560N	LM320N	1.00	CD4204	2.85	MM5375A/N	4.90
74561N	LM320N	1.00	CD4205	2.85	MM5375A/N	4.90
74562N	LM320N	1.00	CD4206	2.85	MM5375A/N	4.90
74563N	LM320N	1.00	CD4207	2.85	MM5375A/N	4.90
74564N	LM320N	1.00	CD4208	2.85	MM5375A/N	4.90
74565N	LM320N	1.00	CD4209	2.85	MM5375A/N	4.90
74566N	LM320N	1.00	CD4210	2.85	MM5375A/N	4.90
74567N	LM320N	1.00	CD4211	2.85	MM5375A/N	4.90
74568N	LM320N	1.00	CD4212	2.85	MM5375A/N	4.90
74569N	LM320N	1.00	CD4213	2.85	MM5375A/N	4.90
74570N	LM320N	1.00	CD4214	2.85	MM5375A/N	4.90
74571N	LM320N	1.00	CD4215	2.85	MM5375A/N	4.90
74572N	LM320N	1.00	CD4216	2.85	MM5375A/N	4.90
74573N	LM320N	1.00	CD4217	2.85	MM5375A/N	4.90
74574N	LM320N	1.00	CD4218	2.85	MM5	

We now have available a bunch of goodies too good to bypass. Items are limited so order today

## MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.

**Call Your Phone Order in Today**  
TERMS: Satisfaction guaranteed or money refunded. C.O.D. add \$2.00. Minimum order \$6.00. Orders under \$10.00 add \$1.50. Add 5% for postage, insurance, handling. Overseas add 15%. N.Y. residents add 7% tax.

### MINI MIKE



Super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes stereo, on-off switch, antenna, battery and super instructions. This is the finest unit available.

4-3 Kit \$14.95  
4-3 Wired and Tested 19.95

### Color Organ

See music come alive! 3 different lights flicker with music. One light each for high, mid-range and lows. Each individually adjustable and drives up to 300 W runs on 110 VAC.

Complete kit, ML-1 \$8.95

### Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit, VD-1 \$7.95

### Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 \$2.95

### Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 \$5.95

### CPO-1

Runs on 3-12 Vdc. 1 watt out. 1 KHZ good for CPO Alarm, Audio Oscillator. Complete kit \$2.95

### CLOCK KITS

Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 \$24.95  
Clock with 10 min. ID timer, 12/24 hour, DC-10 \$29.95  
Alarm clock, 12 hour only, DC-8 \$29.95  
12V DC car clock, DC-7 \$29.95

For wired and tested clocks add \$10.00 to kit price. SPECIFY 12 OR 24 HOUR FORMAT

### Wireless Mike Kit

Transmits up to 300' on FM broadcast range. Uses any type of battery. Runs on 3 to 9V. Added sensitive mike preamp.

-1 kit \$3.95 FM-2 kit \$4.95

### Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 \$6.95

### Tone Decoder

A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts. Complete kit, TD-1 \$5.95

### Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

T-5 Kit \$5.95

### Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC.

MB-1 Kit \$4.95

### Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker. Complete kit, SM-3 \$2.95

60 Hz Time Base  
Runs on 5-15 VDC. Low current (25 mA), 1 min. month accuracy. TB-7 Kit \$5.50  
TB-7 Assy \$9.95

### 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 movement is completely assembled - you only solder 3 wires and 2 switches, takes about 15 minutes! Display is bright green with automatic brightness control photocell - assures you of a highly readable display, day or night. Comes in a satin 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

### Calendar Alarm Clock

The clock that's got it all! 6-5" LEDs, 12/24 hour, snooze, 24 hour alarm, 4 year calendar, battery backup and lots more. The super 7001 chip is used. Size 5x4x2 inches. Complete kit, less case (not available) \$34.95

### Under Dash Car Clock

12/24 hour clock in a beautiful plastic case. Features 6 jumbo RED LEDs, high accuracy (0.01%), easy 3 wire hookup, display blanks with ignition, and super instructions. Optional dimmer automatically adjusts display to ambient light level. DC 11 clock with mtg bracket \$27.95 kit  
OM 1 dimmer adapter \$2.50  
Add \$10.00 Assy and Test

### Video Terminal

A completely self contained, stand alone video terminal card. Requires only an ASCII keyboard and TV set to become a complete terminal unit. Features: single 5V supply, TTL controlled sync and baud rates (10-9600), complete computer and keyboard control of cursor, parity error control and display. Accepts and generates serial ASCII plus parallel keyboard input. The 6416 is 64 char by 16 lines, with scrolling, upper and lower case (optional), and has RS-232 and 20ma loop interfaces on board. Kits include sockets and complete documentation. RE 6416 terminal card kit (add \$60.00 for wired unit) \$189.95  
Lower Case option \$13.95  
Power Supply \$14.95  
RF Modulator + V \$7.95

# PARTS PARADE

### IC SPECIALS

#### LINEAR

1	\$ .35
4	\$ 1.50
5	\$ 1.50
6	\$ 1.45
7	\$ 1.00
8	\$ 1.00
9	\$ 1.00
10	\$ 1.25
11	\$ 2.00
12	\$ 1.50
14	\$ 2.95
18	\$ 2.95

#### TTL

74S00	\$ .40
7447	\$ .65
7475	\$ .50
7490	\$ .50
74196	\$ 1.35

#### SPECIAL

11C90	\$15.00
10116	\$ 1.25
7208	\$17.50
7207A	\$ 5.50
7216D	\$21.00
7107C	\$12.50
5314	\$ 2.95
5375AB/G	\$ 2.95
7001	\$ 6.50

#### CMOS

11	\$ .50
13	\$ .50
46	\$1.85
49	\$ .50
58	\$ .50
59	\$ .50
11	\$9.00
13	\$2.00
18	\$1.35
39	\$1.75

#### Resistor Ass't

Assortment of Popular values - 1/4 watt. Cut lead for PC mounting, 1/8" center, 1/2" leads, bag of 300 or more \$1.50

#### Switches

Mini toggle SPDT \$1.00  
Red Pushbuttons N/O 3/\$1.00

#### Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks etc. 5 for \$1.00

#### Mini 8 ohm Speaker

Approx. 2" diam. Round type for radios, mike etc. 3 for \$2.00

#### Slug Tuned Coils

Small 3/16" Hex Slugs turned coil 3 turns 10 for \$1.00

#### CAPACITORS

TANTALUM	ALUMINUM	DISK CERAMIC
Dipped Epoxy	Electrolytic	01 16V disk 20/\$1.00
1.5 uF 25V 3/\$1.00	1000 uF 16V Radial \$50	1 16V 15/\$1.00
1.8 uF 25V 3/\$1.00	500 uF 20V Axial \$50	100 16V 20/\$1.00
22 uF 25V 3/\$1.00	150 uF 16V Axial \$51.00	100 pf 20/\$1.00
	10 uF 15V Radial \$1.00	047 16V 20/\$1.00

#### AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end.  
8.5 vdc @ 20 mA \$1.00  
16 vdc @ 160mA \$2.50  
12 vdc @ 250mA \$3.00

#### AC Outlet

Panel Mount with Leads 4/\$1.00

#### DC-DC Converter

-5 vdc input prod. -9 vdc @ 30ma  
-9 vdc prod/uses -15 vdc @ 35ma \$1.25

#### Ceramic IF Filters

Mini ceramic filters 7 kHz BW. 455 kHz \$1.50 ea.

#### 25K 20 Turn Trim Pot. \$1.00

#### 1K 20 Turn Trim Pot. \$ .50

#### Trimmer Caps

Sprague - 3-40 pf Stable Polypropylene .50 ea.

### Audio Prescaler

Make high resolution audio measurements, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives 0.1 Hz resolution with 1 sec gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit \$29.95  
PS-2 wired \$39.95

### 600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify -10 or -100.

Wired, tested, PS-1B \$59.95  
Kit, PS-1B \$44.95

### 30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay. PA-1, 30 W pwr amp kit \$22.95  
TR-1, RF sensed T-R relay kit 6.95

MRF-238 transistor as used in PA-1 8-10db gain, 150 mhz \$11.95

### RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay TR-1 Kit \$6.95

### Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and .5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V 1/4 A and 24 VCT. Complete kit, PS-3LT \$6.95

### READOUTS

10 359 4" C.C.	\$1.00
10 507/510 5" C.A.	\$1.00
1N 721R/730 33 CA	1.00
17851 43" C.A.	2.00

### TRANSISTORS

3904 NPN C-F	15/\$1.00
3906 PNP C-F	15/\$1.00
4403 NPN C-F	15/\$1.00
4410 NPN C-F	15/\$1.00
14916 FET C-F	4/\$1.00
15401 PNP C-F	5/\$1.00
80276 C-F	4/\$1.00
13771 NPN Silicon	\$1.50
15179 UHF NPN	3/\$2.00
Power Tab NPN 40W	3/\$1.00
Power Tab PNP 40W	3/\$1.00
*F 102/2N5484	\$ .50
*N 3904 Type T-R	50/\$2.50
*P 3906 Type T-R	50/\$2.50
39055	\$ .80
12648 UJT	3/\$2.00

### Diodes

5.1 V Zener	20/\$1.00
1N914 Type	50/\$1.00
1KV 2Amp	8/\$1.00
100V 1Amp	15/\$1.00

### 25 AMP 100V Bridge \$1.50 each

### Mini-Bridge 50V 1 AMP 2 for \$1.00

### Crystal Microphone

Small 1" diameter 1/2" thick crystal mike cartridge \$ .75

### Coax Connector Chassis mount BNC type \$1.00

### 9 Volt Battery Clips

Nice quality clips 5 for \$1.00  
1/2" Rubber Grommets 10 for \$1.00

### Parts Bag

Asst of chokes, disc caps, tan resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) \$1.00; large bag (300 pc) \$2.50

### Connectors

6 pin type gold contacts for mA-1003 car clock module price .75 ea.

### LEDs - your choice, please specify

Mini Red, Jumbo Red, High Intensity Red, Illuminator Red 8/\$1  
Mini Yellow, Jumbo Yellow, Jumbo Green 6/\$1

### Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - .50 each or 3/\$1.00

### OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 compatible, but 500,000 MEG input z, super low 50 pa input current, low power drain.  
50 for only \$9.00 10 for \$2.00

### Regulators

78MG	\$1.25	7812	\$1.00
79MG	\$1.25	7815	\$1.00
723	\$ .50	7905	\$1.25
309K	\$1.15	7912	\$1.25
7805	\$1.00	7915	\$1.25

### Shrink Tubing Nubs

Nice precut pieces of shrink size 1" x 1/4" shrink to 1/4". Great for splices \$5.00

### Mini TO-92 Heat Sinks

Thermalloy Brand 5 for \$1.00  
To-220 Heat Sinks 3 for \$1.00

### Opto Isolators - 4N28 type \$ .50 ea.

### Opto Reflectors - Photo diode + LED \$1.00 ea.

### Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. 20 strips for \$1.00

### CDS Photocells

Resistance varies with light. 250 ohms to over 3 meg. 3 for \$1.00

# SEMICONDUCTORS SURPLUS

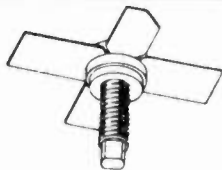
## ARCO CAPS

304	100-550pF	1.50	469	170-780pF	1.40
400	.9-7pF	1.00	4615	390-1400pF	2.02
402	1.5-20pF	1.00	404	8-60pF	1.00
420	1-12pF	1.00	405	10-80pF	1.00
423	7-100pF	1.00	422	4-40pF	1.00
426	37-250pF	1.01	424	16-150pF	1.00
464	25-280pF	1.00	427	55-300pF	1.00
465	50-380pF	1.39	462	5-80pF	1.50
467	110-580pF	1.03			

## TUBES

6KD6	5.00	6939	7.99
6LQ6/6JE6	6.00	6146	5.00
6MJ6/6LQ6/6JE6C	6.00	6146A	5.69
6LF6/6MH6	5.00	6146B/8298	7.95
12BY7A	4.00	6146W	12.00
2E26	4.69	6550A	8.00
4X150A	29.99	8908	9.00
4CX250B	45.00	8950	9.00
4CX250R	69.00	4-400A	145.00
4CX300A	109.99	4-400C	145.00
4CX350A/8321	100.00	572B/T160L	44.00
4CX350F/J/8904	100.00	7289	9.95
4CX1500B/8660	300.00	3-1000Z	229.00
811A	20.00	3-500Z	141.00
6360	4.69		

## RF Transistors



MRF203	P. O. R.
MRF216	19.47
MRF221	8.73
MRF226	10.20
MRF227	2.13
MRF238	10.00
MRF240	14.62
MRF245	28.87
MRF247	28.87
MRF262	6.25
MRF314	12.20
MRF406	11.33
MRF412	20.65
MRF421	27.45
MRF422A	38.25
MRF422	38.25
MRF428	38.25
MRF428A	38.25
MRF426	8.87
MRF426A	8.87

MRF449	12.65	BFR91	1.25
MRF449A	12.65	BFR96	1.50
MRF450	11.00	BFW92A	1.00
MRF450A	11.77	BFW92	.79
MRF452	15.00	MMCM918	14.30
MRF453	13.72	MMCM2222	15.65
MRF454A	21.83	MMCM2369	15.00
MRF455	14.08	MMCM2484	15.25
MRF455A	14.08	MMCM3960A	24.30
MRF474	3.00	MWA120	7.80
MRF475	2.90	MWA130	8.08
MRF476	2.25	MWA210	7.46
MRF477	10.00	MWA220	8.08
MRF485	3.00	MWA230	8.62
MRF492	20.40	MWA310	8.08
MRF502	.93		
MRF604	2.00	NEW MRF472	
MRF629	3.00	12.5 VDC, 27 MHz	
MRF648	26.87	4 Watts output	
MRF901	3.99	10 dB gain	
MRF902	9.41		1.69 ea.
MRF904	3.00		10/9.50
MRF911	4.29		100/69.00
MRF5176	11.73		1000/480.00
MRF8004	1.39		
BFR90	1.00		

TO-3 TRANSISTOR SOCKETS  
Phenolic type..... 6/\$1.00

NEW SIMPSON 260-7 \$99.99

RG174/U - \$15.00 per 100 ft.  
Factory new

PL259 TERMINATION  
52 Ohm 5 Watts \$1.50 each

TORIN TA700 FANS NEW \$29.99 each  
Model A30340  
230 VAC @ .78 Amps  
Will also work on 115 VAC

## CRYSTAL FILTERS

EFCL455K13E	3.99
EFCL455K40B2	2.99
FX-07800L, 7.8 MHz	12.99
FHA103-4, 10.7 MHz	12.99

## CB type crystals

\$4.95 each

T1	51-T	T28
T2	T15	T29
T3	T16	T30
T4	T17	T31
T5	T18	T32
T6	T19	T33
T7	T20	T34
T8	T21	T35
T9	T22	T36
T10	T23	T37
T11	T24	T38
T12	T25	T39
T13	T26	T40
T14	T27	
	51-R	
R1	R15	R28
R2	R16	R29
R3	R17	R30
R4	R18	R31
R5	R19	R32
R6	R20	R33
R7	R21	R34
R8	R22	R35
R9	R23	R36
R10	R24	R37
R11	R25	R38
R12	R26	R39
R13	R27	R40
R14		

NEW CHERRY BCD SWITCH

New end plates

Type T-20..... 1.29 each

## Johnson AIR Variables

\$1.00 each

T-3-5	1 to 5 pF
T-6-5	1.7 to 11 pF
T-9-5	2 to 15 pF
189-6-1	.1 to 10 pF
189-502-Y	1.3 to 6.7pF
189-503-105	1.4 to 9.2pF
189-504-5	1.5 to 11.6pF
189-505-5	1.7 to 14.1pF
189-505-107	1.7 to 14.1pF
189-506-103	1.8 to 16.7pF
189-507-105	2 to 19.3pF
189-508-5	2.1 to 22.9pF
189-509-5	2.4 to 24.5pF
545-043	1.8 to 11.4pF





# SEMICONDUCTORS SURPLUS

## ATLAS FILTERS

ATLAS CRYSTAL FILTERS FOR  
ATLAS HAM GEAR

Your Choice

\$15.95 ea.

- 5.645 - 2.7/8
- 5.595 - 2.7 USB
- 5.595 - 2.7/8/L
- 5.595 - 2.7 LSB
- 5.595 - .500/4
- 9.0 - USB/CW

## Soldering Kit

New Weller Soldering Iron Kit  
#SP-23F..... 9.99 each

Kit includes:

- 1 - 25 Watt soldering iron, develops 750° of tip temperature
- 3 - tips (screwdriver, chisel, cone)
- 1 - soldering aid tool
- 1 - coil 60/40 rosin core solder

## CERAMIC PLATE CAPS

\$1.09 each

- #1 type for 3/8 plate cap
- #2 type for 5/8 plate cap

## Used NiCads

Used C Nickel Cadmium Batteries  
1.8 amp hour  
Pack of ten \$8.99 per pack

## CERAMIC COIL FORMS

\$1.99 each

- #1 3/16" x 4/8"
  - #2 3/16" x 1/4"
  - #3 1/4" x 3/4"
  - #4 3/8" x 7/8"
  - #5 3/8" x 5/8"
- All of the above have powdered iron cores.
- #6 1/2" x 2 3/4"

NEW BOGNER DOWNCONVERTER  
Industrial version.

1 year guarantee ..... \$225.00

NOT FOR SALE IN ARIZONA

UHF/VHF RF POWER TRANSISTORS  
CD2867/2N6439

60 Watts output

Reg. Price ..... \$45.77

SALE PRICE ..... \$19.99

## CHOKES

.1-3 uH .....	2.99
VIV .15 .15 uH .....	2.99
VIV 150 150 uH .....	2.99
5-20 uH .....	1.69
Variable coil 10-80 uH .....	2.99
Transformer dual 8.8 uH .....	1.00
.47 uH .....	1.00 ea. or 10/7.50
.68 uH .....	1.00 ea. or 10/7.50
1 uH .....	1.00 ea. or 10/7.50
1.2 uH .....	1.00 ea. or 10/7.50
1.5 uH .....	1.00 ea. or 10/7.50
2.2 uH .....	1.00 ea. or 10/7.50
2.7 uH .....	1.00 ea. or 10/7.50
3.3 uH .....	1.00 ea. or 10/7.50
6.5 uH .....	1.00 ea. or 10/7.50
7.5 uH .....	1.00 ea. or 10/7.50
10 uH .....	1.00 ea. or 10/7.50
15 uH .....	1.00 ea. or 10/7.50
20 uH .....	1.00 ea. or 10/7.50
22 uH .....	1.00 ea. or 10/7.50
33 uH .....	1.00 ea. or 10/7.50
39 uH .....	1.00 ea. or 10/7.50
47 uH .....	1.00 ea. or 10/7.50
50 uH .....	2.99
56 uH .....	1.69
62 uH .....	1.00 ea. or 10/7.50
68 uH .....	1.00 ea. or 10/7.50
100 uH .....	2.99
120 uH .....	1.69
185 uH .....	1.00 ea. or 10/7.50
538 uH .....	1.00 ea. or 10/7.50
680 uH .....	1.00 ea. or 10/7.50
1000 uH .....	1.00 ea. or 10/7.50
1630 uH .....	1.50
.1 mH .....	2.99
.2 mH .....	2.99
.22 mH .....	2.99
.27 mH .....	2.99
.33 mH .....	2.99
.39 mH .....	2.99
.240 mH .....	2.99
1.2 mH .....	2.99
1.5 mH .....	2.99
1.65 mH .....	2.99
1.75 mH .....	2.99
1.9 mH .....	2.99
1 mH .....	1.69
1.88 mH .....	3.99
2 mH .....	2.99
2.4 mH .....	2.99
2.5 mH .....	1.00 ea. or 10/7.50
2.7 mH .....	2.99
3.0 mH .....	2.99
3.6 mH .....	2.99
4.3 mH .....	2.99

4.7 mH .....	2.99
5 mH .....	2.99
5.11 mH .....	2.99
6 mH .....	2.99
7.2 mH .....	2.99
8.25 mH .....	2.99
8.28 mH .....	2.99
8.6 mH .....	2.99
10 mH .....	2.99
12 mH .....	2.99
15 mH .....	2.99
17 mH .....	2.99
19.6 mH .....	2.99
20 mH .....	2.99
20.5 mH .....	2.99
22.6 mH .....	2.99
24 mH .....	2.99
27.4 mH .....	2.99
28.7 mH .....	2.99
29.9 mH .....	2.99
30 mH .....	2.99
36 mH .....	2.99
36.5 mH .....	2.99
40 mH .....	2.99
40.2 mH .....	2.99
43 mH .....	2.99
47 mH .....	2.99
50 mH .....	2.99
59 mH .....	2.99
60 mH .....	2.99
71.5 mH .....	2.99
78.7 mH .....	2.99
86 mH .....	2.99
100 mH .....	2.99
120 mH .....	2.99
150 mH .....	2.99
175 mH .....	2.99
200 mH .....	2.99
205 mH .....	2.99
237 mH .....	2.99
240 mH .....	2.99
300 mH .....	2.99
360 mH .....	2.99
390 mH .....	2.99
430 mH .....	2.99
500 mH .....	1.50
600 mH .....	2.99
1000 mH .....	2.99
1.5 Hy .....	2.99
2.0 Hy .....	2.99
2.5 Hy .....	2.99
3.0 Hy .....	2.99
5.0 Hy .....	2.99
10 Hy .....	2.99

## HIGH VOLTAGE CAPS

420 MFD @ 400 VDC	3.99 each
600 MFD @ 400 VDC	3.99 each

## New Fairchild Prescaler Chip

95H90DCQM .....	6.50 each
350 MHz prescaler divide by 10/11	

# 1.9-2.5G CONVERTERS

1900 MHz to 2500 MHz DOWNCONVERTERS  
 Intended for amateur radio use.  
 Tunable from channel 2 thru 6.  
 34 dB gain 2.5 to 3 dB noise.  
 Warranty for 6 months Model HMR 11  
 Complete Receiver and Power Supply  
 (does not include coax)..... \$225.00

4 foot Yagi antenna only..... \$39.99  
 Downconverter Kit - PCB and parts .. \$69.95  
 Power Supply Kit -  
 Box, PCB and parts..... \$49.99  
 Downconverter assembled..... \$79.99  
 Power Supply assembled..... \$59.99  
 Complete Kit form .....\$109.99  
 (includes Yagi antenna and instructions)

REPLACEMENT PARTS  
 MRF901..... \$ 3.99  
 MBD101..... 1.29  
 .001 Chip Caps ..... 1.00  
 Power Supply PCB ..... 4.99  
 Downconverter PCB ..... 19.99  
 Instructions for any separate item .... 10.00

# NEW TRANSFORMERS

	Price each
F-18X 6.3 VCT @ 6Amps	6.99
F-46X 24V @ 1Amp	5.99
F41X 25.2VCT @ 2Amps	6.99
P-8380 10VCT @ 3Amps	7.99
P-8604 20VCT @ 1Amp	4.99
K-32B 28VCT @ 100 MA	4.99
E30554 Dual 17V @ 1Amp	6.99

# DIODES

HEP 170 3.5 A, 1000 PIV .20 ea., 100 for \$15.00	High-voltage diode EK500 5000 Volts, 50 mA .99 each
D61005 1.5 A, 1000 PIV .15 ea., 100 for \$12.00	Motorola SCR TO-92 Case, 0.8 Amp, 30 V. lgt 0.2 Vgt 0.8. Same as #N5060. 4/\$1.00 or 100/\$15.00
HVK 1153 25 mA, 20,000 PIV \$1.00 ea., 10 for \$8.00	Dialco Type 555-2003 LED 5 VDC with built-in resistor. .69 each
Fairchild LEDs FLV 5007 & 5009 red. Case type TO-92. 6/\$1.00	Motorola MA 752 Rectifier 6 Amps, 200 PIV 4/\$1.29
SCMS 10K 15 mA, 10,000 PIV \$1.69 ea., 10 for \$12.50	

Motorola SCR TO-92 Case, 0.8 Amp, 30 V. lgt 0.2 Vgt 0.8. Same as #N5060. 4/\$1.00 or 100/\$15.00
Dialco Type 555-2003 LED 5 VDC with built-in resistor. .69 each
Motorola MA 752 Rectifier 6 Amps, 200 PIV 4/\$1.29

## ORDERING INSTRUCTIONS

Check, money order, or credit cards welcome. (Master Charge and VISA only.) No personal checks or certified personal checks for foreign countries accepted. Money order or cashiers check in U.S. funds only. Letters of credit are not acceptable. Minimum shipping by UPS is \$2.35 with insurance. Please allow extra shipping charges for heavy or long items. All parts returned due to customer error or decision will be subject to a 15% restock charge. If we are out of an item ordered, we will try to replace it with an equal or better part unless you specify not to, or we will back order the item, or refund your money. PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Prices supersede all previously published. Some items offered are limited to small quantities and are subject to prior sale. We now have a toll free number, but we ask that it be used for charge orders only. If you have any questions please use our other number. We are open from 8:00 a.m. - 5:00 p.m. Monday thru Saturday. Our toll free number for charge orders only is 800-528-3611.

MIN. ORDER \$10

NEW BCD SWITCH  
 8 switch with end plates  
 Model TSM200-1011 (CDI) \$16.87

CONTINUOUS TONE BUZZERS  
 12VDC.....\$2.00 each

EIMAC FINGER STOCK #Y-302  
 36 in. long x 1/2 in. \$4.99 each

MAGNET WIRE  
 \$22.50 per spool

#24	A.W.G.	9	lb.
#26	A.W.G.	9	lb.
#25	A.W.G.	9	lb.
#30	A.W.G.	8 3/4	lb.
#31	A.W.G.	6	lb.

CORES

T20-12	4/1.00	T37-6
T25-6	T30-6	T37-10
T30-2	T30-12	T44-6
	T37-2	

CABLE TIES  
 #/T-18R 100 per bag  
 mil. spec. #MS-3368S, 4"  
 Made by Tyton Corp.  
 \$2.50 per bag  
 100 bags - \$20.00

Miniature Ceramic Trimmers  
 50 each or 10/\$4.00

CV31D350	2 to 8 pF
HM00-4075-03	3.5 to 11 pF
300425	3.5 to 13 pF
E5-25A	5 to 25 pF
	5.1 to 40 pF
	3.5 to 15 pF
	5.2 to 40 pF
	2.5 to 6 pF

CERAMIC STAND OFFS

#CNP-5	3/8 x 5/8"	.29 each
	7/16 x 1 1/4"	.39 each
#N54W0112	3/8 x 1 1/2"	.49 each
#NL523W03-010	3/4 x 1 1/4"	.79 each

CORES AND BEADS

#43	Shield Bead	4/1.00
#61	Toroid	3/1.00
#43	Balun	10/1.00
#61	Balun	8/1.00
#61	Balun	6/1.00
#61	Balun	4/1.00
#61	Beads	10/1.00
	Ferrite Rod 1/4 x 7 1/2	2.99
	Ferrite Beads 1/8" long	12/1.00
	Ferrite Beads 3/8" long	6/1.00
	Ferrite Beads 1/16" long	12/1.00

DOOR KNOB CAPS

470 pF @ 15 KV	\$3.99 each
Dual 500 pF @ 15 KV	5.99 each
680 pF @ 6 KV	3.99 each
800 pF @ 15 KV	3.99 each
2700 pF @ 40 KV	5.99 each

TRANSFORMERS  
 \$9.99 each  
 #2899652-01  
 26.8 VCT @ 660 MA  
 21.9 VCT @ 1.1 Amps

\$1.99 each  
 #18000711P  
 24 V @ 100 MA

\$12.99 each  
 #2099459-00  
 28 V @ 1.5 Amps  
 9.6 V @ 9 Amps  
 16.8 V @ 300 MA

JUMBO LED'S

Red	8/\$1.00
Clear	6/\$1.00
Yellow	6/\$1.00
Green	6/\$1.00
Amber	6/\$1.00

MEDIUM LED'S

Red	6/\$1.00
Green	6/\$1.00

NE555V TIMERS  
 .39 each or 10/\$5.00

NEW DUAL COLON LED  
 .69 each or 10/\$5.00

PLATE CHOKES

75 uH	3.00
.94 mH	3.99

# TRANSISTORS/IC'S

Motorola MHW 252 VHF power amplifier.  
 Frequency range: 144-148 MHz.  
 Output power: 25W.  
 Minimum gain: 19.2 dB.  
 \$29.67 each

Motorola MC 1316P.  
 House no. same as HEP C6073 & EC9814.  
 2-W audio amplifier.  
 \$1.29 ea., 10 for \$9.50

Fairchild 007-03 IC.  
 ECG no. 707 Chroma demodulator.  
 \$1.29 ea., 10 for \$8.50

Motorola rf transistors.  
 Selection Guide & Cross-Reference Catalog.  
 43 pgs.  
 \$1.99 each

RCA Triacs.  
 Type T2310A.  
 TO-5 Case with heat sinks.  
 1.6 Amp, 100 VDC, lgt 3mA.  
 Sensitive gate.  
 \$1.00 each

RCA power transistors.  
 NPN RCS 258.  
 Vceo 60 NFE 5mA.  
 IC 20 Amps Vce 4V.  
 250 Watts, Ft 2 MHz.  
 \$3.00 each

RCA Triacs.  
 Type T4121B/40799.  
 200 VDC 10 Amps.  
 Stud type.  
 \$3.69 each

RCA Triacs.  
 Type 40805/T6421D.  
 30 Amps, 400 VDC.  
 \$5.00 each

Motorola rf amplifier.  
 544-4001-002, similar to type MHW 401-2.  
 1.5 Watts output. 440-512 MHz.  
 15 dB gain min.  
 \$19.99 each

# SEMICONDUCTORS SURPLUS

2822 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423 ✓64

# BULLET ELECTRONICS

P.O. BOX 401244E GARLAND, TX 75040 214/278-3553

## ★ SUPERSTAR SALE! ★

ALL ITEMS WITH STARS  
BUY 3 GET ONE FREE  
(No Mixing)

## ★ Sound Effects Kit \$18.50★

The SE-01 Sound Effects Kit has all you need to build a programmable sound effects machine except a battery and speaker. Only the SE-01 provides you with additional circuitry that includes a Pulse Generator, Mux Oscillator and Comparator to make more complex sounds a snap. Includes T176477, (w/specs) assembly instructions and programming examples. You can easily create Gunshots, Explosions, Steam Trains, Wind & Surf and much more.

Complete Kit \$18.50  
With quality PC Board  
(Less battery & spkr.)  
76477 Chip is Included \$3.15 ea.  
Extra chips

## ★ ZULU II Clock Kit ★

\$19.95 LESS CASE

- 1/2" LED Readouts
- Quartz XTAL Timebase
- Calendar
- Unique NOX™ Circuit Will Display Readouts On Handclap
- Battery Backup (battery not included)
- High Quality Drilled & Plated PC Boards; Clear Instructions

★ PLASTIC CASE WITH FRONT & REAR PANELS FOR ZULU II \$4.95. ★

## New! ★ Doomsday Alarm ★

If you have trouble sleeping and you would like the rest of the neighborhood to share your misery then this little kit will be for you! There is no way to accurately describe the unearthly howls, screams and tones that come out of this kit. Four separate tone oscillators are mixed, cancelled and stepped at a varying rate. 10 Watts of crazy sounds. A great fun kit or a practical burglar alarm. Complete with PC board and all necessary components less speaker. For 6-12 VDC.

9.95 ORDER  
KIT DA-02

## 7 Watt Audio Amp Kit \$5.95

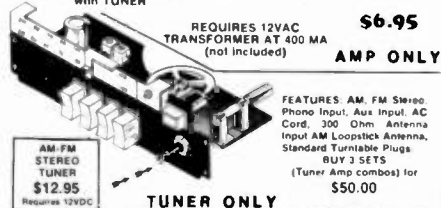
SMALL, SINGLE HYBRID IC AND COMPONENTS FIT ON A 2" x 3" PC BOARD (INCLUDED). RUNS ON 12VDC GREAT FOR ANY PROJECT THAT NEEDS AN INEXPENSIVE AMP LESS THAN 3% THD @ 5 WATTS COMPATIBLE WITH SE-01 SOUND KIT

## Overvoltage Protection Kit \$6.95

Protect your expensive equipment from overvoltage conditions. Every computer should have one! Works with any fused DC power source from 10 to 20 volts up to 25 amps.

## Stereo AMP/Power Supply Board

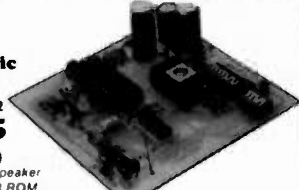
Takes low level audio and drives 8 ohm speakers ON-BOARD Rectifiers and Filter supply power for AMP AND TUNER, VOLUME, BALANCE, and TONE SLIDE CONTROLS



See Special Fall Prices Below  
Prices good thru Nov. 30, 1981

## SHOP EARLY FOR CHRISTMAS!

The Super Music Maker  
REVISION 2  
\$24.95  
(Basic Kit)



Does not include speaker switches or 2708 ROM

Now you can play hundreds of songs using the Bullet Super Music Maker. The unit features a single factory programmed microprocessor IC that comes with 20 pre-programmed short tunes. By adding the additional PROMS (2708's) the system can be expanded to play up to 1000 notes per PROM. Just think... a compact electronic instrument that will play dozens, hundreds or even thousands of selections of music. The kit comes with all electronic components (less the PROM), and a drilled, plated and screened PC Board which measures 4" x 4". The 7 watt amplifier section is on the same PC board and drives an 8 ohm speaker (not included), from a whisper to ear splitting volume. Since the unit works on 12 VDC or 12 VAC, vehicle or portable operation is possible. What do you get for \$24.95? Everything but a speaker, transformer, case, switches, and PROM. Additional 2708 albums containing popular tunes are available for \$15.00 each or you can program your own PROMS using information provided with the kit instructions. Lists of available PROM albums are available on request (Note: Unit plays electronic music one note at a time, it is not possible to play chords or a melody with harmony simultaneously.)

- Envelope control gives decay to notes
- On board inverter allows single voltage (+12) operation.

- OPTIONAL ACCESSORIES
- |   |          |
|---|----------|
| DIP Switches One 8 pos., One 5 pos.<br>(Can be directly soldered to PC Bd. to access tunes) | 2.00/Set |
| Rotary Switches Two 5 position<br>(For remote wiring to PC Bd. to access tunes)             | 2.60/Set |
| Attractive Plastic Case   | 6.50     |
| Wallplug Transformer<br>(For operation on 117VAC house voltage)                             | 3.00     |

## Microprocessor Station Clock \$49.95

The ZULU 3TZ is a full blown ROM and MICRO-PROCESSOR unlike other standard clock IC's, it allows exceptional flexibility. Almost a year in design, it is the most advanced station clock on the market.

Adjustable Brightness  
.6" - High Intensity  
Orange Led Readouts  
Seconds Reset/Hold  
provides easy  
synchronization with  
WWV

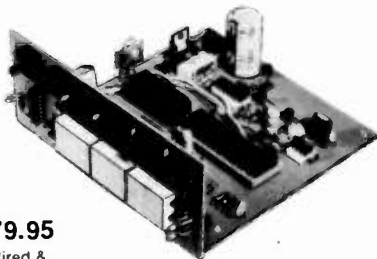
Quartz Crystal  
Timebase and  
Battery Backup

\$49.95

Complete Kit  
Including Case &  
Wallplug XFMR  
for 117VAC  
Operation

\$79.95

Wired &  
Tested



12 Volts  
AC or DC

QUALITY SOLDER  
MASKED & SCREENED  
PC BOARDS MAKES  
ASSEMBLY A SNAP

### ZONE CHANGE FEATURE

Select one of three  
World Time zones,  
Local Time (12 Hr.  
format) and TWO  
24 hr. zones of  
your choice.

RFI Protected

### ID FEATURE

LED Indicator lights  
when activated  
flashes at 10 min.  
Different audio  
tones at  
8 and 9 min.

## FALL SPECIALS: (Good Thru Nov. '81)

1. Super Music Maker with case and two 5-position rotary switches \$32.00
2. Super Music with one 2716 2K X 8 PROM filled with over 50 selections of additional music (>1500 notes) \$32.00
3. The Whole Ball of Wax! #2 + case and switches. \$39.95

## PS 14 REGULATOR CARD KIT

This is the Regulator Card from our famous 20A Power Supply Kit. Although we ran out of the transformers and heatsinks, many customers have been able to locate their own. The regulator card performs the actual voltage regulation and has adjustable fold back current limiting. Output voltage is stable to 200MV from 0 to 20 Amps and adjustable from 11 to 14 Volts. Designed to drive 2 high current NPN transistors (2N3771 2N5301 or equiv.) The unit assembles quickly. Included are all the on board components including a driver transistor and over-temp shutdown sensor. Designed to screw down to a standard 3" diameter computer grade filter cap. The quality plated PC card is 3-1/2" x 4 3/4".

WITH INSTRUCTIONS

REGULATOR CARD KIT \$14.95  
HIGH CURRENT PARTS  
(2 - 2N3772 & 25A Bridge) \$5.00  
51,000 MFD @ 40V Computer Grade \$3.50

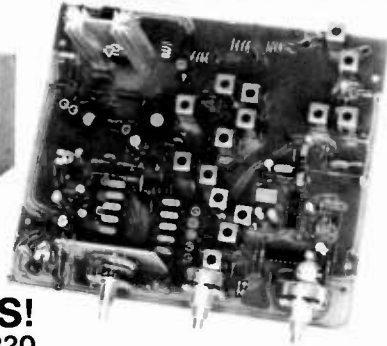
Requires Transformer with 16 - 19 VAC Out @ The Current You Expect To Draw.

- ★ NO C.O.D.'s.
  - ★ SEND CHECK M.O. OR CHARGE CARD NO.
  - ★ PHONE ORDERS ACCEPTED ON VISA AND MASTERCHARGE ONLY.
  - ★ ADD 5% FOR SHIPPING.
  - ★ TX. RES. ADD 5% STATE SALES TAX.
  - ★ ALL FOREIGN ORDERS ADD 30% FOR SHIPPING CHARGES. U. S. FUNDS ONLY.
- (214) 278-3553

- FM • SSB • CW • ATV • OSCAR
- LINKS • REPEATERS • TRANSMITTERS
- RECEIVERS • PREAMPS • CONVERTERS
- TRANSCEIVERS • POWER SUPPLIES • PA'S

# QUALITY VHF/UHF KITS AT AFFORDABLE PRICES

**-NEW-**



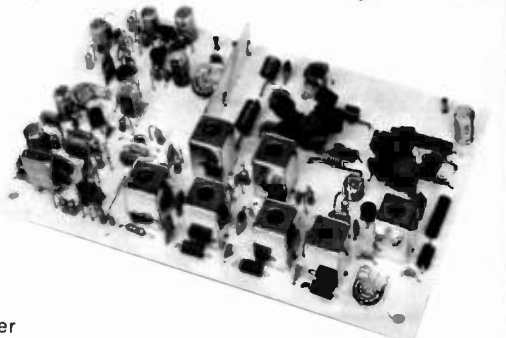
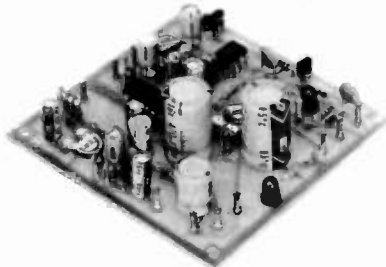
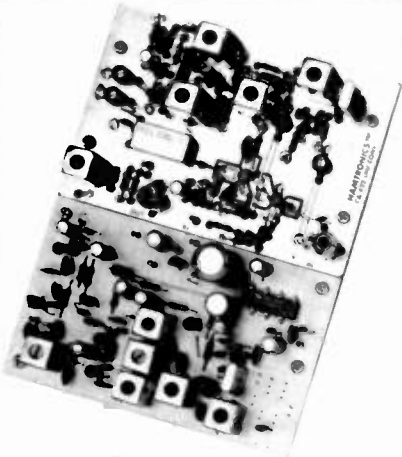
**SAVE A BUNDLE ON VHF FM TRANSCEIVERS!**  
10 watts, 5 Channels, for 6M, 2M, or 220

**Hamtronics® Does it Again!**

Where else can you get a value-packed radio at such reasonable cost?

FM-5 PC Board Kit – ONLY \$159.95 complete with controls, heatsink, etc. Cabinet kit, microphone, crystals, etc. available separately. Request catalog for full details.

## HIGH QUALITY FM MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



- **R75 VHF FM RECEIVER** for 10M, 6M, 2M, 220, or commercial bands. 4 fantastic selectivity options. Kits from \$84.95 to \$119.95
- **R450 UHF FM RECEIVER** for 380-520 MHz bands. Kits in selectivity options from \$94.95
- **R110 VHF AM RECEIVER** Kit for vhf aircraft band or ham bands. Only \$84.95.

- **COR KITS** With audio mixer and speaker amplifier. Only \$29.95.
- **CWID KITS** 158 bits, field programmable, clean audio. Only \$59.95.
- **A16 RF TIGHT BOX** Deepdraw alum. case with tight cover and no seams. 7 x 8 x 2 inches. Only \$18.00.
- **SCANNER CONVERTERS** Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only \$79.95.

- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous. Kits only \$54.95.
- **T451 UHF FM EXCITER** for 450 ham band or adjacent. Kits only \$64.95.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Kits from \$69.95.



### VHF & UHF TRANSMITTING CONVERTERS

For SSB, CW, ATV, FM, etc. Available for 6M, 2M, 220, 440 with many IF input ranges. Converter board kit only at \$79.95 (VHF) or \$99.95 (UHF) or kits complete with PA and cabinet as shown.



### VHF & UHF RECEIVING CONVERTERS

20 Models cover every practical rf and if range to listen to SSB, FM, ATV, etc. on 6M, 2M, 220, 440, and 110 aircraft band. Even convert weather down to 2M! Kits from \$39.95 and wired units.



### VHF & UHF RECEIVER

**PREAMPS.** Low noise.

VHF Kits from 27 to 300 MHz. UHF Kits from 300 to 650 MHz. Broadband Kits: 20-650 MHz. Prices start at \$14.95 (VHF) and \$18.95 (UHF). All preamps and converters have noise figure 2dB or less.

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33

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Phone: 716-392-9430

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# ramsey the first name in Counters!

## 9 DIGITS 600 MHz \$129<sup>95</sup> WIRED



**PRICES:**

CT-90 wired, 1 year warranty	\$129.95
CT-90 Kit, 90 day parts warranty	109.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC Adapter/Charger	12.95
OV-1, Micro power Oven time base	49.95
External time base input	14.95

The CT-90 is the most versatile, feature packed counter available for less than \$300.00! Advanced design features include: three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally, an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

**SPECIFICATIONS:**

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard 10,000 mHz, 1.0 ppm 20-40°C Optional Micro-power oven-0.1 ppm 20-40°C
Power:	8-15 VAC @ 250 ma

## 7 DIGITS 525 MHz \$99<sup>95</sup> WIRED



**SPECIFICATIONS:**

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as: three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

**PRICES:**

CT-70 wired, 1 year warranty	\$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

## 7 DIGITS 500 MHz \$79<sup>95</sup> WIRED



**PRICES:**

MINI-100 wired, 1 year warranty	\$79.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

**SPECIFICATIONS:**

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

## 8 DIGITS 600 MHz \$159<sup>95</sup> WIRED



**SPECIFICATIONS:**

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	8 digits 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double duty!

**PRICES:**

CT-50 wired, 1 year warranty	\$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95

## DIGITAL MULTIMETER \$99<sup>95</sup> WIRED



**PRICES:**

DM-700 wired, 1 year warranty	\$99.95
DM-700 Kit, 90 day parts warranty	79.95
AC-1, AC adaptor	3.95
BP-3, Nicad pack + AC adaptor/charger	19.95
MP-1, Probe kit	2.95

The DM-700 offers professional quality performance at a hobbyist price. Features include: 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3 1/2 digit, 1/2 inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually fool-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

**SPECIFICATIONS:**

DC/AC volts:	100uV to 1 KV, 5 ranges
DC/AC current:	0.1 uA to 2.0 Amps, 5 ranges
Resistance:	0.1 ohms to 20 Megohms, 6 ranges
Input impedance:	10 Megohms, DC/AC volts
Accuracy:	0.1% basic DC volts
Power:	4 °C cells

### AUDIO SCALER

For high resolution audio measurements, multiplies UP in frequency.

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

\$29.95 Kit \$39.95 Wired

### ACCESSORIES

Telescopic whip antenna - BNC plug	\$ 7.95
High impedance probe, light loading	15.95
Low pass probe, for audio measurements	15.95
Direct probe, general purpose usage	12.95
Tilt bail, for CT 70, 90, MINI-100	3.95
Color burst calibration unit, calibrates counter against color TV signal.	14.95

### COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer-included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

\$34.95 Kit \$44.95 Wired

ramsey electronic's, inc.  
2575 Baird Rd. Penfield, NY 14526



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**TERMS**

Satisfaction guaranteed - examine for 10 days, if not pleased, return in original form for refund. Add \$5. for shipping insurance to a maximum of \$10. Overseas add 15%. COD add \$2. Orders under \$10. add \$1.50. NY residents, add 7% tax.

# DIGITAL RESEARCH: PARTS

## "TOP QUALITY PARTS FOR LESS"

### Precision Hybrid Oscillator Module

Has both 1 MHZ and 2 MHZ TTL - outputs — Hermetically sealed — Ultra high stability over wide temp. range — originally cost over \$40.00 each — We made a super purchase from a major computer manufacturer — 5 Volt operation - fits standard 24 pin socket - Manufactured by Motorola oscillator division.



MC6871A

3/20<sup>00</sup>

7<sup>50</sup> w/data

### NEO 2137 by NEC

- Microwave R.F. transistor (N.P.N.)
- Micromold package #37
- Dual Emitter leads
- FT to 4.5 GHZ
- VCEO 10V-CC 20 MA. HFE 40-200
- Gain 10V-20MA-1GHZ = 14DB Typical
- Very low noise - High gain 1.5 DB @ 500 MHZ
- Cleared for high reliability space applications

COMPARE 1 50

### LM117

An easy to use adjustable Voltage Regulator - only two external resistors needed to set the output voltage - TO-3 Case - adjustable from 1.2 to 37V - Regulator is floating, so it can be used in a wide variety of applications, as long as the input-to-output differential voltage is 40V or less - 1.5A output current - house numbered - prime - Motorola.



1 75

### Video Game Board

Hockey • Tennis • Handball

- General Instruments AY38500
- Features Exciting Sounds
- On Screen Scoring
- 1 or 2 Players
- Speed & Paddle Controls
- Works on 9 Volts D.C.

Each board comes with RF Modulator (Ch. 3 or 4) and schematic. The only parts needed to complete game are speaker, 2.1 Meg Pots & Switches.

4<sup>45</sup>

3 for 12<sup>00</sup>



### Video Paddle Controls

2 for 1<sup>00</sup>



Can be used with game board at left.

### Rectifier Diode

IN4007

11/1<sup>00</sup>

1000 Volts, 1 Amp  
DO-41 Case • Prime •  
Long Lead • Marked.



### Transformer

32VCT @ 1 amp 3<sup>25</sup>  
6V @ 1 amp

Measures:  
2" x 2 1/4" x 2 1/4"  
2 3/8" Mounting Centers



SPDT • Made in USA  
with Hardware

### SCOTCH LOK

Great for connecting a wire to an existing wire without stripping. Absolutely invaluable in hard to reach areas such as under car dash, inside television, etc. Simply put Scotch Lok over existing wire. Insert new wire to be connected. With a standard pair of pliers, compress metal on insulator. No need for tape. Super neat installation. Once you use this, you will never go back to the "old" way.

15/1<sup>00</sup>



### IC Specials

MC1488-1489 - RS232 Driver and Receiver 99<sup>c</sup> pr.

NE555-Dual NE555

2/1<sup>25</sup>

NE555

3/1<sup>25</sup> or 10/3<sup>30</sup>

### Variable Inductors

30-40 uh  
.9 uh - 1.2 uh  
11 uh to 20 uh  
.25 uh - .35 uh  
.85 uh - .95 uh

4/1<sup>00</sup>



### Micro Mini Toggle Switch

99<sup>c</sup>

6 for 5<sup>00</sup>



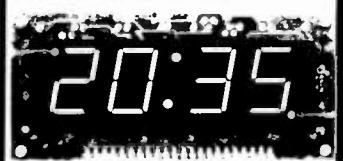
SPDT • Made in USA  
with Hardware

### JFET OP AMP

Super High Input Impedance (10<sup>12</sup> OHMS) — High Frequency Response. TO 4 MHZ. Large DC Voltage Gain 106 DB — New generation OP-AMP with Vastly Superior Features!

LF356BH - 75<sup>c</sup> or 3/2<sup>00</sup>

### MA1010A Clock Module



- Giant .84" LED
- Complete - add only transformer and switches
- 12 hour display format
- 50 or 60 HZ operation
- Power failure indication
- Fast and slow set controls
- Brightness control capability
- PM indicator

4<sup>25</sup>

### Fixed Inductors

.39 uh - 6/1<sup>00</sup> 12.5 uh - 8/1<sup>00</sup>  
500 uh - Hash Filter  
@ 2 Amps - 4/1<sup>00</sup>



### Molded Choke

13 uh - 8/1<sup>00</sup> 50 mh - 6/1<sup>00</sup>  
1.2 mh - 8/1<sup>00</sup>

### 5 Watt Zeners

6.8v 15v 48v  
11v 24v 55v  
12.6v 30v 60v

5% • Some House Numbered  
Cut & Formed • Prime

10 for 1<sup>00</sup>

IN4735 • 6.2V • 1 Watt  
Cut & Formed ... 20/1<sup>00</sup>



### EIAJ #1SS98

NEC #4981-7E

Microwave - Schottky  
barrier diode

HP-Hot Carrier diodes  
5082-2835

99<sup>c</sup> or 6/5<sup>00</sup>

SEE WHAT BILLY BOB HAS TO SAY ON PAGE 18 OF OUR NEW CATALOG!

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Add 1 postage, we pay balance. Orders under 15 add 75 handling. No C.O.D. We accept Visa, MasterCard and American Express cards. Tax. Res. add 5% Tax. Foreign orders (Canada 10%) add 20% P & H.

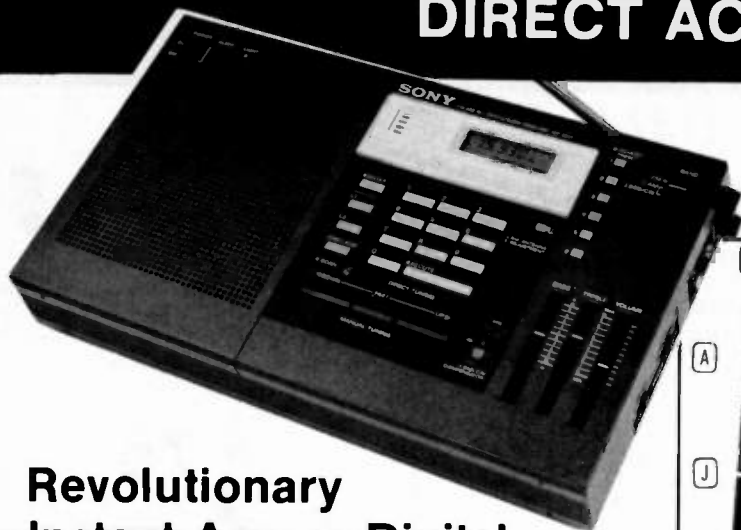
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## Digital Research: Parts

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(214) 271-2461

# INTRODUCING SONY'S NEW DIGITAL DIRECT ACCESS RECEIVER!



only **\$299<sup>95</sup>** plus \$5.00 shipping

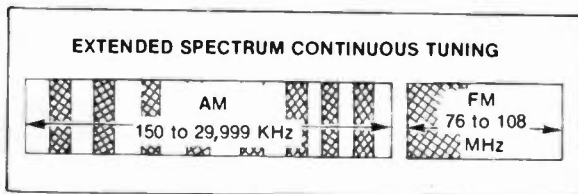
## Revolutionary Instant Access Digital Shortwave Scanner

- Continuous Scanning of LW, MW, SW, & FM Bands
- Instant Fingertip Tuning—No More Knobs!
- 6 Memories for Any Mode (AM,SSB/CW, & FM)
- Dual PLL Frequency Synthesized—No Drift!

**A WHOLE NEW BREED OF RADIO IS HERE NOW!** No other short wave receiver combines so many advanced features for both operating convenience and high performance as does the new Sony ICF-2001. Once you have operated this exciting new radio, you'll be spoiled forever! Direct access tuning eliminates conventional tuning knobs and dials with a convenient digital keyboard and Liquid Crystal Display (LCD) for accurate frequency readout to within 1 KHz. Instant fingertip tuning, up to 8 memory presets, and continuous scanning features make the ICF-2001 the ultimate in convenience.

Compare the following features against any receiver currently available and you will have to agree that the Sony ICF 2001 is the best value in shortwave receivers today:

**DUAL PLL SYNTHESIZER CIRCUITRY** covers entire 150 KHz to 29,999 MHz band. PLL<sub>1</sub> circuit has 100 KHz step while PLL<sub>2</sub> handles 1 KHz step, both of which are controlled by separate quartz crystal oscillators for precise, no-drift tuning. **DUAL CONVERSION SUPERHETERODYNE** circuitry assures superior AM reception and high image rejection characteristics. The 10.7 MHz IF of the FM band is utilized as the 2nd IF of the AM band. A new type of crystal filter made especially for this purpose realizes clearer reception than commonly used ceramic filters. **ALL FET FRONT END** for high sensitivity and interference rejection. Intermodulation, cross modulation, and spurious Interference are effectively rejected. **FET RF AMP** contributes to superior image rejection, high sensitivity, and good signal to noise ratio. Both strong and weak stations are received with minimal distortion.



**A** Enter Button  
**B** Signal Strength Indicator  
**C** Liquid Crystal Display  
**D** Memory Preset Buttons  
**E** Antenna Adjustment Dial  
**F** SSB/CW Compensator  
**G** Execute Bar  
**H** Manual Tuning Buttons  
**I** Scan Button  
**J** High/Low Limit Buttons

### OPERATIONAL FEATURES

**INSTANT FINGERTIP TUNING** with the calculator-type key board enables the operator to have instant access to any frequency in the LW, MW, SW, and FM bands. And the LCD digital frequency display confirms the exact, drift-free signal being received. **AUTOMATIC SCANNING** of the above bands. Continuous scanning of any desired portion of the band is achieved by setting the "L<sub>1</sub>" and "L<sub>2</sub>" keys to define the range to be scanned. The scanner can stop automatically on strong signals, or it can be done manually. **MANUAL SEARCH** is similar to the manual scan mode and is useful for quick signal searching. The "UP" and "DOWN" keys let the tuner search for you. The "FAST" key increases the search rate for faster signal detection. **MEMORY PRESETS.** Six memory keys hold desired stations for instant one-key tuning in any mode (AM, SSB/CW, and FM), and also, the "L<sub>1</sub>" and "L<sub>2</sub>" keys can give you two more memory slots when not used for scanning. **OTHER FEATURES:** Local, normal, DX sensitivity selector for AM; SSB/CW compensator; 90 min. sleep timer; AM Ant. Adjust.

### SPECIFICATIONS

**CIRCUIT SYSTEM:** Fm Superheterodyne; AM Dual conversion superheterodyne. **SIGNAL CIRCUITRY:** 4 IC's, 11 FET's, 23 Transistors, 16 Diodes. **AUXILIARY CIRCUITRY:** 5 IC's, 1 LSI, 25 LED's, 25 Transistors, 9 Diodes. **FREQUENCY RANGE:** FM 76-108 MHz; AM 150-29,999 KHz. **INTERMEDIATE FREQUENCY:** FM 10.7 MHz; AM 1st 66.35 MHz., 2nd 10.7 MHz. **ANTENNAS:** FM telescopic, ext. ant. terminal; AM telescopic, built-in ferrite bar, ext. ant. terminal. **POWER:** 4.5 VDC/120 VAC **DIMENSIONS:** 12 1/4 (W) X 2 1/4 (H) X 6 3/4 (D). **WEIGHT:** 3 lb. 15 oz. (1.8 kg)



**SPECTRONICS, INC.**  
 1009 GARFIELD ST. OAK PARK, IL. 60304


PHONE  
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### National Semiconductor Clock Modules

12VDC AUTOMOTIVE/INSTRUMENT CLOCK



APPLICATIONS:

- In-dash autostocks
- After-market auto RV clocks
- Alcra/air-marline cks
- 12VDC op. Instru.
- Portable/battery powered instruments

Features: Bright 0.3" green display. Internal crystal time-base. 0.5 sec./day accur. Auto. display brightness control logic. Display color filterable to blue, blue-green, green & yellow. Complete—just add switches & leads.

**MA1003 Module (3.05" L x 1.75" H x 0.8" D), \$16.95**

### CLOCK MODULES

MA1023 7" Red Digital LED Clock Module 8.95  
 MA1026 7" Dig. LED Alarm Clock/Thermometer 18.95  
 MA5036 3" Red Digital LED Clock/Timer 6.95  
 MA1002 5" Red Digital LED Clock & Xformer 9.95  
 MA1010 8" Red Digital LED Clock 7.95  
 MA1032 CBA 5" Digital LCD Clock 17.95  
 MA1043 7" Green Digital LED Clock 8.95

### TRANSFORMERS

102-P20 Xformer for MA1023, 1043 & 5036 Models 3.49  
 102-P22 Xformer for MA1026 Clock Modules 3.49  
 102-P24 Xformer for MA1010 Clock Modules 3.49

### 8 OHM SPEAKER

2" — 8 Ohm — 25 watt  
A0201  
\$1.25 ea. 2/\$1.95 ea. 10/\$3.95 ea.

### BATTERY HOLDER

- Holds 2 ea. C cells
- Aluminum Case
- 5" leads

8H-801-159 \$4.45 each 10/\$3.95

### BATTERY HOLDER

- Holds 4 ea. C cells
- Plastic case
- 9" leads

8HB2721 \$4.49 ea. 10/\$4.25

### EPROM Erasing Lamp



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7.5" x 2.7" x 2"
- Complete with holding tray for 4 chips.

UVS-11E Replacement Bulb \$16.95  
**UVS-11E \$79.95**

### JOYSTICKS

JS-9K

JS-5K 5K Linear Taper Pots \$5.25  
 JS-100K 100K Linear Taper Pots \$4.95  
 JVC-40 40K (2) Video Controller In case \$4.95

### 6-Digit Clock Kit

- Bright 300 ht. comm. cath. oled display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold modes
- 4 hrs. easily viewable to 20 ft.
- \*Simulated walnut case
- \*115 VAC operation
- \*12 or 24 hr. operation
- \*Incl. all components, case & wall transformer.
- \*Size: 6 1/2" x 3 1/8" x 1 3/4"

**JE701 \$19.95**

### JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:

- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 150mA.
- Two 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling.
- LED "on" indicator.
- Printed Board Construction.
- 120VAC input.
- Size: 3 1/2" w x 5 1/16" L x 2" H

**JE215 Adj. Dual Power Supply Kit (as shown) \$24.95**

(Picture not shown but similar in construction to above)  
 JE200 Reg. Power Supply Kit (5VDC Amp) \$14.95  
 JE205 Adapter Brd. (to JE200) 5V, 9 & 12V \$12.95  
 JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. \$19.95

## MICROPROCESSOR COMPONENTS

### 8080A/8080A SUPPORT DEVICES

HN54800A	CPU	4.95
OPR212	8-Bit Input/Output	1.25
OPR214	Priority Interrupt Control	1.25
OPR216	Direct Address Buffer	1.25
OPR224	Clock Generator/Driver	3.95
OPR226	Bus Driver	1.25
OPR228	System Controller/Bus Driver	4.95
OPR230	System Controller	5.95
HN54241	I/O Expander for 48 Lines	9.95
HN54550	Asynchronous Count. Element	9.95
OPR213	Prog. ROM (1K) (1/5 PPI)	1.25
OPR215	Prog. Interval Timer	6.95
OPR217	Prog. Peripheral I/O (PPI)	3.95
OPR219	Prog. DMA Control	9.95
OPR204	Prog. Interrupt Control	9.95
OPR211	Prog. CRT Controller	9.95
OPR219	Prog. Keyboard/Display Interface	9.95
OPR210	Octal Latched Peripheral Driver	5.25
OPR204	8-Bit Bi-Directional Receiver	3.95
OPR207	8-Bit Bi-Directional Receiver	3.95
OPR208	8-Bit Bi-Directional Receiver	3.95
OPR209	Octal Latched Peripheral Driver	5.25

### 6800/6800 SUPPORT DEVICES

MC6800	MPU	7.95
MC6802CP	MPU with Clock and RAM	14.95
MC6802AP	128K Static RAM	4.95
MC6802AI	Peripheral Inter. Adapt (MC6800)	1.25
MC6802	Priority Interrupt Controller	1.75
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MC6803	Asynchronous Comm. Adapter	1.25
MC6802	8-Bit Serial Data Adapter	1.25
MC6802	4000ps Digital M/D D/E	12.95
MC6802	1000ps M/D D/E	12.95
MC6802A	Quad-Static Bus Trans. (MC6802)	2.95

### MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK 2800N) (2MHz)	11.95
Z80A (780L)	CPU (MK 2800N-AL) (4MHz)	13.95
CDP180	MPU	18.95
7850	MPU	36.95
10M4200 ADC	8-Bit 8-Bit Slope (Com. Temp. Grade)	19.95
MC6802	Memory/Clock (8K Bytes Memory)	11.95
HN5403N4	CPU — Sel. Cnt. 8-Bit (2K Bytes RAM)	24.95
HN5403N4	CPU (768 Bytes RAM)	24.95
HN5403N4	CPU — 8-Bit ROM	24.95
HN5403N4	CPU w/8-Bit Micro Interpreter	29.95
HN5403	CPU	29.95
HN5403	CPU — 8-Bit	39.95

### SHIFT REGISTERS

MM5950A	Dual 20-Bit Dynamic	3.50
MM5950B	Dual 10-Bit Static	3.50
MM5950C	Dual 8-Bit Static	3.50
MM5950D	Dual 8-Bit Shift Register	3.50
MM5950E	Dual 20-Bit Dynamic	3.50
MM5950F	Dual 10-Bit Static	3.50
MM5950G	Dual 8-Bit Static	3.50
MM5950H	Dual 8-Bit Shift Register	3.50
MM5950I	Dual 20-Bit Dynamic	3.50
MM5950J	Dual 10-Bit Static	3.50
MM5950K	Dual 8-Bit Static	3.50
MM5950L	Dual 8-Bit Shift Register	3.50
MM5950M	Dual 20-Bit Dynamic	3.50
MM5950N	Dual 10-Bit Static	3.50
MM5950O	Dual 8-Bit Static	3.50
MM5950P	Dual 8-Bit Shift Register	3.50
MM5950Q	Dual 20-Bit Dynamic	3.50
MM5950R	Dual 10-Bit Static	3.50
MM5950S	Dual 8-Bit Static	3.50
MM5950T	Dual 8-Bit Shift Register	3.50
MM5950U	Dual 20-Bit Dynamic	3.50
MM5950V	Dual 10-Bit Static	3.50
MM5950W	Dual 8-Bit Static	3.50
MM5950X	Dual 8-Bit Shift Register	3.50
MM5950Y	Dual 20-Bit Dynamic	3.50
MM5950Z	Dual 10-Bit Static	3.50
MM5950AA	Dual 8-Bit Static	3.50
MM5950AB	Dual 8-Bit Shift Register	3.50
MM5950AC	Dual 20-Bit Dynamic	3.50
MM5950AD	Dual 10-Bit Static	3.50
MM5950AE	Dual 8-Bit Static	3.50
MM5950AF	Dual 8-Bit Shift Register	3.50
MM5950AG	Dual 20-Bit Dynamic	3.50
MM5950AH	Dual 10-Bit Static	3.50
MM5950AI	Dual 8-Bit Static	3.50
MM5950AJ	Dual 8-Bit Shift Register	3.50
MM5950AK	Dual 20-Bit Dynamic	3.50
MM5950AL	Dual 10-Bit Static	3.50
MM5950AM	Dual 8-Bit Static	3.50
MM5950AN	Dual 8-Bit Shift Register	3.50
MM5950AO	Dual 20-Bit Dynamic	3.50
MM5950AP	Dual 10-Bit Static	3.50
MM5950AQ	Dual 8-Bit Static	3.50
MM5950AR	Dual 8-Bit Shift Register	3.50
MM5950AS	Dual 20-Bit Dynamic	3.50
MM5950AT	Dual 10-Bit Static	3.50
MM5950AU	Dual 8-Bit Static	3.50
MM5950AV	Dual 8-Bit Shift Register	3.50
MM5950AW	Dual 20-Bit Dynamic	3.50
MM5950AX	Dual 10-Bit Static	3.50
MM5950AY	Dual 8-Bit Static	3.50
MM5950AZ	Dual 8-Bit Shift Register	3.50
MM5950BA	Dual 20-Bit Dynamic	3.50
MM5950BB	Dual 10-Bit Static	3.50
MM5950BC	Dual 8-Bit Static	3.50
MM5950BD	Dual 8-Bit Shift Register	3.50
MM5950BE	Dual 20-Bit Dynamic	3.50
MM5950BF	Dual 10-Bit Static	3.50
MM5950BG	Dual 8-Bit Static	3.50
MM5950BH	Dual 8-Bit Shift Register	3.50
MM5950BI	Dual 20-Bit Dynamic	3.50
MM5950BJ	Dual 10-Bit Static	3.50
MM5950BK	Dual 8-Bit Static	3.50
MM5950BL	Dual 8-Bit Shift Register	3.50
MM5950BM	Dual 20-Bit Dynamic	3.50
MM5950BN	Dual 10-Bit Static	3.50
MM5950BO	Dual 8-Bit Static	3.50
MM5950BP	Dual 8-Bit Shift Register	3.50
MM5950BQ	Dual 20-Bit Dynamic	3.50
MM5950BR	Dual 10-Bit Static	3.50
MM5950BS	Dual 8-Bit Static	3.50
MM5950BT	Dual 8-Bit Shift Register	3.50
MM5950BU	Dual 20-Bit Dynamic	3.50
MM5950BV	Dual 10-Bit Static	3.50
MM5950BW	Dual 8-Bit Static	3.50
MM5950BX	Dual 8-Bit Shift Register	3.50
MM5950BY	Dual 20-Bit Dynamic	3.50
MM5950BZ	Dual 10-Bit Static	3.50
MM5950CA	Dual 8-Bit Static	3.50
MM5950CB	Dual 8-Bit Shift Register	3.50
MM5950CC	Dual 20-Bit Dynamic	3.50
MM5950CD	Dual 10-Bit Static	3.50
MM5950CE	Dual 8-Bit Static	3.50
MM5950CF	Dual 8-Bit Shift Register	3.50
MM5950CG	Dual 20-Bit Dynamic	3.50
MM5950CH	Dual 10-Bit Static	3.50
MM5950CI	Dual 8-Bit Static	3.50
MM5950CJ	Dual 8-Bit Shift Register	3.50
MM5950CK	Dual 20-Bit Dynamic	3.50
MM5950CL	Dual 10-Bit Static	3.50
MM5950CM	Dual 8-Bit Static	3.50
MM5950CN	Dual 8-Bit Shift Register	3.50
MM5950CO	Dual 20-Bit Dynamic	3.50
MM5950CP	Dual 10-Bit Static	3.50
MM5950CQ	Dual 8-Bit Static	3.50
MM5950CR	Dual 8-Bit Shift Register	3.50
MM5950CS	Dual 20-Bit Dynamic	3.50
MM5950CT	Dual 10-Bit Static	3.50
MM5950CU	Dual 8-Bit Static	3.50
MM5950CV	Dual 8-Bit Shift Register	3.50
MM5950CW	Dual 20-Bit Dynamic	3.50
MM5950CX	Dual 10-Bit Static	3.50
MM5950CY	Dual 8-Bit Static	3.50
MM5950CZ	Dual 8-Bit Shift Register	3.50
MM5950DA	Dual 20-Bit Dynamic	3.50
MM5950DB	Dual 10-Bit Static	3.50
MM5950DC	Dual 8-Bit Static	3.50
MM5950DD	Dual 8-Bit Shift Register	3.50
MM5950DE	Dual 20-Bit Dynamic	3.50
MM5950DF	Dual 10-Bit Static	3.50
MM5950DG	Dual 8-Bit Static	3.50
MM5950DH	Dual 8-Bit Shift Register	3.50
MM5950DI	Dual 20-Bit Dynamic	3.50
MM5950DJ	Dual 10-Bit Static	3.50
MM5950DK	Dual 8-Bit Static	3.50
MM5950DL	Dual 8-Bit Shift Register	3.50
MM5950DM	Dual 20-Bit Dynamic	3.50
MM5950DN	Dual 10-Bit Static	3.50
MM5950DO	Dual 8-Bit Static	3.50
MM5950DP	Dual 8-Bit Shift Register	3.50
MM5950DQ	Dual 20-Bit Dynamic	3.50
MM5950DR	Dual 10-Bit Static	3.50
MM5950DS	Dual 8-Bit Static	3.50
MM5950DT	Dual 8-Bit Shift Register	3.50
MM5950DU	Dual 20-Bit Dynamic	3.50
MM5950DV	Dual 10-Bit Static	3.50
MM5950DW	Dual 8-Bit Static	3.50
MM5950DX	Dual 8-Bit Shift Register	3.50
MM5950DY	Dual 20-Bit Dynamic	3.50
MM5950DZ	Dual 10-Bit Static	3.50
MM5950EA	Dual 8-Bit Static	3.50
MM5950EB	Dual 8-Bit Shift Register	3.50
MM5950EC	Dual 20-Bit Dynamic	3.50
MM5950ED	Dual 10-Bit Static	3.50
MM5950EE	Dual 8-Bit Static	3.50
MM5950EF	Dual 8-Bit Shift Register	3.50
MM5950EG	Dual 20-Bit Dynamic	3.50
MM5950EH	Dual 10-Bit Static	3.50
MM5950EI	Dual 8-Bit Static	3.50
MM5950EJ	Dual 8-Bit Shift Register	3.50
MM5950EK	Dual 20-Bit Dynamic	3.50
MM5950EL	Dual 10-Bit Static	3.50
MM5950EM	Dual 8-Bit Static	3.50
MM5950EN	Dual 8-Bit Shift Register	3.50
MM5950EO	Dual 20-Bit Dynamic	3.50
MM5950EP	Dual 10-Bit Static	3.50
MM5950EQ	Dual 8-Bit Static	3.50
MM5950ER	Dual 8-Bit Shift Register	3.50
MM5950ES	Dual 20-Bit Dynamic	3.50
MM5950ET	Dual 10-Bit Static	3.50
MM5950EU	Dual 8-Bit Static	3.50
MM5950EV	Dual 8-Bit Shift Register	3.50
MM5950EW	Dual 20-Bit Dynamic	3.50
MM5950EX	Dual 10-Bit Static	3.50
MM5950EY	Dual 8-Bit Static	3.50
MM5950EZ	Dual 8-Bit Shift Register	3.50
MM5950FA	Dual 20-Bit Dynamic	3.50
MM5950FB	Dual 10-Bit Static	3.50
MM5950FC	Dual 8-Bit Static	3.50
MM5950FD	Dual 8-Bit Shift Register	3.50
MM5950FE	Dual 20-Bit Dynamic	3.50
MM5950FF	Dual 10-Bit Static	3.50
MM5950FG	Dual 8-Bit Static	3.50
MM5950FH	Dual 8-Bit Shift Register	3.50
MM5950FI	Dual 20-Bit Dynamic	3.50
MM5950FJ	Dual 10-Bit Static	3.50
MM5950FK	Dual 8-Bit Static	3.50
MM5950FL	Dual 8-Bit Shift Register	3.50
MM5950FM	Dual 20-Bit Dynamic	3.50
MM5950FN	Dual 10-Bit Static	3.50
MM5950FO	Dual 8-Bit Static	3.50
MM5950FP	Dual 8-Bit Shift Register	3.50
MM5950FQ	Dual 20-Bit Dynamic	3.50
MM5950FR	Dual 10-Bit Static	3.50
MM5950FS	Dual 8-Bit Static	3.50
MM5950FT	Dual 8-Bit Shift Register	3.50
MM5950FU	Dual 20-Bit Dynamic	3.50
MM5950FV	Dual 10-Bit Static	3.50
MM5950FW	Dual 8-Bit Static	3.50
MM5950FX	Dual 8-Bit Shift Register	3.50
MM5950FY	Dual 20-Bit Dynamic	3.50
MM5950FZ	Dual 10-Bit Static	3.50
MM5950GA	Dual 8-Bit Static	3.50
MM5950GB	Dual 8-Bit Shift Register	3.50
MM5950GC	Dual 20-Bit Dynamic	3.50
MM5950GD	Dual 10-Bit Static	3.50
MM5950GE	Dual 8-Bit Static	3.50
MM5950GF	Dual 8-Bit Shift Register	3.50
MM5950GG	Dual 20-Bit Dynamic	3.50
MM5950GH	Dual 10-Bit Static	3.50
MM5950GI	Dual 8-Bit Static	3.50
MM5950GJ	Dual 8-Bit Shift Register	3.50
MM5950GK	Dual 20-Bit Dynamic	3.50
MM5950GL	Dual 10-Bit Static	3.50
MM5950GM	Dual 8-Bit Static	3.50
MM5950GN	Dual 8-Bit Shift Register	3.50
MM5950GO	Dual 20-Bit Dynamic	3.50
MM5950GP	Dual 10-Bit Static	3.50
MM5950GQ	Dual 8-Bit Static	3.50
MM5950GR	Dual 8-Bit Shift Register	3.50
MM5950GS	Dual 20-Bit Dynamic	3.50
MM5950GT	Dual 10-Bit Static	3.50
MM5950GU	Dual 8-Bit Static	3.50
MM5950GV	Dual 8-Bit Shift Register	3.50
MM5950GW	Dual 20-Bit Dynamic	3.50
MM5950GX	Dual 10-Bit Static	3.50
MM5950GY	Dual 8-Bit Static	3.50
MM5950GZ	Dual 8-Bit Shift Register	3.50
MM5950HA	Dual 20-Bit Dynamic	3.50
MM5950HB	Dual 10-Bit Static	3.50
MM5950HC	Dual 8-Bit Static	3.50
MM5950HD	Dual 8-Bit Shift Register	3.50
MM5950HE	Dual 20-Bit Dynamic	3.50
MM5950HF	Dual 10-Bit Static	3.50
MM5950HG	Dual 8-Bit Static	3.50
MM5950HH	Dual 8-Bit Shift Register	3.50
MM5950HI	Dual 20-Bit Dynamic	3.50
MM5950HJ	Dual 10-Bit Static	3.50
MM5950HK	Dual 8-Bit Static	3.50
MM5950HL	Dual 8-Bit Shift Register	3.50
MM5950HM	Dual 20-Bit Dynamic	3.50
MM5950HN	Dual 10-Bit Static	3.50
MM5950HO	Dual 8-Bit Static	3.50
MM5950HP	Dual 8-Bit Shift Register	3.50
MM5950HQ	Dual 20-Bit Dynamic	3.50
MM5950HR	Dual 10-Bit Static	3.50
MM5950HS	Dual 8-Bit Static	3.50
MM5950HT	Dual 8-Bit Shift Register	3.50
MM5950HU	Dual 20-Bit Dynamic	3.50
MM5950HV	Dual 10-Bit Static	3.50
MM5950HW	Dual 8-Bit Static	3.50
MM5950HX	Dual 8-Bit Shift Register	3.50
MM5950HY	Dual 20-Bit Dynamic	3.50
MM5950HZ	Dual 10-Bit Static	3.50
MM5950IA	Dual 8-Bit Static	3.50
MM5950IB		

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The Southwest's most progressive communication company stocking Kenwood, Icom, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! Power Communications Corp., 1640 West Camelback Rd., Phoenix AZ 85015. 241-7222.

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## Preston ID

Has WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Price. Call me for all your ham needs. Ross Distributing, 78 So. State, Preston ID 83263. 852-0830.

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## Littleton MA

The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM, amps, B&W switches & wattmeters, Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, GAM. TEL-COM Inc. Communications & Electronics, 675 Great Rd., Rt. 119, Littleton MA 01460. 486-3040.

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New England's Distributor and Authorized Service Center for all Major Amateur Lines. Located just North of Boston at Exit 5 on I-93. Tufts Radio Electronics, Inc., 206 Mystic Ave., Medford MA 02155. 391-3200.

## Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB9VGH, WB9LJO, WD9OK's and WB9RF behind the counter. Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor, Michigan 48104. 668-8696.

## St. Louis MO

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. Gateway Electronics Corp., 8125-25 Page Blvd., St. Louis MO 63130. 427-6116.

## Phila. PA/Camden NJ

Waveguide & coaxial microwave components & equipment. Laboratory grade test instruments, power supplies. Buy, sell & trade all popular makes, HP, GR, FCI, ESI, Sorensen, Singer, etc. Electronic Research Labs., 1423 Ferry Ave., Camden NJ 08104. 541-4200.

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New Jersey's only factory-authorized ICOM and YAESU distributor. Large inventories of new and used specials. Most major brands in stock. Complete service and facilities. Badios Unlimited, 1760 Easton Avenue, P.O. Box 347, Somerset NJ 08873. 469-4599.

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Kenwood, ICOM, Drake, plus many other lines. Amateur Dealer for over 35 years. Adirondack Radio Supply, Inc., 185 West Main Street, Amsterdam NY 12010. 842-8350.

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Amateur radio hardware displays made to your specifications—call signs, plaques, awards or special orders. High quality, fast service, low prices. A.&M. Woodcraft, 313 N. Madison St., P.O. Box 243, Rome NY 13440. 337-5642.

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ICOM, Bird, Cushcraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W2AU/W2VS, CDE, AEA, Vibronics, Ham-Kev, CES, Amphelco, Sony, Farnor-Corner, B&W, Ameco, Shure LaRue Electronics, 1112 Grandview St., Scranton PA 18509. 343-2124.

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Used computer terminals, printers, modems, surplus, electronic parts. Hours: 12-6. T. W. T. Rondure Company, "The Computer Room," 2522 Butler St., Dallas TX 75235. 630-4621.

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Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. Gateway Electronics Inc., 8832 Clarkcrest, Houston TX 77063. 978-6575.

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Complete 2 way service shop. Call Dec. W5FSP. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-Gain, Standard, Vibronics, Midland, Henrys, Cushcraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Cubic, Tempo, Ten-Tec and others. Appliance & Equipment Co., Inc., 2317 Vance Jackson Road, San Antonio TX 78213. 734-7793.

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Your company name and message can contain up to 25 words for as little as \$150 yearly (prepaid), or \$15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the December issue must be in our hands by October 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

# PROPAGATION

J. H. Nelson  
4 Plymouth Dr.  
Whiting NJ 08759

## EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7A	7	7	7	7	7	7	14	14	14A	21A
ARGENTINA	14	14	7	7	7	7	14	21	21A	21A	21	21
AUSTRALIA	21	7A	7B	7B	7B	7B	7B	14	14	21	21A	21
CANAL ZONE	14A	7	7	7	7	7	7	14	21	21A	21A	21
ENGLAND	7A	7	7	7	7	7	14	21	21A	21A	14	14
HAWAII	21	14	7B	7	7	7	7	7B	14	21	21	21A
INDIA	7	7B	7B	7B	7B	7B	7A	14A	14	14	14	7A
JAPAN	14A	14	7B	7B	7B	7	7	7B	7B	14	21A	21
MEXICO	14	7A	7	7	7	7	7	14	14A	21A	21A	21
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	7A	7	7	7	7	7	7A	14	21A	21A	21	14
SOUTH AFRICA	14	14	7	7B	7B	7	14	21	21A	21A	21	14A
U. S. S. R.	7	7	7	7	7B	7B	7A	21	21A	14	14	7
WEST COAST	21	7A	7	7	7	7	7	14	21	21A	21A	21

## CENTRAL UNITED STATES TO:

ALASKA	21	14	7	7	7	7	7	7	14	14	21	21A
ARGENTINA	21	14	7	7	7	7	7A	14	21A	21A	21	21
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	14	14	21	21A	21
CANAL ZONE	14A	14	7	7	7	7	7A	14	21	21A	21A	21
ENGLAND	7	7	7	7	7	7	7	14	21A	21	14	14
HAWAII	21A	14	7B	7	7	7	7	7	14	21	21A	21A
INDIA	14	7	7B	7B	7B	7B	7B	14	14	14	14	14
JAPAN	21A	14	7B	7B	7B	7	7	7B	7B	14	21A	21
MEXICO	14	7	7	7	7	7	7	14	14A	21	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	14	14	14	14A
PUERTO RICO	14A	14	7	7	7	7	7A	14	21	21A	21A	21
SOUTH AFRICA	14	7	7	7B	7B	7B	7	14	21	21A	21A	21
U. S. S. R.	7	7	7	7	7B	7B	7B	14	21	14	14	7B

## WESTERN UNITED STATES TO:

ALASKA	21	14	7A	7	7	7	7	7	14	21	21A	21A
ARGENTINA	21A	14	14	7	7	7	7B	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7	7B	7	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14	21	21A	21A	21
ENGLAND	7B	7B	7	7	7	7B	14	21A	21	14	14	14
HAWAII	21A	21	14	7	7	7	7	7	14	21	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	14	14	14	14	14
JAPAN	21A	14	14	7B	7B	7	7	7	7B	14	21A	21A
MEXICO	21	14	7	7	7	7	7A	14	21	21A	21A	21A
PHILIPPINES	21A	14A	14	7B	7B	7B	7	7	14	14	14	21
PUERTO RICO	21	7A	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	14	7	7	7B	7B	7B	14	21	21A	21A	21	21
U. S. S. R.	7	7	7	7	7B	7B	7B	14	14	14	14	7B
EAST COAST	21	7A	7	7	7	7	7	14	21	21A	21A	21

First letter = day waves      Second = night waves  
A = Next higher frequency may also be useful  
B = Difficult circuit this period      F = Fair  
G = Good      P = Poor      \* = Chance of solar flares

## OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
				G/G	G/G	G/G
4	5	6	7	8	9	10
G/G	G/F	F/P	F/F	F/F	F/F	G/F
11	12	13	14	15	16	17
G/G	G/G	G/G	G/F	G/F	G/F*	F/F*
18	19	20	21	22	23	24
F/P*	F/P	G/F	G/G	G/G	G/F	F/F
25	26	27	28	29	30	31
F/F	F/F	F/F	F/F	G/G	G/G	G/F

# Full Duplex Oscar Transverter



## YAESU FTV-901R

Tired of compromise in your VHF/UHF operating? Does your "compact" multimode rig leave something to be desired in the selectivity department? With the Yaesu FTV-901R VHF/UHF Transverter, the superb capabilities of your FT-901/902DM or FT-101ZD can be extended to the 50, 144 or 430 MHz bands!

### Multiband Design Philosophy

The FTV-901R comes equipped for operation on the 144 MHz band, with 50 MHz and 430-440 MHz modules available as options. Power input is 20 watts on all three bands.

### Duplex Satellite Operation

For satellite operators, three satellite bands are provided, allowing full duplex operation through the transverter for downlink monitoring. You can transmit on 2 meters while receiving on 10 meters or 70 cm, or transmit on 70 cm while listening on 2 meters. An external receiver is required (in addition to your FT-901/902DM or FT-101ZD) for duplex operation.

### Rugged, Dependable Construction

The FTV-901R is a futuristic blend of FET, bipolar, and stripline techniques, providing high reliability, consistent power output, good noise figure, and outstanding rejection of spurious responses. And there's attention to the details, like the Type N connector for 430 MHz operation.

### Worldwide Power Capability

Equipped for operation from supply voltages of 100/110/117/200/220/234 VAC, the FTV-901R won't become obsolete if you move to another country. The transmit drive requirement of 3V RMS at 28-30 MHz makes the FTV-901R compatible with many older Yaesu transmitters.

### Repeater Split Capability

The FTV-901R comes equipped for repeater operation on the 6 and 2 meter bands. For 6 meters, 1 MHz split is provided, while 600 kHz split is provided on 2 meters. Take full advantage of the FM capability on your FT-901/902DM or FM-equipped FT-101ZD Mk III.

### FT-901/902 Line of Accessories

Other high-performance accessories for your FT-901/902DM station include: the FV-901DM Synthesized Scanning VFO; YO-901P Multiscope with Panadapter; and the FC-902 160-10 Meter Antenna Tuner. See your dealer also for details of the YR-901 Code Reader and SP-901P Speaker/Patch.



For top performance on 1.8 through 450 MHz, Yaesu has the most complete line of transceivers, receivers, and accessories in the Amateur industry. Yaesu products are backed by a nationwide dealer network and two factory service centers for your long-term service needs. So when it's time to upgrade your station equipment, join the thousands of hams that are tired of compromise — join them by investing in Yaesu!

# YAESU

83 **The radio.**



981

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Change Without Notice Or Obligation

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Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 • (513) 874-3100

# Top-Notch.



## VBT, notch, IF shift, wide dynamic range

### TS-830S

Now most Amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 meters (including the three new bands). The TS-830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

#### TS-830S FEATURES:

- **160-10 meters, including three new bands**  
Covers all Amateur bands from 1.8 to 29.7 MHz (LSB, USB, and CW), including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- **Wide receiver dynamic range**  
Junction FETs (with optimum IMD characteristics and low noise figure) in the balanced mixer, a MOSFET RF amplifier operating at low level for improved dynamic range (high amplification level not needed because of low noise in mixer), dual resonator for each band, and advanced overall receiver design result in excellent dynamic range.

#### Matching accessories for fixed-station operation:

- SP-230 external speaker with selectable audio filters
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/SWR and power meter
- MC-50 desk microphone
- Other accessories not shown:
  - TL-922A linear amplifier
  - SM-220 Station Monitor
  - PC-1 phone patch
  - HC-10 digital world clock
  - YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF
  - YK-88C (500-Hz) and YK-88CN (270-Hz) CW filters for 8.83-MHz IF
  - HS-5 and HS-4 headphones
  - MC-30S and MC-35S noise-cancelling hand microphones

- **Variable bandwidth tuning (VBT)**  
Continuously varies the IF filter passband width to reduce interference. VBT and IF shift can be controlled independently for optimum interference rejection in any condition.
- **IF notch filter**  
Tunable high-Q active circuit in 455-kHz second IF, for sharp, deep notch characteristics.
- **IF shift**  
Shifts IF passband toward higher or lower frequencies (away from interfering signals) while tuned receiver frequency remains unchanged.
- **6146B final with RF NFB**  
Two 6146B's in the final amplifier provide 220 W PEP (SSB)/180 W DC (CW) input on all bands. RF negative feedback provides optimum IMD characteristics for high-quality transmission.
- **Built-in digital display**  
Six-digit large fluorescent tube display, backed up by an analog dial. Reads actual receive and transmit frequency on all modes and all bands. Display Hold (DH) switch.
- **Adjustable noise-blanker level**  
Built-in noise blanker eliminates pulse-type (such as ignition) noise. Front-panel threshold level control.

- **Various IF filter options**  
Either a 500-Hz (YK-88C) or 270-Hz (YK-88CN) CW filter may be installed in the 8.83-MHz first IF, and a very sharp 500-Hz (YG-455C) or 250-Hz (YG-455CN) CW filter is available for the 455-kHz second IF.
- **More flexibility with optional digital VFO**  
VFO-230 operates in 20-Hz steps and includes five memories. Also allows split-frequency operation. Built-in digital display. Covers about 100 kHz above and below each 500-kHz band.
- **Built-in RF speech processor**  
For added audio punch and increased talk power in DX pileups.
- **RIT/XIT**  
Receiver incremental tuning (RIT) shifts only the receiver frequency, to tune in stations slightly off frequency. Transmitter incremental tuning (XIT) shifts only the transmitter frequency.
- **SSB monitor circuit**  
Monitors IF stage while transmitting, to determine audio quality and effect of speech processor.

More information on the TS-830S is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

 **KENWOOD**  
...pacesetter in amateur radio



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