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EGO

Yes, when you write to Wayne Green, I get your letters. Usually I answer, too, much to the surprise of a lot of hams. There is some sort of weird concept that because someone is rich and famous, he is no longer reachable.

Ha! There's that Wayne Green ego again—rich and famous, indeed! Well, golly, I am rich in some ways—and though I've worked a lot harder than most people to get this way, many begrudge it. I've been writing for how many years now telling you how to get rich? I wrote a booklet on the subject twenty years ago. And fame? Well, I'm well known in a couple of esoteric circles, if that qualifies. Wayne Green is not yet a household term.

Several letters of interest arrived in the last few days. One chap advised me that he was canceling his subscription because my ego is too big and three thanked me for egging them on to become entrepreneurs and make a living.

Well, I don't know what to do about my ego except ask you to live with it and enjoy it the way I do. Without my ego prodding me, I'm not sure where a lot of things would be.

It's a funny thing about "rich." Sure, I have millions to spend just about any way I want, so what am I doing with all of that loot? Well, for the most part, I am using it to help people with ideas bring them to fruit and to make some of my own ideas work. A plane? Nope, I tried that almost 30 years ago, back in '57, and got it out of my system. A big house, right? Tired that in '69 and didn't like it. No, I have a small room over my office which is all I need for the few hours I waste sleeping each day. I've been putting in hundred-hour weeks for years and enjoying it.

A few weeks ago, I attended an evening class in the art of conversation here in Peterborough. Each of us was asked to explain why we'd come to the class. My rationalization was that I really didn't know how to cope with cocktail parties. What in the hell can one possibly talk about when meeting someone for the first time in a noisy room where the meeting will be for only a few minutes? As I explained, I realized that I had exactly outlined one of the big problems with amateur radio—we meet new people under noisy conditions and are expected to provide some entertainment.

I was assured by everyone else in the class that my problem was not as bad as I thought it might be. I hope you can help with the problem. Well, I'm sure I can, for I've written a book on the subject twenty years ago.
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This Antenna Is Too Good To Be True

It’s cheap. It works well on all bands. And it radiates a super signal.

Would you like to have an antenna that is capable of working all the HF bands, or any combination of the HF bands including the new WARC bands, with excellent results, at a fraction of the cost of any of the commercially-available multi-band antennas now on the market? Would you also like to have an antenna with an extremely low noise factor? I’m about to describe an antenna that is just what you’ve been looking for.

This antenna is a combination of the old reliable Zepp with the addition of a balanced, shielded feeder system which has been described in various articles in past years.

This antenna has been in use at this QTH as well as other locations for over two years and has yielded many fine DX contacts and many good reports stateside.

To determine the comparable merit of this antenna, I erected separate dipoles cut for the center of each band and fed with a single coaxial cable. Then I connected all antennas so they could be switched rapidly to determine the comparable signal strength of each as compared to the Zepp antenna.

In addition to the favorable signal strength comparisons, I also found that the noise level on the Zepp antenna was as much as 5 S-units lower than the noise on the cut-to-frequency dipole with single coax feed. I noticed this particularly on

<table>
<thead>
<tr>
<th>Desired Bands of Operation</th>
<th>Length of Each Side of Antenna From Center to Each End</th>
</tr>
</thead>
<tbody>
<tr>
<td>160-10 meters</td>
<td>108 feet</td>
</tr>
<tr>
<td>80-10 meters</td>
<td>54 feet</td>
</tr>
<tr>
<td>40-10 meters</td>
<td>27 feet</td>
</tr>
<tr>
<td>30-10 meters</td>
<td>18.7 feet</td>
</tr>
<tr>
<td>20-10 meters</td>
<td>13.5 feet</td>
</tr>
<tr>
<td>17-10 meters</td>
<td>10.4 feet</td>
</tr>
<tr>
<td>15-10 meters</td>
<td>9 feet</td>
</tr>
<tr>
<td>12-10 meters</td>
<td>7.8 feet</td>
</tr>
</tbody>
</table>

Completed antenna mounted in tree.

Table 1.
the model of this antenna which was erected inside the attic of the house in close proximity to the ac wiring of the building, where the noise level dropped from an S-7 on the regular dipole to an S-2 on the Zepp antenna.

To erect this antenna, you simply figure the length of each side of the flat-top from the center to one end by using the figures shown in Table 1.

This antenna can be cut for operation an any combination of the HF ham bands, including the WARC bands which have not yet been released. For example, if your space is limited, you could put an antenna in the attic of the house, as I did at one location where I had an attic length of only about 30 feet, by figuring the antenna for operation on the bands from 30 through 10 meters, resulting in a length each side of center of 18.67 feet. Then I ran the wire in a Z configuration through the attic to compress it into the available space.

I have used various configurations on this antenna, such as the halo and the inverted vee, and all give good results. If you can get the wire running in a fairly straight line, though, your radiation pattern will be more predictable.

The flat-top portion is designed so that it is non-resonant on all bands of operation, thereby avoiding any extremely high or extremely low impedance points at the feedpoint. It is designed to be resonant between the one-quarter, half, three-quarter, and full-wave points on each band, thereby presenting an impedance to the antenna tuner which is well within range of the tuner on each band and will not cause any loading problems. An antenna tuner is required which has a built-in balun or you must use a 4-to-1 balun at the bottom end of the line if you don’t have one built in the tuner itself.

The feedline is made of two runs of RG-8/U cable for powers up to 2 kW PEP, or for low-power operation under 100 Watts output, RG-58/U cable may be used. The lower loss of the larger cable is to be desired, however, even if low power is used.

At the top end of the feedline, you connect the shields of the two coax cables together but do not connect them to anything else. Then at the bottom end of the line, the shields are tied together and connected to the ground connection in the shack and to the frame of the tuner.

The inner conductors of the coax cables are tied to each leg of the antenna wire at the top of the line, and at the bottom end of the line they are connected to each of the balanced-output terminals of the antenna tuner.

The feedline can be run anywhere — underground, through metal or vinyl conduit, or in the open. The advantage of this arrangement, however, is that unlike the old open-wire feedline previously used on Zepp antennas, it does not have to be kept clear of surrounding objects and is not affected by anything it lies against.

There is only one precaution that must be observed, and that is to cut both runs of the cable exactly the same length. They do not have to be run together, however, as the shield on the cables provides exact electrical separation of the inner conductors even if the two cables are widely separated.

As to the length of the feedline, I found that best results were observed with line lengths of a little more than one-quarter wavelength at the lowest frequency of operation (or anything longer than that). Try to avoid making the feedline resonant at any particular frequency you are operating on, particularly the quarter-wave points, or you may have a bit of trouble tuning on this band. Optimum length seemed to be about 55 feet for 80- through-10-meter operation.

As for the mechanical construction, it is a good idea to use a long insulator, the same type used on the ends of the antenna, at the center of the antenna. Then slip the end of another insulator of the same type over the wire on either side of the center insulator, coming off at right angles to the wire and tying the support wire to these two side insulators so that equal pull is achieved on either side of the center insulator. Then
at the point where you need to support the two coax cables, just strip off about 2 feet of the braid, leaving the plastic inner insulation, and bend this part along the center insulator on each side and tape securely to the insulator. This will make a very solid support for the coax cables and will prevent wind damage.

It is also a good idea to bring the coax up the support mast a little higher than the antenna wire and bend it over in a loop and down about a foot or so to prevent the water from leaking into and running down the shield on the cables.

To separate the braid from the inner conductor on the coax, strip the outside plastic covering off about two feet from the end, then take the end of the shield and push it down, compressing it so that it becomes larger in diameter. Then take an awl or the tip of a small screwdriver and carefully spread the strands of the braid apart, opening up a hole in one side of the braid. At this point, bend the coax in a U shape and pull the plastic insulated center conductor out through the hole in the side of the braid, U-end first. This will eliminate the need for making a solder connection directly next to the plastic where it might create a weak spot.

I have used this antenna in various situations cut for all different combinations of bands and have had excellent results with all of them. I have also made up a portable version of this antenna using stranded insulated wire such as zip-cord and RG-58/U cables which I use in conjunction with a small antenna tuner for operation on 20 through 10 meters. This one is only 13.5 feet long either side of center with two runs of coax 20 feet long. It is ideal for stringing up in a motel room or apartment by supporting it with nylon fishing line. Just keep the antenna out a foot or so from the wall and support it by anything you can find to tie it to. Try it. You'll like it!

---

Fig. 3. Allband trapless antenna for HF.
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Some People Want A Super "Loaded" Machine—
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Now you can have Either!

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Construct the Minuteman Timer

As faithful as a grandfather clock, this timer tells when to ID—and when not to.

But why do you need another ID timer?

my wife asked when she saw me trying to sneak yet another Radio Shack bag to the workbench.

The question was no surprise because my very first electronics project had been an ID timer described in one of the ham magazines. It had worked perfectly, and I remembered well how I had shown it to her and carefully explained why I had added a single LED to the circuit for a visual signal.

The answer to her question, however, was that this timer is even better but it is still simple. Using a seven-segment LED, the timer steps off the minutes beginning with zero.

Many ID timers provide only an audio and/or visual signal when eight or nine minutes have passed. Using this type of timer, the radio operator never knows how much time has elapsed until the signal sounds. I found myself identifying too often because I was never sure when the 10-minute mark would come.

Gary L. Fait KABQBQ
302 E. Lexington St.
Davison MI 48423

But why do you need another ID timer?

Photo A. Interior view of the timer.

Photo B. Front panel and cabinet for the ID timer.
To solve the problem, I began with a basic timing circuit using three ICs plus the seven-segment LED. I added two push-button switches, one to restart the timer after identifying and one to reset the numeral on the LED.

The 555 timer is controlled by R1, a 1-meg pot. The circuit can be set to time anything from seconds to hours. In this case, obviously, it is adjusted to provide one timing pulse per minute.

Opening S2, a normally-closed momentary-contact switch, causes the resetting pins on the 7490 to go high. This resets the LED to the numeral nine. S3, a normally-open momentary-contact switch, is then closed. This shorts R1, causing the 555 to pulse, beginning a new timing period and by the way causing the LED to pulse to zero.

After turning on the timer, operation is as simple as one-two. Simply push S2, then S3, to begin at zero. If you identify before the 10 minutes have completely elapsed, simply give it the one-two again and the timer is back to zero and counting a full minute.

All parts for the LED ID timer are readily available from Radio Shack. Many parts are probably in any well-stocked junk box, but even if purchased new, the timer will cost less than $10. It can be housed in any suitable enclosure. I used a small, steel-topped cabinet because I wanted to impress my wife, but the extra expense of the cabinet is not necessary.

The circuit is extremely simple and is an ideal project for the beginner, but one note of caution is in order. I suggest the use of IC sockets for mounting the three ICs and the LED, instead of soldering them directly to the circuit board. The entire project can be assembled before the ICs are installed, reducing the risk of damaging them in the process. The sockets also allow easy replacement for troubleshooting.

My LED ID timer now sits beside my rig, faithfully ticking off the minutes and saving a lot of unnecessary callsign transmissions. Now, if I could just get my wife to stop borrowing the thing to time her daily exercises...
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The Secret of Remote Control

Inside those miniature planes lie some sophisticated circuits.

The Field House falls quiet as the pilot winds up the rubber-band motor of his scale model of the Porterfield Collegiate. The plane, which is made of lightweight balsa and covered with tissue paper, is held against the pull of the motor by a helper. Then, with the controls checked, the pilot gently tosses the plane toward the far end of the basketball court and steers the plane as it climbs. The pilot guides the Porterfield around the ceiling lights and basketball backboards until the motor winds down and the plane lands on the floor.

The pilot, a member of the State College, Pennsylvania, Radio Control Club, is an amateur who reworked his Heathkit® radio to reduce its size and weight to fit inside the small Porterfield. By removing the receiver case and using hearing-aid batteries and special small servos, he was able to make a flying machine small enough to fly well inside the confines of an indoor basketball court.

At the other end of the spectrum is the PennFl, an original design of a radio control (R/C) pilot from Indiana, Pennsylvania. The aircraft has a fourteen-foot wingspan and weighs over five pounds. In the warm air of summer, this plane can climb to heights of more than a quarter mile and fly over an hour without landing. It uses warm air up-drafts to stay aloft without a motor and its flight time is limited by the size of the batteries on board.

The Porterfield and the PennFl, for all their differences in size and weight, share a common guidance-system principle. It's called serial digital data transmission and it links the pilot's hands to the steering controls of the aircraft he's flying.

In Fig. 1, the scope trace shows that a timing or clock pulse initializes the sequence by turning on the decoder chain in the aircraft receiver. The next pulse in the series is a data pulse of between one and two milliseconds duration, the width of which is controlled by a joystick on the transmitter. The length of the pulse determines what position the servo arm will take. A push-rod connected between the arm and a control surface, in this case the rudder, links the servo to its workload. The receiver detects the transmitter's signal, decodes the serial data, and routes the proper pulse to each servo. In the servo, the pulse is compared to another from the onboard circuits, a function of where the servo arm is positioned. The error dif-

The PennFl, an unlimited class sailplane of fourteen-foot wingspan, weighs about five pounds. Made of balsa and plywood, the plane is covered with a plastic film which shrinks and sticks to the wood when heated with a common clothes iron. Controls are rudder, elevator, spoiler (airbrakes), and releasable tow hook.

A one-fourth full-sized model of a WWII fighter is started up. Constructed of balsa, plywood, and thin aluminum and covered with fabric, the plane uses a chain-saw engine and two-cycle mix fuel for power. A four-channel R/C rig controls ailerons, rudder, elevator, and engine speed.
The tiny Porterfield at rest. The model is made from a $5.00 free-flight kit of thin balsa strips covered with lightweight tissue paper and lightly sprayed with model paint.

A one-inch-per-foot scale model of a Porterfield Collegiate is powered up. A small hand drill and hook are used to wind up the large rubber band to full power.

The tiny Porterfield at rest. The model is made from a $5.00 free-flight kit of thin balsa strips covered with lightweight tissue paper and lightly sprayed with model paint.

were all this taking place on the ground where conditions were constant, R/C control would be a fairly simple system. By installing half the control system in an aircraft which at launch is mere inches from the transmitter, then flying the plane so high and far that it looks like a dot in the sky, using simply a length of hookup wire for an antenna, a very special receiver is needed to maintain constant control. As the radio is amplitude-modulated, static or other electrical noise could blank or change the length of one or more data pulses causing steering problems and possibly a crash. A 500-milliwatt rf signal from the transmitter is hot enough to provide solid contact out to over a mile depending on the altitude of the aircraft. The receiver is usually triple-tuned at its antenna circuit for adjacent channel rejection while a double-stage agc circuit holds the signal from the single-conversion rf strip constant no matter how much rf is picked up by the antenna.

All this is performed by a receiver board about the size of a pack of book matches. The decoder board is the same small size and is wired to take power and audio signal output from the receiver. The long clock pulse sets the time sequence for the decoder and helps it to disregard stray noise which does not occur in the proper or expected time frame. The clock also tells the decoder which of the following data pulses are to be routed to the individual servos. The clock does not leave the decoder board while all the following data pulses are fed to their respective servos.

Most systems today are powered by nickel-cadmium rechargeable batteries in both the transmitter and the airborne unit. Airborne battery voltage is normally 4.8 volts from four 500-mAh AA-size batteries wired in series. The transmitter uses 9.6 volts from eight batteries of the same size and rating as the airborne pack. For aircraft which are ½-size scale models of full-size planes and have six or eight controls under R/C command, D-cell-size nicad batteries are needed to handle the high net current draw. The added weight of the big pack is also helpful in balancing the model for stable flight.

While most R/C systems are factory built, Heathkit and Ace R/C, Inc., both offer full lines of radios in kit form. As mentioned earlier, the small size and high parts density of the receiver and servos make the building
task somewhat more critical than wiring an HW-101. While it does call for some high-grade construction skills, most any amateur with some bench time will have no trouble assembling kits from either of these vendors. Both offer operating frequencies in the six-meter band where few interfering signals exist and where there is no crowding, as up in the 72-MHz CB band. While there is no mode restriction for R/C in the amateur bands, only Kraft Systems, Inc., offers an FM-type R/C rig; it is only available factory built. In high rf noise applications such as R/C model helicopters, an FM radio with its higher immunity to static would be a good choice. In most other types of models, the AM type of modulation is very reliable.

Equally as important as the system's electrical specifications is its ability to take physical punishment and be reliable. Whether the air-
craft has a large or small engine, each will vibrate the R/C to some degree. If components on the receiver or servo circuit boards aren't mounted close to the board and well soldered, vibration will get them sooner or later. Even gliders, which have no engine, are battered in the landing zone as they have only thin rubber skids on the bottom of the fuselage. The quality of workmanship is very important in R/C rig construction, since almost any circuit failure would cause the plane to crash.

Once an R/C system is built, it can be modified to "fly" many different types of models. Miniature replicas of ocean-going sailboats can be raced in a pond or swimming pool using especially watertighted gear. Even submarines which have the ability to submerge are available as R/C model kits. The hottest Formula and Indy-type race cars are built from kits and raced us-
ing two-channel radios and either electric motors or glow-type model engines. New military tank models have come out which will climb obstacles, go forward, reverse, go left and right, and swing the turret cannon. Helicopters fly in scale fashion in competition by carrying cargo or flying in formation or firing small solid-fuel rockets at targets. By far the most popular are the scale models of World War II military aircraft. With the reliable radios available today, anyone can pilot the model of his favorite plane and enjoy the thrill of flying the old war birds.

Adapting the radio system to function in any of these models will allow the amateur to use the same rig in several models. In some cases, extra receivers and servos are built for installation in models and operated from a common transmitter so that two or more planes can be flown without having to field-change radios from one model to another.

Since there are few of us who can afford to own a Mustang fighter or a B-29 Superfort, a model of these planes is more practical. From biplanes to the space shuttle, R/C radios allow us to build and fly the most exotic flying machines safely and reliably. Imagination is the only limiting factor in choosing which model to operate, and amateur skills at the workbench make the radios as inexpensive as they are reliable.

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Calculate Your FT-101

Here's how to treat your trusty FT-101 to a truly automatic digital display and get a frequency counter in the same box—at the flick of a switch.

The FT-101 series of HF transceivers has been one of the most popular in amateur radio history. One lingering criticism of the models through the "E" series, however, was the lack of a true calculating digital display. While Yaesu did offer the YO-601 digital display, it counted only the vfo and required operator adjustment for correct frequency display with any band or mode changes.

The "VK8DE Calculating FT-101 Display" is a "hands-off" calculating counter giving true zero-beat frequency readout on all modes and bands. It is inexpensive and straightforward to build and requires only a simple passive interface to the FT-101. It can also serve as a 50-MHz bench frequency counter, and also sports a switchable calibration output signal. The implementation used is LSTTL (Low-power Schottky), available worldwide at low cost. An accurate, automatic digital display is a necessity on the crowded bands, and this project is a convenient and economical upgrade for FT-101 owners.

The counter performs the following frequency calculation formula according to the FT-101 oscillator mixing scheme: \( F = bfo + LO - vfo \), where \( F \) = the displayed frequency, \( bfo \) = mode-switched Beat Frequency Oscillator (LSB, USB, and
CW/AM), LO = band-switched Local Oscillator (1 crystal per band), and vfo = dial-tuned Variable Frequency Oscillator.

General Description

Reference to the block diagram of Fig. 1 will be helpful for a general description. The three oscillator signals are routed from the FT-101 external vfo octal socket (13) on three previously unused pins through coax to the display box.

Isolation amplifiers buffer the signals and then perform a TTL level conversion for the digital processing. A crystal-referenced oscillator feeding a decade divider chain provides necessary timing for the control section. The control section directs up-down counters to follow the frequency determination formula and finally to store and display the information in 7-LED numerical displays. The FAST/ SLOW switch offers the operator a choice between 80- or 800-ms-display updates with 100- and 10-Hz resolution, respectively.

The FT-101/external switch allows the unit to function as a normal frequency counter using the LO jack as the input source. The bfo-detect circuit is used to provide a preset substitute value in the absence of bfo signal, such as in AM receive mode. This feature also gives zero-beat CW frequency when the FT-101 mode switch is moved from CW to AM. The "normal" CW presentation is offset low by 800 Hz if tuned properly, which happens to be the difference between the FT-101's USB oscillator of 3.1785 MHz (used in CW receive) and the CW/AM oscillator of 3.1793 MHz (used in CW/AM transmit). A regulated +5-volt source supplies the necessary power for the counter, displays, and isolation amplifiers.

Circuit Details

References to the timing diagram (Fig. 2), and the four sections of the schematic (Figs. 3, 4, 5, and 6) will be made in this section. Fig. 3 shows the raw analog bfo, LO, and vfo cables routed to the BNC jacks J1, 2, and 3, respectively. With the exception of a single input resistor change in the bfo isolation amplifier, the three buffer-converters are identical. One description will, therefore, serve for the three circuits.

Because of the JFET input and the 1-megohm bias resistors, each of these amplifier's input impedance is essentially the value of the input resistor. For high sensitivity it is 1000 Ohms for the LO and vfo, and 10,000 Ohms for the bfo. These impedances do not appreciably load the oscillator signals with 1-meter connecting lengths of RG-174/U coax from the FT-101.

The FTJET then feeds an NPN driver which emitter-couples via a large value capacitor to a linearly-biased 74LS04. The IC wired in this manner, as a dc-coupled multistaged amplifier, produces a TTL level (HIGH > 2.7 V, LOW < 0.8 V) pulse output from the sinusoidal input. This cheap but utilitarian dc 50-MHz analog-to-TTL amplifier has been used so often by so many that it must nearly be "public domain."

Fig. 4 shows the bfo, LO, and vfo TTL signals as inputs to the timing and control section. In order to guarantee the successful use of low-cost LSTTL, the signals are each prescaled (divided) by a factor of 2. This forces the maximum LO input of 35.52 MHz (used in the 29.5-30-MHz band of the FT-101) to a value of 17.76 MHz after passing through U8, a 74S74 flip-flop.

The guaranteed specification of 30 MHz for a 74LS74 flip-flop, or for that matter, the 74LS192 up/down counters, is thereby never tested. The penalty for prescaling by two is a corresponding extension of the counting time by the same factor.

The control-section activity is directed by a four-state counter made up of U18, a 74LS74. Besides creating a specific counting interval for the bfo, LO, and vfo, the state counter provides a fourth interval to display the resultant frequency calculation and then prepare the machine for another cycle. The timing diagram of Fig. 2 shows the succession of these states and the ensuing events. The state names of 00, 10, 11, and 01 are derived from the successive logical conditions of U18 pins 5 and 9, called QA and QB. The 1-MHz crystal oscillator of U6 is divided down to provide a continuous stream of state clock pulses as shown in Fig. 2.

Three state clock pulses cause the machine to count up the bfo, count up the LO, and count down the vfo, or add, add, and subtract, in accordance with the F = bfo + LO-vfo equation. The fourth state, called 01, causes a LATCH command to store the frequency value.

![Fig. 1. Block diagram.](image-url)

![Fig. 2. Timing diagram.](image-url)
for display viewing and a LOAD pulse to prepare the 74LS192 up/down counters for the next display cycle. A bfo-detect interval is also defined that will determine whether the counter chips are to be loaded with zero or whether, in the absence of a bfo signal, the preset value of 031793 (the CW/AM oscillator frequency) is substituted for the bfo.

The two UP clock signals (bfo and LO) are multiplexed by U15, a 74LS158. The QA (U18-5) line selects the bfo when QA is a logical 0 (less than .8 volts), and the LO signal when it's a logical 1 (at least 2.7 volts). During the vfo (11) and Latch/Load (01) states, U15 is disabled, producing a solid logical 1 output. The vfo flip-flop, U9, is similarly disabled during the bfo, LO, and Latch/Load states. This action was necessary to properly condition the 74LS192 counters for up/down counting. Thus, for UP counting of the bfo and LO, the DOWN line is disabled, and during DOWN counting, the UP line is disabled.

The occurrence of the 01 state produces the LATCH command at U16-8, which stores the counter bits into 74LS175 quad flip-flops. U17 is the bfo detector, and if bfo activity was present during the bfo-detect interval, U17-B will go to a logical 1, disabling U3. The disabled outputs of U3 will be all zeros and will be jammed into the 74LS192 counters (U22 through U28) when the LOAD pulse occurs later in the 01 interval. U17 is enabled only during the Latch interval (01 state) and, because of U10, only when the machine is in the FT-101 display mode. The extra U16 gates are used as a delay to ensure U3 output stability during activity of the LOAD signal.

The presence of two display times, together with the bfo-detection concept, was responsible for the inclusion of U3 and its strangely-named outputs. Table 1 shows how U3 (when wired as shown in the schematic) will (when no bfo signal has been detected) inject into the seven 74LS192 counters the value 0031793 when in the FAST mode (80-ms display update), and 0317930 when in the SLOW mode (800-ms update).

Fig. 4 shows the 74LS192s, the 74LS175 storage flip-flops, the 74LS247 decoder-drivers, current-limiting resistors, and common-anode right-hand decimal-point displays. The direct-drive approach was chosen to minimize the chance of display-driver RFI, which often is an unwanted result of the more efficient method of display-digit multiplexing.

Two decimal points are lit for each display mode: one to distinguish megahertz from kilohertz and one to separate kilohertz from Hertz. The FAST position illuminates decimal points on digits 5 and 2 while the SLOW setting drives digits 6 and 3. The decimal point switching and driving derive from a gate of U1 and an open collector-inverter, U2. The seven digits plus the four decimal points require 53 180-Ohm, 1/4-W resistors. The displays are 8mm red 5082-7731 units, but any common-anode right-hand decimal-point displays will work.

Fig. 6 shows the power supply. An LM323K in a 15-Watt heat sink is ample for the maximum 2.1-Amperes current requirement. About 1.5 Amps is used by the

Table 1. Preset counter bit values.

<table>
<thead>
<tr>
<th>Display Digit</th>
<th>74LS192 Counter</th>
<th>D (pin 9)</th>
<th>C (pin 10)</th>
<th>B (pin 1)</th>
<th>A (pin 15)</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>U28</td>
<td>0/0</td>
<td>0/1</td>
<td>0/1</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>6</td>
<td>U27</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>5</td>
<td>U26</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>4</td>
<td>U25</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>3</td>
<td>U24</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>2</td>
<td>U23</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>1</td>
<td>U22</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
</tbody>
</table>

* Preset value: Fast: 0031793; Slow: 0317930. Above inputs are active when no bfo signal is present and counter is in FT-101 display mode. All counter-presets inputs are zero when in EXTERNAL mode, or when a bfo signal is present in FT-101 mode.

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the display during a lamp test, when all digits show eights. A 15-V center-tapped, 3-Amp transformer in a fullwave configuration was used. The ac primary is double-pole switched and fused for safety. A single-point ground system was employed to minimize the chances of ground loops.

The time base for the project is conventionally implemented from a 1-MHz TTL crystal oscillator (U6) and a cascaded string of 74LS90 decade dividers. U14 is wired as a 1-of-2 selector to change the frequency of final divider U11's outputs by a factor of 10 for the FAST/SLOW display presentation. An unused portion of U9 divides the 1-kHz oscillator signal by 2, then a remaining U6 gate buffers it and feeds a CRC differentiation network. When the CAL switch is activated, a 500-kHz harmonically rich signal is routed to the J4 output jack. This easily allows band-edge checks and frequency station-standard checks against WWV, JY, CHU, etc.

**Construction and Checkout**

The project was built in stages. The FT-101 interface was wired first. Many thanks to KH6BK (March, 1977, QST) for this simple but effective method of accessing the three FT-101 oscillator signals.

FT-101 interface instructions: The objective is to capacitively couple the bfo, LO, and vfo via small sections of RG174/U coax routed through the underside of the chassis to the vfo accessory socket (J13) at pins 3, 7, and 2, respectively.

---

Photo B. Rear view. Shown are the FT-101 inputs, the 500-kHz CAL output, and the operating controls. For frequency counter use, the toggle switch is set to EXT and the signal of interest connected to the LO/EXT input (photo by R. Campbell).
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The shields will be soldered to J13, pin 8. Dress and tin the leads for neatness.

(1) Vfo: Prepare a suitable length of coax and solder the inner conductor to one side of a 0.01-µF capacitor. Solder the other end of the capacitor to pin 6 of PB 1184A connector. Solder the shield to pin 7 (gnd). Route the cable to the octal vfo socket and solder the inner conductor to pin 3. Solder the shield to pin 8.

(2) LO: Prepare a length of coax and solder the inner conductor of one end directly to pin 15 of the PC connector for PB 1181A. Solder the shield to pin 18 (gnd). After routing the cable back to the vfo socket, solder the inner conductor to pin 7 and the shield to pin 8.

(3) Vfo: Prepare a length of coaxial cable. Solder the inner conductor to one end of a 0.01-µF capacitor. Solder the other end of the capacitor to pin 11 of the PC connector for PB 1180A (mixer). Solder the shield to pin 10. Route the cable to the vfo socket, soldering the inner conductor to pin 2 and the shield to pin 8.

(4) Remove PB 1181A. Solder a 0.01-µF capacitor between test point TP and pin 15. Replace PB 1181A.

The interface cable from the FT-101 to the VK8DE Calculating FT-101 Display consists of an octal plug, three equal sections of RG-174/U coax up to 1m in length, and three plugs. The plugs used in the prototype were BNC, but RCA shielded phono plugs would work. Prepare the plug ends of the cables, check for shorts, then solder the inner conductors to octal plug pins 2, 3, and 7. Label the cable to pin 2 "VFO," the pin 3 cable "BFO," and the pin 7 cable "LO," and solder the three shields to pin 8.

Plugging and unplugging the cabled octal plug at the external vfo socket will probably shift the receiver frequency a few Hertz. This is normal and merely re-
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Along with great performance, the AIR-1 boasts an impressive list of features, some of which are exclusive to Microlog.

- Computer enhanced detection means extensive use of software digital filtering techniques for noise and bandwidth that track the operating speed and code.
- Full speed RTTY 60 to 132 WPM, CW to 150 WPM, & 110/300 Baud ASCII.
- Full speed RTTY 60 to 132 WPM, CW to 150 WPM, & 110/300 Baud ASCII.
- Choice of full or split-screen display with large type ahead text buffer and programmable memories.
- On screen tuning indicators mean you never have to take your eyes off the video for perfect copy tuning. RTTY "scope" cross hatch and "red-dot" signal acquisition monitor right on the screen.
- Keyword or manual control of VIC or Parallel printer and receive buffer storage.
- Convenient plug-in jacks for all connections.
- Single board design contains TU & ROM software that does not require external power.
- Full one year warranty.
- WRU, UNshift On Space, Word wrap-around, Test "Quick Brown Fox" & "RYRY" in ROM, Break buffer, Random Code generator, Hand-key input, Real-time clock, sturdy metal cover and more.

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- Full speed RTTY 60 to 132 WPM, CW to 150 WPM, & 110/300 Baud ASCII.
- Choice of full or split-screen display with large type ahead text buffer and programmable memories.
- On screen tuning indicators mean you never have to take your eyes off the video for perfect copy tuning. RTTY "scope" cross hatch and "red-dot" signal acquisition monitor right on the screen.
- Keyword or manual control of VIC or Parallel printer and receive buffer storage.
- Convenient plug-in jacks for all connections.
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- Full one year warranty.
- WRU, UNshift On Space, Word wrap-around, Test "Quick Brown Fox" & "RYRY" in ROM, Break buffer, Random Code generator, Hand-key input, Real-time clock, sturdy metal cover and more.

AIR-1 Future
There's room for expansion and adaptability with some really "neat stuff" planned for the AIR-1. But then, why tip off the competition? Now you understand how we live up to the title "Innovators in Digital Communications." The complete AIR-1 for VIC-20 or C-64 is $199 (with AMTOR, $279). See it at your local dealer or call Microlog Corporation, 18713 Mooney Drive, Gaithersburg, Maryland 20879. TELEPHONE (301) 258-8400, TELEX 908153.
flects the small change in oscillator loading.

The next step suggested is the construction of the three isolation amplifiers. Compact layout, either by printed-circuit etching or point-to-point wiring, is called for. A reasonable example layout for the amplifier from WA2FPT can be found in the September, 1982, 73, on page 44. The three amplifiers were mounted in small metal boxes for shielding, with BNC inputs (J1, 2, and 3) and RCA phono-output jacks (J5, 6, and 7). RCA phono connectors could be used instead of BNC jacks to save a couple of dollars. The boxes were positioned at the rear of the cabinet so that J1, J2, J3 would protrude into the enclosed compartments.

The board layout shown in Fig. 7 allows a choice of packaging. Using the single-board approach minimizes interconnections between pieces but requires a larger cabinet and right-angle sockets for the display LEDs. Cutting the larger board into three smaller sections, as shown by dotted lines, allows for a more compact chassis but requires a larger layout. The choice is yours.

Power and ground wires to all ICs should be wired next. Use of a TTL data book is helpful, remembering that the wiring side is a mirror image of the component side. The control section was wrapped next, and the timing diagram of Fig. 2 should
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be referenced for verification. Access to a dual-trace triggered sweep oscilloscope would be extremely helpful if substantial troubleshooting is anticipated (or necessary!). The last section connected is circuitry from Fig. 5, consisting of the 74LS192 up/down counters, 74LS175 latches, 74LS247 decoder drivers, the 180-Ohm resistors, and the displays. The front of the prototype contains only the display bezel to emphasize the “hands-off” design concept. The FAST/SLOW switch is a long “bat handle” type on the upper-rear center panel that is easily accessed by a finger flick. For even easier access, it could as readily mount on the front, centered beneath the display. Operational checks are made by watching the display as the FT-101 is tuned. Upon the application of power, the display will briefly flash all 8s. When displaying frequency, the last digit will be plus or minus a digit, and will change at either the 80-ms fast rate, or every 800 ms, the slow rate. The 80-ms (12.5 Hz) updates will track any tuning rate generated by human hands. Moving the FT-101/EXT switch to the EXT position with the unit cabled to the FT-101 will display the particular LO crystal-oscillator frequency. The bfo-detected circuit is checked by noting the difference in frequency as the FT-101 is switched from CW to AM. The AM position should read about 800 Hz higher than the CW display. When the CAL signal is input into the LO/EXT jack (12) and the EXT switch activated, the counter should read exactly 500.00 in the SLOW position, and 500.00 in the FAST position. A short wire inserted into the CAL jack (J4) and placed near the FT-101 antenna input will couple the CAL signal into the FT-101, allowing band-edge checks. The 1-MHz oscillator can be trimmed against WWV in this manner. Although any suitably-sized, well-ventilated metal cabinet could be used to house the display counter, those in the LMB CO series of two-tone gray cabinets are particularly appealing. The prototype is housed in the CO-4A model (20 x 18 x 10cm) which required careful, dense packaging. This line of cabinetry has a convenient sub-chassis that allows all the ac wiring to lie under the sub-chassis plate. A source for LMB cabinets is Tri-Tek, Inc., 7808 N. 27th Ave., Phoenix AZ 85021. The VK8BDE Calculating FT-101 Display can be built from all-new purchased parts for about US$100. A little scavenging can reduce that figure substantially, however. Areas of cost reduction are cabinetry and point-to-point wiring to avoid wire-wrap construction. The project was conceived, designed, and built sporadically over a two-year period, allowing for some circuit refinement, and, admittedly, for economical parts acquisition. An “as-built” parts list appears in the box. My only regret is that it was not built sooner. A display counter such as this one is well worth the effort for the home-brewing FT-101 owner. Variations on the conventional design themes used are quite feasible and are to be encouraged for the adventurous experimenter. As the one and two “kilo-buck” price barriers are regularly burst by new HF transceivers, investing a modest sum and a little work to modernize the venerable FT-101 seems a rather attractive alternative. Happy digitizing!
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73 Magazine • February, 1984 33
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Strictly for FM Deviates

Ever wonder how the modulation is on your FM rig? Try this simple deviation meter and find out.

Rudolf E. Six KABOBL
30725 Tennessee
Roseville MI 48066

Unlike AM-SSB, FM modulation monitoring on most rigs simply is not available. It's unusual to see audio-modulated transmitters without some indicator to monitor modulation. The opposite is true of FM transceivers. The only indication that your talk power is too high is distortion at the receiving end.

The FM deviation meter I built can be used for monitoring modulation, frequency offset between transmitters, etc. Its most attractive features pay off when, in conjunction with an audio-frequency generator, the transmitter is bench-checked for equal deviation on both sides of the carrier, maximum deviation, and audio distortion. Amateur FM uses narrow-band FM, ±5 kHz maximum deviation from the carrier. The instrument can measure ±10 kHz deviation at 146.52 MHz, the common direct 2-meter frequency. An audio output with 750-μsec de-emphasis is available for scope monitoring. Most parts are available from Radio Shack, coils and variable cap were purchased from Radio Kit, and the crystal from Sentry Manufacturing.

The heart of the deviation meter is a 565 PLL FM demodulator listed as having a high linearity of demodulated output (0.2%). Calibration proved this out, better than 1% at the meter. The circuit uses the heterodyne method. A crystal-controlled local oscillator beats with the incoming signal and the resulting lower frequency FM is demodulated by the phase-locked loop. After filtering, a peak detector displays the maximum positive or negative frequency excursion of the incoming signal.

How It Works

The internal frequency generator starts with FET local oscillator Q2 at 14.655 MHz. The output tank circuit is tuned to the 5th harmonic; it drives doubler circuit Q1. The output is thus 146.55 MHz. The incoming signal with a carrier of 146.52 MHz and the local oscillator are lightly coupled into the mixing diode, D1, resulting in a beat frequency of 30 kHz. This signal has the modulation of the incoming signal. To minimize capacitive loading of the diode, the signal first goes through high-frequency choke L5 and
then low-pass filter L6-C24. Amplifier Q3 boosts the signal approximately 10 times.

The 565 PLL has a voltage-controlled oscillator centered to 30 kHz with C16-R13-R14. Basically, the incoming signal is compared with this oscillator and a dc voltage is generated which is directly proportional to the frequency of the input signal. As the input frequency shifts, it is this output signal which causes the vco to shift its frequency to match that of the input. The peak voltage occurs at peak frequency deviation.

This demodulated audio signal is available at pin 7 of IC1 and is connected to the low-pass filter and to the audio output jack through deemphasis network R15-C21. Low-pass filter IC2a filters some 30 kHz noise generated within the PLL. The peak-detecting circuit, IC2b, charges C23 to either the positive or negative peak, selectable with switch S1. M1 essentially shows the peak voltage across C23.

The null mode of S1 is used for adjusting the difference between the unmodulated carrier and local oscillator to 30 kHz. The output voltage from the PLL at pin 7 is a dc voltage since there is no modulation. Amplifiers IC2a and IC2b work as straightforward dc amplifiers and M1 is calibrated at 30 kHz for zero reading with R16, an offset potentiometer. During use, zero adjust is made by changing the local oscillator frequency with C9, the null control.

**Construction**

A 7" x 5" x 3" aluminum box is used for the enclosure. The oscillator is mounted on a separate board and is shielded from the rest of the circuitry. Feedthrough capacitors for power to the oscillator and the PLL input signal are used to prevent rf leakage. The shielding extends wall to wall of the enclosure; slits were filed in the box lip to let the shields slide through. Both oscillator coils were close-wound with #22 enamel wire. The top of the coil connects to the collector and the bottom end to the power supply. Tuned-circuit caps should be temperature-stable NPO discs or silver micas and are mounted at the coil with the shortest leads possible. The rest of the parts are mounted thorough the perfboard, bent over and soldered. The complete oscillator mounts on a 1.5" x 1.75" surface with 1/4"-long spacers.

The mixing diode, D1, is mounted right behind the BNC connector. C1 reaches from the oscillator board, and L5 leads the signal to the PLL circuitry. D1 works best with a minimum of parallel capacitance. The PLL and meter circuitry together with the power supply also are mounted on perfboard. The parts are soldered to flea clips and are wired at the rear with a Vector wire pencil. All variable pots face the back for easy adjustment when the instrument is out of the enclosure. The meter is shielded from all the circuitry since rf could enter through its face.

The calculated value of the resistors used in the low-pass filter are shown on the schematic. The nearest standard value is listed in the parts list. I used a borrowed LCR bridge to select C19-C22-R18-R19-R20 to within 1% of the calculated value. If this is not possible, use standard values and check the low-pass filter for flat response with an audio generator. With 1% parts, the response curve is flat to 2 kHz, drops to approximately...

---

**Fig. 1. Cable connectors.**

---

**Fig. 2. Schematic.**

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The microammeter is a 100-0-100 movement liberated from a local surplus store for $3.50. It is an accurate movement and originally came from a General Radio instrument. An off-center scale movement can be used but extra contacts will be needed on S1 to reverse the meter.

The parts are readily available. D1 is a UHF mixer diode purchased from a local Radio-TV supply firm. The negative voltage regulator and 10-turn pots are available from mail-order electronic parts suppliers. Coils, chokes, and caps are available from Radio Kit, Box 4115, Greenville NH 03048. They have a small catalog listing radio parts which are almost impossible to obtain elsewhere. Radio Shack fills out the remainder of the parts list.

**Calibration and Use**

The PLL was calibrated with an audio generator monitored by a frequency counter. A 30-kHz audio tone of approximately 40-mV pp output is fed into amplifier Q3 at R26. L6-C24 is disconnected. Pin 7, IC1 is monitored with a dc voltmeter and R14 is adjusted to a point where there is no change in voltage between the audio tone connected and disconnected. This establishes the internal vco of the PLL at 30 kHz. Switch S1 is turned to center position, or null, and R21 is adjusted at approximately the midpoint of its resistance range. M1 is now adjusted for zero, or null, with R16.

---

**Parts List**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>24V power-on indicator</td>
</tr>
<tr>
<td>C1</td>
<td>3.3-pF disc</td>
</tr>
<tr>
<td>C2</td>
<td>5 pF (May)</td>
</tr>
<tr>
<td>C3</td>
<td>50 pF be</td>
</tr>
<tr>
<td>C4</td>
<td>15 pF disc</td>
</tr>
<tr>
<td>C5</td>
<td>33 pF NPO</td>
</tr>
<tr>
<td>C6</td>
<td>25 pF or</td>
</tr>
<tr>
<td>C7</td>
<td>100 pF silver mica)</td>
</tr>
<tr>
<td>C8</td>
<td>1.8-8.7-pF air variable, null control (Hammarlund MAC-10 or equiv.)</td>
</tr>
<tr>
<td>C9</td>
<td>5-pF disc, NPO, or silver mica (see text)</td>
</tr>
<tr>
<td>C10</td>
<td>500-pF disc</td>
</tr>
<tr>
<td>C11</td>
<td>100-pF feedthrough capacitor</td>
</tr>
<tr>
<td>C12</td>
<td>.0022 µF</td>
</tr>
<tr>
<td>C13</td>
<td>1000 µF</td>
</tr>
<tr>
<td>C14</td>
<td>.01 µF (see text)</td>
</tr>
<tr>
<td>C15</td>
<td>.01 µF (see text)</td>
</tr>
<tr>
<td>C19</td>
<td>1% F, 16-V dc tantalum or electrolytic</td>
</tr>
<tr>
<td>C20</td>
<td>.0022 µF (see text)</td>
</tr>
<tr>
<td>C21</td>
<td>1% F, non-polarized electrolytic</td>
</tr>
<tr>
<td>C22</td>
<td>.003 µF</td>
</tr>
<tr>
<td>C23</td>
<td>.02 µF</td>
</tr>
<tr>
<td>C24</td>
<td>.1 µF disc, mounted at meter terminals</td>
</tr>
<tr>
<td>C25</td>
<td>.25-pF disc</td>
</tr>
<tr>
<td>C26</td>
<td>.220 µF, 25-V dc electrolytic</td>
</tr>
<tr>
<td>C27</td>
<td>.05-pF disc</td>
</tr>
<tr>
<td>C28</td>
<td>4.7-µF, 16-V dc electrolytic</td>
</tr>
<tr>
<td>C30</td>
<td>.004 diode (EGC 112)</td>
</tr>
<tr>
<td>C31</td>
<td>1N84 diode (EGC 112)</td>
</tr>
<tr>
<td>C32</td>
<td>1N914 or equiv.</td>
</tr>
<tr>
<td>C33</td>
<td>1A-50-pv bridge rectifier</td>
</tr>
<tr>
<td>C34</td>
<td>6-V zener diodes 1N4735</td>
</tr>
<tr>
<td>L1</td>
<td>4½ turns, 122 enamel wire close-wound on J.W. Miller 20A400-4 core</td>
</tr>
<tr>
<td>L2</td>
<td>7 turns, 122 enamel wire close-wound on J.W. Miller 20A400-4 core</td>
</tr>
<tr>
<td>L3</td>
<td>100 µH rf choke (J.W. Miller 74F104A1)</td>
</tr>
<tr>
<td>L4, L5</td>
<td>1.72-µH rf choke (J.W. Miller RFC-144)</td>
</tr>
<tr>
<td>L6</td>
<td>2-mH rf choke (J.W. Miller 4666)</td>
</tr>
</tbody>
</table>
Vary the audio generator above and below 30 kHz and note the meter movement. An increase in frequency should show an increase in meter movement, a frequency decrease, a decrease in meter movement. If it is the reverse, interchange D2-D3 wires to S1.

Set the audio generator at 35 kHz and adjust the meter reading to 5 kHz with R21. Turning S1 to + deviation should not have any effect on the meter reading. Conversely, adjust for 25 kHz and note a negative meter reading of 5 kHz in null, or −, deviation. Slowly decrease the frequency to 20 kHz. The meter should come close to 10-kHz deviation and then suddenly return to zero. The PLL has lost control at that point.

Set the audio generator 1 kHz below the point the PLL loses control and now slowly decrease the input voltage. Again at some input level the PLL will lose control. Carefully note this voltage; it is the minimum voltage required to give full-scale indication. It could be as low as 5-mV p-p. For reliable operation, the voltage from the mixing diode, D1, should be at least four times this minimum level. I checked the meter in 1-kHz steps and found the calibration better than 1%.

Reconnect the L6-C24 filter to R26 when the calibration is completed. The local oscillator is tuned up by first turning the tuning slugs all the way in. R26 is monitored with a dc voltmeter, and L2, L1 is tuned for a peak reading of approximately ¾ volts dc. Make sure the output is the 10th harmonic or 146.55 MHz, with a wavemeter or such, and not the 11th or 9th harmonic.

The transceiver is now connected to the dummy load with a T connector. Attach the special cable and tune the transceiver to 146.52 MHz direct. Set C9, the null control, at half capacitance. Attach a scope to resistor R26. The scope, during transmit, should display a sine wave of approximately 40-mV p-p amplitude and a frequency above 30 kHz. A value of 5 pF for C10, installed across C9, should bring the frequency to about 30 kHz. The idea is to have C9 in the middle of its operating range.

At this point, we are ready to try measuring deviation. I tested a 10-Watt unit and a 2-Watt hand-held in high and low power. With the deviation meter switched to null, push to transmit and zero the meter with the null control. Turn to + deviation and hum loudly into the microphone. The meter will show maximum positive deviation. Turn to − and repeat for negative deviation. The reading should be the same, and at 5 kHz.

---

Q1  MPS 918
Q2  MF 102
Q3  2N3904 or equiv.
C1  LM565 PLL
C2  1458 dual 741
C3  LM340T12
C4  LM7912CT
R1  470-Ohm, ¼-Watt resistor, 10%
R2, R10  1k
R3, R17  10k
R4  150k
R5, R6  100
R7  33k
R8  8.2k
R9  6.8k
R11, R12, R13  4.7k
R15  15k
R22  47k
R23  100
R24, R25  390
R14  5k 10-turn pot, PLL frequency adjust
R16  5k 10-turn pot, meter null adjust
R21  20k 10-turn pot, meter calibrate adjust
R18  10k (see text)
R19  8.2k (see text)
R20  4.7k (see text)
T1  24-30V-ac c-t transformer
Xtal  14655.00-kHz crystal (parallel resonance, 32 pF)
Chassis  BUD AC-429
S1  SP-3T miniature rotary switch
S2  DPDT miniature toggle switch
J1  BNC connector, chassis mount, female
J2  1/8" miniature phone jack
M1  100–0–100μA dc meter*

*Fair Radio lists several 0–50μA or 0–100μA movements. Meter-reversing switch arrangement is needed. Switch S1, Radio Shack 275-1386, can be used.

Photo C. Right side—the internal frequency generator. C1, D1, and L5 are shown connected to the BNC connector. L4 at the left top supplies power through feedthrough C13. The molex connector at the bottom connects to the transformer.
Build a Better Hamfest

These hints from 25 years of experience will help make your event a success.

After over a quarter of a century of hamfest attendance as a spectator, retail exhibitor, manufacturer, and hamfest committee member, I have been asked numerous times to put down a few thoughts as to what I and other exhibitors liked and disliked. I will comment mostly from the point of view of exhibitors, as they probably have the least input to a hamfest committee.

Every committee wants to do the very best job, and most put in lots of effort and time with the very best of intentions. I can remember several hamfests that really bent over backwards to give the exhibitors maximum exposure to the public. We could set up all day Friday, open the exhibits Friday night, 6:00 to 10:00 pm, open Saturday, 8:00 am to 6:00 pm, have a Saturday night party, and be open on Sunday from 9:00 am to 5:00 pm.

The committees in these instances really did mean well and had good intentions, but if an exhibitor has to fly in or drive many hours Friday to set up, the last thing he needs is to open the exhibit area Friday night. He is ready to collapse for awhile and get ready for Saturday and/or Sunday. After all, he probably worked the last 5 days also. Saturday 9:00 am to 3:00 or maybe 4:00 pm is enough for one day of standing around trying to be alert and cheerful!

Several hamfests have a Saturday night cocktail party with a free bar for the first hour for the exhibitors only, then open it up for the rest of the attendees with a cash bar. This has worked quite well in most cases and is certainly a good way to show appreciation to the exhibitors. And best of all, key members of the committee can be there to get information as to what the exhibitors like and dislike about the hamfest and get suggestions of how to make next year's better.

Now here is something which could be very important. A few small exhibitors may have only one person in the booth and it is very difficult for them to take coffee or rest breaks. Some hamfests have local Boy or Girl Scouts or C.A.P. squadron members to help out. Such local community groups often are looking for things to do and would be happy to help man a booth and watch things for a few minutes—or go and get coffee, donuts, or a sandwich.

Some committees arrange to have coffee and donuts for the exhibitors and bring them to the booth or have it available in a central location; some even have a room where exhibitors can sit down and relax for a few minutes.

I certainly do not mean to imply that all or any committees should do all of the things mentioned here. They are things that I have observed over the years and are meant only as food for thought. And some of these ideas are more important than others. For example: It would be a very useful and desirable thing if all hamfest organizers provided some means for exhibitors to be reached in an emergency situation. A telephone situated in the display area or, at the very least, near the PA system would be one possibility. Another possibility would be a telephone located near the person who is running the radio talk-in operation. Perhaps both locations could be covered. In any case, there have been emergencies at almost all hamfests where exhibitors had to be reached quickly. Some thought should be given to this problem.

Hamfest Dates

There are times when it is difficult or impossible to coordinate your event with others on the same date. You could be locked into a date by the facilities that you use. Last year there were several hamfests that had the same dates as others that we wanted to attend as exhibitors. I am sure that situations like this will continue as it is very difficult to arrange no-conflict dates. It helps, however, if you get your date out and announced ASAP. Keep plugging this date in publications and on the air if it is a large affair that you want the big manufacturers and dealers to attend. Make sure that they know the date of the next one ASAP after the last one. Some commitments (such as ARRL national conventions) are made more than a year in advance by exhibitors.

Security is a major concern with many exhibitors, and rightly so since some have many tens of thousands of dollars worth of equipment on display. During setup times, I have observed many people walking around convention areas without benefit of any ID (committee, exhibitor, or general public). I think this is a real no-no, for two reasons. First, when you are trying to set up your area, the last thing you need is a distraction, especially by curious committee members or
other exhibitors who probably are not customers. They may mean well, but as I said before, an exhibitor may have left before the chickens got up that morning and perhaps drove or flew many hours before arriving for a weekend hamfest. He may also have worked the week before and maybe the last several weekends in the hamfest season.

Second, it seems that over the last few years the need for more and better security has increased drastically. I'm not sure why; maybe it's just the economy, or maybe, with our lack of ability to enforce our laws and prosecute shoplifters, more people are willing to take a chance. Anyway, could it be time to need a bill of sale on your person for your new-looking HT as you walk in and out of the exhibit area? Time for a bill of sale for any package, box, or equipment that you carry in and out of the exhibit area? I certainly hope not, but the Consumer Electronics Show and others have had to take this approach, with guards on the doors doing briefcase inspections, etc.

Last year I went to numerous hamfests that had equipment stolen right off displays during show hours. At the Cedar Rapids national ARRL convention last summer, a sharp-eyed and concerned attendee witnessed an HT slide off a display and into the wrong person's possession. He reported it to the exhibitor who immediately gave chase and ran the person right into the arms of a policeman. I don't know if there was a prosecution or not, but the name and call of the individual were known by a lot of exhibitors in very short order.

In your flyers or exhibitor packages, a map of your location with respect to the local airport, expressways, and major landmarks is certainly nice—along with approximate times and mileage from them. A list of local motels, hotels, and nice restaurants along with any 800 numbers and local numbers, rates, and specialty menus would make it easier for a stranger to make a choice to meet his needs or desires. Quite often, you can arrange a block of rooms, especially in a dead season, and you can really get a price break.

SAROC used to hold its convention the first week after New Year's Eve—the slowest weekend in Las Vegas—and got super room and exhibit-area rates. (Now CES has taken this time slot for the very same reasons.) So don't overlook the expensive convention areas if you can use them in their slow times; a little income for them is better than zero. But be careful of union-contract areas. The exhibit area may be inexpensive, but the electricians and dray people may turn out to be very expensive.

An absolute must for good rapport with the commercial exhibitors is a thank-you-for-coming letter sent no later than 30 days after the hamfest. It also gives you the excellent opportunity to include a questionnaire. How did you like the hamfest? What could stand improvement? What services or functions would you like to see added or dropped? Was there anything exceptionally good or bad? Did you like the location and facilities? The list can go on and on.

If you use a form letter that requires only a check mark (✓) for yes or no and includes space for comments, you will get a better response. If you ask only for written comments, don't expect very many to answer you. Make it easy for the busy exhibitor to respond.

It is certainly appreciated when at least one person from the committee takes time and comes around once or twice, minimum, to each booth and asks if there is anything needed or wanted to make it a better show. Such visits should not interrupt a sale or a serious conversation. Committee members should wear some kind of ID to let exhibitors know who they are. And they should try to talk with the boss, if possible; all such good efforts might be for naught if only the hired help is seen when the boss might have something he feels is important to chat about.

Make sure, in all correspondence to exhibitors, that there is a phone number, name, and address of a responsible person who can make commitments for the event or at least will follow up with a prompt response. If you have a large event, supply a committee list of chairpersons complete with phone numbers and addresses and their responsibilities.

Booth fees at some events are negotiable, and at some they are not. Almost all hamfests need door prizes that have to come from somewhere, and trading for them with booth space is probably one of the best ways to stretch a hamfest budget. I think that most dealers or manufacturers would rather trade merchandise than pay cash for a booth. There are bookkeeping problems on both sides sometimes in doing this, so play this one by ear to satisfy both sides.

In conclusion, I'd like to add that hamfests are fun for all concerned, and a little more attention to some of the details can turn a mediocre hamfest into a spectacular show satisfying to exhibitors, committee members, and hams alike. I hope that some of these ideas and comments will help your hamfest become the most successful and talked-about one this year and for years to come.
Caveman Radio

With underground inductive transmission, 300 feet is almost DX.

Magnetic-induction equipment which transmits signals through the ground is a valuable aid to cave-mapping and underground rescue. Even more useful than its communication ability is its ability to accurately find a spot on the surface above an underground transmitter. It can also determine depth within a few percent, using field-geometry measurements.

It's legal! Magnetic induction is not real radio—it's simply very-loosely-coupled transformer action. The FCC does not define equipment operating below 10 kHz as "radio frequency devices."

How It Works

Inductive communication is a very old technique (see "Who Really Invented Radio?—The Twisted Tale of Nathan B. Stubblefield," 73, December, 1980). When amateur radio was banned during World War II, many hams communicated by "ground wave," i.e., magnetic induction and earth-current. ("Earth-current" is transmission of audio-frequency signals through the ground between pairs of widely-spaced ground rods connected to amplifiers.) Ranges greater than one mile were claimed.
Skin effect, which causes rf currents to travel only on the surfaces of conductors, normally prevents radio waves from penetrating ground or water more than a few feet. The depth of the "skin" increases as frequency is lowered; thus, submarines can receive transmissions from very powerful VLF stations. Experimenters have reported successful cave-to-surface communications on 160 meters. Others report positive but unpredictable results on higher frequencies.

Audio-frequency magnetic fields penetrate most geologic structures easily. There are methods for locating ore bodies, using magnetic-induction equipment as a sort of giant metal-detector (see QST, June, 1928).

Inductive communication is inherently short-range because magnetic dipole field strength decreases as the cube of the distance from the source, unlike radio waves which obey an inverse-square law. Conductive overburden will absorb the signal, but the inverse-cube attenuation is so predominant that absorption is rarely noticeable. Generating true radio (electromagnetic) waves at audio frequencies would require enormous antennas.

E. R. Roeschlein suggested using the directional properties of magnetic fields to map caves in an article in Electronics, September 23, 1960. Cavers, notably William Mixon and Richard Blenz, refined the equipment and developed depth-measuring techniques which are independent of signal strength (several articles appear in Speleo Digest, 1964).

**Equipment**

It's easy to get 300-foot range with very simple equipment. Longer ranges are more challenging.

A transmitter is just an audio oscillator driving an amplifier which is driving a coil. Impedance matching is important for maximum coil current. Perhaps the most important part of the transmitter is the keyer—a circuit to make it go "beep... beep... beep." In addition to the advantage of saving battery power, a pulsed signal is much easier for the receiver operator to distinguish against a background of interference than is a steady tone.

A simple resonant coil connected to an audio amplifier will work for a receiver. Use crystal earphones, because magnetic phones will cause feedback.

The circuit of Fig. 1 is a Q-multiplier. The resonant circuit is in negative feedback instead of being simply connected to the amplifier's input. The Q (regeneration) control taps some of the output and feeds it back to the noninverting (+) input. The amplifier forms a negative resistance which cancels the resistance of the coil. As the Q control is advanced, sensitivity and selectivity get higher and higher until the circuit goes into oscillation (infinite Q). Since it will oscillate, the circuit can also be used as a very-low-powered transmitter.

A 60-Hz notch filter will not get rid of power-line

---

**Fig. 1.** One-chip transceiver uses Q-multiplier effect for high sensitivity and selectivity. Antenna needs no electrostatic shield. U1 is any 741-type op amp.

**Fig. 2.** Receiver with frequency conversion allows very high gain without feedback problems.
interference, which is not just 60 Hz but many harmonics. Don't use active filters indiscriminately. Very strong interference can intermodulate with the desired signal in an active filter, creating even worse interference.

Even with crystal earphones, receiver gain cannot be increased indefinitely. After a certain point, no amount of shielding and decoupling will prevent feedback. You can keep the antenna far from the amplifier, but then it's not portable. A balanced mixer and local oscillator can convert the input frequency to some other frequency, which can then be filtered and greatly amplified without feedback problems. Fig. 2 is a block diagram of one such receiver.

**Interference**

Power lines are the major source of interference, even in isolated areas. Harmonics of 60 Hz extend well into the ultrasonic frequencies. Power-line interference is usually directional and can be partially nullled out by the receiving antenna. To minimize interference, choose an operating frequency in between a pair of power-line harmonics and use a receiving filter narrow enough to reject the adjacent signals. Resonant-reed or tuning-fork filters of the type used in radio pagers can provide the necessary selectivity. Such extremely narrow bandwidths require precise frequency control and very slow CW speeds.

Atmospheric noise from distant thunderstorms can be a problem in summer. Daytime atmospheric noise is minimal around 3.5 kHz (National Speleological Society Bulletin, vol. 32, no. 1, January, 1970). The noise level increases appreciably after dark. Atmospheric noise is polarized such that it nulls when the receive coil is horizontal.

What's the best frequency to use? Mid-range audio frequencies work well, and the equipment is easy to build. I use 3500 Hz. 3276.8 Hz would be a good frequency because it is easy to generate from a 32.768-kHz wristwatch crystal. 3276.8 Hz falls in between harmonics of both 50- and 60-Hz power lines, and so could be used in any country. At higher frequencies, ground absorption increases and audio amplifiers become less efficient. Some experimenters have tried SSB on ultrasonic frequencies, but have found no advantages to justify the complexity of the equipment. Below 2 kHz, atmospheric noise and power-line harmonics are very strong. Subaudible frequencies below 60 Hz have been used, with very complex receiving equipment.

The OMEGA navigation system transmits very strong signals on several frequencies between 10 and 14 kHz. OMEGA stations make good beacons for testing receivers. Each station transmits for one second in a sequence that repeats every ten seconds.

**Antennas**

For best performance, maximize the magnetic moment of the coils. Magnetic moment is Ampere-turns multiplied by the coil's area.

Doubling the range of an inductive system requires an eightfold increase in magnetic moment, other factors being constant. Self-resonance limits the number of turns a coil may have. An eightfold increase in current implies either much larger wire or a 64-fold power increase. It's easy to see that

Surface location and depth of transmitter are found by null-seeking with a directional antenna and by measuring shape of magnetic field.

---

**Fig. 3.** A cave-radio transmitter. Precise frequency control is necessary if receiver uses very-narrow-bandwidth filters.

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**Fig. 4.** Surface-to-cave transmitter uses large antenna and high power, so that underground equipment can be small. Surplus 400-Hz transformers are very cheap or free because there is little demand for them. (Caution—possible shock hazard between chassis and earth grounds if amplifier has no internal output transformer.)
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KSR-4300 FM MOBILE 50W,11 MEMORY $320.00
SOUTHCORE PCS-100 FM HANDHELD 1W 8 MEM. $85.00
TEMP. B-107 S-15 WITH 1K UV TONE PRO $229.95
(Continued)

2 METER HANDHELD ACCESSORIES
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HT-BAT SPARE BATTERY FOR PGR-4000 $24.95
ST-200R SPARE BATTERY FOR ST-14 $24.95
ST-14 LEATHER CASE FOR ST-14 $24.95
SL-15 AC QUICK CHARGER FOR S-15 $57.95
SL-15 LEATHER CASE FOR S-15 $50.00
(Continued)

2 METER BASE ANTENNAS
BUFFET ANT. 1/4 SWAVE TRIBOWNE $29.95
BUFFET ANT. 3/8 SWAVE SUPER TRIBOWNE $34.95
CUSHCRAFT AR-210 BASE 20W AMPLIFIER $99.95
CUSHCRAFT AR-11-11 ELEMENT BEAM $44.95
CUSHCRAFT AR-327-30 ELEMENT BEAM $67.95
CUSHCRAFT AR-329-30 ELEMENT BEAM $67.95
CUSHCRAFT AR-329-30 WITH WIDE BAND $81.95
(Continued)

2 METER MOBILE ANTENNAS
AMAREX AP-151-36 1/2 SWAVE ON AIR HANDLE $29.95
AMAREX AP-141 TRUNK MOUNT TRIBOWNE $29.95
AMAREX AP-141 TRUNK MOUNT SUPER TRIBOWNE $39.95
HUNTER BH-144 1/4 SWAVE NARROW BAND $27.95
HUNTER BH-144 1/4 SWAVE WIDE BAND $27.95
VALVO VA-4 PM 2006 WIDE BAND $27.95

2 METER AMPLIFIERS
MICRO BM-200F SSB 2W IN 90W OUT $75.00
MICRO BM-90F SSB 3W IN 90W OUT $75.00
SOUTHCORE BM-90F SSB 3W IN 90W OUT $75.00
VJ PROD. W-1A FM/SSB 2W IN 90W OUT $129.95
VJ PROD. L-45 PM 2006 WIDE BAND $27.95
TEMP. B-530 FM 2W IN 90W OUT $79.95

HF/10M/6M RADIOS
TENTEC AMBRY 100W SSB/CW, 10-600M $510.00
TENTEC AGENT 2000 SSB/CW, 10-1600M $999.00
TENTEC 165W VERTICAL 1600M $999.00
ADEN PCS-4900 600M WIDE 16 MEM. $279.95
KENWOOD TM-200 ALL MODE RF OUTPUT $550.00

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BUFFET HF-10-20M & 30M VERTICAL 105-72
BUFFET HF-320 30M VERTICAL 105-72
CUSHCRAFT AR-6 1-20M TRAP VERTICAL $47.95
CUSHCRAFT AR-8 1-20M TRAP VERTICAL $47.95
CUSHCRAFT AR-10-1-20M TRAP VERTICAL $47.95
CUSHCRAFT AR-15-30M TRAP VERTICAL $47.95
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3 Magazine • February, 1984

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the brute-force approach soon reaches limitations.

For a given length of wire, the optimum antenna is a single huge circular turn. Very large loops are OK for fixed locations, but coils for direction-finding must be rigid, flat, and portable. Transmitting coils must be small enough to fit through tight cave passages. In any case, the easiest route to long range is with coils of the largest manageable diameter. Build a transmitter of a few Watts, carefully match it to the coil, and concentrate the rest of your effort on a good receiver.

Ferrite-core antennas should perform well if properly designed. Ferrite cores can introduce problems of temperature instability, microphonics, and magnetic saturation. Doug DeMaw's recent book, Ferromagnetic-Core Design and Applications Handbook, published by Prentice-Hall, is an excellent reference.

Nathan B. Stubblefield may have discovered the interesting interaction between the magnetic-induction and earth-current modes of communication: Current injected into the ground between a pair of widely-spaced rods flows around a large underground area, creating a large magnetic moment. An inductive receiver will detect the signal. Likewise, a pair of ground probes can detect voltage induced by a distant current-carrying coil. Some cave-radio experimenters have built equipment which operates in either mode, allowing greater flexibility in varying conditions of ground conductivity.

Voice Operation

My own equipment was designed primarily for direction-finding and minimum weight. It can transmit from cave to surface by CW, but it does not transceive. Two-way communication is not essential for surveying operations, but it can be very useful. (People who don't know Morse code can usually send it intelligibly if provided with a code list and a few minutes of instruction on lengths of dots, dashes, spaces, letter and word spacing, and abbreviations.)

For a “downlink” I use a 12-volt-operated, 100-Watt police siren/PA amplifier driving either a large loop of wire lying on the surface or a pair of ground rods. A surplus 400-Hz variable autotransformer matches the amplifier to different loads. The underground voice receiver has a ferrite-core coil connected to an audio amplifier through a high-pass LC filter which cuts off at 600 Hz, with 70 dB of rejection below 300 Hz. The filter rejects the strongest power-line harmonics. A band of voice energy called the first formant is lost, resulting in loss of the qualities that distinguish individuals’ voices, but intelligibility remains. The female voice works best here.

Magnetic Direction-Finding

Someone must take the transmitter into the cave to the point of interest and turn it on at an appointed time. The transmit coil must be horizontal and very accurately level.

Received signal strength depends on how much magnetic flux passes through the coil. With the plane of the coil parallel to the field, no

Receiving antenna has inclinometer made from vernier radio dial and spirit-level for measuring vertical angles.
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figured depth of transmitter.

Finding Depth

The receiver antenna should be mounted on a rigid, flat board or framework and must be equipped with some type of inclinometer, such as a carpenter’s protractor. Estimate vertical angles to the nearest 1/10 degree when taking data for depth.

Mark ground zero with a stake or rock. Stretch a measuring tape horizontally away from ground zero and measure the vertical angle of the field at several different distances away. Use the distance-and-angle data in the calculator formula above or plot the data on the family of curves in Fig. 8. Average the results of several pairs of data. The depths should be consistent, falling near the average value and randomly either side of the average. An increasing or decreasing trend indicates an error in ground zero location or an unlevel transmitter coil. Most of the error can be recovered by taking another set of data in the opposite direction away from ground zero and averaging the results of both sets.

Note that the slope of the depth function (Fig. 8) is very steep for small angles, i.e., a small error in measuring the angle will produce a large depth error. For best results, use only angles between 12° and 75°. (At vertical angles

CALCULATOR METHOD

Finding depth by calculator is fast, easy, eliminates plotting errors, and provides wider range than the graph. (The graph still has the advantages of low cost and easier error detection.) A programmable pocket calculator with nonvolatile memory, such as the Hewlett-Packard HP-29C, is ideal for calculating depth while on location.

HP-29C Program for Depth of Cave Radio

Equation solved for depth:

\[ D = \frac{L(3 + \sqrt{9 + 8 \tan^2 \theta})}{4 \tan \theta} \]

\[ 0^\circ < \theta < 90^\circ \]

Example: \( L = 50', \theta = 45^\circ \): Depth = 89.04'
near and greater than 90°, the null is less distinct and, of course, the signal is weaker at greater distances from ground zero.)

The depth chart (Fig. 8) derives from the formula:

\[ \tan \theta = \frac{3D(2D^2 - L^2)}{L} \]

where: \( \theta \) = angle of field (measured from vertical = 0°), \( L \) = horizontal distance from ground zero, and \( D \) = depth. The formula is an approximation which assumes that the transmit coil is very small relative to depth.

Note that the closed curves of the magnetic field are ellipses, not circles. Simple triangulation cannot be used to determine depth (\( D = L \) when \( \theta = 71.57° \), not 90°). An 8 1/2" x 11" working copy of the depth chart is available from the author for an SASE.

The Future

Extending the range of underground communication makes a fine project for hams, especially VLF enthusiasts. Experiments on 1750 meters should be especially interesting.

Correlation, signal-averaging, and other sophisticated techniques for weak-signals are becoming increasingly attractive to amateurs with new developments in integrated circuits. Very-long-range cave radio could, of course, be accomplished by interfacing short-range cave-to-surface links with conventional amateur radio equipment. Future technology may allow communication through the entire Earth on modulated beams of neutrinos!

---

The National Speleological Society is an organization promoting safety and conservation in the sport and science of cave exploring. Their address is Cave Avenue, Huntsville, Alabama 35810.

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73 Magazine — February, 1984 53
Here's the Split-Second Timer

In the darkroom or the shack, this beeper has 1001 uses. Its simplicity makes it the perfect beginner's project.

Editor's Note: This article, although not exclusively amateur radio oriented, so impressed us at 73 that we are presenting it here. The author has come up with a nifty audible clock circuit. The timer could be used in a photography darkroom, as suggested by the author, or in the ham shack to time your exposure of circuit boards. The timer is simple enough to build as a first-time project. We hope you enjoy this project as much as we did.

Like many hams that I've talked to, I have a second and maybe more expensive hobby—photography. Inflation has made my photo darkroom even darker with paper costs climbing to over 25 cents a sheet. Chemicals spiral upward along with paper prices while freelance jobs dwindle. The result is that I'm very money-conscious each time I open my bright yellow box of printing paper. I even scrawled "25¢ a sheet" on top of the box, but that didn't seem to cut back on the mountain of wasted paper.

With rising paper costs in mind, I decided that the cure might be a new darkroom timer. Too many prints ended up in the wastebasket because of bad dodging and burning. What I needed was a timer that would help me be more accurate, print after print. But the new digital timers cost more than I was willing to spend.

My old mechanical timer worked fine as long as I left...
it set on one particular time. The problem crept in when I needed to reset the timer to a new time to burn in part of the print. When I returned the pointer to the original time to make another print, that new print never looked the same as the first print.

Enter Bruce WA3PTU

I talked over my problem with Bruce Long WA3PTU. We reasoned that an audible beep sounding each second coupled to my present timer would permit me to set the timer for, say, 10 seconds and then never move it again. To add or subtract printing time would be easy. All I would have to do would be to count the seconds that ticked by, then block the enlarger’s light path with my hand when the correct time was reached.

Dodging and burning prints could be done more accurately since I would hear the passing seconds as I worked over each print. All that was needed was an inexpensive add-on beeper (and, of course, the circuit from WA3PTU).

I built the beeper for about $11. The handful of parts came from the local Radio Shack store and fit into a plastic box. Calibration was simple using only my wristwatch. The beeper was interfaced with my darkroom timer by plugging it into a cube tap shared with my photo enlarger. The add-on beeper has made darkroom life more enjoyable and cost-efficient—so, let’s build one.

How It Works

The beeper is simple. A piezo buzzer sounds each second that the enlarger lamp is on. Line voltage is also routed to the add-on beeper through a cube tap. That line voltage turns on a 2N2222 transistor switch in the beeper. The 2N2222 switches on the 555 timer circuit by grounding an internal 9-volt battery. When the mechanical darkroom timer shuts off the line voltage, the enlarger lamp and the beeper turn off, for practical purposes, simultaneously.

Part of the 555 timer circuit was borrowed from Don Lancaster’s TTL Cookbook. I won’t repeat Lancaster’s very complete description of why the circuit works. All that’s necessary is to note that the combination of R1 and C1 produces a beep about 1 second long. The 5k pot adjusts the beeper’s volume.

The 500k pot calibrates the timing cycle. This pot is carefully adjusted until 61 beeps are timed in 60 seconds. That’s right, 61 beeps. When the enlarger lamp and the beeper are first turned on, a beep sounds. That’s the extra beep. I really wasn’t sure that I could live with that first beep coinciding with the enlarger lamp turning on. Now, after 7 months of use, I expect that first beep and compensate for it. Look at it this way: When you have 20 identical prints to make of the family reunion, it doesn’t matter if you remember 5 beeps or 6 beeps as the time for burning in Aunt Lydia’s face. What counts is that you consistently give her face that same extra exposure on each of the 20 prints if you don’t want to waste paper. Whether or not you count that extra first beep is your decision.

Building the Beeper

Now let’s build the beeper. My beeper shown in the photos was built on a printed circuit board. However, a 2" x 2" square of perfboard or an etched and drilled Radio Shack IC board, catalogue number 276-024, makes construction simple. The important thing is to make certain that you assemble the parts in an all plastic box. That’s a plastic box with a plastic panel. Do not substitute any of the multitude of boxes available with aluminum panels. The 110-volt-ac line is quite safe as long as it remains isolated inside the case. Aluminum panels could provide a dangerous path outside the box.

The circuit board and battery are friction-fit inside my case. Don’t use metal screws to fasten the board to the box because of the shock hazard. Instead, glue the battery and board to the case with a few well-placed drops of silicone rubber cement.

A word about parts. No, I don’t manage a Radio Shack store or have stock in Tandy Corporation. The parts list has Radio Shack catalog numbers to help beginning builders. I’m certain that these commonly available parts can be found in most any ham junk box. Parts layout isn’t critical, either. Observe the polarity of the piezo buzzer. The schematic is marked to show placement of the red and black leads.

Operation

I included a switch to turn off the beeper while focusing or composing under the enlarger. When you are ready to make that first print, turn on the beeper. Set the mechanical darkroom timer for your average printing time. I’ve standardized on 10 seconds. Never move the mechanical timer off the time you selected—in my case, 10 seconds. If you have a dense negative and must burn in parts of the print, simply press the mechanical timer’s button again for another 10-second cycle and count off the extra time. You will probably find that the old mechanical timers are sufficiently accurate when used this way. Inaccuracies creep in when changing the time setting back and forth. For this reason it is much more accurate to set the timer and print as I described than it is to print for 10 seconds then reset the timer for another 5 seconds to burn in part of the print. Consistent dodging can be done by counting the beeps as you hold back underexposed parts of the negative.

Consistency and repeatability result from using the beeper and the “hands-off-the-timer” method. If you don’t believe me now, wait until you finish that print order of 20 reunion pictures. Aunt Lydia will look the same on each print—guaranteed.

An Extra Added Bonus

Now that you’ve built the add-on beeper and love it, let’s take it out of the darkroom. Remember that picture you tried to take last December of the Christmas tree and lights after dark in
### Parts List

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Total $11.62

Catalog numbers from 1982 Radio Shack Catalog No. 354.

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This page appears to be an advertisement for BUTTERNUT ELECTRONICS. It contains listings of various computer accessories, including filters, transistors, and other electronic components. The ad also mentions a complete filter kit for $60 and lists various models and their prices. The footer includes a call to action to contact Westcom for further information. The page number and a list of advertisers are also mentioned. The text seems to be a mixture of marketing and technical specifications, typical of a catalog or advertisement for electronic components.
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Peak Your Picture With Home-Brew SSTV Test Gear

Go from gray scale to color bars with these simple generators. No monitor should be without them.

In my spare time I enjoy viewing slow-scan television on my home-brew monitor and like to keep up to date with advances in this field. Also, I enjoy designing with all types of integrated circuits, CMOS in particular. Thus, I have combined these two interests into the two projects described here. Each generator has nine ICs and few other components and both can be built for well under $100.

The SSTV gray-scale generator is used as a standard to adjust brightness and contrast levels on commercial slow-scan monitors and to peak sync and bandpass filters on home-brew equipment. It also can be used to check repairs or modifications on any monitor.

In addition to the above-mentioned operations, the SSTV color-bar generator is useful when selecting red, green, and blue filters for color slow-scan photography. It provides a pattern with these colors plus mixtures of them into blue-green, violet, yellow, and white.

Gray-Scale Generator

The MM5369 is a crystal-controlled oscillator providing a square wave at 3.58 MHz. This signal is divided by a factor of 10 through each of the 4017 dividers. A 35.8-kHz signal is present on pin 9 of the 4520 binary divider. A binary code is fed into the 4514 decoder.

Meanwhile, the 4069 clock provides a 240-Hz square wave to pin 1 of the other binary divider in the 4520 package. Here, the binary-coded output selects one of the 16 available input pins from the two 4051 digital selectors and passes reset information from the 4514 decoder through pin 3 of both 4051 ICs to the reset pin (pin 15) of the first binary divider.

Fig. 1. CMOS SSTV gray-scale generator.
As the 16 input pins are swept through (top to bottom on the schematic), the 35.8-kHz frequency is divided by factors of 15, 12, 10, 9, and 8 respectively. This will constitute one scan line on the monitor. The 4024B takes frequencies from the "0" pin (pin 11) of the 4514 and divides all by a factor of two. The result is an SSTV gray scale with frequencies within one percent of 1200, 1500, 1800, 2000, and 2250 Hz. All are 50/50 duty-cycle square waves so gray-scale shades will result only from changes in frequency. The only adjustment necessary is horizontal sweep speed.

Color Bars for SSTV

The same general operation of the gray-scale generator can be redesigned to give us the three frame patterns necessary to produce, photographically, a slow-scan color-bar frame. We start again with a 3.58-MHz oscillator and divide by a factor of 100, this time in a single 4518. A 35.8-kHz signal is fed to pin 9 of the 4520 and a binary-coded output is available at the address inputs of the 4514. Also, a clock frequency of 120 Hz is provided at pin 1 of the 4520 and a binary code is presented to a single 4051.

The action of the 4051 and the two sections of the 4053 can be described as switches in series. Binary data on address pins 9, 10, and 11 of the 4051 and control pins 9 and 10 of the 4053 will route data from the 4514 pins 15, 14, and 18 to pin 15 of the 4520. The timing of these connections will produce horizontal and vertical pulses as well as full cutoff and saturation (black and white) bars when viewed on the monitor. When looking at the three frame patterns, one can see a relationship forming between the width of the bars and the square-wave frequency at the RGB select switch.

A 555 timer is used as a 98/12 duty-cycle clock to control pin 10 of the 4053. This clock and the bottom 4053 switch provide a vertical sync option for the generator. For about two scan lines worth of time, the generator will produce a 1200-Hz tone. The monitor will look at this tone as a vertical sync pulse.

The 4013 is a divide-by-two stage that operates identically to the 4024B in the gray-scale generator. The output inverter is not necessary if one has a "B" series 4013 device.

Going Further

The heart of these audio-tone generators can be a good starting point for other projects. Add a memory (ROM) and send graphics or your call letters without a computer. Build a flying spot scanner, vidicon camera, or a totally solid-state SSTV camera with the new Reticon photodiode arrays (see Radio Electronics, March, 1982, page 75)
Op Art

Include the ubiquitous op amp in your next circuit.
KC0EW tells how.

When the Linear IC Hall of Fame is established, it's a pretty safe bet that among the first to be inducted will be the operational amplifier, or op amp. From the venerable 709 and 741 to the latest wideband wonders, this class of component has found its way into more circuits than practically any other chip.

The op-amp IC has made possible designs that would have been prohibitively expensive or complex just a couple of decades ago. You can filter with them. You can amplify with them. You can add, subtract, multiply, divide, integrate, buffer, mix, and oscillate with them. And if you can learn just a little bit about how to use these versatile gizmos, you'll find that design challenges that looked almost impossible can be simple—with some imaginative use of "Op Art."

Simply put, an operational amplifier is just a very high gain voltage amp with high input impedance and practically no output impedance. A typical op amp will show a voltage gain of several hundred thousand, with an input impedance in the megohms.

On a schematic they're not much to look at—Fig. 1 shows the ubiquitous triangle symbol of the op amp. The inputs are marked + and −, denoting the inverting and non-inverting inputs, respectively. The output is at the tip of the triangle.

The op amp is really a differential-input device, meaning that the output is an amplified version of the voltage difference between the two inputs; the + and − symbols merely give an indication of the polarity, or phase, of the output with respect to the input. Both inputs must be used for the output to do anything meaningful.

So we've got a part which will amplify a voltage by a hundred thousand times or more. Seems like just the thing for a stage with lots of gain, right? Just think, we'll feed the input a few millivolts (maybe from that turntable over there) and drive our speakers directly from the output!

Well, not quite. The op amp isn't meant to be a power amplifier, and that hundred-thousand gain simply isn't usable in this fashion. This gain figure, called the open-loop gain, is very important but not like this. The op amp, or any other single stage with this much gain, tends to be very unstable when run without something to keep it under control. That doesn't mean that all this gain is useless; we've just got to find the right way to apply it. The thing that makes the op amp's huge gain very desirable (and the key to most op amp applications) is the principle of feedback.

Feedback simply means that we're going to take a small portion of the output of a given stage (or series of stages) and return it to the input. Feedback can cause an otherwise stable circuit to suddenly go into violent oscillation—as anyone who's ever spent some time with PA systems knows! The squealing heard when a microphone is placed too close to the speaker it's driving is an example of positive feedback—the output signal is returned in-phase with the input, adding to it and driving the system farther and farther into oscillation.

But if you return the output so that it is out of phase with the input, in negative feedback, you can actually improve the stability of the circuit. Here's how it works.

Consider the simple block diagram shown in Fig. 2. The triangle here is used to indicate some amplifier (not necessarily an op amp) with a voltage gain of A. This means that the output voltage is A times as big as the input voltage (V_in). V_in is applied to the amplifier so that it appears as the voltage difference between the two input leads, so we're still talking about a differential amplifier.

So far, no big deal, right? But suppose we add a block which returns a part of the output back to the input, as

![Fig. 1. The symbol for the op amp.](image1)

![Fig. 2. An amplifier with a voltage gain of "A."](image2)

**EQUATIONS**

1. \( V_o = V_i - FV_{out} \)
2. \( V_{out} = AV_i \)
3. \( V_{out} = A(V_i - FV_{out}) \)
4. \( V_{out} = V_i (A/1 + AF) \)
5. \( V_{out} = V_i (1/F) \)
6. \( V_{out} = V_i [1/(R1[R1 + R2])] \)
7. \( V_{out} = V_i (1 + R2/R1) \)
8. \( V_{out} = -V_i (R2/R1) \)
9. \( V_{out} = -[V1(RF/R1) + \ldots + V3(RF/R3) + \ldots] \)
10. \( V_{out} = V1 - V2 + V3 - \ldots \)

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in Fig. 3. Here, the block marked F is doing just that. We'll use F as the gain of this block, saying that F times the output is fed back to the input. In Fig. 2, the output was just an amplified version (A times) of the input. But what's happening in this new arrangement?

Well, the output of the amplifier—the triangle stage—still has to be A times as big as the input. But the input to the amplifier is no longer just the input signal, \( V_{in} \). The input to the amp—the voltage difference between the two input terminals—is now the difference between \( V_{in} \) and F times the output. If we call this signal \( V_a \) (for voltage at the amplifier), we can write Equation 1 (see box).

It is this combined signal that the amplifier block is working with, so the amplifier output (and the output of the whole thing, since they're the same) must be A times \( V_a \) (see Equation 2).

What we'd really like, though, is some relation between the original input signal \( (V_{in}) \) and the output. Well, Equation 1 gives us \( V_a \) in terms of both of these, so we can get rid of that pesky \( V_a \) just by plugging in the right side of 1 for \( V_a \) (see Equation 3).

This says that the output depends on both the input and itself. (Well, what did you expect with feedback?) A few more algebraic tricks: dividing both sides by \( V_{out} \) and rearranging gives us Equation 4.

This might not look all that impressive at first glance (heck, it might not look that impressive at second glance), but let's think a bit about what it means. Remember, A is the gain of the triangle block in Fig. 3—the amplifier proper—and F is the gain of the feedback path around the amp. Since we know we're trying to find some use for a large gain amp, what happens if A in this equation becomes very large?

If A is a large number, then A times F must also be a large number, at least until F gets pretty small. And if A times F is large, then adding one to it shouldn't change it very much—1 mean, 100,000 and 100,001 are pretty much the same, right? So in Equation 4, the 1 + (A \times F) might just as well be simply A \times F—the added one isn't going to make much difference one way or another. Well, if we drop the one we get Equation 5 which then, dividing through by A, results in Equation 6.

Now, that's something we can use. What this has all boiled down to is the fact that if our assumption about A \times F being large is true, then the output does not depend on the actual gain of the amplifier at all! As long as the gain of the amplifier (A) is large enough to make A \times F much bigger than one, the output of this whole gadget will depend only on the input and the gain of the feedback path, F. The gain of that path might actually turn out to be a loss; if F is one-fifth, then \( V_{out} \) will be five times the amplitude of \( V_{in} \) regardless of the actual gain of the op amp we use to build it.

What's actually happening here is that we're comparing a part of the output to the input and getting a signal (\( V_a \)) which is a measure of how far off the output is from the desired signal. \( V_a \) is an "error voltage." If \( V_{out} \) were an exact copy of \( V_{in} \) just five times bigger, and we compare \( V_{in} \) with one fifth of \( V_{out} \), we would expect an error voltage of zero. This is how negative feedback controls the output of the stage.

As an example, look at Fig. 4. Here, F is one; all of the output is being fed back to the input. This says that the output will be an exact copy of the input. This circuit, called a non-inverting buffer, is useful for picking off a sample of a certain signal without loading down that signal's source—remember, the op amp has extremely high input impedance. If you'd rather get an inverted version of the signal, you can use the inverting amplifier circuit of Fig. 5, with \( R_1 = R_2 \). (Actually, Fig. 4 is a special case of the non-inverting amplifier shown in Fig. 6—it just has \( R_2 = 0 \) and \( R_1 \) infinite.)

Figs. 5 and 6 show how feedback is applied for the cases of inverting and non-inverting amps. Fig. 6, the non-inverting amp, is probably the easiest to understand: \( R_2 \) and \( R_1 \) form a voltage divider and the voltage across \( R_1 \) is what is compared to the input. So, for this case, the F of our earlier equations is simply the voltage divider, and we can write Equation 7.

Equation 8, a rearranged Equation 7, is the usual way of expressing the gain of this configuration. The inverting case is a bit more difficult to see since the feedback isn't in series with the input signal. But if you think of it in terms of current—the amount of current required through \( R_2 \) to produce the same drop as a given amount through \( R_1 \)—then it looks like F will simply be the ratio of these resistances, and we get Equation 9. The minus sign shows up because this is an inverting amplifier—\( V_{out} \) is reversed from \( V_{in} \). Notice that these circuits give us a quick and easy way to build voltage amplifiers with gains set simply by the proper selection of resistor values.

There are a couple of other things we can do with the inverting amp that you might be interested in. Since the gain is set by the ratio of the two resistors, we can use the circuit of Fig. 7 as a mixer. The output will be the sum of the input signals added in proportion to the ratio of their input resistor and the feedback resistor (see Equation 10). The input resistors might even be variable, as in Fig. 8, so that you can change the level of each signal simply by adjusting the proper potentiometer. This circuit could form the basis for an audio mixer for your home-brew PA system.

---

**Fig. 3. An amplifier with feedback.**

**Fig. 4. A non-inverting buffer.**

**Fig. 5. An inverting amplifier.**

**Fig. 6. A non-inverting amplifier.**

**Fig. 7. An inverting amplifier used as a mixer.**
Another interesting use for the op amp is the differential amplifier shown in Fig. 9. This circuit's output is related to the difference of the two input signals, V1 and V2. Note that the corresponding resistors on either side of the circuit are equal in value—R2A equals R2B, etc. The amplitude of the output is still set by the ratio of the resistances, and is expressed in equation II. This circuit can also be used for level shifting, if one of the inputs is fixed to a reference voltage.

But why limit ourselves to just resistances in the feedback loop? If we use some reactive components in this path (capacitors and inductors) we should be able to come up with a circuit whose output depends on the frequency of the input signal—in other words, a filter. Active filter design is a topic which can (and has) filled textbooks, but Fig. 10 shows a sample circuit to demonstrate the op amp's use in this area. Active filters turn out to be much simpler to design and build than their passive counterparts, due to the ease of isolating sections of the filter and the elimination of the need for inductors.

A couple of applications show some other uses of the op amp's characteristics. Fig. 11 is a peak-detecting circuit. Here, the capacitor charges to the peak voltage present at the input and stays there since it has no place to discharge. Remember, the input impedance of the op amp is very high, so it doesn't present much of a path for discharging the capacitor.

You should recognize the way the op amp is connected here—it's just the buffer from Fig. 4. One might place a resistor across the capacitor so that the cap will eventually discharge. The bigger the resistor, of course, the longer the cap will take to discharge and the closer the output will remain to the peak value. This circuit can be useful in tailoring meter responses, such as slowing down the response of some of the new bar-graph displays so that you can follow them more easily.

This should give you some idea of how to use the op amp for various jobs, and maybe already you can think of some applications for the circuits I've shown. There are, though, a few practical considerations to keep in mind.

First, the op amp usually will require both positive and negative supply voltages (though not always—see National Semiconductor's Linear Databook and Linear Applications Handbook). These supply voltages must not exceed the rating for the part you're using and will always limit the maximum amplitude allowed for the output. Make sure you're not asking for so much gain that you exceeded this limit, or the output will clip at the maximum.

Also, while most modern op amps include some form of current limiting on the output, try not to use it. Keep your circuits running so that the op amp is running well within its maximum current-limit spec.

You should also be aware of the bandwidth and slew-rate limitations of the part you're using. Slew rate, usually expressed in something like volts per microsecond, is a measure of how fast the output voltage can change. This will determine how well the op amp can track signals at high frequency.

Compensation is another subject that often comes up for discussions of op-amp circuits. Here, I'm going to have to refer you to the manufacturer's data sheet for the op amp you're using. Some parts are internally compensated, while others will require that some external components (usually a resistor and capacitor in series) be added for compensation. All compensation means is that the frequency response of the amplifier is being adjusted to ensure that it will operate properly over the desired frequency range. This can be tailored to suit the application, but for now you're safest sticking with the recommended compensation for the part you're using. The 709, for example, wants around 2000 pF and 1.5k Ohms in series across its compensation leads; the 741 is internally compensated and needs no external components.

As with most ICs, supply bypassing is always a good idea—and don't forget you've got two supplies to worry about. A ceramic capacitor from each supply lead to ground, say around 0.1 uf, should be about right. You might want to add more, maybe a 10- or 20-uF tantalum if you're a good distance from the filter caps in your power supply or if you run into noise or oscillation problems.

The applications for the operational amplifier are practically innumerable—so go right ahead and see what you can do with your own version of Op Art.
Specifications: (40M-4)
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VSWR: 1.5:1
F/B: 20 dB
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BOOM LENGTH: 42 ft.
WINDLOAD: 12 sq. ft.
GAIN: 7.2 dBi

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

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

Specifications: (7.2/10-30-7LPA)
FREQUENCY: 7.2/10-30 MHz
VSWR: 2:1 typical
F/B: 10/15 dB
FEED IMP.: 50 ohm unbal.
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WINDLOAD: 12 sq. ft.
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<th>BURST TONES:</th>
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</thead>
<tbody>
<tr>
<td>67.0 XZ</td>
<td>91.5 ZZ</td>
<td>118.8 2B</td>
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<tr>
<td>71.9 XA</td>
<td>94.8 ZA</td>
<td>123.0 3Z</td>
</tr>
<tr>
<td>74.4 WA</td>
<td>97.4 ZB</td>
<td>127.3 3A</td>
</tr>
<tr>
<td>77.0 XB</td>
<td>100.0 1Z</td>
<td>131.8 3B</td>
</tr>
<tr>
<td>79.7 SP</td>
<td>103.5 1A</td>
<td>136.5 4Z</td>
</tr>
<tr>
<td>82.5 YZ</td>
<td>107.2 1B</td>
<td>141.3 4A</td>
</tr>
<tr>
<td>85.4 YA</td>
<td>110.9 2Z</td>
<td>146.2 4B</td>
</tr>
<tr>
<td>88.5 YB</td>
<td>114.8 2A</td>
<td>151.4 5Z</td>
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<th>TEST-TONES:</th>
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<th>BURST TONES:</th>
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<tr>
<td>600</td>
<td>697 1209</td>
<td>1600 1850</td>
</tr>
<tr>
<td>1000</td>
<td>770 1336</td>
<td>1650 1900</td>
</tr>
<tr>
<td>1500</td>
<td>852 1477</td>
<td>1700 1950</td>
</tr>
<tr>
<td>2175</td>
<td>941 1633</td>
<td>1750 2000</td>
</tr>
<tr>
<td>2805</td>
<td>1800 2100</td>
<td>2350</td>
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Put the DX World on a Screen

Everything you need to know about a country can be at your fingertips. All you need is a VIC-20 and this program.

How many times have you been sitting at your receiver listening to the DX come in when you suddenly heard a prefix that you couldn’t identify at all? Well, if you own a VIC-20 with at least an 8K expansion cartridge or an Apple II Plus, your worries are over. With this program, all you have to do after loading it is enter the prefix at the keyboard and a variety of pieces of helpful information will appear on your screen.

Immediately available to you will be the name of the country, its latitude and longitude, prefix, antenna bearings, and distance in miles and kilometers. At the touch of another key, the computer will check for any other country listed by the same prefix. If you still are unsure of the location of the country, the computer can indicate which countries border the one in question.

In the Apple program, many of the major cities in the United States and around the world are included in the data so that you can determine exactly how far it is to New York, Denver, or even Paris, France. In the program for the unexpanded VIC, only major US cities have been included in the data. A useful feature of this program is that the user can customize it for individual needs. If you are a VHF enthusiast, you can enter cities located within your listening radius.

Adaptability

The locator program can be adapted to almost any size of memory from the VIC-20’s small 3.5K to the Apple II Plus with its 48K. I have found that in order to get all the prefixes in the world excepting the US, one needs at least 11773 bytes, or 12K of memory.

With this program, bearings and distances can be figured by the latitude and longitude on the keyboard. In this mode, the computer can perform a search and identify the countries located around your coordinates. Another feature of this program is that if you enter the name of a country or island on the keyboard, the computer can tell you where the country is, its prefix, antenna bearing, and distance. At the touch of a key, the country’s alternative prefix is provided, if it has one.

Program Run

After loading the program, type in the RUN command. At this time you will be presented with the following main menu with four selections: (1) Country or City, (2) Prefix, (3) Longitude and Latitude, and (4) Quit.

For our first example, let’s take selection (1). Key strokes: 1<RET>. Now you will be asked to enter the name of a country or city. Enter the name of the country in question. For our purpose, enter ITALY. Key strokes: ITALY <RET>. The screen will clear. Then the flashing prompt SEARCHING DATA will appear. If the information is not found, the screen will clear. a prompt will say END OF DATA, and the program will return you to the main menu. If the data is found, the screen will clear and the information will appear.

First will be the name of the country. Next will be the latitude and longitude, followed by the prefix, antenna bearings, and the distance in miles or kilometers. At the bottom of your screen will be the prompt (F7) SEARCH DATA OR HIT ANY KEY. If you press any key, you will return to the main menu. If you press the F7 key, the computer will search for any other listings for the country entered. If there are none, the program will return to the main menu. If there is another prefix, the alternative prefix and the country’s data will be provided.

Now let’s go back to the main menu again. Let’s pick the second selection. Key strokes: 2<RET>. You will now be asked for a prefix. For our example, let’s use TT. Key strokes: TT<RET>. Again the screen will go blank and the prompt SEARCHING DATA will appear. When the data is found, the prompt will stop flashing, the screen will clear, and the information for the Republic of Chad will appear. If you press the
will go through its data file and locate any coordinates within 20 degrees of the search area. If the computer finds any country around the entered coordinates, it will stop the search and print the data on the screen. If you press the F7 key again, it will continue the data search for another country around your coordinates. When the program comes to the end of the data file, the screen will clear and the prompt END OF DATA will appear and return you to the main menu.

The last selection on our menu is number 4. I do not think this needs any explanation.

Now that we have been through the programs, let me point out a few things. First, when entering a city or country name, it must be spelled correctly. If the country in question is an island, it needs to be entered as such, e.g., CAICOS IS. Secondly, when entering south, north, east, or west, there should be no space between the abbreviation, the period, and the name, e.g., W.SAMOA. Whenever the word Saint is used, it should be abbreviated as ST, e.g., ST. VINCENT IS. This is done to conserve as much memory for data statements as possible.

I chose Basic for the program because of the language adaptability, and this makes it easy for the user to customize the program for special needs. A big gun DXer may want prefixes from around the world while the net operator may want only cities across the nation.

The program design is as simple as I could make it to accommodate a lack of memory. Rewriting the program for the Sinclair, Atari, or the TRS computers should not be difficult. As you look through the listing, you will notice a few special characters. These generally concern the screen display. For a definition of some of the VIC special characters, refer to the sample run accompanying this article.

For a look at how the program works, start at line 10. Line 10 is where the main menu is printed. Line 24 is a very important line. This is where the user puts his information concerning his location. CLR will clear all variables. RESTORE returns the data pointer to the start of the data statements. The variable A is the latitude of the user’s QTH. L1 is the variable for the user’s longitude and SPS is the name of the user’s city and state. Line 25 is the input line for your selection from the main menu and line 26 sends the program on its way.

Line 50 is the start of the routine for entering the name of the city or country. CS is the name of the country we are looking for. Line 55 is the gosub that sends the program to the read statement and a line of data is then read. After the data is read and the variables Z$ prefix, L$ name of the city or country, B latitude, and L2 longitude are filled in, then the program compares the L$ and the CS. If the L$ and CS are the same, the program goes to subroutine 500 and then to line 200, the display routine. If the variables are different, the computer reads another line of data.

Line 57 checks to see if all data has been looked at. If it has, the program goes to line 250 and does an end-of-data routine. Lines 60 through 64 work the same as lines 50 through 58 except that the variables H$ and Z$ are compared for a match.

Lines 70 through 84 are the routine for entering the latitude and the longitude. Lines 85 through 110 are the area where I put the gosubs. Line 85 is the error message for whenever the user inputs data the computer cannot use. Line 100 is the flashing SEARCHING DATA prompt and the read statement. Line 110 is a delay loop.

Lines 200 through 227 contain the routine which displays the information after it has been processed by the math subroutine located on lines 300 through 900. Line 200 prints the value of L$, the name of the state or country. Line 201 prints the longitude, B. Line 202 prints the latitude, L2, and line 205 prints the prefix, Z$. Line 210 prints antenna bearings, R2, derived from the math routine. Line 215 prints the name of the starting point, home QTH, and the distance in miles from SPS. Line 220 prints the distance in kilometers from SPS. Line 224 prints the prompt at the end of the display, (F7)=SEARCH DATA OR HIT ANY KEY.

At this prompt, the program waits for you to press a key. If you press the function key, F7, the program will go into the search routine depending on what selection you choose from the main menu. Lines 227 through 230 take care of this function. If you press any other key, the program will return to the main menu, line 232.

Lines 235 through 244 are the search routine used for main menu selection number 3, the latitude and longitude. Line 239 checks for the end of data. Lines 240 through 243 filter the value of the latitude and longitude read in the data statement. If all conditions are met, the value of the variable is filled from the math routine (lines 500 through 900) and forwarded to the display routine. Line 250 is the executed line whenever the data read statement reaches the end of the data (line 3000).

Math Routine

The math routine was derived from two sources, the ARRL Antenna Handbook and a math routine used in a program published in The Giant Book of Computer Software (1st Ed., pp. 264-265). I made a lot of changes in order to save memory, but basically it works the same. The math routine is
performed only when there is a match between what is input by the operator (lines 50 and 60) and what is read in line 100 or when latitude and longitude are entered, main menu selection number 3 (lines 70 through 84).

Line 500 converts A to radian. Lines 510 through 545 determine the value of \( L \) and send the program to the correct place as determined by that value. The variable \( X \) is used to test the value of \( L \). The first part of line 610 con-

Program listing.

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vertices L and B to radians. The remainder of line 610 computes the distance angle, looks at its value, and checks to see if it is positive. If P2 is less than 0, 180 is added to its value (line 645).

After P2 is taken care of, the program moves to line 650. Line 650 computes the distance in miles and kilometers. Line 655 computes the bearing angle and converts bearings to degrees rounded to nearest tenth. Lines 670 and 675 determine which quadrant the bearing angle is in and adjust the degree. Line 680 makes some adjustments to the value of R2. Line 690 makes adjustments to the value of R4. Lines 710 through 865 perform any necessary adjustments to the value of R2, the bearing angle, and send the program to line 900. This is the RETURN statement used to send the program back to the main program after performing the subroutine.

I have not gone into a great deal of explanation of the math routine as the purpose of this article is not to explain the geometry. If you would like a better explanation of this subroutine, I suggest you consult the ARRL Antenna Handbook or any other advanced math book.

Conclusion

I hope this program can be of help to some of you. I have used it a lot. I have needed to make some simple changes in the data statements, but I have attempted to keep the program simple enough so that changes can be made easily. I know that this program will have to be updated occasionally. I used the most current information available. Most of the locations are figured to the center of the country, give or take a degree. Most of the small island latitudes and longitudes have been taken to the tenth of a degree to make the data very accurate.

If you find that you do not have the time to type in the program, I will send it to you on tape for the VIC. The cost is $5.00, and I need to know the amount of memory you have. I also have this program for the Apple II Plus and the VIC-20 on disk for $9.00. (Checks should be made out to me at my address, above.) If you do take the time to type it in and run into trouble, write to me describing the problem you are experiencing and I will try to correct it. I know that no program is perfect.

There are many things that can be done to spruce up the program, especially the Apple version. My main goal was to keep it as simple and efficient as possible, but you can have some fun trying to spruce it up a little. You can always add more data as you expand your memory configuration. Have fun and good luck!
Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

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

AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018, Victoria
Australia

THE AUSSIE YL

How often have we heard the pileups and QRM disappear when a rare DX station says those magic words "Please stand by — there's a YL calling." Even those persistent callers, jammers, and deliberate QRM merchants who have, unfortunately, become a sad fact of life on amateur radio these days seem to go QRT when the ladies are transmitting. Maybe it is chivalry, or perhaps a mark of respect to these adventurous young ladies who have involved themselves in what was predominately a male hobby in the early days of amateur radio. Every so often, a YL operator is heard who is a fine example of why we OMs have that respect.

Austine VK3YL

Austine Henry VK3YL is such a young lady. As a life member of the Society of Wireless Pioneers and as a member of 54 years standing with the Wireless Institute of Australia, she has the distinction of having the longest YL membership record. In 1930, Austine was awarded a trophy from the WIA for the best piece of home-brew gear in the local WIA homebrew competition.

1930 was an active year for Austine, as she also became a member of the ARRL on April 14, 1930. She has 30 years of membership in the RSGB, plus she has been a member of NZART over the last few years. Austine has really kept her finger on the pulse of overseas amateur-radio activities. No wonder she has many tales to tell of the good old days in radio.

When she received her first crystal set as a child, she immediately pulled it to pieces to see how it worked, graduating to valve [tube] sets that she made herself, gaining enough expertise to pass her experimental license exam on May 13, 1930. Only the third woman to obtain an amateur license in Australia, Austine became VK3YL.

As there was no commercial gear available for amateurs in those days, Austine learned at an early stage how to get the best out of a home-brew 1-Watt input transmitter. To get the crystals for her sets, she used to do a tour of the city opticians, getting their broken or rejected quartz lenses, and, if successful, would hurry home with them to grind her own crystals.

With this type of equipment, Austine had her first CW contact into Belgium on September 30, 1931, with Baron de la Ruche ON4HM. To commemorate this contact, the Baron sent her a bronze replica of the Sacred Guardian Monkey of Mons. She also had a successful contact with a South African amateur in the early 1930s, using a UV199 tube fed with dry batteries, with less than 1 Watt of input power, in a portable situation.

Being an adventurous young wisp of a girl, Austine was fond of horseriding and driving a little sports car, plus riding motor bikes. It was only natural, therefore, to take up flying. On September 6, 1933, she became the first woman admitted to the Royal Australian Air Force Radio Reserve, the training for which included flying around in a Wapiti biplane. This plane, although old, was very solidly constructed and was used extensively to train both pilots and radio operators, with the pilot in the front cockpit and the radio instructor and pupil in the back cockpit. With these cramped conditions, the student virtually had to sit on the instructor's knee (lucky instructor!). The main requirement for flying in these conditions was to stand up when you landed. Otherwise, if the landing was bumpy and you were sitting down, you could crack your skull on all the gear.

Austine was most upset that they would not send her to the war zone as a radio operator in one of the planes, just because she was a woman, but despite other commitments during WWII, which ate up a lot of her spare time at the WIA on a volunteer basis, instructing service personnel and others in the art of Morse code. It was not unusual for Austine to take her own home for free private tuition so that they could pass their exams.

After WWII, Austine maintained her interest in amateur radio, with a particular interest in DX. One of her most interesting contacts was in 1957 with Michael FO6APMM, on the ill-fated Tahiti NUI raft expedition between Tahiti and Chile. This expedition ended up 600 miles short of Chile when the raft broke apart after a week of storms. Michael was using a transceiver with 1 Watt of input power at that time. Could you imagine trying to send S55, plus your position, on a raft of 20-inch logs that are breaking apart in the middle of the ocean with 30-foot waves pounding down on you? That would definitely take a steady hand on the key.

CW is a mode at which Austine has remained very proficient, proof of this being her entry to the DXCC Honor Roll as the first and only Australian YL to gain this achievement, but this is only one of Austine's many firsts in the field of amateur radio. Up until 25 years ago, Austine was using only a 40-meter Zapp antenna, graduating to a half-wave centered dipole, but in the last few years she has upgraded her antenna system to a triband beam. Her transmitters have graduated from home brew, to converted surplus WW11 equipment, to these days, when she is using Drake equipment.

Austine is quite proud of some of her earlier award achievements, some of which are: the first to work WAC-YL, Certificate No. 22 for the YL DXCC from Canada (hand-printed in gold), and from Heath-Mitchell VK3AZU (the designer of the Alara award), a certificate for being the first VK YL to receive this award.

Those are only a few of the various awards Austine has to her credit. She is also a foundation member of Yasmine, winning Certificate No. 7 in the prestigious Yasmine award, one in front of the famous Don Wallace W8AM who got Certificate No. 8 in 1980.

What more can be said about a woman who, after 54 years of amateur-radio operating, is still heard in the pileups, helping her operating techniques in CW and SSB sharp, just in case there comes on the air one of the four countries she still needs to have worked the lot. 88s, Austine!
The card sent to Austine by Michael FOSARIMMM who, here in 1957, is looking over the rear of his raft.

Introducing a similar Novice-class license and, going by the upsurge in amateur radio in Australia, it would be a good thing, as up until the advent of CB and the Novice-class license, the amateur-radio scene in Australia was virtually stagnant.

As an example, going by WIA membership (which remained at approximately 60% of the total amateur population), from 1983, with 3,500 members, to 1973, there was an increase of 1,000 (28%), but by 1983, with the advent of CB and the Novice license, there was an unprecedented upsurge in new amateurs and membership was 8,500. That represented a 53% 10-year increase, nearly twice that of the previous 10-year period.

However, like everything else in life, you get nothing for nothing. The cost to the amateurs so far has been the loss of the 27-MHz band and, with retailers down here now quite blatantly advertising CBs with a frequency coverage of 26.965 to 26.605 MHz in 5-KHz steps, how long before we also lose 28 MHz?

"It will never happen," I hear the old-timers saying into their 807s, but the CB fraternity in Australia now legally has 40 channels and no restrictions on antennas (six-element beams are quite common) plus freely-advertised linear amplifiers of up to 600 Watts output for 27 MHz. What happened to the legal limit of 12 Watts PEP for CB? The CB operators in Australia also enjoy a section of the UHF band quite legally, with access to repeaters and, believe it or not, freely-advertised linear amps for UHF.

I would not be surprised if in the near future, due to our archaic import and resale laws in Australia, 14-MHz sets appear for resale, as it is quite legal to import and resell any type of equipment providing it is not dangerous to health or does not interfere with emergency services. A CB operator can quite legally buy himself an FT-902DM with an FL2100Z linear, connect it to his 6-element monobander and, unless he causes interference (with a resulting visit from the overworked DOC investigator), can operate illegally to his heart's content.

That is the negative—but worth thinking about—side of the CB input to amateur radio in Australia.

The positive side has many pluses. It is not unusual to hear on the CW section of the Novice band a couple of Novices ratti ng away on CW at 20 wpm; some are even faster. These speed merchants on the key usually are ex-service personnel or post-office telegraphists who, over the years, have forgotten all about radio but, with the advent of the Novice license, have found that with a little study on solid-state basics, they can get back into the communications field. As most of these gentlemen are now retired, they tend to study and get their full-call license. The result is that many ex-signal ops of the various services during WWII now get on the air with their own net frequencies to chew the fat about old times.

We also have the lifetime SWL who could not pass the previous license test for the full call, but now, due to the Novice license, with a bit of study is able to transmit to stations he has logged as an SWL over many years.

In conclusion, due to the upsurge of CB radio we have had both gains and losses, and only time will tell if it has been good for amateur radio in Australia. I do personally feel, however, that with the advent of the latest toy, namely a cordless telephone with a 9-km range (together with other as-yet-untested frequency damaging devices being imported into this country), we may suffer an unprecedented interference problem on the amateur bands and commercial frequencies.

The extent of such interference could be such that the Department of Communications (DOC) may have some difficulty in controlling it, as in past instances with 27 MHz. There is some ray of hope, however, since at this very moment a new Act of Parliament (Radio Communications Bill) is in the final stages of debate and is expected to pass the Senate shortly. If this occurs, the Department of Communications will have little difficulty in obtaining a prosecution against illegal operations, since the mere possession of transmitting equipment without a license or just cause will be an indictable offense.

QSL Bureau handles thousands of cards monthly and it is easy for us to spread out our QSL cards around the world. Inside Brazil, the service is very good and fast. The QSL travels from one Bureau to another in only one day.

Working so well, it is not difficult to receive a Brazilian card via the Bureau after a short time. Foreign amateurs may also send their QSL cards to Brazil, addressing them to the QSL Bureau when they are not able to find out the right direction. The QSL Bureau are located in all capital cities (see box). The main one is in Brasil—la, the Federal District.

RESULTS OF THE HUNTING LIONS ON THE AIR CONTEST—1983

The principal objective of this contest is to create and foster a spirit of international understanding and cooperation among Lions and ham-radio operators throughout the world. The contest is held in tribute to the birthday of Melvin Jones, the founder of Lionism. It is sponsored by Lions and coordinated by the Rio de Janeiro (Arpoador) Lions Club.

About 13,000 contacts were made among stations located in 114 countries. In the Single-Operator Class—phone, the winner was VK6NO, followed by K7QX, ZL6DJ, ZL1SZ, and PY1PE. In the Single-Operator Class—CW, the highest score was for the very well-known operator Tim Chen BV2A, followed by PY2ASV, OH6OC, K4EBT, and OH4SV. For the Club Station Class—phone, the winner was G3JDCVC, the Jersey Amateur Radio Society, and in CW, CT1APS, the Southern Radioamateur Association of Portugal.

MGc AWARD

Sponsored by the Morse Clube Gaucho (CW Group), the MGC Award is available to all operators for confirmed contacts with 5 (five) different MGC members. Contacts must be made after May 1, 1980, on any amateur band, only two-way CW mode. No QSLs, Send CCR list of stations worked (call, date, time, band, mode, and report) and 5 IRCs for mailing expenses to: MGC Bureau, PO Box 2296, 90000 Port-Alegre, RS, Brazil.

For SWLs, the same rules apply.

MGC members: PY3AVF, PY3AZL, PY3AKS, PY3AZ, PY3AO, PY3BC;

BRAZIL

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

Carlos Vianna Carneiro PY1CC
Rua Amao Peix 49, Apt. 901
20270 Rio de Janeiro, RJ
Brazil

QSL BUREAU
The Brazilian amateurs who are members of the League (LABRE) may use the QSL Bureau to send and receive their QSL cards, free of charge. In this way, each

QSL BUREAUS IN BRAZIL

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74 73 Magazine • February, 1984
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DOMINICAN REPUBLIC

M. P., (Te) Pintimeter H18MF
PO Box 2797
Santo Domingo
Dominican Republic

Some of you have probably worked Dominican (HI) stations in the 20- or 40-meter bands but have been less fortunate in contacting the other bands and getting QSLs.

To contact and get QSLs from HI is not an easy task. DX bands such as 6 and 160 meters seem to be “Mission Impossible,” but even so, there are possibilities.

To be successful, you first have to know which station you’re looking for, at what time you should search for it, and last, be lucky enough to find it. Once you have made contact, it will be easy for you to receive the QSL because there are few people who work on 6 and 160 and those who do confirm on time.

In the 6-meter band we have key people such as Waldo H18WP and Domingo H18DA. The same applies in the 160-meter band with Jose HI1BQA, Mike HI18S, and Virginia HI18S. The stations generally work from 0000 GMT to 0800 GMT. Within these times, schedules could be arranged by sending the above-mentioned stations a note to Box 1057, Radio Club Dominicano, Santo Domingo, Dominican Republic.

Another difficult HI contact is the one via wired or teletype. The practice is that whenever there is Jorge HI1BYP and he is on the air, you can get on them. They usually work in the following frequencies: 7340 KHz and 14,050 KHz, for example.

Ecuador

B. Patrimonio Receives S12HF
PO Box 571
Guayaquil
Ecuador

July 23 and 24 last year will be remembered by the technical department of the Guayaquil Radio Club as historic. They were a Saturday and a Sunday. What did we do?

Well, a party of amateurs, H2C2N, H2C2L, H2C2G, H2C2U, H2C2I, H2C2Y, went up Chimborazo, the highest volcano in Ecuador (6,209 meters high). In order to install a 40-meter link in a 2-meter repeater, the idea became reality after a mere four weeks of planning. All Saturday they kept working until around 1700 hours, which is late for the altitude of the repeater (4,400-4,500 meters—14,500 feet). They did a lot of testing, and now it is giving the best results.

Now, from all the coast of our country, it is possible to access the repeater from your car and get through to 40 meters. The frequency is 7060 KHz, and you’d better look for Ecuador so you can test the 40-meter link.

Getting there was a lot of fun (troubles + adventures = fun), Saturday evening, H2C2H’s car got stuck in mud and snow, and on the way out, the steel bar that keeps the front wheels aligned broke loose. Well, at that time and in that place, all that was left to do was sleep and wait until the next day. The hero (who slept in the car with the engine running, the heater on) was H2C2U. The temperature was below freezing (0°C), so the car didn’t even heat up.

Anyway, on Sunday was a tougher test: to try to reach the members of an expedition that was on the Irazu volcano, at 4,250 meters, in San Jose, Costa Rica (Til a lot of arrangements had been made through the goodwill and work of T1KC and H2C2E. At those heights, the wind, the temperature, etc., were a challenge: the people at both places did a good job preparing for the contacts.

In San Jose, they were ready with 10,000 Watts FM, SSB, and HF. The link in 40 meters was not working due to the lack of a better antenna with the Chimborazo expedition, so H2C2P was the guy that linked them all together via 2 meters and 40 meters. While everybody was getting ready, many amateurs from all places were very helpful in clear communications and giving good advice.

Around 1232 GMT—1723 GMT—on July 24th—the Irazu expedition transmitted on 146.500 MHz with no results. After a few trials on FM and SSB on 2 meters, there were positive contacts; the same was true with the Chimborazo expedition. Around 1800 GMT, we tried through a repeater situated where the Ecuadorian expedition was, and we heard nothing. While everybody was expecting the repeater to be activated, it was not. No activation, but it gave us a nice feeling of something. Anyhow, after two hours, all the equipment and gear were disconnected. Confirmation was given, T1KC2G, and the president of the Costa Rica Radio Club (T12KC) interchanged greetings and thanks for all the efforts, and both confirmed that in the near future, with more positive results.

Well, they decided to try more testing in a new place, Cerro de la Muerte (Death Mountain), that is believed to be better. All amateurs who participated in that operation believe we are taking some more coordinated efforts, and we are positive about our next results.

The next step is another project, and that is to try to put a repeater on a small island that belongs to Panama. Why? Because H2C2N, on old sailboat, did the access repeater in 146.665 (I’ll be clear from that point, which is more than 200 nautical miles from the repeater, at 4,400-4,500 meters above sea level), and I will keep you informed, and we are going to make it.

FRANCE

Claude Gues FID0Y
11 Rue Emile Laliberté
28110 Saint-Brieuc
France

I would like to say some words about the first French association (RF—Reseau des Entrelaceurs Français), founded in 1925. Some years ago, the situation was rather confused, but thanks to the work of a new and very good team, it is now completely reversed. We see that RF again has a fine future! Furthermore, dealings with the second association (URC—Union des Radio-Clubs) are more hearty than formerly. At the beginning, the two were at daggers drawn, but now they cooperate in facing difficulties (new license examinations, UHF, regulations, etc.).

Some hams and SWLs are getting in trouble: They have bought general-cover­age receivers, called “scanners,” which unfortunately are illegal here. As a matter of fact, these devices are bought up for trial and connec­ted with (a nice view and receiver configuration). However, RF has lodged an appeal. The few amounts to say that French hams have the right to listen to the amateur allocations. No comment.

Once again, we have heard on the air that tickets for part of the 28-MHz band would be granted at a Monica test. Actually, this is utterly false. It is a CB rumor which till now officials have turned down. On the other hand, new regulations for 27 MHz are generous; 40 channels up to 5 Watts peak, 1 Watt AM, and 6 channels of 6-B31 antennas. It goes without saying that CBers are not yet satisfied. This band is so busy that some people escape to the 6-MHz band.

50-year-old hams without Morse-code knowledge can ask again for the full license or for CW tests. Since the beginning of this year and the new license regulations, this gift had been forgotten.

A French magazine is born: Megahertz. Covering microcomputers, astronomy, private FM broadcast, and of course all ham activities, this third French ham magazine looks very promising and means that amateur radio in France enjoys good health.

GREAT BRITAIN

Jeff Maynard GAEJA
10 Churchfields
Widnes WA8 9HP
Chester England

One of my particular interests is RTTY (WAC and some 70 contacts worked to date). The RTTY enthusiast over here is well looked after by BARTG, the British Amateur Radio Teletype Group, which promotes RTTY services, ad­vises on RTTY matters, transmits a RTTY bulletin, and publishes the BARTG newsletter. (Readers interested in joining BARTG should write to the Membership Secretary, Mrs. T. Crane, Greta Woods, Bromley Road, Arle­sgate, Colchester CO7 7SF, En­gland—dues are about US$5 per year.)

A recent BARTG survey reveals that about 65% of its members still use tradi­tional clacking teletype for their RTTY with the Orion line (444, 54, 7, etc.) being by far the most popular. It would be surprising, to me at least, was the comment that a number of stations have 4 or 5 such ma­chines in constant use. I am not sure that the floor of my shack (I live in a loft) would stand the weight of even one such machine. I am sure though that the rest of the family would rebel at the noise from a traditional RTTY station.

Something like 34% of BARTG members use electronic RTTY systems or home com­puters (with 5% using AMT0). Com­mer­cial equipment is represented by the Micro­wave modules line for whom has cap­tured about 13% of the UK market.

With my own all-electronic RTTY station (Doveron terminal unit, Exel VDU, and ma­
Convert the Oddball
Hy-Gain Board

Some of these boards have two crystals and some have three.
Now you can put them all on 10-meter FM.

Recently, the popularity of the Hy-Gain surplus boards has been tremendous. However, there are several types of these boards on the market today, and each type requires a different method of attack. The 3-crystal model with the PLL-02 phase-locked-loop chip has been well discussed in a previous article. The board I am going to discuss is the board with the part number PTBM051AOX, available from Surplus Electronics Corp.

The major differences with this board compared with the other Hy-Gain boards is the 2-crystal approach. The third offset crystal has been eliminated so that all frequencies are generated by the 10.24-MHz reference crystal. The other crystal, 10.695, is used to offset the synthesizer/mixer output by the amount of the receiver first i-f.

This presents three problems. First, with this mixing process, the PLL programming is upside down. That is, if you increase the divide-by-N, the frequency goes down, and since a prerequisite of any of my 10-meter FM conversions is a direct frequency readout system, this makes it a bit difficult. The second problem is that you cannot decide what divide-by-N equals which frequency. This is decided for you. The third problem is the odd 5-kHz output frequency. By that I mean that when this conversion is made, we want the operating frequency of the transceiver to be 29.600 MHz, not 29.595 or 29.605 MHz. So a change will have to be made here. All that is done here is to raise the reference frequency slightly, making each channel a few Hertz more than 10-kHz channel spacing.

Circuit Description

There will be three added circuits to the original board. Those are the FM detector/squelch board, the modulator board, and the frequency-selector board.

The FM detector/squelch board (see Fig. 1) consists of one IC and two transistors and is designed to interface the CB board easily. The 2111 IC is a common IC that is used in television receivers and scanners. This chip provides the i-f limiting and the quadrature detection necessary for FM detection. The IF transformer T01 is tuned to 455 kHz, and the transformer can be obtained from an old transistor radio. The primary winding is used.

The noise to operate the squelch is taken from pin 1 of the IC which is before the de-emphasis capacitor, C01. The noise is filtered and amplified by the two-
transistor circuit, and the output is applied to the base of the audio switch in the receiver (Q13). The input at C02 is taken from the secondary of the last 1-f transformer through a short length of RG-174 coax. The volume and squelch pots are front-panel-mounted.

The easiest board to construct is the modulator board (see Fig. 2). The input is taken from the audio output chip in the receiver. On receive, this line is shorted to ground, causing the modulator to be disabled. The gain pot provides audio voltage to the diode clipper, which clips the audio peaks to approximately 1.2 volts p-p. The deviation pot selects which portion of this clipped audio is to be applied to the vco. This provides for direct FMing of the transmitter.

The third board is the frequency selector board. There are three controls on the front panel. There are two single-pole, 10-position switches, 29.50-29.59 and 29.60-29.69 MHz. There is also a three-position toggle switch (SPDT C-O), used so that either 29.50-29.59 MHz simplex, 29.60-29.69 MHz simplex, or 29.50-29.59 transmit and 29.60-29.69 MHz receive can be selected. The last combination is for repeater offsets.

A look at the frequency selector board circuit (see Fig. 3) shows a diode matrix and a two-transistor circuit. The two transistors select which of the two single-pole, 10-position switches gets the 5 volts. The switch that gets the 5 volts is the switch that is active for frequency selection.

The steering for this circuit comes from board pin 12, which is operated by the PTT. This pin is high on receive and low on transmit. This is what happens: With the SPDT C-O switch in the center-off position, the 29.60-29.69 selector gets the 5 volts on receive and the 29.50-29.59 on transmit. By switching the SPDT C-O switch to one of the two other positions, the switching from pin 12 is disabled and locks up to a certain 10-position switch in transmit and receive.

The diode matrix programs the PLL-02 IC in the radio. On the right of the frequency selector circuit are the binary weight values for the PLL-02 IC, along with the pins to which the wires must be connected. Along the top are listed the total binary weighting values for the various switch positions. Next to the switch positions are the last two digits of the operating frequency. The 5 volts to operate this circuit is brought from a 5-volt regulator which is part of the Hy-Gain board.

Construction

First, a few modifications to the Hy-Gain board must be done. Connect board pins 38 and 39 together. Re-
move R69, R71, D13, RV2, and C12. Connect a wire from board pin 20 to where the cathode of D13 was. To modify the PLL chip wiring, first isolate PLL IC pin 7 from the original wiring. Connect PLL IC pin 7 to PLL IC pin 8. Run a wire from PLL IC pin 1 to jumper J4. The other connections to the board are shown on the schematics. The three boards are made from ‘.1’-spacing perfboard.

To make the diode matrix, on one side of the perfboard string 7 bare wires 4.5 inches (11.3 cm) across on one side. On the other side, string 20 bare wires perpendicular to those on the other side. Be sure to skip a row of holes between each string of wires. Then the diodes can be placed with one lead bent over in through the holes and soldered.

The FM detector can be mounted to the square hole above the BA521 IC with a small angle bracket. The modulator perfboard can be glued against the side of vco coil L1, being sure that nothing interferes with the tuning of the coil. The frequency board can be mounted across the front of the CB board, standing up vertically.

**Tuning**

For tuning, you will need a dc voltmeter, an rf probe, a signal generator (or a weak signal from an amateur transceiver), a frequency counter, and a General Cement model 9440 tuning tool. A small hex head plastic tuning tool is also handy. Nothing ruins a powdered iron slug faster than trying to tune up with a regular screwdriver.

First, set the transceiver on 29.60 MHz simplex. Place a dc voltmeter on pin 6 of the PLL-02. Carefully tune vco coil L1 until 5 volts or so is reached. Move the voltmeter to pin 5 of the PLL-02. Carefully adjust vco coil L1 for 2.5 volts.

Next, attach a dummy load to the antenna jack.

Place the rf probe on the base of Q3 (rf predriver). Adjust T1, L2, T2, L5, and T3 for maximum rf. Then move the rf probe to the antenna jack and adjust L7, L11, and L12 for maximum. Place the frequency counter on the antenna jack, and the counter should read 29,600 MHz. If the reading is a few kHz off, adjust trimmer C11. If the reading is unstable, check the vco tuning. Run through all channels and see how each frequency looks. If an error shows, check the matrix and associated wiring.

Now, on receive, place the dc voltmeter on board pin 39 and adjust T5, T6, L14, T7, T8, T9, and T10 for maximum. Be careful not to overload. Adjust the quadrature coil on the FM detector/squelch board, with no signal, for maximum noise. Later tune when listening to another FM signal for best sound.

As a building hint, the housing for this radio can be built from aluminum. The box size is 6” (15.24 cm) by 8.5” (21.6 cm) by 2.5” (6.25 cm). Two U-shaped pieces of metal make up the top and bottom covers which fit over the ring of metal which makes up the main chassis.

That’s it. Just look at the way I constructed it. As they say in the old country, “Ein Bild sagt tausend Worte.” I would like to thank Bob Russo WB2BMM for taking the photos shown here. If I can be of further help, please write, include an SASE, and I will try to help.

**References**

2. Surplus Electronics Corp., 7204 NW 54 St., Miami FL 33166.
3. General Cement Electronics, Rockford IL 61101, or from your electronics parts distributor.
4. “A picture is worth a thousand words.”

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CLASSIFIED ADVERTISING

WOMING-UTAH RANCH LAND, 10 acres, $50 down, $50/month. FREE information, maps, photographs. Trade equity for ham gear, home computer, test equipment, etc. Owner—Mike Gauthier. 9550-B—Gallatin Rd., Downey CA 90240. BN8001

MOBILE IGNITION SHIELDING. Free literature. Estes Engineering, 833 Marine Drive, Port Angeles WA 98362. BN8006

GSL MANAGER ALBUM™. Beautiful leather-grained vinyl ring binder for displaying 240 of your prized GSL cards. 30-day guarantee. $18.95 ppd or send stamp for fry. Walter Beaton W5D0X, 3760 Cecilia Ave., Cleveland OH 44109. BN8009

WANTED: Early telegraph instruments for my collection. Keys, sounders, call boxes, registers, meters, and related items including pre-1910 paper. Larry Nutting WP8W, 5267 Yerba Buena, Santa Rosa CA 95405. BN8018

COLOR COMPUTER owners—call (212) 441-2807 for FREE color computer hardware and software catalog or write to Spectrum Projects, 93-15 86 Drive, Woodhaven NY 11421. BN8023

FORTH ANNUAL Ohio State Convention and Flea Market: Join in the even bigger "Cincinnati APRR '84," February 25 and 26. Activities for hams and electronics enthusiasts: forums, meetings, vendors, Wouf Hong women's activities, banquet, hospitality suite, more. Sure cure for "cabin fever." Hospitality suite Friday and Saturday nights. The $5 convention registration includes all convention awards. Flea market is $4/space for two days—ham and electronics items only. Write: Cincinnati APRR '84, POB 11300, Cincinnati OH 45211 or telephone (513) 825-8224. Vendor and exhibitor inquiries invited. BN8024

ON MARCH 11, 1984, the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8:00 am. Table reservations: Aileen Scales, 3142 Market Place, Bloomington IN 47401. BN8039

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog. $3.00. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90805. BN8045

RUBBER STAMPS: Name, call, and address. $3.75 postpaid. U.S. Floyd Durand W072C, PO Box 67, Westwego LA 70094. BN8046

DX HIDDEN ASSET LOOP ANTENNA. Get on the air, comply with no-visible-antenna rules, from most indoor locations. Inexpensive, easy-to-build antenna couples directly to 50-Ohm coax; no antenna matcher or balun needed; omnidirectional with vertical, bi-directional with horizontal polarization. Wav typically 1.2:1 at resonance; useful bandwidth 3 to 5 percent or resonant frequency. Plans and instructions, $12.50 postpaid. H. Stewart Designs, PO Box 643, Oregon City OR 97045. BN8047

RTTY FDM DEMODULATORS, FDM RTTY exists on satellites, FM SCA broadcast subsystems (e.g., Commodity News Service), and HF radio. Four solid-state synthesis models, N8A surplus, new-used, $50 to $350. Call/write for brochure. Elec- trical Industrial, Inc. Box 376-WF, Morris Plains NJ 07960; (201)-267-1117. BN8032

SPECIAL NOTICE—Buy and sell your amateur equipment, computers, and video equipment on our national computer system that you access from your home, office, or shop. Add whatever you want daily. Low cost is only $15.00 per year for unlimited access 24 hours a day. For details, send SASE. NAR- MID ELECTRONICS, 61 Bellot Road, Ring- wood NJ 07648. BN8037


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FOR SALE OR TRADE: Swan 100MX 5-band solid-state transceiver and ac PS and Heathkit SB-201 amplifier, $325 each. Wanted: CW transceiver. W7LHO, (509)- 471-6377. BN8041

BUMPER STICKER—"My Favorite Radio Station is yours(g). Display anywhere! Great gift idea. Only $3. Apreso, Dept. ST, 115 Hicks Pike, Walton KY 41094. BN8042

PRINTERS: LX38 Deictwir II with keyboard, variable-width paper, etc., $325. CDI 1930 with keyboard, built-in modern, $125. W0GH, 11209 Hwy. U., Waussau WI 54401 BN8043

WWW RECEIVER, $35. RF signal generator, 80 kc to 60 mc, $35. Hickock tube tester, $30. Audio signal generator, $35. K5KZ, 2255 Alexander, Los Osos CA 93402. BN8044

DRESS UP YOUR CLUB! Jackets, tee-shirts, hats, sportshirts, etc., with your logo or we'll custom design. Wavelength Productions, 20-22 120th St., College Point NY 11356. BN8048

FREE SAMPLE—send stamp. Buy/sell radio, computer equipment in "Electronic Exchange," Box 486E, Forest Lake MN 55025. BN8049


HELP! Cleaning garage—test eqpt., 6 and 2m FM gear, tubes, 1000s of service manuals for all makes and models of commercial FM xecivers 1975 and older. Reasonable prices. Send SASE for list. Tom McLaughlin WBANEX, PO Box 411, Mango FL 33550; (813)-681-9709. BN8051

WANTED—you're unused Teletype™ repair. High prices paid! Send SASE for list of Teletypewriter parts and supplies. PETRYPECONS, Box 8873, Fort Lauderdale FL 33310; (205)-583-1340 after 9:00 pm. N4TT. BN8052

WANTED: Old bugs for my telegraph and radiotelegraph key collection. I am trying to find each make and model of bug manufactured before 1960. Vibroplex, Martin, McElroy, Bunnell, Mecograph, MacDonald, D & K, Warner, etc. Also looking for Spark keys, Boston keys, coolties, side-swipers, and large or unusual radiotelegraph keys. 73 de Neal McEwen KE5RW, 1128 Midway, Richardson TX 75081; (214)-234-1653. BN8053

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The R3 half wavelength design eliminates the ground radial system required by other verticals. Optimum current distribution gives more efficiency and low angle radiation for DX communications.

R3 brings high performance antenna features to those living in apartments, condominiums or on small city lots. Even if you have plenty of space, R3's combination of neat appearance and DX capability make it ideal for your station. The R3 includes an integral tuner to give a perfect match across 10, 15, and 20 meters. The remote tuning feature allows easy finger-tip control as you operate your station.

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FEATURES
3 dB Gain, ref ¼λ whip
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Add up the features—you'll find that you can have ALL OF THIS PERFORMANCE without the need to buy tower, rotator and associated hardware. R3 IS ANOTHER PRODUCT CREATED FOR THE ENJOYMENT OF YOUR HOBBY BY THE WORLD RENOWNED CUSHCRAFT ENGINEERING DESIGN TEAM.
SOCIAL EVENTS

 Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements are reviewed by 73 Magazine for the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Pittsburgher NB 04356.

TRAVERS CITY MI
FEB 11
The Cherryland Amateur Radio Club will hold its 10th annual swap and show on February 11, 1984, from 8:00 am to 1:00 pm, at the immaculate Conception School Gym, 2 blocks south and 1 block west of the intersection of M-37 and M-22, Traverse City MI. Registration will be at the door. Talk-in on 146.25/85. For more information, call Jerry Cerrak KBYU at (619)-947-4848.

MANSFIELD OH
FEB 12
The Mansfield Midwinter Hamfest/Auction will be held on Sunday, February 12, 1984, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Table spaces are $5.00 in advance and $5.00 at the door. Table spaces are available on a first-come, first-served basis. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, coffee and a large flea market. Talk-in on 146.34/94 or 147.63/03. For further information, write Bernie Schwitzgebel W9LJZ, 121 Adalard Court, Glassow KY 42141.

FRIDLEY MN
FEB 25
The Robbinsdale Amateur Radio Club will hold its 3rd annual Midwinter Madness hobby Electronics Show on Saturday, February 25, 1984, from 9:00 am to 3:00 pm, at Totino-Grace High School, 1350 Gardenia Avenue NE, Fridley MN (a Minneapolis suburb). Admission is $3.00 in advance and $4.00 at the door. There will be manufacturers and dealers of ham, computer, satellite, and R/C gear, as well as seminars and a flea market. Talk-in on 146.52 simplex or 147.00/00 repeater (KLTC). For more information, contact Robbinsdale ARC, PO Box 2263, Robbinsdale MN 55422, or call Bob at (812)-533-7354.

AKRON OH
FEB 26
The Cuyahoga Falls ARC will hold its 30th annual electronic equipment auction and hamfest on Sunday, February 26, 1984, from 8:00 am to 4:00 pm, at North Canton Community Center, 3535 Canton Ave NE, Canton OH. There is easy access from the Tallmadge Avenue off-ramp of North Expressway (Rte. 78). Tickets are $2.50 in advance and $3.00 at the door. Some tables are available for $2.00 or $2.50. Some may bring their own; advanced reservations are advised. Talk-in on 871.27. For more details or reservations, please contact Corinne Maes E9IR, write CFArc, Cuyahoga Falls OH 44222. Table reservations may also be made by calling Bill Solsky KBJLU at (216)-923-3830 and will be held until 9:00 am.

EGG HARBOR CITY NJ
MAR 10
The Shore Points Amateur Radio Club, Inc. will hold the Springfest '84 on Saturday, March 10, 1984, from 9:00 am to 4:00 pm, at the Atlantic County 4H Center, Egg Harbor City NJ (approximately 15 miles west of Atlantic City). Admission for buyers is $2.50 in advance and $3.00 at the door. Sellers' space is $5.00 (facing your own table). There will be 8,000 square feet of heated indoor selling space, and covered tailgating will be available. Weather permitting. For more information, write SPARC, PO Box 142, Absecon NJ 08205.

INDIANAPOLIS IN
MAR 11
The Morgan County Repeater Association Club will hold the Martinsville Hamfest on March 11, 1984, indoors at the Indiana State Fairgrounds Pavilion Building, Indianapolis IN. Admission is $4.00 at the door, but all flea-market tables are $3.00 each, flea-market tables are available for $1.00. All tables must be reserved in advance and setup will be Saturday, March 10, from 1:00 pm to 9:00 pm. Space setup will be Sunday, March 11, from 6:00 am to 8:00 am. There will be free parking, talk-in on 147.21 and 146.52 simplex. For more information or table reservations, send an SASE to Aileen Scales KCGYA, 3142 Market Place, Bloomington IN 47401 before March 1.

WINCHESTER MA
MAR 11
The Randolph Amateur Radio Association will hold its 5th hamfest on Sunday, March 11, 1984, from 8:00 am to 5:00 pm, at the Franklin County Guard Armory, Winchester MA. Admission is for all days is $5.00. Ticket donation is $3.00 and children under 12 years old will be admitted free. Table space (by reservation only) is $5.00 with a table and $2.50 without. There will be a flea market, dealers, programs, food, and drink. Setups will be on Saturday from 6:00 pm to 8:00 pm and on Sunday from 8:00 am to 5:00 pm. Talk-in on 146.25 simplex, 146.23 to 146.25. For reservations and more information, contact RARA, Box 203, Winchester IN 47394, or phone Jake Life WWVU at (317)-564-0361.

MIDLAND TX
MAR 17-18
The Midland Amateur Radio Club will hold its annual St. Patrick's Swapfest on Saturday and Sunday, March 17-18, 1984, at the Midland County Exhibit Building, east of Midland TX on the north side of Highway 80. The hours on Saturday are from 10:00 am to 6:00 pm and on Sunday from 8:00 am to 2:30 pm. Registration is $5.00 in advance and $5.00 at the door; tables are $6.00 each. Refreshments will be available. Talk-in on 16.76 and 33.93. For further information and reservations, please contact Midland Amateur Radio Club, PO Box 4401, Midland TX 79704.

DAYTON OH
APR 27-29
The 1984 Dayton Hamvention's International VHFRUHF Conference will be held concurrently with the Hamvention from Friday through Sunday, April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. There will be technical forums by acknowledged experts; noise-figure, dynamic-range, and antenna-range measurement contests; and a hospitality suite with refreshments. Technical papers and presentations on VHFRUHF topics of interest are being solicited for consideration. Potential speakers should submit their requests immediately. For further information, contact Jim Stitt WABQ, VHFRUHF Conference Coordinator, 4126 Crest Manor, Hamilton OH 45011.

DAYTON OH
APR 27-29
The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. Admissions for all three days, is $7.50 in advance and $10.00 at the door. The Saturday evening Grand Banquet and Entertainment is $14.00 in advance and $16.00 at the door. Harry Dannals W2HD, past president of the ARRL, will be the featured speaker. Because seating is limited, early reservations are recommended. There will be a flea market starting at noon on Friday and continuing all day Saturday and Sunday. Flea-market space is $15.00 for all three days and will be sold in advance. Only one space for setups will be available starting Wednesday and the special flea-market telephone is (513)-225-0302. Other features will include forums, awards and exhibits. For special motel rates and reservations, write Hamvention Housing, Box 1286, Dayton OH 45402; no telephone reservations will be accepted. Address all other inquiries, payments for setups, to FOXHUNTER Information, Box 44, Dayton OH 45401, or phone (513)-433-7720. Please send advance registration checks to Dayton Hamvention, Box 2205, Dayton OH 45401.

FCC
Reprinted from the Federal Register

Changes in Procedures for Approval of Proposed Antenna Structures in the Amateur Radio Service; Announcement of Effective Date and Correction

AGENCY: Federal Communications Commission.

ACTION: Final Rule; announcement of effective date.

SUMMARY: The effective date of rules amending this document sets Parts 17 and 97 to change procedures for approval of proposed antenna structures in the Amateur Radio Service (2.5–81; 46 FR 10015). The rule amendments were adopted by the Commission on January 8, 1981, but their effective date has been held in abeyance pending compliance with reporting requirements by the General Accounting Office. The amendments are necessary to permit amateur radio operators to file a single form to obtain approval of proposed antenna structures, instead of the two forms (619 and 714) currently required. The effect of this action is to extend the time period of the antenna approval process for both amateur radio licensees and the Commission. The antenna approval form number is 854.

DAY: Effective date of the rules changes is January 3, 1984.

In § 17.4(f), there will be a blank space following the word Form, insert the number 854. In § 97.45(a), there is a blank space following the word Form, insert the number 854.

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AWARDS

Bill Gosney K7EC
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

DX AWARDS FROM SWEDEN

The Ball Award

In order to make the province of Dalsland, Sweden known, and to increase the activity of the amateurs in that region, the Mellenders Radio Club (SK0CM) decided to issue the Ball Award.

The award is given to all amateurs in Sweden, Norway, Finland, and Denmark who achieve 10 points, other European stations must achieve 5 points, and stations outside Europe must obtain 2 points credit. Every QSO with a radio amateur residing in Dalsland will give the applicant a point toward his or her goal. Should you have a QSO with SK0CM, 2 points will be credited to your total. All bands and modes will be allowed, but only one QSO with each station will count. All QSOs must be on or after January 1, 1979. Contacts via a repeater or satellite will not count.

Applications must list each callsign worked, date, time, GMT, band, mode, and the applicant's own name, call, and full mailing address. QSLs are not required. General certificate rules apply. The award fee is 5 US dollars or 20 Swedish kroner. Send your application to Mellenders Radio Club, 484-04 Mellender, Sweden.

As of April 25, 1979, the following amateurs would qualify for contacts to obtain this award: SK0CM, SM5s: AGW, AJL, AMU, ASJ, AWZ, BFR, BBG, BLE, BUT, BXP, CQI, CKJ, CJX, CMK, CQ, COZ, COX, CQA, CUA, CYQ, CYU, DXY, EAI, EAD, EUC, EUT, FCM, FKK, FLR, FTE, GAS, GDP, GMR, GQI, HQZ, HRL, HFP, JZJ, JKB, JMA, JOD, JOM, JOO, JQH, JRI, JYU, KFA, KBB, KFF, and ST.

The SWL Activity Club of Sweden and their award manager were very kind to send me complete award program information about the two major DX awards being offered by this club. Worked All Zone-14 Countries Award

This award is available to amateurs in three levels of achievement: Class A—work 27 countries in CZQ Zone 14, Class B—work 22 countries in CZQ Zone 14, and Class C—work 15 countries in CZQ Zone 14. There is no band or mode limitations, nor are there any date restrictions known at this time. Applications for WA7ZCA are sent with US$5.00 or 10 IRCs to Worked All Zone-14 Countries, Box 55, S-780, 40 Mockfjord, Sweden. GCR applies.

Countries in Zone 14 are: CT3, CT5, CT14, DDF, DQ, DF, DJ, DM, EA, EL, EY, FI, GM, GO, GJ, GI, GL, GM, GI, GW, HB, H8, H9, LA, LQ, ON, OY, OZ, PAP, SLS/KOM, ZBB, 3A, 4U (Geneva).

Worked ITU Zones 17/18 Award

This award is available to amateurs in three levels of operation: Class A—work all countries in Zones 17/18, Class B—work 7 countries in ITU Zones 17/18, including TF Island, and Class C—work 5 countries in ITU Zones 17/18.

Endorsements will be made available for single-band or mode achievements. Applications must be sent to the SWL Club Activity with 10 IRCs or US$2.00.

Y09s: AJD, AS5, BGV, CN, EM, OP, HH, HT, IA, IF, KAG, KPD, VI, W1, WD4, and YL0RA.

In Y0iland, the suffix for the same licensed ham is the same for any prefix.

Terrestrial DX Awards From Sweden

The AMCA is given for confirmed contacts with Mediterranean countries in three levels of achievement: Class A—41 countries, Class B—30 countries, and Class C—20 countries. A ZP contact is obligatory in any class of award. The following prefixes qualify as valid contacts: A2, A3, AC3, C1, CP, HA, HB, HBB, HV, JX, JT, GX, OE, TX, TT, TZ, U2, UD, UG, UB, U8, UG, UX, UOS, XT, XD, YE, ZA, ZP, ZD, 4U, 5U, 5T, 7X, 7P, 7Q, M1A(A), 9J, 9Z, 91, BE, IX, BU, DX, and ZA.

All Zone 11 Prefix Award

The AZ1FX Award is given for confirmed contacts with prefixes in CZQ Zone 11, below Class A—30 prefixes, Class B—19 prefixes, and Class C—12 prefixes. ZP to ZPY, PY1 to PY8, and the special prefixes used for WFX contacts are the only prefixes which qualify for this very difficult award.

The Tropics of Capricorn Award

The TCCA Award is afforded to those applicants who confirm contacts with countries touched by the Tropics of Cancer and Capricorn boundaries. A ZP contact is obligatory for this award. For Class A, 28 country contacts are required from the list below. Class B requires 20 countries. Class C requires 12 countries. The following prefixes qualify as valid contacts:

Tropic of Cancer: S20, BV, BY, E9, KH6, A8, A6, SU, TZ, CV, U6, XE, XZ, SA, S5T, SUT, 7X, 7Z, 7W.

Tropic of Capricorn: A2, CE, C9, LY, PV, VK, ZP, Z3, Z83, 58R.

The Diploma Suz-Amer

The DSA Award is given for contacts with countries located in ITU Zones 12, 13, 14, 15, and 16, and 73 as follows: Class A—33 DX zones and 6 ITU zones, Class B—25 DX countries and 6 ITU zones, and Class C—18 DX countries and 5 ITU zones.

Countries which qualify are contacts are:

Class A—February 25, HC, HC8, HK8 (Majela), OQ, BZ, 8R, YV, CP18, 390.
Class B—November 13, P6Y9, 7Y8 (Fernando de Noronha), P18 (St. Peter, St. Paul), 380, CE70/223/48, 6V, TP, CEZ, CP70/223/4/5, 6Z, CP, LX/AA74.
Class C—November 23, 5Y9 (Tiradentes Island).

Class B—November 6, CE879, VP8 (Falikian), LX/AA74.

Class C—November 7, KC1AUS, LX, CE879, VP8 (Graham Land), VP8 (Sandwich), VP8 (Shetland).

Diploma Paraguay

The DP Award is given for confirmed contacts with five different ZP stations in States in South America are required to contact 15 ZP operators.

Worked All ZP

The WAZP Award is being offered to amateurs making at least one confirmed contact with ZP stations in each of the ZP districts: ZP1–ZP9.

Diploma Departamentos Del Paraguay

The DDP is given for confirmed contacts with the nation's capital and different departments into which Paraguay is divided. Class A requires 20 contacts; Class B requires 16 contacts; Class C requires 12 contacts.

Dead bands by prefix are: ZP1—Bo-que: Chaco, Nuevo, Asuncion; ZP2—Altos, Pte. Hayes; ZP3—Amambay, Concepcion; ZP4—Canendeny, San Pedro; ZP5—Central, Cordillera, Paraguari; ZP6—Caaguazu, Caazapa, Guaira; ZP8—Misiones, Neuroebou; ZP9—Alto Parana, Paraguay.

Contacts must be made on or after May 15, 1952, to qualify for any of the awards sponsored by the Radio Club of Paraguay. A certified list of contacts with a fee of 5 IRCs for each award is available for Elio Donna ZP5CE, Award Manager, RC Paraguay, PL Box 512, Asuncion, Paraguay.

3905 CENTURY CLUB AWARDS

Representing the 3905 Century Club, Bill Herbst WAZ7YM writes to share with us the various awards available to ama- teurs who frequent their net operation.

The SWL Activity Club of England is basically a WAS (Worked All States) network which grew out of the old Bicentennial Net on 60 meters back in 1976. The net now operates daily on 40 and 90 meters, 5000–5050 on 7.233 MHz and 0500–0600 on 3.905.

Naturally, as time went on, it became apparent that an awards program of some kind was in the offing. As amateurs work each other on the band, they gather a point per contact. Once 100 points are earned, you become a member of the club and are issued a certificate to illustrate your affiliation.

As members continue their contacts on the normal levels of achievement are recognized, with the ultimate being the 1000-Point Award, which is certainly no overnight venture.

Certificates awarded net participants are the 3905 Century Club States Awards, which requires the applicant to contact at least 35 state capital cities. Each contact award certificates US$2.00, and the maximum of 50 state capitals worked on the sponsor net.

HAROA AWARDS

We will mention the long hours of dedi- cated operation should not go unnoticed, nor should the high degree of enthusiasm of amateur-radio operators go neglected in their pursuit of self-set goals. That is why we have an awards column in this magazine. We are proud to present the awards and certificates made available by HAROA.

As we review each one individually, we find that all of their awards are very high quality and will make a very impressive addition to any radio shack.

GCR apply in making application for HAROA Awards. Each award is two dollar or 5 IRCs. At your request, special en- dorsements will be added for CW, SSB, RTTY, SSTV, FM, QRP, All YL, or single band endorsements. Applications must be signed and are mailed to each station contacts and satellite contacts are correctly handled. Endorsements are also given for 25, 50, 75, 100, 200, and 500 DX
Official Traffic Handler Award
This award is a self-assigned issue, especially allowing you to display the fact that you are indeed an official handler of radio traffic.

HAROA Super Operator Award
This certificate is rendered for those providing a service on behalf of amateur radio, such as weather observer, public service, emergency, helping a new ham, providing communications for a community function, etc. The requirements are for the applicant to briefly describe the event of service. The officials at HAROA will determine whether it deserves this special recognition.

For your personal copy of HAROA award program rules or to apply for any awards presented here, write: HAROA Award Program, PO Box 341, Hinckley OH 44933.

NORAC WINTER CARNIVAL
The North Okangan Radio Amateur Club Club will have a special station set up during the NORAC Winter Carnival (western Canada's largest). This is a free award but we would sure appreciate $1.00 or 2 IRCs to cover the postage. The award is available for amateurs worldwide who contact 3 Vernon area stations or QSO once with our club station VE7Nor, any mode or band is permissible. Our special station will be operating daily from February 1 until February 12, 1984. Times will be from 2100Z to 2400Z. Look for us in the General portion of each band, about 50 kHz up, calling "CQ Winter Carnival Award."

SCHOLARSHIP HONORS SENATOR GOLDWATER
In Washington DC on November 9, Senator Barry Goldwater (R-Arizona) announced to his fellow ham-radio operators around the world that the American Radio Relay League had established an annual $5,000 scholarship award in his honor.

The League will award the scholarship to a licensed amateur radio operator enrolled in college-level study of electronics, communications engineering, or a related field. The program will be administered by the ARRL Foundation, Inc., the League's fundraising and educational organization.

Goldwater, known to thousands of radio amateurs as K7UJA, made the announcement from his "ham shack" on Capitol Hill. Within seconds after the ceremonial transmission, Goldwater began receiving congratulatory messages from ham operators throughout the US and several foreign countries.

The late Vic Clark, League president, explained that Goldwater was selected as the recipient of the award because of his lifelong dedication to amateur radio and his contributions to the development of radio communications.

COAXIAL CABLE
RG-8U/65% BRAID-FOAM/0.235/M" MICRO 8U/65% BRAID-FOAM/15/M" RG-213U/96% BRAID-POLY/0.75" RG-214U/2.96% BRAIDS-POLY/0.95/M"

ROTOR CABLE
8C HAMLINE HD-1/186-184/0.04/M"

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ROTOR CABLE
8C HAMLINE HD-1/186-184/0.04/M"

CALL COLLECT
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CONNECTIONS

UHF PL-259 576 ea.
UHF PL-770 1.86

SLEEP SPECIALS

RCKWELL COLLINS
KWM-380 transmitter + hand-guage coverage receiver, 5-30 MHz with WARC/MAKS coverage, laser marked with s/n above 2,200. All production units thru 218, built to AC/DC power supply LIST $6,600.00, SALE $5,475.00

KWM-380 OPTIONS
AC-3801 noise blanker LIST $160.00, SALE $115.00
AC-3802 graphic equalizer LIST $208.00, SALE $185.00
AC-3803 control interface LIST $175.00, SALE $135.00
AC-3805A keypad, ready to plug in control interface, as seen in Goldwater's shack LIST $160.00, SALE $135.00
AC-3810 CW filter, 300Hz LIST $180.00, SALE $160.00
AC-3811 CW filter, 140 Hz LIST $180.00, SALE $160.00
AC-3812 RTTY filter, 1.7 kHz LIST $180.00, SALE $160.00
AC-3821 emergency DX stand-by cable LIST $108.00, SALE $90.00
MC-280 handheld microphone LIST $64.00, SALE $56.00
KWM-380 service manual LIST $40.00, SALE $30.00

HENRY LINEAR TUBE AMP LIERS
1KDS, 1200 WEP, desk type, 1-500 LIST $695.00, SALE $625.00
2KDK Classic, 2KW EP, desk type, pair, 1-500 LIST $1,080.00, SALE $960.00
2K Classic, 2KW EP, console type, pair, 1-500 LIST $1,395.00, SALE $1,249.00
4K Classic, 4KW EP, console type, pair, 1-500 LIST $2,195.00, SALE $1,995.00
3K Classic, 2KW EP, console type, 857 tube LIST $2,695.00, SALE $2,450.00

GO VHF/UH DX WITH A HENRY SSB CW AMPLIFIER
1002A 166 MHz, 1KW EP input, rack mount, 874 tube LIST $895.00
1002A 220 MHz, 1KW EP input, rack mount, 874 tube LIST $995.00
1002A 440 MHz, 1KW EP input, rack mount, 874 tube LIST $995.00
1004A 220 MHz, 1KW EP input, console, SXO 800A tube LIST $1,299.00
1004A 220 MHz, 1KW EP input, console, SXO 800A tube LIST $1,395.00
1004A 440 MHz, 1KW EP input, console, SXO 800A tube LIST $1,299.00

Shipping charges additional. We accept VISA/MAEC or TAKE ADDITIONAL BONUS OF 2% DISCOUNT off purchase price by cash or major credit cards.

For personal service, write or phone Bill Slep 704-524-7519.

Slep Electronics Company
P.O. BOX 100, HWY. 441
OTTO, NORTH CAROLINA 28763

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NEW PRODUCTS

TC-1 PLUS ATV TRANSMITTER/ DOWNCONVERTER

P. C. Electronics has upgraded their TC-1 all-in-one-box 420-450-MHz full-color ATV unit with some new features. The new unit is called the TC-1 Plus. With more and more amateurs using computers and VCRs on ATV, separate video and audio inputs were added to the existing camera and mike inputs. This allows front-panel switching back and forth between the camera and computer, or transmitting the VCR audio along with voice-over commentary using a microphone. It has made learning Basic computer language over the air and retransmitting the Space Shuttle video and audio easy.

Capability for external 13.8 V dc has been added to the built-in ac supply for those who want to go mobile or portable on battery power during Fall Day, emergency services, CAP searches, parades, marathons, or other public-service events. A video monitor output is now provided to enable making your own picture exactly as it is transmitted in order to better set modulation levels, lighting, etc. This is accomplished by the built-in diode detector on the transmitter if output strip line which then connects to the composite video-monitor line-driver circuit.

The TC-1 Plus has the new TXA5-5 excite-er-modulator which features two-frequency plug-in crystal switching with just the addition of an SPST switch. Also, the built-in sync stretcher and hi-lo power switch capability enable superior stable color video if a higher-power linear amplifier, such as the Mirage 100-Watt D1010N, is added later or run barefoot at its greater than 10 Watt PEP output.

The 420-450-MHz, tunable downcon-verter has the low noise NE6435 preamp stage to dig out the weak signals. It acts like a super hot UHF TV tuner but covers only the 73cm band when connected to your TV set antenna input and set for channel 3 or 4. Both color video and sound live action ATV are available on your TV set just as the broadcast stations provide. The standards are the same.

With the TC-1 Plus, the only other items necessary to get on ATV are a good 70cm antenna and low-loss coax, your TV set, and any device with a standard low-voltage p-p composite video output common-ly found on black and white CCTV cameras, home video color cameras and VCRs, computer, RTTY/video converters, etc. A Technician class or higher amateur-license is required for operation and purchase from P. C. Electronics.

For more information and a complete catalog of ATV equipment, antennas, cameras, modules, and accessories, call or write P. C. Electronics, 2322 Passion Lane, Arcadia CA 91007; (818) 447-4565.

SOFTWARE PROTECTION SYSTEM

Software Protection Devices, Inc., a division of Wayne Green Enterprises, has introduced Copyright, a hardware-based protection system using encryption technology. The Copyright system has been proven by beta testing to provide pirate-proof software protection.

Software to be protected by Copyright is first encoded using a Data Encryption Standard (DES) algorithm which scrambles the machine code of the program. The customer, on the first use of the protected program, has to enter a 256-bit number and obtains a code which will unlock the program. The user types in this enabling number to decode the DES encryption and provides for use with the Copyright CPU (C-CPU).

The C-CPU is a standard CPU with a different decoder built into each unit. It is installed by a dealer on owned equipment or at the factory on new computers. One C-CPU can be used to decode any number of protected programs, yet it will run unprotected software with no interference. This system does not slow down the CPU, even on protected programs. A protected program may be freely backed-up by the user on any medium and will run only on the user's computer.

Copyright software protection boundaries are flexible enough to allow the publisher to leave certain portions of their software, such as I/O routines, unprotected and modifiable by the user. All unprotected portions may be written in any programming language.

For more information, contact Ken Witham at Wayne Green Enterprises, Inc., 80 Pine St., Peterborough, NH 03458; (603) 924-9471; Reader Service number 480.

SATELLITE RECEIVER

Lowrance Electronics of Tulsa, Oklahoma, has introduced a new satellite receiver for 1984. The new receiver unit, called the System 70, follows the firm's System 7 and will be manufactured at the company's headquarters in Tulsa. The receiver will be marketed through a worldwide distributor network.

The System 70 receivers feature detent tuning, polarity control, a signal-strength meter, built-in modulator, scan tuning, and wide and narrow audio filters. The receivers are available as the standard model 70X or the stereo version, 70S, which decodes both matrix and discrete stereo sound and features simplified stereo tuning. Both models carry a full one-year warranty.

For additional information, contact Lowrance Electronics, Inc., 12000 E. Skel- lify Drive, Tulsa OK 74128. Reader Service number 479.

NEW TRIBAND BEAMS

Palomar Engineers has announced the availability of two triband beams. Model DX-33 has three elements on 10, 15, and 20 meters. Model DX-43 has four elements.

These antennas have long been used by European DXers and are being made available in the US for the first time. Designed for use with solid-state transceivers, the antennas feature low swr and wide bandwidth. Gain and front-to-back ratio are particularly good. Each trap is individually swept tested at the factory for uniform performance. Stainless-steel U-bolts are used throughout.

For more information, contact Palomar Engineers, 1924-F West Mission Road, Encino CA 91360; (818) 747-3343.

NEW SOFTWARE FOR THE TRS-80

Woodall Software has announced a TRS-80 program for transmission and reception of RTTY that does not require a TV or interface for operation. The SOFTTY program will work as well or better than software/hardware packages requiring a DLL decoder. Only the much more expensive TUs may give consistently better results.

Gary Woodall has devised an algorithm for this program that samples the incoming audio signal to measure the tone frequency and shift using the cassette READ port. This method is very effective and makes the system immune to most noise. The only thing that may be a problem is a stray signal which is almost exactly on your operating frequency.

The program was written entirely in Z80 machine language to obtain the processing speed necessary for the algorithm and associated functions. Timing is very criti-cal and necessary close attention to T states and M cycles during programming (down to micro-seconds).

The tone-generating section of SOFTTY simulates the two RTTY tones by produc-ing an alternating time-controlled voltage and outputting via the cassette WRITE port. The output from the AUX plug is then fed into the microphone input circuit of the transmitter. Most microphone circuits will smooth the simulated sine-wave signal, making it sound like a true sine wave when transmitted.

SOFTTY Version 1.0 has split-screen operation. For more information, contact Woodall Software, 2015 E. 19th Ave., Denver CO 80210; (303) 397-0028.
operation so that the main buffer may be filled while decoding and displaying the received signal. A choice of high and low tones is keyboard selectable, as well as normal and inverted (mark/space or space/mark) tone detection.

SOFTTY 1.0 is set for a 170-Hz tone shift used by amateur-radio operators. Other versions are available for different shifts used by news and weather services. A visual tuning indicator makes setup easy to accomplish.

There are five programmable buffers available, each of which can hold up to 255 characters. They can be filled from the keyboard and saved to magnetic tape for later retrieval.

For more information, contact Bill Gouge or Gary Woodall at Woodall and Associates, PO Box 284, 11 Glenda Drive, Plainfield IN 46168; (317)-271-2565. Reader Service number 481.

NEW FROM ICOM

ICOM has introduced three new models of amateur equipment: the IC-27A two-meter 25-Watt mobile unit, the IC-04A and IC-04AT 440-MHz hand-held transceivers, and the IC-27H 100-Watt two-meter base-station transceiver.

IC-27A

The IC-27A is an important breakthrough in two-meter mobile communications. Measuring 1-1/2 inches high by 5-1/2 inches wide, the IC-27A contains an internal speaker making it easy to mount.

Although the IC-27A is compact, it has not sacrificed any features. Standard features include 25 Watts of output power, 32 PLT frequencies, ten full-function tunable memories, scanning of memories and the band, priority scan, and a microphone which includes a 16-button touchtone pad for access to a repeater or dialing through an autopatch. An optional speech synthesizer is also available to verbally announce the receiver frequency of the transceiver through the push of a button.

The IC-25A, measuring 2 inches wide by 5-1/2 inches high, will continue to be available for those individuals preferring a mobile unit with larger operating knobs.

IC-04A and IC-04AT

ICOM has announced their latest in 440-MHz hand-held transceivers: the IC-04A and IC-04AT. These multi-function, multi-feature hand-helds for 440-449.995 MHz feature frequency entry, control functions, and 32 PL tones which are controlled by the 16-button pad on the face of the radio. Also included are priority scanning (both of memories and programmable band scan) and DTMF (0-AT only).

For scanning, 5-kHz increments are front-panel selectable. Ten memories with internal lithium battery backup afford flexibility for channeling operation for easy access to most-used channels. The custom LCD readout with S-meter is unique.

There I met the most helpful and supportive crowd of guys and gals and before you knew it, I had my ticket. The NNMARC holds regular classes both for the Novice and for upgrading to other classes. All are at no charge.

The hams who helped me on the way to a license were most eager to do so and extended every courtesy to the point of going out of their way several times, especially when it came time for the Novice exam and code test.

So, not all Southwest hams are snobs, and I hope Mr. Fearon has by now found that to be true.

Michael Langford

KASSAT

Santa Fe NM

LETTERS

LOG PROGRAM AVAILABLE

The response to my article “Proofproof Logging” on page 58 of the November, 1983, issue of 73 was overwhelming. I had noted in the article that if enough persons were interested, I would make the program available.

The program is now available for the TRS-80 Model III under TRS80DS 1.3 and for the IBM-PC under PC-DOs 1.1 or 2.0. The cost is $35.00 each including the diskette and user’s manual. Postage is included in the cost. A version written in dBASE-II source code will be available by January 1, 1984, for some computers.

John E. Fall

KL7GRF

Long Beach, CA

NO SNOBS IN SANTA FE

In response to the letter from Mr. Fearon printed in the October issue, please be advised that the snobbery he felt in Albuquerque has not reached the higher elevations and arrived in Santa Fe. Being 60 miles apart, there is a world of difference in all attitudes and amateur radio especially.

The Northern New Mexico Amateur Radio Club in Santa Fe will be more than happy to assist Mr. Fearon in directing him to hams who have the time and energy to be an Elmer. When I made up my mind to go for a ticket, I started going to the Saturday morning breakfasts the club holds each week at The Pantry restaurant.

The IC-04A and IC-04AT have the same styling, control features, and functions as the IC-02AT and utilize the existing accessory line available for the IC-2A and IC-2AT plus new accessories such as long-life and high-power battery packs.

IC-27H

For two-meter communications, ICOM has also developed the IC-27H, a transceiver with a high dynamic range receiver and a 100-Watt transmitter. Operating from the IC-PS30, IC-PB15, or the internal IC-PS35 (optional), the IC-27H integrates all the functions of the latest CPU-controlled radios.

Standard features include 100 Watts of power, 32 built-in subaudible tones, 32 full-function tunable memories, 10-Hz PLL locking, easy-to-read fluorescent display, scanning, and mode scan. It is 11-1/4 inches wide by 4-3/8 inches high.

To facilitate the operation of the IC-27H, ICOM has incorporated a duplex touch switch, all-mode squelch, receive audio tone control, S-meter, center meter, seven-year lithium battery memory back-up, 24-pin accessory connector, and microphone. Optional features include a switchable preamplifier, CTCSS codec/decoder (encoder is standard), computer interface, and voice synthesizer.

For more information, contact ICOM America, Inc., 2112 116th Ave. N.E., Bellevue WA 98004; (206)-454-8155.

ALBATROSS

The editorial in the October issue of 73 revealed some interesting things. I have found 73 to be a very enjoyable magazine. The editorial touched on one area I am in agreement with. QST and the League are getting to be a useless albatross to amateur radio. The magazine has fewer and fewer technical articles and more and more pages of contests and patron- the-back data.

I am of the old school of home brew: if you want a transformer, wind it. I've even made my own tubes out of light bulbs. Now I run my computer on what the filament used to draw.

I am an amateur more interested in construction than in operating, so the "incentive" of the League left me cold. Similarly, there is a trend to buy everything from Japan, yet we developed the technology they copied or stole.

This country still has creative engineers, people who are amateurs. I call it poor boy research, amateur because of low funds, not lack of skill. This country is becoming a high-technology and farm export country, though our government and corporations are too stupid to foster education or family farms.

I like 73's view of trying to stay ahead of the pack. The concept of developing a college (no, I didn't misspell college) can provide an "edge" to a student not filled by some of our prestigious struc-
tured schools, provided it teaches creativity. Creativity is a rare commodity at best, yet it is something that once made this country great.

Escalating the college via cable is a good limited short-term idea. But cable TV is not like the covering because of greed and failure to make it duplex. The time will soon come when fiber optics will replace it, allowing duplex operation. There is your future.

In the meantime, the proliferation of satellite dishes (7-10') will fill the void of cable. Direct satellite broadcast (2 dishes) will bankrupt the cable companies.

The concept of interactive teaching is an area not touched. Suppose the main program (class) was on laser disk, supported and controlled by a magnetic diskette for your microcomputer. Q&A would be on the disk and your terminal CRT. Further support could be by packet transmitted to the satellite or local data line.

At present, I spend about $1000 (plus four times a year to go to schools: $500 travel, $500-$600 class and lodging). Wouldn't it be more profitable if I could take an interactive class here for $750 a year total?

The University of Wisconsin at Madison and Milwaukee have superb extension programs. George Washington University, Georgia Tech, and UCLA have extension work in engineering. These people have had to come from all over the country to teach a class, which the school only organizes the class. I have made friends all over the country this way and gotten credits as a bonus.

Phil Jedlicka W9DIEE
Norman OK

CALL FOR PAPERS

The American Radio Relay League will hold its Third Amateur Radio Computer Networking Conference on April 15, 1984, in Trenton, New Jersey. The conference will be held in cooperation with the Trenton Computer Festival (TCF84) being held April 14-15 at Trenton State College.

The deadline for camera-ready papers is March 1, 1984. All papers should be mailed to Paul R. Rinaldo W4RI, American Radio Relay League, 225 Main Street, Newington CT 06111. If you plan to present a paper, please request an author’s guide and identify the title of your paper immediately. Proceedings will be sold at the conference and by mail from ARRL Headquarters.

Technical papers are invited on all aspects of amateur computer radio, AMTOR, computer-based message systems, digital communications, and related amateur radio digital communications via terrestrial, ionospheric, meteor-scatter, and satellite media including AMDAT-OCSAR 10 and PACSAT. Topics may include network and system architecture, proposed standards, hardware, software, protocols, and encoding schemes, applications, and practical experience.

Paul Rinaldo W4RI
Newington CT

MARKETABLE EDUCATION

I enjoyed the editorial in the October issue of 73. However, I would go a little bit further. I think that education is a big isle bring huge profits for the first businesses to take full advantage of it. I think that the attention focused on education by the present language is that the media has helped to make the time ripe for business to enter. I speak with some experience, since I now teach mathematics and computer science at this time.

In the beginning, there was machine language. Programmers would program by punching holes or flipping switches corresponding directly to memory locations in the computer. This was a tedious affair, but engineering and math types were content with this method for a number of years.

The instructions that a computer program consists of are represented as numbers in the computer’s memory, and the same memory is used for both data and instructions. That means that the contents of a byte containing the binary number 10101010 could be anything from a computer instruction to a data item. One cannot tell the exact meaning of an isolated byte of memory—it must be looked at in context.

Needless to say, this business of binary numbers soon got confusing. It was extremely difficult to debug a program consisting solely of spots on a storage tube, or of marks on a paper tape represented in base 16 or base 32. Because of this, assembly language was developed.

Assembly language and machine language are very closely related. There is a one-to-one correspondence between statements written in the two languages. It goes in essence, as: The instruction: move 32 bits to location specified by the next two bytes.

Assembly language also allows the user to work with decimal or hexadecimal numbers; conversion from one radix to another is another function handled by the assembler. Finally, an assembler allows a person to create a program to run in various parts of memory. A machine-language program generally cannot be relocated to another portion of memory. An
assembly-language program can be placed into another portion of memory by reassembly of the program.

Each microprocessor has its own machine language and, therefore, its own assembly language. For example, the Atari computer and the Apple computer both use a microprocessor chip in the 6502 family. Because of this, they both have the capability of "understanding" the same assembly language. The obvious conclusion a person could make is that those two machines would be software compatible, at least at the machine-language level. Unfortunately, this conclusion is erroneous.

There is another factor to consider when dealing with software compatibility: differences in hardware. Let's continue with the Apple vs. Atari comparison and look at aspects of the hardware differences. Consider the simple matter of the clock speeds of the computers. The Atari's internal clock, which controls the speed of the microprocessor, runs at about 1.6 MHz as compared with the 1.024 MHz of the Apple.

Does this mean that the same machine-language program will run 56% faster on an Atari? No! The Atari will be about the same speed, if not slower, because of Atari's special display processor chip. This chip takes control of the computer's bus every so often in order to fetch display data from memory. In order to do this "disk memory access" (DMA) of data, the 6502 microprocessor must be "halted" during the DMA cycle.

Another thing that slows down the computer's performance is Atari's use of interrupts. Every 60th of a second, and sometimes more often, the microprocessor is interrupted from the program that it is executing and runs a system-maintenance routine. All this interrupt and DMA business simply means that the amount of time the Atari computer takes to execute a program cannot be calculated by simply knowing the clock speed, nor can the speed of the computer be compared to another computer's just by looking at the clock frequency.

The reason that we have to consider hardware when dealing with assembly language is that one cannot separate the two. It is necessary to have some hardware knowledge in order to program effectively in assembly language. This is especially true when doing I/O-related tasks. After all, how can you get data in or out of a computer without knowing the hardware configuration?

Just keep in mind that assembly language is simpler than any other language. Think small. Each statement can do only very little. If you approach the matter with this attitude, you will find learning assembly language to be equally simple.

**High-Level Languages**

High-level languages remove the user from the computer's hardware. Many times an assembly language must worry about are "shielded" by the language processor. It is this shielding that makes some things impossible to do in a high-level language, sometimes complete control is needed. However, most of the time a high-level language (such as BASIC) is the better choice. The easiest solution is often the high-level language.

A wide variety of high-level languages is now available for microcomputers. In addition to BASIC, implementations of C, PL/I, Algol, FORTRAN, LISP, Ada, COBOL, PL/M, Forth, and Logo are commonly available. I will devote some time to these and comment on their suitability for amateur radio applications in future months.

**Graphics**

I still need more feedback on the development of a graphics standard for amateur radio. As I mentioned in past columns, I would like to establish some standards to allow users of different computers to exchange graphics data. Possibly techniques could include "unit square" graphics (where coordinates are given relative to a 1 by 1 screen thereby making the center point 0.5,0.5) or standard graphics character sets. Any comments along these lines would be appreciated. Don't forget: include a SASE to ensure a reply!

---

**ELEMENT 1**

**MULTIPLE CHOICE**

1) An electrical generator's magnets are:
   1) small
   2) non-polarized
   3) oppositely-polarized
   4) similarly-polarized

2) What is the current value in the circuit of an 8-Watt lamp running at 200 volts?
   1) 0.04 Amps
   2) 40 Amps
   3) 400 Amps
   4) 4 Amps

3) The henry is the unit of:
   1) work
   2) voltage
   3) capacitance
   4) inductance

4) Impedance is:
   1) the total opposition offered by a circuit to the flow of alternating current
   2) the total opposition offered by a circuit to the flow of direct current
   3) the complete resistance offered by a circuit to ac or dc
   4) determined by dividing voltage by resistance

5) The two most common semiconductor materials are:
   1) germanium and curium
   2) silicon and argon
   3) iron and lead
   4) germanium and silicon

6) Transistors can:
   1) amplify voltage
   2) amplify current and voltage
   3) amplify current
   4) none of the above

7) The banded end of a diode indicates that:
   1) anode
   2) cathode
   3) emitter
   4) filament

8) A multivibrator is a type of:
   1) Hartley oscillator
   2) Armstrong oscillator
   3) Colpitts oscillator
   4) resistance-capacitance oscillator

9) A disconnected capacitor:
   1) is harmless
   2) does not retain energy
   3) can be used as a transistor
   4) can kill you

10) D'Arsenal:
    1) was the inventor of the transistor
    2) is a type of analog meter
    3) is a type of digital meter
    4) refers to D'Arsenal's Law

**ELEMENT 2**

**MATCHING**

Match the term to its definition.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Acorn</td>
<td>A) Diode rectifier</td>
</tr>
<tr>
<td>2) Kystron</td>
<td>B) Unit of work</td>
</tr>
<tr>
<td>3) Nuistor</td>
<td>C) Squat UHF tube</td>
</tr>
<tr>
<td>4) Dyne</td>
<td>D) Miniature metalceramic tube</td>
</tr>
</tbody>
</table>

**ELEMENT 3**

**TRUE-FALSE**

1) The daraf is the unit of elactance.
2) Doubling a number and adding one is called "diluting."
3) One handy oscilloscope uses the measurement of capacitance.
4) The coulomb is the unit of charge.
5) In magnetism, opposites repel while likes attract.
6) A "zigzag" is a type of rectifier circuit.
7) A "zenor" can be used as a voltage regulator.
8) There are two individual rectifiers in a bridge rectifier.
9) Batteries generate voltage through photosynthesis.
10) A logic probe is used to test 5-volt dc circuits.

**ELEMENT 4**

**FILL IN THE BLANK**

1) A _______ is a precisely dimensioned, hollow metal pipe through which microwave energy is sent.
2) The instrument that presents visual representations of an electrical quantity is an
3) The soft form of carbon used in most resistors is called
4) The main control electrode in a vacuum tube is the
5) In a bipolar transistor, emitted current travels toward the

**THE ANSWERS**

**Element 1:**
1) 1-2-3-2-1, 3-4-1, 5-4, 6-2, 7-2, 8-4, 9-4, 10-2.
2) 1-2-1-2, 3-2-1, 4-2-3, 5-2-1, 6-2-3, 7-2-1, 8-2-3, 9-2-1, 10-2.

**Element 2:**
1) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

**Element 3:**
1) 1.
2) 2.
3) 3.
4) 4.
5) 5.

**Element 4:**
1) 21. Thes"....
2) 22.
3) 23.
4) 24.
5) 25.
6) 26.
7) 27.
8) 28.
9) 29.
10) 30.

**THE ANSWERS**

1) The daraf is the unit of capacitance.
2) Doubling a number and adding one is called "diluting."
3) One handy oscilloscope uses the measurement of capacitance.
4) The coulomb is the unit of charge.
5) In magnetism, opposites repel while likes attract.
6) A "zigzag" is a type of rectifier circuit.
7) A "zenor" can be used as a voltage regulator.
8) There are two individual rectifiers in a bridge rectifier.
9) Batteries generate voltage through photosynthesis.
10) A logic probe is used to test 5-volt dc circuits.

**SCORING**

**Element 1:**
1) Two and one-half points for each correct answer.
2) Two and one-half points for each correct match.
3) Two and one-half points for each correct answer.
4) Five points for each word correctly filled in.

**Element 2:**
1) 1-2-3-2-1, 3-4-1, 5-4, 6-2, 7-2, 8-4, 9-4, 10-2.
2) 1-2-1-2, 3-2-1, 4-2-3, 5-2-1, 6-2-3, 7-2-1, 8-2-3, 9-2-1, 10-2.

**Element 3:**
1) 1.
2) 2.
3) 3.
4) 4.
5) 5.

**Element 4:**
1) A _______ is a precisely dimensioned, hollow metal pipe through which microwave energy is sent.
2) The instrument that presents visual representations of an electrical quantity is an
3) The soft form of carbon used in most resistors is called
4) The main control electrode in a vacuum tube is the
5) In a bipolar transistor, emitted current travels toward the

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**John Edwards K2IU**
PO Box 73
Middle Village NY 11379

**BASIC ELECTRONICS**

I've just finished looking through the FCC's new list of suggested questions for Novice-class exams. Most of the material looks pretty good. Still, it comes off looking kind of dull—row upon row of gray boilerplate. I can't help but think that the FCC could have done better by coming to me. Boy, would I have put together a test for them—you know, crossword puzzles, matching, acrostics, and so on. Don't laugh. Is it any sillier to make prospective hams memorize a binary code system? ASCII code yes, Morse code no. At least my puzzles would have a relevance to current technology, which is more than you can say for those silly dits and dahs.

Taking things a step further, imagine the new look in study guides. Page after page of puzzle solutions. Can't you just see Dick Bass at the Dayton Hamvention hawking his Final Exam Crossword Dictionary? Hey, FCC! I can still help you with the General, Advance, and Extra-class tests lists. Drop me a line.

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**FUN!**
THE YAESU FT-980 TRANSCEIVER

As transceivers became completely solid state, size and weight were reduced dramatically, so I was particularly surprised at the FT-980, the latest descendant of the Yaesu FT line. This now-famous line began with the FT-400 and became perhaps most popular with the FT-100 series. But the FT-800 HF Transceiver CAT System (for, I suppose, computer-aided transceiver) is no lightweight and it's packed full of features aimed at providing the serious radio amateur with the best communications tool available. For this review, along with the FT-980 I had the optional SP-980 speaker system and the MD-881 stand microphone. More about these accessories later. General specifications for the transceiver are shown in Table 1.

PACKED in with the set was a pretty good installation and operation manual that explains the rig's capabilities. The manual included a couple of loose sheets that detail connections for an alternate means of keying a linear amp if it requires more than 200 mA of switching and updated filter installation instructions. Because this FT-980 had all the optional AM and CW filters already installed and I was trying to key a linear with current requirements less than 200 mA, these provided no extra trouble—and I doubt they would anyway.

The manual is reasonably well written and doesn't contain many misspellings and odd sentence structures typical with some imported equipment. Separate from the manual are 22 pages of schematics and 7 pages of block diagrams! If you have the "right stuff" to tear into the FT-980, at least you'll have a fighting chance with this documentation. Also in the manual is a thorough description of accessory interconnection along with pinouts for each plug and connector. An added bonus in the package is a nice four-color map of Japan for award use; it's in Japanese, though.

So much for the documentation—let's get this unit on the bench and start operating. "Det." says I, "This thing weights a ton." Actually, it weighs close to 40 pounds with all the options installed. In the shipping box I found a bag of all kinds of plugs and connectors, till feet, fuses, three-wire line cord, and two AA-cells for the power-off memory retention. The AA-cells were the first of several oddities.

Memory backup is provided solely through these cells—no nicads, lithium cell, or anything else. Yaesu says to replace them every six months or "advises" to the FT-980's memory.

As with several other available "competition-grade" transceivers, the FT-980 covers all the amateur bands, including WARC, and acts as a separate 150-kHz-to-29.9999-MHz general-coverage receiver. With the memory backup energized, upon power-up the FT-980 greets you exactly as you last left it. Should you elect not to use the memory back-up or should the AA-cells fail, the 980 defaults to 7,000 kHz, general coverage.

Rocking the power switch on illuminates the two large analog meters and the blue digital frequency mode displays. The meters provide quite a monitoring capability as shown in Fig. 1. The upper digital display includes frequency readout to 10 Hz as well as USB, LSB, CW (narrow), CW (wide), AM, AMW, FSW, and FM to match the position of the Mode switch.

Receive Features

To operate, first select Ham or Gen (general-coverage) coverage by depressing the appropriate push-button. Band selection is made through three momentary-contact push-button: Up, Down, and Repeat. These as well as most other functions are selected via momentary-contact push-buttons that function either as toggles (push-on/push-off) or as simple entry switches. A soft beep verifies that switch contact has been made and the beep can be turned off.

Operating frequency can be selected five ways: 1) main tuning knob, 2) 10-kHz step push-button, 3) Up/Down 5-kHz push-buttons, 4) a keypad, and 5) up to 12 memory frequencies selected by a rotary switch. Yaesu's optional stand and handheld microphones afford frequency selection via push-buttons, although without as many options.

Upon power-up, I was impressed with...
The Yaesu FT-880 with companion Mike and speaker.

Operating side of the FT-980. The curious pseudo-analog display is right above the main tuning control (more on this in the text and Fig. 2).

Rear panel of the FT-980 has almost as many switches as the front panel. The projecting module holds the power amplifier (left) and the power supply (right).

Top view of the FT-980. The optional keyer module is the small rectangular PC board located at about the one-o'clock position. The vco, PLL, and vfo subassemblies are under the metal covers. Power supply and control circuitry are under the screened-in section at the rear.

the audio quality of the receiver. It has an excellent built-in speaker. When the accessory speaker or headphones are plugged in, the internal speaker is disconnected.

On receive, you have AF gain, RF gain, Noise Blanker, Tone, Squelch (FM only), IF Width and Shift, wide and narrow filters (if installed), a calibrated 0-30-dB IF attenuator (in 10-dB steps), a Mode switch, and Notch and APF audio peak filter—CW only controls to play with. You can do something quite fine knob-twiddling and slide away at the pipsqueaks and heterodynes. The narrow filters are very sharp and a dial-lock push-button holds the frequency. In case you accidentally bump the main tuning knob while tweaking all the other controls.

The frequency displays require some special mention. Beneath the upper digital frequency and mode display is another window, a sub-display that Yaeasu calls a "...synthesized analog display [that] provides a relative frequency indication which scrolls when the frequency of the selected vfo is changed." What amounts to is a digital simulation of an analog dial display of frequency. See Fig. 2. It's confusing; I couldn't find a single reason for its being there. Because a digital frequency display accurate to 10 Hz is right above it, and this pseudo-analog display is accurate only to 1 kHz, I'm curious as to Yaeasu's intentions. And while speaking of displays, a Dim push-button reduces meter and display brightness by about half for low-light or nighttime operating.

Other controls include push-buttons for transmit and receive clarifiers that actually use the main tuning control. This is a little strange if you are used to a separate clarifier knob. Also included are push-buttons for selecting which vfo (ham or general coverage) will be used for transmit (ham only) or receive (either) or which memory channels will do the frequency controlling.

Split-frequency operation is possible, along with push-buttons to give you the difference between vfo and memory channel frequencies. It's relatively easy to store and retrieve a memory frequency, but it's too complex to describe here all the possible interactions, shifting, and operating options available. This transceiver does not have a built-in scan capability, but you can store, retrieve, and exchange memory and vfo frequencies handily. In place of a bfo control, there's a rear-panel CW pitch switch that selects 500, 600, or 700 Hz as the CW receive tone.

One thing that I really did miss was a WWV calibration control. Yaesu must figure that the synthesizer is right on because there is no way that I could find to adjust zero-beat with WWV. The specs say frequency accuracy is better than 3 ppm for 0-40 degrees C (32-104 degrees F). That means WWV should only be about 50 Hz off at 10 MHz.

Transmit Features

Satisfied that I wouldn't do any damage, I next tried loading the FT-880—no problem. Power output is adjustable with a Drive control. I was, however, a little suspicious of the built-in vsw metering circuitry when it indicated an absolutely flat 1-MHz bandwidth on the 10-meter elements of my triband quad. The swr monitoring circuitry will protect the finals, though, reducing power out to about 75 percent of available output power at ideal (1:1) conditions when a 3:1 swr is encountered. An on-demand fan cooling system is employed to control output transistor temperature.

This rig also had the Curtis 8044-chip-based keyer option installed and the whole system is set up for full-break-in operation. I was a little disappointed at the speed control of the keyer, though. It seemed to have a very narrow realistic speed range but would go phenomenally high.

The FT-880 has a nice control and metering setup for speech compression. You can read dB of compression and use the Monitor control and a pair of headphones to adjust the processor for maximum punch and minimum distortion while listening to yourself. And an Automatic Mike Gain control enables you to set a modulation threshold to help eliminate background noise. Although a little tricky to adjust, these controls can give you tremendous audio capabilities.

Recalling frequency memories and returning to your original frequency, using the transmit and receive clarifiers, and figuring out just what split frequencies you are on is a little confusing at first. The yellow LEDs next to some of the switches help, but because the radio can do so much, it's a little overwhelming. You eventually feel comfortable after getting to experiment for a while. Three Tab push-buttons can be employed on transmit and receive to limit the frequency excursion between a high and low limit you select. As the manual states, possible uses for this feature include limiting operation to legal bands or subbands of an operator's license class.

An FSK Shift slide switch on the rear panel selects shifts of 170, 425, or 850 Hz while the mark tone stays at 2125 Hz. Power output is limited to 50 Watts for FSK as well as FM, 25 Watts on AM.

SP-980 Remote Speaker

This outboard speaker not only complements the FT-980, it also adds some more knobs to twiddle during receive. Built-in passive LC circuits are switched in and out of the circuit via front-panel selector switches. Response curves on the front panel show the bandpasses produced as the Low and High filter switches are clicked through their ranges. An Input switch enables you to select from two separate audio inputs, and there's also a Phones jack. Combined with the Tone switch on the transceiver, the filters provide an extra dimension in receive capability. All in all, a nice addition to the station.

MD-1 Microphone

Yaesu's penchant for buttons and switches carries over into their "stand" microphone. In addition to a standby/transmit switch located on the mike itself, the rig's Up/Down/fast frequency select
inside the SP-960 speaker. If you’ve ideas for station accessories, you have plenty of room here.

tween the two loops (36.5") was already pre-marked on his support board, so the next step was to clamp these pieces in place with the hose clamps.

Next, I assembled the loops themselves by butt-lining the three pieces of tubing in the connectors and clamping them with the hose clamps. Then, I inserted the ends of each loop into the four elbow pieces to a depth indicated by black tape wrapped about 9" from each end and clamped them in place for a final trial. This resulted in an assembly that looked like two large basketball hoops, one above the other, attached to the board and connected to each other by a pair of vertical elements spaced a few inches apart, forming a loop at each end of the board. The instructions said that the antenna should resonate at 28.5 MHz. If the dimensions were followed exactly during assembly, however, depending upon the environment in which the antenna is erected, it is possible that the resonant frequency will be slightly different due to house wiring, plumbing, proximity to power lines, etc. In my case, with the antenna in the attic, no changes had to be made.

I attached the vertical support board to a horizontal two-by-four that I nailed to the attic rafters. Now it was time to connect the coax to the parallel vertical elements. One of these is separated by about an inch in the middle, forming a gap across which the coax is fastened. The shield braid of the coax goes to one side (lower) of the element, and the center conductor goes to the other (upper) side. Soldering is easy and quickly accomplished. The coax was then led away from the antenna at right angles for about 10 feet (instructions say for at least a half-wave—16 feet—for best results) and then downward through a plastic conduit to my attack in the basement.

After that, I was ready to get on the air, but I felt that a test of swr should be made first, so W1XU brought over his bridge. Applying power at 28.1 MHz (the lower end of the 10-meter Novice band), the swr came out at less than 1.5:1, so I decided not to change anything. Now for the on-air test.

Within an hour’s time, I worked two Texas stations on 10 meters. The band had just opened, yet one station gave me a 579, and the other (a few minutes later) gave me a 599! This was with about 70 Watts output from my FT-707.

Just for fun, we switched to 40 meters to see if we could receive anything there. Signals were jumping! So, what the heck, it couldn’t hurt to see if the antenna loaded on 40, could it? Believe it or not, it did, even though the swr was high. The FT-707 has a shut-down circuit in the final to protect it from overload, but I found that the output was still about 50 Watts... so I went ahead and called CO. I worked one ham in Maine and another in New York, with a 559 and a 599, respectively! I was hooked on the DX Hidden Asset Loop Antenna. Even on 80 meters, the reception I
get is remarkable, but I haven’t had the nerve to try transmitting on 80.

I feel that the antenna is highly suited for emergency and Field Day communications and ideal for lock switches, a high (50k-Ohm)low (200-Ohm) mike impedance switch, and a three-position tone switch. The mike can be easily removed from its cradle stand but the lock switch limits your mobility. An optional MH-1 hand-held mike also is available that includes Up/DownFast push-buttons and a two-position tone switch.

Conclusion

I really liked the FT-960. While it’s designed with the serious amateur in mind, it also can help simplify the operating position because it can include a keyer, swr monitor, FM circuitry for transceiver duty, full break-in QSK switching circuitry, a separate receive-only antenna switch, and a full array of interface connectors. It also has rear-panel jacks that access its internal microprocessor and a serial interface that allows external control via an outboard microcomputer. Unfortunately, details other than plug pinouts and some cryptic signal names are not provided. So you’ll just have to experiment (carefully).

The current crop of amateur transceivers offers tremendous flexibility, along with capabilities unheard of a few years ago. The penalty for this is increasing cost and initial bewilderment when confronted with the maze of controls and switches. But get your hands on an FT-998 and spend some time getting used to it. I think this is one nice piece of equipment.

For more information, contact Yaeu Electronics Corp., 685 W. Walfhall Way, Paramount CA 90723, (213)-633-4007. Reader Service number 476.

Gene SmarTe WBSTOV
Hancock NH

DX HIDDEN ASSET LOOP ANTENNA

H. Steward Designs has just introduced a new antenna design called the DX Hidden Asset Loop Antenna. What you get for $12.50 are the plans to build the antenna and a complete description of the antenna itself, including history, performance, configuration, construction, and installation. It is called the DX Hidden Asset Loop because it is capable of performing DX, it can be installed indoors and is thus “hidden,” it is undeniably a loop, and it is an asset to your station. Read on and find out how we proved to our satisfaction that this antenna is well-designed.

73 received a prototype antenna that had been made up by H. Steward Designs to illustrate the construction materials and method of assembly. They even included a wooden mounting support!

Jim Gray W1XU asked me if I would be interested in reviewing the DX Hidden Asset Loop Antenna for 73. I readily agreed. Not knowing what to expect, I went to work.

After opening the package, I discovered that I had a support board with vertical antenna sections already attached, two antenna loops, each consisting of three pieces of small-diameter aluminum tubing, connectors, clamps, four corner pieces with clamps, and one set of plans and instructions.

With the vertical elements already attached to the support board (which had all the necessary holes pre-drilled), it was easy to insert the four corner pieces (tubing elbows) through the holes provided and slide them over the ends of the vertical elements. The required distance be
fewer paddle movements when keyed in the iambic mode.

Many operators have discovered the Bencher full-iambic key paddle, suitable for use with all of the electronic keyers and well known for its functional beauty. In fact, I have been using a Bencher paddle since 1979 and find that I like it better and better each year. It seems to be settling in... or perhaps I am the one that's settling in? Unfortunately, I have never learned iambic keying, and I use the key in the ordinary bug fashion. Just the other day I was talking with Bob Locker W8PKJ, who — with Jerry Benedict — is a partner in Bencher, Inc. (Benedict plus Locker = Bencher). I lamented the fact that I had never learned iambic keying and therefore wasn't making full use of my paddle. Bob laughed and said, "You're not alone, but we have just developed something for hams like you and for hams who are used to a bug—a non-iambic paddle for use with either full-iambic or non-iambic keyers."

We chatted a while longer about keys, keyers, and paddles, and, after a bit of adroit arm-twisting on my part, Bob finally knocked under and promised to send me one of the new paddles, realizing perhaps that I was one of the few remaining holdouts who could never learn iambic CW. Maybe he just took pity on me.

Whatever the reason, I soon received a large box full of plastic worms. Buried within the plastic protection was a smaller box enclosing the key. Inside that box I found a cardboard partition or separator that holds the very heavy paddle base in place and prevents the relatively delicate paddle mechanism from being dislodged and damaged during shipment. The entire package is neat, strong, and extremely well designed... a hint about the contents, too!

The key itself looked much like the original—only better, if that is possible. It has a heavy chrome-plated base with rubber feet that keep the key solidly in place on your bench or desk and inhibit its walking around when energetically operated. The paddles and their unique gimballed actuating mechanism are supported on sturdy pillars screwed into the base. The paddle pads are clear plastic ovals (as opposed to triangles on the original Bencher paddles) with chamfered, or beveled, edges that invite your fingers to slip over them while keying... providing a very nice feel.

The tension spring is very easy to adjust on this model because the spring loop is captured by an adjustable screw with a knurled knob at the center post. The contact space adjustment between paddles and wide posts is made as before, with Allen screws and lock screws set into the posts. Bencher has thoughtfully supplied the Allen wrench for you, attached to the underside of the base, where it can't get lost. Perfect spacing adjustment and a good feel to your own keying actions, can be obtained quickly and easily the first time you try.

The two sides of the key, that is, the paddle electrical contacts, are brought through the side of the paddle to solder lugs attached by 10-32 Phillips head screws. The ground side of the key is a solder lug firmly screwed to the base itself. There is also a plastic retainer that firmly holds the lead wire from your paddle to your electronic keyer. The wire is not provided, of course, but the one you use now may be suitable. It is a simple coated, double conductor, shielded cable... similar in size and appearance to a microphone cable, or a piece of coax. After the electrical attachment to the solder lugs, the cable is clamped down so that the connections can't pull loose.

You'll find the Bencher paddle easy and pleasant to use. It seems to invite your fingers to use it easily and correctly. In my own case, I was extremely pleased to find that I stopped making keying errors through misuse of the iambic feature. My CW improved perceptibly, if not dramatically, I think you'll like your new Bencher paddle, especially if (like me) you don't know iambic. I'm sure that many a key that will enable you to get the most out of your electronic keyer and make beautiful 'music.'

The Bencher paddle, Model ST-1 (black-finished base), is available at $46.95 amateur net. Model ST-2 (chrome-finished base) is priced at $59.95, and Model ST-3 (gold-plated base, available on special order) costs $150. Write to Bencher, Inc., 9200 East Avenue, Long Beach, CA 90806. Reader Service number 477.

Jim Gray WIXU  
73 Staff

WHAT DO YOU THINK?

Have you recently purchased a new product that has been reviewed in 73? If you have, write and tell us what you think about it. We will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, 73: Amateur Radio's Technical Journal, Peterborough NH 03458.

Marc L. Leavey, M.D. W3ASJR  
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It's February, and, not to offend the followers of your friendly neighborhood groundwater, I'd like to celebrate Valentine's Day this year. A Valentine to all of you readers, who send me the most interesting mail.

I would like to lead off with a note from Peter Martinez G3PLX of AMTOR fame. In part, Peter writes, "I am glad to see that interest is picking up over here after such a long time. It seemed for many years that AMTOR was strictly a European system.

"It is true that in the early days of AMTOR, I was offering a program that would run AMTOR on a 6800-based computer, but this was written in source code only and was incomplete in that it required all the interfacing to the computer hardware to be written. There were very few people able enough to use the program in this form.

"So this program is no longer available, and I turned my attention at that time to designing a small PCB, with on-board CPU, ROM, etc., which would enable people to get on the air much easier than tackling the difficult software task. The MIQ version of this kit is still available from

ICS Electronics Ltd, PO Box 2, Arundel, West Sussex, England, either in kit form or as a ready-made board. It requires a simple 5-volt supply, and will interface at TTL serial Baudot code to any existing RTTY system.

"I think you will see that the initial approach to AMTOR in its early days 5 years or so ago has fallen by the wayside and given way to others. There are not, as then, very many experienced machine-code programmers amongst the amateur radio fraternity, and most users now and in the future will prefer to buy ready-made hardware or software. There will be no shortage of either before very long."

"I do appreciate these comments, except from a much longer letter written by this pioneer of AMTOR.

Bill Emerson WA1EVO, D.M.D., passes along his comments that he would like to see a compilation of RTTY Loop columns and also that, "I hear more AMTOR now, but 60-wpm Baudot is still the common mode. Linguo France?" I suspect that Murray, or Baudot, will remain such for quite a while, Bill. With the number of machines out there, I doubt if the "sixty standard" will soon roll over and die.

Nonetheless, several of you are expressing various forms of interest in commercialized RTTY. Lester L. Johnson AM6AA of Sandpoint, Idaho, relates having built a demodulator from an article in an old issue of 73. He couples that with a commercial AFSK oscillator and a TRS-8000 computer, model unspecified. Lester would like a way to interface his computer to the terminal unit and such. He notes that the IGO structure of the Model I TRS-80 is different from the Model III, but that is the way which he has. He does not have any ready information to accomplish this, Lester, but I am sure that a number of our readers have. Let me hear from you out there, and I will publish the best schemes for all to benefit.

"Lester also notes that he would like to run his rig, a Kenwood TS-120, on RTTY, with the power out back to about ten Watts. I would say, off the top of my head, that this should be okay. Normally, cutting the power back to that extent should be sufficient to protect the finals from overheating. I have run my 100-Watt transmitter at about 50 or 60 Watts for prolonged periods without damage, but I like to take chances!"

Another computer user is Anson R. Hyde K4EK, M.D. Dr. Anson, who lives in Alexandria, Virginia, just over the river from Washington DC, has used his IBM-PC on two-meter ASCII RTTY using a telephone modem to output tones. He would like to know if there are any programs around to run Murray on this machine. Well, that is one machine that I have seen nothing for RTTY printed on. I don't think if IBM-PC users are not the "hamming" type (I suspect that they are not) or if the average ham is looking for a more modestly priced machine (so that is where the manufacturers concentrate their marketing), but RTTY for the IBM-PC7 Zip! I would encourage anyone who has put together such a program to write it up and send it to me here. This would fill a full column, or make it a full-scale article and send it to our fair editor. We're waiting, we're waiting!"

Greetings to Dean E. Strand KAKBQ of Davenport, Iowa, for sending along a string of thoughts, a few of which I shall share with you all. Dean notes that he is using a Robot 800 keyboard, and when using it on CW in the Novice bands, he likes to set it to send characters at ten words per minute, with five-word-per-minute spacing. He feels that this makes the code more enjoyable and helps the newcomer improve his code speed. I agree, Dean, and this has been the way the best code tapes are made.

Dean writes he has difficulty tuning in stations using a dedicated scope display on his terminal unit. Well, in an edition of this column several years ago, I covered how to hook up a general-purpose oscilloscope to act as a tuning device for RTTY. All you need are one or two outputs from your demodulator. Feed them to the vertical and horizontal input of any old scope and tune the “v” pattern to maximum contrast. Dean suggests the idea at most hamfests and can be used for other things when not tuning in a RTTY signal.

Like all of us, Dean is looking to computerize his station. He notes that there are at least two ways to go, one to get a good general-purpose computer (when I say good, I mean DEC Rainbow, IBM-PC, or HP Professional class, not VICO or Alari.

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stuff and use and interface . . . that includes A M T C Q . The other way would be to get a top-of-the-line unit, with all the whistles and bells.” Now hold on, Dean. I think you might find that the top-of-the-line computers you mentioned might be overkill for a ham shack. Don’t knock the cheap stuff. I just got another small computer here in Texas, a TRS-80C (also known as the CoxCo), and we are amazed at what can be done. The 8609 is a fantastic chip that can run rings around many other systems. If you want a big computer for business use or such, fine, but don’t sell the little stuff short. It isn’t so little anymore.

Leonard Laurel WA5FBL of Fort Bragg, California, is one of those with what might be considered a small system. He is looking to hook up his TI-99/4A to RTTY, Well, Len, as I write this column, the newspaper is filled with the news of Texas instruments’ desire to stop production of the 99/4A, so I don’t know what the future holds. As with the IBM-PC, I have seen next to nothing in print about using the 99/4A on RTTY. I only hope that someone out there is doing it and sending the information in to be passed along. Good luck.

From the “left hand doesn’t know what the right hand is doing” department comes a note from Karl Thurber W8FX from Millbrook, Alabama. Karl asks, “Have you run into someone who has successfully interfaced a Commodore VIC-1525 printer to a HAI CT-2100 Communications Terminal? The Commodore printer which is the standard output (with the VIC-20 and C64 computers) has a so-called ‘Commodore serial ASCII’ bus, while the GT-2100 has provisions for an ASCII printer and RS-232C output, neither of which appears to be suitable for connection to the 1525 printer without some sort of interface. A letter to HAI brought a ‘we know nothing about that printer response, so I’m stymied at this point.”

The first thing which occurs to me is to check that both devices are operating at the same baud rate. It is possible that one may be set at, say, 110 baud—like for a Teletype KSR-33—where the other may be at something such as most serial printers are. Also, check to see if the Ready To Send (RTS) and Clear To Send (CTS) lines are used and inhibit printing. If that is so, then they are hooked up correctly. Without some sort of documentation, those are my first suggestions.

Perhaps others have done this hookup and will let us know. I have confidence in you all out there!

Several of you in your letters suggested, that a book compilation of the first several years of this column would be desired. I agree with you, but it will take more than your notes to me and my intentions to make such a book a reality. Drop a line to the editor of 73, and to me as well, and let us know that there are enough of you out there interested to make a go of it. In the meantime, keep up with all the new developments yet to come. With the arrival of the CoCo here in the shack, I hope to be able to take a look at some of the 6860/6869 software that has been floating around beyond my reach for a few years. As soon as I see it, I’ll tell you about it—right here, in RTTY Loop.

Robert Baker WB2GF E
15 Windsor Dr.
Atco NJ 08004

ARIZONA QSO PARTY

Starts: 1800 GMT February 4
Ends: 0600 GMT February 5

Sponsored by the Southern Arizona DX Association. Single-operator and club entries; all bands and modes but no repeater contacts allowed. Each station may be worked only once per band per mode.

EXCHANGE:
RS(T) and state, province, DXCC country, or Arizona county. Novices and Technicians also sign IN or IT respectively.

FREQUENCIES:
Phone—3895, 1230, 6280, 21365, 28560.
CW—50 kHz up from lower band edge. Novice—25 kHz up from lower band edge.

SCORING:
Count 1 point per phone QSO, 2 points for each CW or other mode QSO, and 4 points per QSO with Novice or Technician in the Novice bands. Arizona stations multiply QSO points by number of states, provinces, and DXCC countries. Others multiply QSO points by number of Arizona counties (15 max.). The club station W7WNO also counts as a multiplier for non-Arizona stations. Non-Arizona stations working all Arizona counties and W7NO may double the multiplier.

AWARDS:
Certificates for the highest-scoring station in each category: Arizona, non-Arizona, and Novice/Technician. In addition, certificates for highest score in any Arizona county, state, province, or DXCC country in which there are entries. Other certificates for Arizona and non-Arizona clubs whose members’ scores combine for the highest score. Club entries must consist of at least 5 individual entries to be eligible. Club residency is determined by mailing address.

ENTRIES:
Individual entries should show each station worked, exchange plus time, frequency, mode, and number of QSOs. Include a summary sheet of your scoring and the time log.

CALENDAR

February 4-5
South Carolina QSO Party

February 4-5
Arizona QSO Party

February 4-5
Vermon t QSO Party

February 4-5
Zero District QSO Party

February 4-5
New Hampshire QSO Party

February 5-12
Dutch PACQ Contest

February 18-19
YL-ISSB Commo System QSO Party—Phone

February 18-19
ARRL DX Contest—CW

February 18-20
America Radio Club International DX Contest

February 24-26
IARU World VHF Contest

February 25
RTTY World Championship Contest

March 3-4
ARRL DX Contest—Phone

March 17-18
YL-ISSB Commo System QSO Party—CW

March 17-18
Southeastern 160-Meter DX Contest—SSB

March 17-18
Spring QRP CW Activity Weekend

August 24-27
New Jersey QSO Party

August 24-27
AS North American UHF FSTV-DX Contest

September 22-23
Late Summer QRP CW Activity Weekend

RESULTS

1983 ARIZONA QSO PARTY CERTIFICATE WINNERS

ARIZONA STATIONS
Call QTH Score
K8LL Yuma County 75,468
K7KZ Pima County 66,965

AZ-NON-ARIZONA STATIONS
W5PVG 200
EXCHANGE: QSO number and state, province, country, or two-letter ARRL section call of station (AD, BE, CA, CH, ES, FR, GI, LA, OE, OS, RU, WA, WM, WR). Do not send RS(I).

FREQUENCIES: Phone—3910, 7230, 14260, 14320, 21360, 28570, 50, 110, 1442. CW—3530, 3730, 7030, 7130, 14060, 21060, 21160, 28060. RTTY—3620 and *900 or other RTTY sub-bands.

SCORING: Score one point per phone contact, 2 points per CW or RTTY. Vermont stations multiply QSO points by number of states plus Canadian provinces plus ARRL countries (exclude US/Canada). Others multiply QSO points by the number of Vermont counties (14 max.).

AWARDS: For non-Vermont stations, certificate to highest-scoring station in each state, province, and country. Certificates will be given each Vermont station submitting a log; annual plaque to highest-scoring Vermont station. WVT Award given to stations working 13 of Vermont's 14 counties.

ENTRIES: Send an SASE for official log and score sheets. Send logs/faces/miles, name, class of license, and address not later than March 1 to: D. Newin KIXU, W. Hill, Northfield VT 05663. Include an SASE for a copy of the results.

NEW HAMPSHIRE QSO PARTY
1900 GMT February 4 to 0700 GMT February 5 and 1400 GMT February 5 to 0200 GMT February 6
Sponsored by the New Hampshire Amateur Radio Association. Stations may be worked once per band per mode. New Hampshire stations may work each other.

EXCHANGE: Send RS(I) and country, ARRL section, or New Hampshire county, as appropriate.


SCORING: New Hampshire stations score 1 point per QSO, multiplied by the number of ARRL sections plus countries. Others score 5 points per New Hampshire QSO times the number of New Hampshire counties worked.

ENTRIES: Send your entry no later than March 15 to Pete Cates K11M, 19 Hawfield St., Hudson NH 03051. Include a large SASE for results.

DUTCH PACC CONTEST
Starts: 1400 GMT February 11 Ends: 1700 GMT February 12
Use all bands, 160 through 10 meters on CW and SSB. No crossmode operations allowed. Each station may be worked only once per band regardless of mode. Operating categories include single operator, multi-operator, and SWL.

EXCHANGE: RS(I) plus sequential QSO serial number starting with 001. Dutch stations will send their two-letter prefix abbreviation instead of a QSO number: GR, FR, DI, OV, GD, UT, VP, NY, ZH, ZL, NL, and LB.

SCORING: Each QSO with PA, PB, or PI counts one point. Multiply QSO points by the number of provinces worked on each band (72 max.). SWLS count one point per Dutch station heard and multiply by provinces heard on each band (72 max.).

ENTRIES: As usual, a score calculation is required. Please use a multipiler column and insert multiplers only if new. A log must be signed for observations of the contest rules. SWL logs must contain categories given by the Dutch station and the foreign station worked with. Send logs no later than March 31 to: F. Th. Oosthoek PABIN, PO Box 499, 4600 AL Berg op Zoom, Netherlands.

A certificate will be awarded to each country winner in each category along with the second and third-place stations provided that there are sufficient participants in that country. Certificates will also go to winners in each call district of JA, LU, PY, UA3B, VEVO, VK, W, ZL, and ZS.

AMERICA RADIO CLUB INTERNATIONAL DX CONTEST
Starts: 0500 GMT February 18 Ends: 0500 GMT February 20
Any amateur station making two contacts with America Radio Club DX member operators during the two-day contest will be eligible to apply for the Special Gold QSL Award. Stations making three contacts will be eligible for the Special Gold QSL Award. Contacts must be made during the two-day period listed above. Suggested frequencies include all authorized frequencies in the 10, 15, 20, and 40-meter phone and CW bands. Exchange RS(I) and country. SWL stations may also apply for this award on a heard basis. For special awards, send QSL and $2.00 in US funds or 6 IRC's to: America Radio Club QSO Contest, PO Box 3576, Hialeah FL 33013.

YL-SSB COMMODO SYSTEM QSO PARTIES
Phone Starts: 0001 GMT February 18 Ends: 2359 GMT February 19 CW Starts: 0001 GMT March 17 Ends: 2359 GMT March 18
Use the General part of all bands. Deadline for all logs, summary sheets, and comments is June 1. Entries should be sent to Rick and Missie Connolly, Star Route 1, Crocker MO 65452. Individuals needing extra application and instruction forms send a 4 x 9 SASE to the same address.

CQ WORLDWIDE 160-METER SSB CONTEST
Starts: 2200 GMT February 24 Ends: 1600 GMT February 26
Operating classes include both single and multi-operator (maximum of 5 ops per station).

EXCHANGE: RS plus QTH, state for USA, and province for Canada.

RESULTS
1983 DUTCH PACC CONTEST
USA WINNERS BY CALL AREA

<table>
<thead>
<tr>
<th>QSOs</th>
<th>Multi. Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1KI</td>
<td>129 46 5934</td>
</tr>
<tr>
<td>WAZD</td>
<td>31 18 558</td>
</tr>
<tr>
<td>WARI</td>
<td>63 10 1890</td>
</tr>
<tr>
<td>W4VG</td>
<td>106 37 3922</td>
</tr>
<tr>
<td>KNGO</td>
<td>8 5 40</td>
</tr>
<tr>
<td>NBS7</td>
<td>11 7 70</td>
</tr>
<tr>
<td>WDBMKG</td>
<td>10 10 290</td>
</tr>
<tr>
<td>WGOA</td>
<td>47 19 993</td>
</tr>
<tr>
<td>WKBXV</td>
<td>22 13 1896</td>
</tr>
</tbody>
</table>

1983 A5 NORTH AMERICAN UHF-FSTV CONTEST

<table>
<thead>
<tr>
<th>QSOs</th>
<th>Multi. Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>K8GYXWBBWCF</td>
<td>26530</td>
</tr>
<tr>
<td>W7BCEP</td>
<td>9420</td>
</tr>
<tr>
<td>W8BMCF</td>
<td>5440</td>
</tr>
<tr>
<td>W2WIKH</td>
<td>4520</td>
</tr>
<tr>
<td>KABIVT</td>
<td>4360</td>
</tr>
<tr>
<td>W2RPO</td>
<td>3755</td>
</tr>
<tr>
<td>N7B2</td>
<td>3350</td>
</tr>
<tr>
<td>W2A2JW</td>
<td>2815</td>
</tr>
<tr>
<td>W2B2KGM</td>
<td>1995</td>
</tr>
</tbody>
</table>

SCORING: Contacts with stations within own country and/or other countries but same continent are 5 points, other continents are 10 points. KH6 and KL7 are considered countries.

Multipliers are each US state, VE province, and DX country. USA and Canada are not country multipliers. However, there are three VE1 provinces: New Brunswick, New Scotia, and Prince Edward Island. Final score is total QSO points times the sum of the multipliers. Maritime mobile scoring will be determined by the location.

AWARDS: Certificates to the top scorers in each class in every state, VE province, and DX country. Special plaques are also being awarded for top USA, Europe, and world scores.

PENALTIES: Three additional contacts will be deleted from the score for each duplicate, false, or unauthorized contact removed from the log. A second multiplier also will be removed for each one lost by this action. Violation of the rules and regulations pertaining to amateur radio in the country of the contest or the rules of the contest, or unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification. Disqualified stations or operators may be barred from competing in CQ contests for a period of up to three years.

ENTRIES: Sample log and summary sheets may be obtained from CQ by sending a large SASE with sufficient postage to cover your request. It is not necessary to use the official form, you can use your own. Logs should have 40 QSOs per page and show time in GMT, numbers sent and received, and separate columns for QSO points and multipliers. Indicate the multiplier only the first time it is worked. Include a summary sheet with country showing the scoring and other essential information, and a signed declaration that all rules and regulations have been observed. Mailing deadline for SSB entries is March 31. Logs can be sent direct to the 160 Contest Director, Don McIlenon N4IN, 3075 Florida Avenue, Melbourne FL 32901 USA. Alternatively, they can be sent to CQ 160 Meter Contest, 76 North Broadway, Hicksville NY 11801 USA. Please indicate "SSB" on the envelope.

3RD ANNUAL RTTY WORLD CHAMPIONSHIP
0000Z to 2400Z February 25, 1984


OPERATOR CLASSES: (A) Single operator, single transceiver. (B) Multi-operator, single transceiver.

ENTRY CATEGORIES: (A) Single band: (B) Allband: 1000-meters.

MISCELLANEOUS RULES: The same station may be worked once on each band. Crossmode contacts do not count. Single-operator stations may work a maximum of 15 hours maximum, while multi-operator stations may operate the entire 24-hour period.

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MULTIPLIER POINTS

1 multiplier point is awarded for each of the 48 continental United States (a District of Columbia contact may be substituted for a Maryland multiplier), Canadian province/states, and DX countries worked on each band (excluding US and Canada).

FINAL POINTS

Total QSO points times total multipliers equals claimed score

CONTEST ENTRIES

Entries must include a separate log for each band, a dup sheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

ENTRY DEADLINE

All entries must be postmarked no later than April 15, 1984.

DISQUALIFICATIONS

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2½% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS

Contest awards will be issued in each entry category for each band in each of the US call districts and Canadian province/states, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 25 QSOs must be worked to be eligible for awards.

CONTEST ADDRESS

RTTY World Championship, c/o The RTTY Journal, PO Box 97, Cardiff CA 92007.

QSO POINTS:

5 QSO points for contacts with WAVE stations located within the continental United States and Canada. 10 QSO points for all other contacts.

QSO:

A QSL card is required for all contacts. A QSL card is an index card containing the data about the station, such as name, callsign, location, etc. It is a way for DXers to keep track of their contacts and to send confirmations of their contacts to other DXers.

QSO:

A QSL card is required for all contacts. A QSL card is an index card containing the data about the station, such as name, callsign, location, etc. It is a way for DXers to keep track of their contacts and to send confirmations of their contacts to other DXers.

CHOD HARRIS VP2ML

Box 4878

Santa Rosa CA 95402

QATAR

One of several tiny countries around the Persian Gulf, Qatar's chief claim to fame is its black, gooey, crude oil under a barren desert surface. Actually, Qatar is a peninsula sticking into the Persian Gulf from Arabia, not far from the island country of Bahrain. Most of Qatar's 4000 square miles are barren sand and low hills; annual rainfall is about 5 inches. Most of the country's 170,000 inhabitants live in the capital city of Doha.

As are most Middle Eastern countries, Qatar is antagonistic toward strangers. These countries are highly suspicious of foreigners and not only discourage but actually prohibit most visitors. (Consider Iran's feelings toward Americans, for example.) DXpeditions and amateur operations by foreigners living in these countries are seldom permitted, and few of the native amateur operators spend much time handling out DX contacts or QSL cards. So the report of an American with a well-equipped station active from Qatar is good news indeed.

Mike Smedal AT1AD (Photo A) is the first foreigner to receive an amateur-radio license since the country became independent 14 years ago. To qualify for the license, Mike had to show that he worked and lived in Qatar, and he had to pass a security clearance. That done and the $250 license fee paid, AT1AD was on the air.

Mike's station includes a Yaesu FT-11 transceiver feeding a Yaesu FL-2100Z amp. When conditions get a little rough, Mike runs the output of the Yaesu amp into an export version of Alpha's 775X amplifier! The antenna farm is also first class (Photo B) -- a Hy-Gain TH7DX above a Hy-Gain 402BA two-element 40-meter beam. An inverted V provides 80-meter coverage. Mike says that the TH7 handles the high-power levels without difficulty. Mike runs RTTY on his Radio Shack TRS-80 Model I and is active on OSCAR, too.

The best times to look for Mike (and other Middle Eastern amateurs) are Thursday evening and Friday. The work week is six days long in Qatar, with Friday (the Arab holy day) as the day off. So the equivalent to our weekend is Thursday night and Friday.

On the subject of QSL cards, Mike writes, "Please tell everyone that we do not have a radio club in Qatar. Therefore, we do not have a QSL bureau. If [DXers] want a QSL card, please QSL direct to PO Box 4747, Doha, State of Qatar, Middle East."

SAUDI ARABIA

An exception to the no-visitor policy of the Middle Eastern countries was made for the recent visit of Lloyd and Iris Colvin, W6KG and W6QPL of Yasme DXpedition fame. The Colvins managed not only to visit most of the countries in the region, but also actually obtained permission to operate in many of them.

Iris faced special problems in Saudi Arabia. Women occupy a very special role in the Arab world, quite different from that in the more liberal Western nations. Women are seldom seen out in public, and then only heavily veiled. Those few women who do venture out of doors find themselves escorted to the head of the line and receive other special attentions. On the other hand, an unmarried woman in Saudi Arabia faces a nasty surprise from the local authorities.

Saudi policemen carry two items on their belts: a can of black spray paint and an ice pick. Upon seeing a woman with bare face or arms, the policeman will, very politely, spray black paint over the exposed skin! (The ice pick sees similar service in the Saudi's swift, uncomplicated justice system. Illegally parked automobiles are not ticketed or towed. The police, when they stop a car, strik...
for maximum "smoke" is the usual practice, and many amateurs have run "excessive power" for years. Under the new FCC power regulations, most of these amplifiers have been "grandfathered" into legality.

But there is a greater problem in excessive power than squeaking out a couple extra Watts over the legal limit. While some amateurs are still saving their bucks for a better antenna, some hams have quietly been installing real high-power amplifiers, amps that require 500–1000 Watts of drive.

The Houston seminar turned to the problem of what to do about that small number of amateurs who run super-power. Frequent contest (and occasional DXpeditioner) Gene Zimmerman K3ZZ (Photo C) suggested that the current rules about power during contests be changed.

Gene recommended that inspectors stop by the shack of hams seriously involved in the contest and look at the amplifiers. If any amp had final plate dissipation (or the transistor equivalent) of more than 1600 Watts, the contestant would be disqualified.

He reasoned that if you don't have an amp capable of running excessive power, you won't run it! The same idea holds for DXers, of course, with the offending amateur losing the right to participate in DXCC, for example.

Al Slater G2FXB (Photo C) talked about a similar program used by the Radio Society of Great Britain for their Field Day, which is even more popular there than the same activity on this side of the Atlantic.

The RSGB requires each Field Day team to register before the contest and include their operating locations. During the contest, a volunteer RSGB inspector stops by and checks that the group is meeting their strict rules of 30 Watts maximum input power!

This 30-Watt limit poses special problems for British amateurs; most standard transceivers have little or no output at the 30-Watt input level. So the G hams build special final amplifiers designed for maximum output with 30 Watts of input power. These simple amps are often fed with a 100-Watt output transceiver and are run so close to the limit that some groups change final tubes every hour of the contest!

The question of high power is of special interest to AI, who spends much of his time on 160 meters, where the British hams face a 10-Watt power limit. AI said the government licensing authorities no longer worry about power and have suspended their station inspections. Most hams run a full 200 Watts on 160 meters, and 2000-Watt amplifiers are not unheard of.

In other comments on the high-power question, panelist Ellen White W1YL felt that the contest rules already permit disqualification of anyone running illegal power. On the other hand, Ellen felt that the idea of inspectors coordinated from League headquarters would be unworkable. Ellen favored handling excessive-power users at the local level, by drumming them out of the local DX club, for example.

Both Iris and Lloyd Covin recommended increasing the existing power limits as a means to eliminate the "excessive-power" problem. Lloyd particularly suggested higher power limits on the lower frequencies, including 160. Iris noted the advantages of high power on DXpeditions, when the power helps to control the pileup. If the stateside stations calling can't hear the DX station very well, the rate of contacts drops and fewer hams get a chance to work the DX station.

Several members of the audience took exception to the idea of ever-increasing power limits. Tod Olsen K9TO disagreed with the concept of letting the manufacturers of amateur equipment decide what the legal or moral limits to excessive power should be. "Just because it is openly sold to hams doesn't mean that the power level is acceptable." Dick Norton N6AA felt that in the contest field the power level doesn't really matter as long as the final contest results are not affected. But if someone wins the contest or moves ahead of a legal power station by running excessive power, he should be disqualified.

I have my own definition of "excessive power." The FCC amateur regulations state that amateurs should always use the minimum power necessary for the communications. So two hams talking across town on 26 meters don't need the amplifiers, much less the excessive-power amps. And frankly, even a few thousand Watts of power cannot compensate for bad operating techniques or inadequate antennas.

How much power is really needed for amateur communications? Listen any time to 14100. A series of beacons all over the world ticks down every ten minutes with ever-lower power levels. See how far down into the mud you can copy the "coast" signals. We'll be talking more about this beacon network and other propagation aids and suggestions in future issues. Stay tuned. Meanwhile, keep an ear out for some of these coming attractions.

Photo C. Gene Zimmerman W3ZZ (standing) makes a point at the Excessive Power seminar of the First International DX Symposium, in Houston. Al Slater G3FXB (left) and Bob Ehhardt YSRVE listen intently.

Photo D. Jim Smith VK9NS is aiming for Kermadec Islands this season, after his event-filled DXpedition to Heard Island last year.

COMING ATTRACTIONS

The DXpedition circuit continues to hum in February, with two major expeditions scheduled for the month. Jim Smith VK9NS (Photo D) is spearheading an amateur and scientific DXpedition to the Kermadec Islands, a small, sparsely-inhabited group of volcanic islands about halfway between New Zealand and Tonga. Under the control of New Zealand, they have no special amateur call prefix.

The Kermadec Islands have been slowly moving up in the Most-Wanted-Countries list and now rank 17th, up with Spratly, Laos, and Chipperston. This DXpedition should satisfy a good chunk of that demand, with several operators and plenty of time on the island.

Jim Smith organized the Heard Island DX Association trip to Heard Island last winter and hopes for fewer problems on this year's DXpedition. Jim is also looking for donations for the trip and memberships in his Heard Island DX Association. Contact Jim via PO Box 90, Norfolk Island, South Pacific 2899.

Also scheduled for this month is a DXpedition to Aves Island, halfway around the world in the Caribbean. Isla de Aves (The Island of Birds) is a tiny part of a submerged reef about 150 miles west of the Windward Islands. The island is under the control of Venezuela, and the Venezuelan military restricts access most of the time.

The island itself is only about 1500 feet long and about 400 feet wide at the largest. Its maximum ten-foot elevation means it really is a large rock out in the middle of the ocean. Whenever the waves or tides are high in the Caribbean, landing on Aves is impossible. Only during a short period in mid-winter do calm conditions permit amateur operations.

Because of the restrictions and landing problems, DXpeditions to Aves are few and far between. Any station on the island is easy to work from the States, thanks to the excellent propagation from that part of the world. (Why do you think I lived there?) But you won't want to miss this DXpedition, as the next one might be years down the DX road. And Aves is already in the top 30 most wanted.

The DXpedition is sponsored by the Radio Club Venezolano, which is celebrating its 50th anniversary this year. The callsign on Aves will be TV9AA, with QSLs handled by YV5DFI, PO Box 50332, Caracas, Venezuela 1050-A, South America.
HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½” x 11” sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a “1” look like a “1,” not an “1,” which could be an “el” or an “eye,” and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I'm looking for a schematic for a Lavoie oscilloscope, model no. LA265A. I will pay for copying and mailing costs.

L. C. Houghtt W4EO
4257 Via Alta Dr.
Mobile AL 36609

I am interested in obtaining the vox relay that plugs into the back of the Swan 700 transceiver. I would appreciate hearing from someone who may have one of these lying around that they don't have any future use for.

Augustus B. Wells
PO Box 50
Tunica 70782

I am looking for a copy of the instruction booklet for the Knight KB670 RC tester made by Allied Radio. I will pay the costs for copying and mailing or for the original manual.

Lionel Roach K5VO
3033 Teakwood
Garland TX 75042

Wanted: Collins 706/7A PTO (permeability-tuned oscillator) for a Collins 75A1 receiver. This PTO covers 2.3 MHz and is used to tune the receiver.

Harold Smith W2GKE
28 Linden St.
Bayonne NJ 07002
(201)-436-1405

I am using the VIC-20 as a RTTY terminal with Kantronics interface and software. Can anyone help me with information on building an adapter which would let me use Atari cartridges on the VIC-20?

Robert F. Cann W4GBB
1606 Lochwood Dr.
Richmond VA 23233

I would appreciate receiving a copy of the schematic for an NCX-3 65CW transceiver by National. I have the owner's manual already, I will gladly reimburse for costs.

Jeffrey M. Blackmon W2YI
2107 Turnbull Road
Beaver Creek OH 44411

I need the schematic for the Model TV-7DU tube tester.

Stan LaDage W2EZM
421 Oakland Ave.
Maple Shade NJ 08052

I want to replace the tubes in my Collins R-392 receiver with solid-state devices. Any information on replacement parts would be greatly appreciated. I also need information on the R-392 Club and sources for 2kHz filters for the Collins R-390A.

J. P. Barnes GB8HN
2 Mapleins Rd.
Catterliffe, Rotherham
South Yorkshire S60 5TH
England

NOW! A State-of-the-Art Antenna for State-of-the-Art Transceivers—Why Settle for Anything Else?

At last there is a mobile antenna that is truly a fit companion for today's solid state, no-tune transceivers. Once the Spider™ 4-Band Antenna is tuned for 10, 15, 20 and 40 meters, all you have to do is turn the band switch on the transceiver—the antenna follows by itself. Write or call now for full information on this, the top of the line in mobile antennas.

NICAD MEMORY ERASE—WHAT??

The GMS 401 is a complete automatic NICAD conditioner and rapid charger. Never before has this been offered anywhere at any price and it's so good it's being patented. NICAD memory characteristics must be dealt with otherwise your battery pack is not delivering all it could. The GMS 401 will automatically erase and rapid charge any type NICAD pack from 1 to 10 cells.

Write or call for more information:

MICA COMMUNICATIONS CONSOLES

MICA 4-6-8-Wide - 1 to 2 wide operation
L & U & Circular set ups—with optional center table
Reinforce Front Panel—for station changes
Prewired cut panel holes—for component wood cutters
High station density—because no shelves are necessary
Hidden accessory shelf—for power supplies, dummy load
Puppets of all your equipment—for easy station layout

OPTIONAL ITEMS:

Drawer Bookshelf combination—ramps under desk
1000 Mic’s to select from—to match your decor
Desk recessed for keyboard—optimum 26 tuning height
Desk top extensions into panel—for same 1000 unit storage
Matching only for floor amps—to keep cords out of sites
Shell under desk, quick access—for headphones, Key Mic
Exhaust cooling fan system—thermostatically controlled
Wire duct, wire labels, etc...

5817 S.W. 21st Street, Dept. 73—Hollywood, Florida 33023
Phone (305) 989-2571
Getting back to my ego: I wonder if my hopes to inspire you to greater things come across as ego? I delight in getting letters from people who have several basic drives: One is to educate and another is to share my enthusiasm. You may have noticed that all of my magazines are both educational and fun—expressions of my drives.

I don't believe that you can make all of the money you want, I know it. I hate it when I get letters complaining that, gee, I can't afford your magazine, a new rig, or something. What rot! There are so many ways to make money these days that just about anybody who wants to can do it... from kids right up to the retired.

No, if you are going to pursue a life goal of swilling several thousands of gallons of beer and seeing every Monday-night football game, you're a loser. You don't get rich very often without working hard at it. But you have to work with some goals in mind. A lot of people work their butts off and never get anywhere. The brutal fact is that, though not by any conscious design, this is the normal pattern. You do have to outwork the average person to make it big.

Why am I getting ready to invest several million dollars in a college? Here we are at a time when colleges are going out of business all around the country and I want to start a college! Dumb or shrewd? Well, I think I have a plan which will teach kids to become entrepreneurs and to beat the system. The end result will be a bonanza for our country and a few thousand more millionaires. Everyone will win.

There's Wayne's ego again? Well, perhaps—yet I've gone over my idea with the presidents of ten colleges now and haven't yet found one who doesn't think it will work. I'm getting quite a bit of support.

The average 73 reader is way above the average person in this country. It isn't easy to get a ham ticket, even with the Bash method, so that's a filter. And beyond that, the average 73 reader is another step ahead of the average ham just by virtue of his interest in keeping up with technology. The ham who does not read 73 has far less of an opportunity to be a success just because he doesn't take advantage of this remarkable resource.

From that aspect, I really feel sorry for the foreign hams who can't afford 73 or who are prohibited from subscribing because their money can't be sent away.

Most of my time is spent these days looking for people to help me with my projects. I really need help—enthusiastic, non-smoking help. My editorial a few months ago discussed this and resulted in a couple hundred letters. Some of those people are already here in Peabody helping me get new projects started.

One enterprise, a franchise chain of software stores, is getting started. I have a whole new approach to the business which should make it possible for several thousand people to make an awful lot of money. It's an ingenious concept that no one else has thought of yet, so we have a very good chance, despite the recent proliferation of software stores.

Software Production Devices, Inc., is also moving along on schedule. This isn't my idea, but when I saw what two chaps from Bangkok had come up with and realized how desperately the computer industry needs the product, it seemed like a good investment. Indeed, I know of no other practical approach to software protection, and I think I know an all.

I have several new magazines in mind which are needed, each to help a new industry to grow just as Byte and Kilobaud helped the microcomputer industry to flower. Magazines can't be started unless I have editors, writers, ad sales, circulation, administration, typesetting, production, photography, accounting, data processing, promotion, and so on. It takes about 25 people (minimum) to make a magazine work, and between the seven magazines we have now, the two of McGraw-Hill, and a half dozen others in the area, we've just about cleaned out southern New Hampshire of available talent. Interested?

A surprising number of the people we've been hiring of late are hams, fliers, and computerists—quite a combination for success, I suspect.

And speaking about project...
PROJECT OSCAR

Project OSCAR, Inc. has prepared a new set of orbital predictions for the period covering the calendar year 1984. The predictions provide the UTC times and longitude for all south-to-
north equatorial orbits of the four Amateur OSCARS (RS, R5, R6, and R8). In addition, the UTC time and sub-satellite latitude and longitude are given for the apogees of each orbit of AMSAT OSCAR 10 (AO-10). This document, when used with the appropriate plots, allows the user to determine the access times to all the present-
early available amateur radio satellites carrying communication transponders.

The large expense incurred in producing and disseminating a calendar of this magnitude necessitates a special discount for a minimum donation of $10 for mailings to the US, Canada, and Mexico ($12 for overseas mailings). To receive your copy of this orbital predictions, send a completed mailing label along with a check or money order payable to Project OSCAR, Inc., POB 1136, Los Altos CA 94022. The donation covers the cost of first-class mailing within the US, Canada, and Mexico, and airmail printed matter to overseas des-

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Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

For information, call: (602) 242-3037

Prices Subject to Change Without Notice

MHz electronics
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* Prices are subject to change without notice. For information call: (602) 242-3037.
COAXIAL RELAY SWITCHES SPDT

Electronic Specialty Co./Kaven Electrons
Part # 2SN28
26Vdc Type N Connector, DC to 1 GHz.

FSON 5985-556-9683
$49.00

Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99

FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.

FSN 5985-543-1225
$39.99

FXR
Part # 300-11173
120Vac Type BNC Same

FSN 5985-543-1850
$39.99

BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00

$8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1D872
5vdc turn on
PRICE EACH $5.00

120Vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with

silicon grease.

Digitag, Inc. Model ECS-215
5vdc turn on
PRICE EACH $7.50

240Vac contact 14amps or 40amps on a

10"x 10"x .124 aluminum. Heatsink with
silicon grease.

Grigsby/Barton Model GB7400
5vdc turn on
PRICE EACH $7.50

240Vac contact at 15amps or 40amps on a

10"x 10"x .124 aluminum. Heatsink with
silicon grease.

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

MHZ electronics

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**RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER**

The Recall Phone Telephone employs the latest state of art communications technology. It is a combination telephone and automatic dialer that uses premium-quality, solid-state circuitry to assure high-reliability performance in personal or business applications.

$49.99

---

**TOUCH TONE PAD**

This pad contains all the electronics to produce standard touch-tone tones. New with data.

$9.99 or 10/$89.99

---

**FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.**

Features:
- 1.2 to 1.6 volt operating range, less than 0.5ma current consumption. 150KHz to 3MHz Frequency range. Easy to assemble, no alignment necessary. Effective and variable AGC action.
- Will drive an earphone direct. Excellent audio quality. Typical power gain of 72dB.

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<th>Part Number</th>
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<td>MCI358P</td>
<td>IF Amplifier, Limiter, FM Detector, Audio Driver, Electronic Attenuator.</td>
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<td>IF Amplifier</td>
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<td>MCI310P</td>
<td>FM Stereo Demodulator</td>
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<td>MCI496P</td>
<td>Balanced Modulator/Demodulator</td>
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$2.99 or 10/$24.99

---

**MITSUMI UHF/VHF VARACTOR TUNER MODEL UE1A**

Perfect for those unscrambler projects. New with data.

$19.99 or 10/$149.99

---

**NI CAD RECHARGEABLE BATTERIES**

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<th>Battery Pack</th>
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<td>12vdc at 2.5Amp/HR.</td>
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<td>12vdc at 5Amp/HR.</td>
<td>$15.99</td>
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$2.05 or 10/$15.00

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**MOTOROLA MRF559 RF TRANSISTOR**

- hfe 30min 90typ 200max.
- ft 3000mhz
- gain 8db min 9.5typ at 870mhz
- 13db typ at 512mhz
- output power .5watts at 12.5vdc at 870mhz.

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800-528-0180
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73 Magazine • February, 1984 109
"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

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JOHNSON TUBE SOCKETS AND CHIMNEYS

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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¢ 1001 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

TOLL FREE NUMBER 800-528-0180
(For orders only)

MHZ ELECTRONICS

For information call: (602) 242-3037

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## TUBES

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73: Amateur Radio's Technical Journal • Box 931 • Farmingdale, NY 11737

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In 1978 we created the first microprocessor based repeater and here is its successor the incomparable MARK 4CR. Of course it has autodial and tail messages, after all, we invented those features. Sure it has autopatch, reverse patch and built-in ID. But hold on -- it also has Message Master™ real speech and receiver voting. Its all new receiver puts 7 large helical resonators up front for extremely high dynamic range. Yes, MARK 4CR is the next generation!

- Unlimited vocabulary speech messages in your own voice
- Hundreds of tone access functions, many with time-of-day setting
- All vital parameters can be set remotely by tone access
- Two phone lines and dozens of input/output control lines
- 4 channel receiver voting plus full linking capability
- Bus structured design for easy hardware/software expansion
- "Overload proof" receiver with 7 large helical resonators
- Our famous MCS squelch, often called the best in the business, is now even better with automatic fast/slow switching
trix printer), I am obviously not a fan of mechanical systems. I was surprised, therefore, to note that 60% of traditionalists plan to keep their mechanical RTTY.

As more and more computers come into amateur-radio stations, the desire for higher transmission speeds will take on a more urgent note. After years of watching news agency reports print at 50 baud, the thought of 300 (or even 1200) baud is indeed enticing. A problem with the existing de facto amateur data-transmission standard (UTS or Kansas City) is that it uses harmonically-related tones which will give very poor results in conditions of low signal-to-noise ratio.

BARTG has therefore proposed (for consideration at the IARU region conference in 1984) that existing RTTY standards be used as follows—300 baud, 170-Hz shift; 1200 baud, 850-Hz shift. FSK transmissions will have space on the lower radio frequency and AFSK will use 1275 Hz for space and 1145 Hz (170-Hz shift) or 2125 Hz (850-Hz shift) for mark for 300 baud or 1200 baud, respectively.

Further BARTG proposals for the conference include:

- The adoption of a 10-bit ASCII code using even or odd-parity (plus 1 start, 7 data, and 1 stop). (Author’s note: Many commercial systems use 11 bits for asynchronous ASCII by adding a second stop bit.)
- The adoption of CGC 476:1 at 100 baud (the basic of ADMOR as the international amateur standard for an error-correcting code.
- Standard amateur RTTY speeds of 50, 75, and 100 baud (note the dropping of 45.45).
- Dropping the requirement that amateur RTTY stations regularly transmit voice or CW identifications when using CDITT alphabet no. 2 (Baudot).
- The adoption of a letter coding system by VHF operators of the protocols used for Viewdata (Videotex).

I find the last proposal rather odd and think it is almost a backward step! Viewdata does not use error-correction and is asymmetric (uses different speeds in the forward/reverse directions).

TRI, Jan/Feb 1984, page 76

INDIA

A VISITING HAM’S GUIDE TO INDIA

The time is given when the mention of India conjures up visions of snake charmers, elephants, and maharajas. All these are there, but there is much more of interest to the visitor—ham radio, for instance.

Those who believe that India is a backward country are in for a jolt. Your first exposure to India will, of course, be the airport (or the seaport, if you are the MM type). Modern communications and facilities at these entry points convince the visitor that he has come to yet another advanced country. What then, is this talk about underdeveloped and developing countries? That is for consumption by the World Bank and other UN organizations. Yes, we do have a lower per capita income, but everything is cheap in the same proportion. In brief, you can live in India on as many rupees as you would need dollars living in the US for a comparable standard of living. India builds its own nuclear power plants and launches its own satellites on its own rockets—a little late, but with the technological advances of the state of the art. Soon, Indian hams will be using a satellite built by them and launched by them for the Indian Space Research Organization. It will probably be called the Indamsat—such an appropriate acronym!

So, you probably landed in Bombay on a Pan Am flight. Bombay has over 200 call signs and most of them are members of a club called the Radio and Electronics Society of India. One of the dream shacks is that of Capt. D. Dasan VU2AID, a senior manager in Air India who also holds the Australian call V68K. Most shacks in Bombay have Icom or Kenwood equipment, thanks to VZFR (which represents these two companies). Quite a few of them sport quad or tribander beams. Activity is mostly on the 14-, 21-, and 26-MHz bands. 2 meters is just getting started, but it will take a repeater to really turn this band on. It won’t be long before one is installed. The calling frequencies are 145.0 and 145.5 MHz all over the country.

There are more than 50 call signs in Delhi, but quite a few are inactive. The active calls were Bernd VU2LOA from the German embassy, Aoki VU2JPN from the Japanese embassy (both of whom have left India), and brothers Rakesh VU2RAK and Rahul VU2YK, who are still in Delhi. Brad VU2JE from the American embassy was active, but he has now been posted to some other country.

Madras has its share of active hams, including Chauhan VU2MV, President of the Federation of Amateur Radio Societies of India (FARSI), who uses a Ten-Tec Delta. Equipment in the Madras shack is mostly Heath, Ten-Tec, and Yaesu. In this city of 4 million, you will find the pace of life brisk but not breakneck. Hams here will find time for a friendly chat with you, even if you arrive unannounced. Avoid morning visits if you can, except on holidays. Life begins early—around 5:00 in the morning—and most hams are at work (known in India as morning QTH) by 8:30. Most of them can receive visitors at their place of work and in any case can be got at on the telephone. The 2-meter net meets on 145.5 at 0000 and 2000 hours daily.

Bangalore, promoted as the Garden City of India, is about the same as Madras, except that work for many begins at 7:00 in the morning. The Bangalore boys are back home by 5 in the evening even after commuting tens of miles. Many of these are not available by telephone, but put your 2-meter rig on scan and you may meet many of them.

If you are planning a short visit of a few weeks to India, you will probably not have enough time to obtain a reciprocal license. You can, however, operate from an Indian shack with the permission of the OM and can save the trouble of bringing along your shack. However, the path towards W opens up at an inconvenient time for working hams (around 1100), so unless you plan to operate from a permanent shack, it is likely that you will get to everywhere except your homeland!

In the event that you are planning to have a home in India for a few months, you can apply for a license at the same time that you apply for a visa. Your application should be addressed to the Wireless Adviser to the Government of India, Dept. of Communications, WPC Wing, Sardar Patel Bhawan, Sardar Sq., Parliament Street, New Delhi 110 001. The application fee can be obtained from that office or more promptly by writing The Federation of Amateur Radio Societies of India, 3 Thiru-Vi-Ka Road, Post Box No. 725, Madras 600 006, India (including 3 IRCs to cover postage). A self-addressed envelope will further speed up action; the forms will be posted the same day as your letter arrives. The fee in India is 10 more IRCs if you want a copy of the Indian Callbook (which also contains telephone numbers).

You need not send money with your application, but send a copy to the Federation. When you get your visa, write a letter to The Wireless Adviser to the Government of India, confirming that you got it. Send a copy to the Federation. You will normally get the license by the time you arrive in India, although much depends upon your department at the time of your application.

The power allowed in India is 150 Watts RF output to antenna, which covers any background noise by far more than the KWM2. Unless you are holding a Novice license, you will be allowed the use of the following bands: 7.000-7.100 MHz; 14.000-14.350 MHz; 21.000-21.450 MHz; 28.000-29.700 MHz; and 144-146 MHz.

The Indian government is extremely friendly towards amateur radio and for- merly would not refuse your application in response to your application, interpret it generously as resulting from excessive workload. Once in a while the government may turn down your application. The reason will probably be the same as when the US embassy turns down an Indian application for a visa to visit the US. You cannot fight Capitol Hill, so resign yourself to operating from an Indian shack if your visa is not also refused. In the latter event, the problem neatly solves itself!

Now you have a good idea of what to do, plan your next vacation in India. Air India is a good airline and will be pleased to be of service if you choose to fly with them. You might want to run into Capt. D. Dasan VU2AID, their operations manager, Vice-President of FARSI, on one of the jumbos or at one of the airports.

NEW OPERATING FREQUENCIES FOR HAMS

The government of India has authorized the following operating frequencies for VU2 hams. Certain frequencies as indicated (*) are shared with other services:

- 3500-3540 kHz; 3890-3900 kHz; 7000-7100 kHz; 1406-1435 kHz; 18066-18161 kHz; 21000-21450 kHz; 24890-24900 kHz; 28000-29700 kHz; and 144-146 MHz.

The type of emission allowed to grade II operators in the band up to 24000 kHz is A1 only with 50 W maximum dc input power. On 28-29.7 MHz, A1, A3, A3A, A3J, and A3H are permitted. On 144-146 MHz, A3, A3A, A3J, and F3 are permitted with a power of 100 W. For grade I license holders, A1, A3, F3, A3A, A3J, A3H, F1, F2, F3, and A5 are permitted on the HF band; A2 is permitted, in addition to A1; and F3 is permitted with a power of 100 W. For grade I license holders, A1, A3, F3, A3A, A3J, A3H, F1, F2, F3, and A5 are permitted on the HF band; A2 is permitted, in addition to A1; and F3 is permitted with a power of 100 W. For grade I license holders, A1, A3, F3, A3A, A3J, A3H, F1, F2, F3, and A5 are permitted on the HF band; A2 is permitted, in addition to A1; and F3 is permitted with a power of 100 W. For grade I license holders, A1, A3, F3, A3A, A3J, A3H, F1, F2, F3, and A5 are permitted on the HF band; A2 is permitted, in addition to A1; and F3 is permitted with a power of 100 W.
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station. A1, A3, A3A, A3H, F1, F2, F3, and A5 operations are permitted in the HF bands (with power limited to 150 W). Also, A1, A2, A3, A3A, AJ1, F1, F2, F3, F4, ASH, A4, and A5 operations (with a power limit of 50 W for terrestrial and 100 W for satellite-work) are permitted.

**VU2BEL**

The Managing Director of Bharat Electronics Limited (BEL), Mr. N. L. Krishnan, has promised to help their club station (VU2BEL) with all facilities and equipment. There are more than 40 hams on the roll of the establishment. In addition to the club building, the establishment has provided their communications equipment, test equipment, antenna systems, and now it is left to the inclination and interest of the hams to exploit and utilize the facilities openly offered by the Managing Director. He has wholeheartedly said that he is willing to help hams with projects for the design and development of new amateur equipment, especially hams who can produce and market it so that the national market for ham equipment can evolve.

The photographs show the Managing Director presenting one of the transceivers manufactured by BEL and given to the VU2BEL club station.

**ISRAEL**

Ron Gang 4X4MK Kibbutz Urim Negev Mobile Post Office 85300 Israel

I hope that from the last few columns you haven’t gotten the impression that the only amateur pioneering work being done here is in the VHF/UHF frontiers. Yes, the lower end of the amateur spectrum is a new territory just beginning to be mapped here. You see, when in 1970 the World Administrative Radio Conference decided to expand the ham bands, the groundwork was laid for 160 meters to be opened up in this part of the world. So, for the hardy souls who brave the static-crash-torn reaches of the Top Band, we can now see what this band has to offer...

In the forefront of the pioneering effort here is Riki 4X4NJ of Gan Yavne on the Mediterranean coast about fifty kilometers south of Tel-Aviv. Riki’s endeavors on 160 go back to pre-WARC years when, for the CW Worldwide test in October, 1973, a special license was granted to set up a station. A full-size sloping dipole was hung from the top of the Four Seasons Hotel in Netanya, on a cliff overlooking the Mediterranean, and a 160-meter transceiver on loan from VECMRM provided the means of exciting this effective antenna. From here on, Riki continued to experiment with various transmit rigs, with or without OTH, applying for special permission whenever an international contest would come up.

In October, 1982, along with 30, 17, and 12 meters, 160 became available to the Israeli radio amateur. 1610–1650 kHz may be used on a primary basis by Class A amateurs running a maximum of 100 Watts input with Class B operators with 10 Watts. 1850–2000 kHz may be used by A licenses only on a secondary-non-interfering basis with 10 Watts input.

The 4X4NJ has since then worked all continents and run up the all-time record for Asia in the CW WW contest. The credit must go to hard work, perseverance, and sparing no efforts on a good antenna system.

Riki began by loading the insulated guy wires of his 65-foot-high tower, resembling an inverted L sloping towards North America. Since then, the sky-wires have become more sophisticated, transmitting into a 100-foot wire hung from the top of the tower which is base loaded through a silver-plated coil. Sixteen 80-meter radials plus five quarter-wavelength 160-meter radials which are strung out temporarily over adjoining fields for contest weekend and assorted buried pipes comprise an effective ground system.

Receiving was all first the real problem: It was painstakingly difficult to dredge the far-off stations calling 4X4NJ out of the atmospheric noise. Thus, Riki switched between four different receiving antennas: the transmitting antenna plus attenuators, a horizontally-polarized omnidirectional dipole twelve feet up, a two-element vertical phased array composed of two twenty-foot elements with a rotatable pattern and remote transitor preamps, and an 80-foot-long non-terminated Beverage wire bidirectional to Europe and North America on one end and VK3L on the other. The Beverage, which Riki added last season, far outshone the previous receiving antennas, finding the North American stations, unreadable on the other antennas, were Q5 on this. This receiving antenna, added last winter, made it possible to hear better than Riki could have hoped, so he decided that the next step in which to go was that of better transmitting effectiveness.

In early October, I got hold of Riki on the Tel Aviv repeater, and he told me of what appears to be his latest breakthrough. He recently completed a phased transmitting array with a very low angle of radiation and a rotary switch for selecting antenna direction. Construction details are being withheld until this antenna has been thoroughly tested out. Riki says that it appears to have a 15-to-20 dB front-to-back ratio and a forward gain of 6 to 10 dB. On receiving, it competes with the Beverage, and in certain instances actually outperforms it! Both G3BDQ and DJ9W report that he was coming in like a local, with a greatly improved signal, so Riki is expecting big things out of this antenna.

On the equipment end (notice that we've left this for last, as on 160, the antenna is what really makes the difference), Riki is using the Drake C-9line, with a combination of I-f and after filtering to squeeze the weak signals out of the noise. At this time, 4X4NJ has worked on Top Band 72 countries (52 confirmed), 25 US states, and all continents.

We wish Riki best success on 160 this season, and hopefully some of you will be able to contact him in person. There are other Israeli stations on 160 meters, but by far 4X4NJ is the most serious of all!

I would like to conclude this month by thanking all those who have taken the time to respond to this column, either by letter or on the air. It has been heartening for me to know that so many people are interested in what's happening in this country outside of the tense headline news. This underlines the human aspect of amateur OTH that makes possible people-to-people contacts, bypassing international boundaries and tensions. Until next month, Shalom (peace) and 73.

**SOVEREIGN MILITARY ORDER OF MALTA**

The 1A0KM picture. QSL card, showing the SMOM location, an ancient village near the Tevere river which has been recognized as a national monument. For that reason, the tripod beam shown on the terrace (just right of the pine tree) had to be dismantled. A tilting-down five-rotor vertical is now planned for the same terrace.

**ITALY**

Giancarlo Martelli 4X0XR Via Chiodo 18 00162 Roma Italy

Mario Ambrosi 12MQP Via Stradella 13 20129 Milano Italy

1A0KM — THE SOVEREIGN MILITARY ORDER OF MALTA HAM STATION

One of the most requested countries in the DXCC fan's world is the Sovereign Order of Malta, prefix 1AB. This political entity, founded in 1099, recognized by Pope Pascal II in 1310, and known as SMOM—Sovrano Militare Ordine di Malta—is fully independent from the Italian state, and under the provisions of international law, it maintains diplomatic relations with many countries and international organizations. The main activity of the tiny political and territorial entity, which is located in a beautiful spot of Rome near the Tevere River, is concerned with worldwide assistance projects for the elderly, educational efforts, and support for religious, social, and medical causes.

The 1A0KM station was activated in November, 1980, when the Knights of Malta asked some amateurs to give their assistance in setting up radio contacts with their field hospitals located in the territory hit by the tremendous earthquake in Irpinia, south Italy. Just following that event, 1A0KM worked the world, until January, 1981, raising savage pileups whenever it appeared on the bands. During that period, the station made about 8,000 QSOs, with many European stations, until January, 1981, raising savage pileups whenever it appeared on the bands. During that period, the station made about 8,000 QSOs, with many European stations, and every time was on air.

The 1A0KM prefix was assigned through the ARRL, after a complete survey of the documents submitted by SMOM through the station operators, recognized the independent political status of the territory governed by the Knights of Malta and added the 1A0B prefix to the DXCC list, giving credit to the 1A0KM cards starting from its earliest operations. The amateur station was started up the station and the new country, and who at present are the exclusive operators allowed to carry out ham-radio activity there, are AI3AMJ, Tony IBJ, Tony IJJX, Mario MMG, and Mario MMX.

Due to the room shortage in the ancient villa which houses SMOM, the 1A0KM station does not yet have a fixed setup, and the rigs, as well as the antennas, are being taken inside and assembled whenever the station must operate; this is neither practical nor fast.

A tribander beam antenna which was mounted on the building roof had to be disassembled for esthetic reasons, since the villa is recognized as an antique and a valuable monument.

At the time of this writing, the 1A0KM crew is trying to get a corner to set up a permanent shack and a permanent antenna. The already-mentioned valuable rocks and rocks will be taxed themselves and bought a Yaesu FT-901D transceiver, a Henry REDK Classic.
amplifier, and a five-band 1B7AV ground plane. They plan to use the antenna and building terrace, with provisions to tilt it down on the floor when not in operation. This stable arrangement will allow the station to be visible on the air more frequently, possibly entering some international contests as well.

The official QSL manager is Mario @MMX, but the HAM radio task involved with such a management, the cards for contacts made with the other operators (1B7, 1B3X, 1B7MM, and 1B7MMX) will manage their own QSLs: Antonio Privitera IB7V, Via Caresio, 34, 00199 Rome; Antonio Vernuccio IB7V, Via G. C. Abba, 8, 00141 Rome; 8032, Via 190 Cassia, 920, 00189 Rome; Porfettos Porretto IB7, Lgo S. Pio V, 16, 00165 Rome; and Mario Monaco IB7MMX, Via R. Pacciu, 2713, 00152 Rome.

HAM RADIO IN ITALY BEFORE WWII

It may be that the old timers who started their activity after WWII are interested in knowing what amateur radio was like in Italy during the Fascist period. Italy had its own pioneers, like Adriano Ducati, who gave us the first Italian-French contest at the age of eighteen. In 1924, other than Ducati, who broke the shortwave DX frontiers, establishing some world records in the roaring old times, around 1924-1925. They had good equipment, usually home built or imported, and then, as no laws or rules on amateur radio activity was issued in our country at that time. These laws or rules were never made. They were good friends, even including one point of the Italian Postal Code where it was stated that “amateur shall exercise a transmitting radio station with the permission of the Ministry of Internal Affairs and the Ministry permission.” Theoretically, ham radio was not forbidden, but on the other hand, the permission was not granted either. The reason for this was that the Fascists did not see with much pleasure every form of private contact between the Italian citizens and foreign democratic countries.

Naturally, radio had many fans in Italy, mostly devoted to home-breeding. There were three or four consumer magazines devoted to these fans, publishing descriptions, schematics, articles, how to build BC radios, SW radio, and even amateur transmitters. There were also many good technicians, many of them very young, with no problem to build good SW receivers and listened to international BC stations and to foreign amateurs.

During that period, Ing. Ernesto Montu, an electronics engineer and university teacher who was famous in Italy for his Radiotecnica Manual, and who also had been one of the ham-radio pioneers many years before the Fascist government took over, published his first edition of the Italian Official Journal of the RADIO AMATORI ITALIANI, which still officially represents amateur radio in our country. At the same time, some amateur stations appeared on the bands, in the 20-meter band, using assigned callsigns. They did not communicate their names or QTHs, and they operated undisturbed. Their number started to grow, and in the meantime, Ing. Montu started a very small (but very dangerous in those times) GSB bureau in his own home, which also housed the ARI headquarters and a new ham radio station, the very first in Italy, the official journal of the association.

Year after year, the number of Italian hams increased. They tried to have a clear and official registration of their activity, but in order not to raise any suspicion as to their intentions. The political police and the postal police played a very fair game and were highly tolerant as they apparently seemed to ignore that kind of activity.

I was almost a kid then and was deeply involved in what we call today DXers—at first simple crystal types, then regenerative sets with two or more tubes. When I first received shortwave, I was speechless for days, then I learned and learned it in a hurry; then when I started to listen to the amateurs, I got really excited. I tried to get some information on them, but there were not many contacts. Many operators told me that they were Fascists, and that only Fascists could operate radio stations. Others may have been more lucky and got into something interesting. I was 17 when I decided that I had to get on the air. My poor pocket (I was a student) permitted me to buy only a valve, a simple crystal set, and some parts, all secondhand, and I started my activity with the 45’s self-oscillating in a Hartley circuit and a large antenna.

I made a lot of DX contacts with that makeshift rig and got my WAC, which lived in my heart since I could not get the license to take it. The ARRI decided not to declare my QTH and my name on the air, I found that some form of hidden intelligence, word after word, indication after indication, can make you feel the presence of another. I get in touch with other Italian fellows. That system worked, and I joined other friends and attended the annual meeting, a valuable experience in Milan, where I met Mr. Montu and had the chance to receive some QSL cards.

I had to rely only on that simple QRP rig and on a three-tube regenerative receiver, as I didn’t have any money for more. Many Italian hams were in possession of sophisticated transmitters, like crystal-controlled MOPAs with transmitting power of 500 watts and more; these tubes and components, like 807s and 813s, were coming into Italy through bootleggers from Switzerland. In Italy, we also had our own good commercialized receiver, with a six-band drum coil switching system, low-loss materials in the front end, S-meter, and optional bin. It filled all those requirements as a BC receiver, but in reality, it was a real communication receiver. It was put out by IMCA, a firm owned by an under-ground Fascist. That beautiful receiver was in many Italian shack during the latter half of the thirties.

One day, I got an answer to a QSO from a very powerful station, presumably local, which invited me to pay him a visit. His open style was very unusual in our community, but his invitation and his voice sounded so friendly that I decided to go. I turned pale when on the road with the radiogram, I’m afraid of the National Security—Radio Center.” I decided to turn back when a gentleman who was standing near the door asked me if I was looking for the “Radio Centro.” I replied, “Yes, I was going to the National Security—Radio Center.” He asked me if I was looking for the “Radio Centro.” I replied, “Yes, I was going to the National Security—Radio Center.” He said, “I’m sorry for your fear, so I was waiting just to reassure you, Old Man.” He cordially invited me inside.

Wow! For the first time in my life I saw an RCA AR8 and an RME 601! All around were racks filled with radio gear. “Boy, what is that strange key with two black levers. I’ll bet that’s the rear panel of the 802!” I felt myself getting faint when I saw some shelves filled with QSTs, ARRL handbooks, and bunches of QSLs from everywhere. “Kind of QSL, but what are you using?” I asked him. “Direct mail” was the answer. My surprise was endless, as there was a tight censorship of mail to and from abroad.

I visited another room where I saw several AR8s and some operators typewrit-
aeronautical ones. The whole situation is absolutely inexcusable due to the amount of political and commercial interests lying under it. The administration is also looking at this as a national problem, like the continuous increase of pirate stations. These stations work with amateur transceivers, often using linear amplifiers, and have been able to take advantage of the described mess and overloaded by the problems caused by the fast growth of the communications systems in our country. 

Many Italian groups understand that their problems cannot be solved through traditional organization with the administration. They need a different platform. Maybe in the near future they will look for the support of the national media: TV, newspapers, and magazines. It may happen also that they decide to follow the lead of the amateurs around the world and from ham magazines and foreign ham associations. We regret to inform the hams who read "73 International" around the world that, for the moment, Italian amateurs are cut off from the international path on the 3.5-MHz band and must disappear from the friendly amateur communication band. We hope to be back with you very soon.

\[de IM0XK\]

MEXICO
Mark K. Toutjian XE1KMT
Nandu 21
Vergel de Arboledas
Cd. Lopez Mateos, Mex.
54500 Mexico

OPERATING IN MEXICO
I have received quite a few letters from foreign colleagues with regards to operating within Mexico while on vacation. No doubt the following information will be useful to many who may have wondered this as well.

Can You Operate In Mexico?
Sure you can! However, just as in all lands, papers are required. And where there are papers, paperwork is involved. Mexico is not the exception. Some call it "red tape." It all depends on how you look at it. This brings to mind an expression that my mother often helped me to appreciate: "What's worth getting is worth waiting for!" It's the same in handy and helped me keep a proper perspective of things in life.

What Do You Need To Do?
Well, there are different factors involved. First of all, this depends on whether your country and Mexico have a bilateral or reciprocal agreement or not. The United States does not. But if your country does, then you can write to Mexico for an application at the following address: Secretaria de Comunicaciones y Transportes, Subdireccion de Operacion de Sistemas Radioelectronicos, Depto. de Normas y Reglamentos, Mexico 12, D.F.

The application will state what present requirements are in your case. This, of course, all depends on what details are covered in the reciprocal agreement between the countries. And if a full copy of your present ham license will definitely be asked for upon submitting your application. All foreign visitors will be given a license not exceeding one year from the date it was issued and not longer than the expiration date on your visa. If your home license expires even earlier, don't expect to receive a permit to stay in Mexico for a longer term than what you were issued in your homeland.

No Reciprocal Agreement, You Say?
There still exists the possibility of your getting a limited ham license here, so don't fret. The Mexican FCC (Secretaria de Comunicaciones y Transportes - SCT) will establish the requirements that should be satisfied in addition to those requirements that are already set for national amateurs-to-be. The tourist receives a visa for no more than six months, so his license could not be issued for more than that amount of time. The immigrant has to renew his visa (FM-2) each year for five years, so he can be issued a renewed license each year upon presenting a copy of his renewed immigration papers.

In either case, if your country does not have a reciprocal agreement with Mexico, then three tests are to be taken.
1) Morse code. If you apply for a first-class license, you will be tested on 13 words per minute, second-class applicants will be tested at 10 words per minute, and the beginners will be tested at 5 words per minute. This will test your skill and license (good for one year and not renewable) does not require the code test.
2) Theory. This includes electricity, magnetism, and radio communication. Yes, you guessed it! All in Spanish and in your own words! What better incentive could you have for brushing up on your Spanish, besides coming to Mexico?!
3) Regulators. You could compare this to a written driver's test. You'll have to know the laws and regulations of the airwaves here in Mexico, just as in any country.

Whether your country has a reciprocal agreement with Mexico or not, you will be required to send in with your application a letter of responsibility, where a national amateur who has the same or higher grade license than what you are applying for states that he will become responsible for you. Many of our 73 readers have already established long-term contacts with different experienced Mexican amateurs over the years and perhaps even had an "eyeball" or two together. So that should not present a problem for you.

Study Material for the Mexican Ticket?
Why don't you write to Pablo A. Mooser AX, Wh. Nicaragua, for a study guide? He will send you one with his personal greetings.

Class License Do You Want? Well, then again, that only depends on what your country has. Class License I and Class II are similar (the only difference being that you can transmit with 1 kW with the Class I license in certain areas and with 250 Watts with the Class II license in certain areas. This is all explained in detail in the above-recommended book and in Mexico's official regulations.

After applying for your license, the Mexican government will then advise you where you should go to get your license. Most of the countries will be located in the north of Mexico (where your home license was issued). This will be a few months will be given as a margin. So it would be best for you to apply as far in advance as possible for these tests if your country has no bilateral agreement with Mexico.

Since Mexico borders with the United States, I know that many amateurs from this US visit this country frequently and some may have assumed that there is no way to operate here in Mexico. Nevertheless, my idea here has been to help you realize that you can operate a legal amateur here in Mexico upon fulfilling the proper requirements, even though there is no reciprocal agreement between the US and Mexico. There are no license fees, nor is there any other fee to get an FCC license, unless he fulfills requirements asked by the FCC. And when you think of it, isn't this part of amateur radio? Don't forget that "what's worth getting is worth waiting for!" And thanks again for your many fine letters!

LIBERIA

Brother Donat Steffes, C.S.C.
EL1ALW@BBHF
Brother of the Holy Cross
St. Patrick High School
PO Box 1000
Monrovia
Republic of Liberia

Did you ever hear of a fixed-frequency amateur net?

Anything can happen in Liberia! We are setting up a fixed-frequency net in the forty-meter band at 7.000 MHz. It is not limited to fixed-frequency radios and it is not limited to stations in Liberia. Actually, the net is in operation at the present time and DX stations, or without traffic, are welcome to check in. It meets every Sunday morning at zero eight hundred zulu and on other days at zero seven hundred zulu.

Then why all this talk about the fixed-frequency net?

Well, the Liberia Radio Amateur Association is receiving some two dozen fixed-frequency radios. They are Heathkits and will be converted and crystalized for 7.060 MHz. We have no reason to believe that they will not be used for DX work and DX stations, or without traffic, are welcome to check in. These fixed-frequency radios are going to fill a real need.

The 7.060 MHz is an important "get-together frequency" for Liberia and the countries within hearing distance, so our DX operators should have ample opportunity to get out. At the same time, they can talk to each other and they can practice code, on the air, communicating with each other by code. We are excited about this little venture.

The fixed-frequency net is not needed in many other countries, but for us it holds real promise.

THE NETHERLANDS

H. J. G. Meerman F0DDV
Zandweg 33
2111 GR Aardenhout

The Netherlands

RADIO-AMATEUR EXAMS

Twice a year, spring and fall, the Dutch amateur-radio exams are held. All persons who want to get a Dutch license (45 MHz, no code) or upgrade to C class (145 and higher, no code) have to pass this exam.

The exam for the Dutch novice D li-
cense consists of 40 multiple-choice questions on transmitters, receivers, antennas, filters, radio regulations, and license conditions. Three answers are given for each question; you must have at least 21 correct to pass this exam with good results.

For the C license, you have to fill in 50 questions and you have the choice of four answers to each question, but you must have 30 answers correct to pass a C license.

For the D exam, you have 75 minutes to complete all the questions. For the C exam, you have 30 minutes more time to finish the exam.

The exam is held in a large hall normally used as an exhibition hall. Hundreds of tables and chairs are placed in this enormous hall, so you have enough between each table so that it is impossible to look at your neighbor's exam papers.

The exam questions are bundled in a small 15-page booklet. The answers to the questions are filled in with a specific answer form, so that the answers can be calculated by a computer.

The Dutch amateur-radio exams are not tough. The cost is 50 Dutch guilders and you must be paid in advance to the account of the Dutch PTT.

After passing the C exam, you can upgrade to the A and B exams. For this status, you have to pass a code exam of 12 words a minute.

The results of the exams are mailed to each participant, and it takes about three weeks before the results are mailed. In the meantime, however, there is another way to know the results.

After the exams, the Central Dutch Amateur Radio Station PAGAA has a special broadcast about the exam results. The Dutch television also publishes the results on the "Dutch Testex System." The last question in the exam is "You are looking to the D exam. 2429 persons took the exam. So it is plain to see that the interest in amateur radio is very much alive in Holland. Most of this interest is due to the code-free exam of the C and D licenses, but most of the amaters try to master the code after some years working on VHF and UHF.

If you pass a Dutch amateur-radio exam with good results, you have to sign a paper, a kind of contract, which states that you agree with the license conditions and that you'll agree to all conditions taken by the authorities in the future. So you are agreeing with rules that you do not even know well. Isn't that a bit strange?

A person enters the exam room, takes his seat for the exam room, where his goes away and walks to a parked car or a hotel room. In this car or hotel room, his friends are waiting for him and they sort out in no time the correct answers to the questions. They do this with the help of some smart guys and a couple of books. Now they transmit all the answers by radio into their exam room, where their friends are waiting with their receivers. Although the check-in at the exam room is very sharp, some manage to bring their receivers along.

You can imagine that the Dutch Radio Control Service has a lot of radio direction-finding at the exam. When I heard this story for the first time, I thought it was a joke! However, last year I heard it with my own ears on the FM band of my car radio.

NEW ZEALAND

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ZL PREFIX CHANGES

NZART made proposals to the regulatory body, the New Zealand Post Office, that separate prefixes should be allocated to the Chatham Islands, the Kermadecs, and the Auckland/Campbell Islands instead of the present IC, etc., method of identification.

The proposals were adopted, and from January 1, 1964, the ZL9 series will be for the Chatham Islands, ZL5—New Zealand (no change), ZL4—for mainland New Zealand, i.e., North Island, South Island, and Stewart Island (no change). The prefix was changed from ZL5—New Zealand Untrader Watch (no change); ZL7—Chatham Islands; ZL8—Kermadecs; ZL9—Auckland/Campbell Islands.

The ZK series will be as follows: ZK1—Cook Islands (no change); ZK2—Niue (no change); ZK3—Tokelau Islands (previous ZL4 series).

The ZMB series will continue to be held in reserve and used on special occasions at the discretion of the Post Office. So, frequencies and call signs and all other data for amateurs, as of January 1, 1964, there will be a few more prefixes available by working the New Zealand off-shore islands under their new call signs.

THE ARCE STORY CONTINUED

ARCE in ZL today consists of about 75 Sections and between 800 and 900 active members. Because there are more ARCE Sections in Auckland and Wellington regions than there are call signs in the ZL1E and ZL2E series, the New Zealand Post Office has introduced the use of ZLB calls in the Auckland region and ZL7 calls in the Wellington region. So when you hear such calls as ZL6EB, ZL6DE, ZL7EB, ZL7DE, it is not a pirate station of some rare DX, but Amateur Radio Emergency Corps stations in the Auckland and Wellington regional areas operating emergency communications networks. Who knows what the next 50 years will bring? A massive increase in the South Island population could mean ZL8E and ZL8EB call signs for ARCE.

Two features of ARCE in ZL are unique.

Both stem from the Post Office recognition of the Radio Emergency Corps from ARCE.

The first unique feature is the distinctive call sign series allocated for ARCE stations in the first letter of each call sign following the prefix to always an "E." The special "E" call signs identify stations engaged in emergency communications and warn other amateurs not to interfere with this emergency or vital traffic. No other country has the advantage of such a system.

The other feature is the allocation of spot frequencies specifically for the amateur bands specifically for ARCE use. These are 3500 kHz, 3900 kHz, 7100 kHz, and the exclusive band of 1900-1925 kHz. This band could also be used for ARCE communications when and as required.

In the early days of ARCE, all equipment was home-built and performance varied considerably depending upon the skill of the constructor and the skill of the operator. Initially, all operation was on CW. All operators were amateurs who, when involved in field searches, had to be fit enough to travel with the search parties and carry the extra weight of their radio equipment.

The postwar saw the adaption of war-surplus equipment for ARCE use. Subsequently, special radio equipment was developed and produced for ARCE use, initially AM and CW, and in the last few years, SSB, the present ARCE sets for field work being TR 105S, while most base stations and field-SX stations are modern-day transceivers suitable for operation from emergency power supplies.

The advent of modern amateur equipment has revolutionized ARCE operations, operators now being able to use complex equipment that was not dreamed of in years gone by. Just as HF equipment is unique and suitable for amateur use, the migration of VHF amateurs to the two-meter FM band and the establishment of repeaters has revolutionized mobile and portable operation.

The facilities for purely local communications are excellent, and because most VHF equipment is easily portable, government emergency and military defense applications is obvious. With VHF links between the search teams and field-search HQ, the amateurs do not have the expensive equipment, but the callers are hand-held with an additional battery supply, and they are good for several hours of search and rescue work.

Many Sections have been established and developed along with ARCE since 1948. The first of these, the Search and Rescue Organization, is sponsored by the New Zealand Civil Aviation Division of the Ministry of Transport and the Police Department. Any search for missing persons or for missing aircraft comes under the auspices of ARCE. In 1950, it was transferred to the government departments, and ARCE has the continuing role in the provision of communications to and from the field and frequently in the field as well. ARCE is financed by an annual grant from the Search and Rescue Organization.

ARCE also has a role in the Civil Defense Emergency Communication Service, providing the communication between Civil Defense Headquarters and the Sector Posts in most Civil Defense areas.

In February 1970, the Director Commanding of the ZL ARCE, Ron Morgan ZL2GQZL2EZ, is quoted here to conclude this resume of the emergency amateur service as it exists in New Zealand:

"On the line of OCs of ARCE, I am aware of the work, the planning, and the efforts that have been put into the development of the ARCE of today by my predecessors and conscious of the need to continue to make every effort to preserve the good repute in which the Corps is held. To me, amateur radio is the greatest hobby in the world. Above all else, the aspect of amateur radio that can be of service to the community, and in return for the privilege of enjoying the hobby, I shall continue to work in every other ZL amateur, too, owes support to the Corps."

AWARDS

Remember the Hastings Centennial Award, 1001 hours GMT, February 1, 1984, until 2400 hours GMT, February 29, 1984. All bands, all modes; see last month's column for details of contacts required.

BIT 'N' PIECES

Recently, another World Communications Year took place at the Hawke's Bay Royal Show (County Fair) when the Napier and Hastings Branches of NZART combined to display amateur radio to the public. During the three days of the Royal Show, the combined Branches were allocated the special call sign of ZLWCY and operated amateur stations from the display stand at the show. Also, they had static displays of ARCE equipment, old and present day, some vintage radio equipment, and present-day transceivers.

There were three working amateur stations on two meters, one on 40 meters, and the other on 2 meters for local communications. Propagation was not good for the HF bands, but some excellent QSOs were made with US amateurs and others that helped to demonstrate amateur radio to the public.

There was a large display to the public where the public could touch special display items such as a vintage receiver tuned to the local broadcast station, with good for the HF bands, but some excellent QSOs were made with US amateurs and others that helped to demonstrate amateur radio to the public.

In an earlier column, when I described the national organization of amateur radio in ZL, it has been pointed out to me that I failed to indicate clearly the method by which our president is chosen. NZART is probably one of the few national radio organizations where the members elect the president every year. For the biennial elections, nominations are called for all offices, including that of the president, so here in ZL the members elect the NZART president, unlike other national organizations which appoint from one of the elected council or executive.

For the first time in June 1984, the NZART Rose City Conference took place in Napier, which is a 2 hours drive from the active Branches somewhere in the North Island. Good luck to the YL team; the extra multiple contacts points will be appreciated by all National Field Day participants.

More 50-year certificates to members of the ZL Old-Timers Club have been issued. Congratulations to the following: M. D. Mason ZL1NW, Tauranga; S. C. Bavey stock ZL1NX, Tauranga; Watty Briden ZL1PA, Auckland; George Anderson ZL1R, Waitakare; Jack Moore ZL2JM, Fielding.

Dates to remember: June 1-4, 1984—the NZART Rose City Conference at Palmerston North; then a trip to ZL about that time, you will be most welcome at our annual convention. Enquiries to the Rose City Conference, PO Box 718, Palmerston North, New Zealand, or to me at my home QTH.

NORWAY

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Since my last column there have been some interesting activities in Norway. Of special interest was the yearly national conference held on board the MS "Doro" in northern Norway. This year's elections seemed both to underline the differences between the QH members and the ordinary member and to smooth them out. I guess that's democracy is all about, is it not?

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Mr. Odd Andersen from the Norwegian Telecommunication Direktorat in Oslo gave a speech on the new license regulations expected to be issued. Word about a promised A license of 600 Watts output was very popular information for the nearly 100 members gathered—representing about a third of the total voting membership.

At a DX session earlier that morning, Alf Almedal LA9OK announced that they are at work getting Peter I Island recognized as a new DXCC country (which by now may already have been confirmed). He also said that a Norwegian Antarctic expedition will take place in late 1984, and that they were working to see that some of the members of that expedition will be ham operators. Rangnar Solberg LA7FD and Mathias Bjerrang LA5NM, well-known operators from XJ- and JW-Land, held an interesting session about operation from the Arctic.

The convention was an absolute success, and the two local sections of NRRL, the Bodo and Fauske groups, could not have been praised more for their excellent planning and the smooth-running sessions.

DX CONVENTION

At the annual DX convention in Oslo, most of the members of the LADX group were gathered to elect a new president and members of the board. An unfortunate accident to Stig Lindblom LA7JO a week before kept members from central Norway away from the convention and kept the mood of the meeting rather low. Happily, LA7JO survived the fall from his 15-meter (48-foot) tower. He fell head first, and it is a mystery how he was able to survive without any greater harm than broken and crushed arms, although his condition was very serious for the first couple of days.

Svein Ovostad LA3XI was elected as the new president of the LADX group. His predecessor was the late LA7KI, and the presidential chair had been empty for nearly a year since no one really wanted to touch the memory of our highly respected and beloved friend LA7KI, Norway's well-known top DXer for many years. The members of the board ran the LADX group in the meantime and did a good job.

Kare LA7GV was presented the trophy for having operated the highest-powered operator in the SAC contest, 1982. The single-operator/arrays band, LA7GV had won the same trophy before, and I had the great pleasure of receiving the trophy on his behalf.

The LADX group is now looking into how to get SMAXGD to come over and talk about his DXPeditons to our members; it is also involved with a couple of rather interesting projects which the board seems to be keeping secret.

MALPELO EXPEDITION

Hurray, Colombiad! You did it! K9FTU (Malpeo) went on the air. The whole world was waiting, and you gave it to us. And congratulations for an excellent operation, which must have been very thoroughly prepared, with a touch of the good old days in it: not a fool word, no irritation over the too-often-eager operators trying to work them. This operation was something all the members of that crew could be proud of.

We here in Europe too well remember a certain PY8 operation not too long ago which will go into legend as one of the poorest SSB operations from a rare place in years. But a German group put that all right again. That group actually always does a good job, so anything else from that side would have been a shock. The Colombians did their effort to straighten this out in a tremendous manner. Thanks again, guys; good work.

DXers, well, it's time to look for Europe on the lower bands again. 40 has always been very good, but when you are reading this, 80 and 160 will be at their peak to many areas. Remember, keep clear of the DX windows. You never know, day or night, when the bands will open. Most of the day and night there will be openings from Scandinavia both on 40 and 80 meters, toward North America and Japan. Listen in if you're interested in some good DX QSOs.

New countries we all are waiting for include Kermadec, Clipperton, China, Bouvet, Peter I Island, and San Felix. When will they come? Kermadec is due, China has been worked by many, but the rest? We'll wait and see, won't we? The thrill of a new one is always there, and the pleasure after working it, as well. Hours of strained listening, intensive calling, and then the feeling of your heart doing a couple of extra beats when your call is returned. And then the nervous tremble in your voice when confirming and giving your report, that's what it's all about! Thanks to the guys giving us that pleasure of working them.

PAPUA NEW GUINEA

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This will be my last contribution from Papua New Guinea. In fact, as I write this, the station has already been dismantled and the antennas have been taken down. All the ham gear is packed and en route to VK. P29NSF went QRT on October 3, 1983, and will reemerge as VK4VSF from Brisbane.

We have spent 22 years in Papua New Guinea and been witness to great changes in the country. We have seen the peaceful transmission from Australian administration to self-government to independence in 1975. We have seen a people emerge from the Stone Age into the 20th century. I have been a P2 amateur for 3½ years and enjoyed it immensely. An excellent location, good equipment, and a husband who can be connected with amateur radio made it a pleasure to operate. It has been fun being a DX station; being at the receiving end of pileups gives you a feeling of being very good company. However, at times I have had to go QRT because some operators have no discipline or manners.

On September 20, 1985, at 0153 GMT, I worked VK4MAL, aeronautical mobile, operator Barry, on 15m en route to Blak in West Irian, enroute Manila and Hong Kong. There is quite a story attached to this one. The aircraft, a 41-year-old DC3, saw service with the US Army during World War II and was bought by a retired pilot who flew it to Hong Kong for Cathay Pacific. It became that airline's first aircraft and flew the Hong Kong-to-Sydney run carrying passengers and mail.

In 1963, the old girl was sold to Mandarin Airlines (Mal and the callsign) and flew in Papua New Guinea for 10 years. When Ansett Airlines of Papua New Guinea bought out MAL, the DC3 was sold to the Travelair Group every time connected. The DC3 played a major role for bush pilots for another 10 years. Now Cathay Pacific has bought the old bird back to display her in their museum in Hong Kong. A fitting retirement! The aircraft made a nostalgic flight into Port Moresby on September 19 under its original Cathay registration, VH-MAL, on one side and the Mandated Territory registration, VH-MAL, on the other side. The aircraft is painted in original Cathay Pacific colors.

After refueling in Port Moresby, the DC3 flew to Wewak and made an overnight stop there. I worked the station VK4MAL aeronautical mobile on route Wewak to Blak and consider myself privileged to have had the contact.

The aircraft was due in Hong Kong in time for the 37th anniversary of Cathay Pacific on September 23. Every "Ter- ritorian" has a soft spot for DC3 aircraft, as they gave wonderful service to the traveling public in this country in the past. Many of them we have flown "simply" in a DC3! Nowadays Boeing 707s and F28s are used by Air Niugini, but several
DCs are still with the Papua New Guinea Defense Force.

What news from the 2P amateur scene? A new arrival is Bob P29PR, ex-V5SRP and Q3REP. Bob has just joined the Post and Telecommunication Corporation in Port Moresby. He has a Kenwood TS-180 and is active mainly on CW on all bands. Bob hopes to put P2 back on the CW map! His favourite band is 1.8 MHz, but he has found the noise level extremely high. Bob reports reasonable success on 80m, but as yet has not managed to get into W-band on that band.

No doubt the ranks of amateurs will be swelled in Papua New Guinea as the OK Tedi Mine becomes fully operational in the Western Province. Already on the air from Tabubil are John P29NSJ and Stan P29SO.

The Papuan Motor Sports Club in Port Moresby held its annual Saturday night Weekend Car Rally starting at 6 pm on September 14 and ending at 9 am on September 16. Throughout the event, communications were maintained by members of the Papua New Guinea Amateur Radio Society. The communications aspect was an unequalled success with stations working through the Moresby repeater and simplex, and as the rally moved further away from Port Moresby, on 40m during the day and on 80m at night.

Twenty-seven teams participated in the rally, amongst them six entered from Australia. Operating from O car was Peter P25NJUKZK, maintaining contact; the director of events, Wayne P29ZVW, upheld communications from another vehicle; the vehicle setting up control was manned by Bob P29BSF. Finally, and bringing up the rear in the sweep vehicle, a sturdy 4WD to ensure that all cars had managed to get through safely, was Paul P25NPL. Manned relay stations were in operation, as well as field stations, and Rick P29ZFS was working as a mobile relay controller. The complete success of the Independence Weekend Car Rally has convinced organizers to hold similar events throughout the year and Peter P25NJ intends to participate as navigator in the next one.

Good work by the PNGARS!

The weekend of October 15-16 saw activity for the jamboree zone 2. The Governor General of Papua New Guinea opened the event on P29JOA. Widespread interest was created, not only amongst guides and scouts, but also among police cadets with a view to forming a police radio club.

So much from me and from Papua New Guinea and my best wishes to everyone.

POLAND

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Radio-Locaton Contest

Amateur radio-location contests in Poland are becoming more and more popular. The Radio-Locaton Contest is organized in two bands, 3.5 MHz and 144 MHz. Competitions in each band are separate. Each participant can compete in both bands or in only one of them. All participants of the contest are divided into the following categories:

(a) women irrespective of age
(b) teenagers (boys and girls under 15 on January 1st of the year of the contest);
(c) juniors under 18;
(d) men more than 18;
(e) seniors over 49.

Women, juniors, and men are appraised as a collective and as a team. The teams taking part in the top competition—the championship of Poland—represent provinces. The number of partakers from any province is to be limited to three in all categories. Individual contestants can take part in other competitions.

Every participant in the contest brings a radio receiver with antennas of one's own, a magnetic compass or the other one, a wristwatch, and a medical certificate of one's health. The use of a radio receiver with noises detectable at a distance of 10 meters is forbidden.

The organizer of the contest provides every participant with a map of the contest terrain. The terrain of the contest is to be predominantly arborescent and differences in its levels cannot be greater than 200 meters.

Five radio transmitters are to be placed at distances not less than 750 meters from each other. The overall length from the transmitter to the receiver end number 5 is to be 4.6 kilometers measured on the map. The transmitters are to be hidden so as not to be seen at a distance of 3 to 5 meters. The transmitters must not be placed in buildings or impermeable places.

In each band, work the 5 transmitters successively: first minute—transmitter number 1, second minute—transmitter number 2, fifth minute—transmitter number 5, sixth minute—transmitter number 1, and so on.

The emission A (telegraphy without modulation) is used in the 3.5-Hz band and A2 (telegraphy with modulation) is used in the 144-Hz band. Recommended keying rate is 30-45 marks/minute. All the transmitters are to operate best at the same frequency: 3000-3600 kHz in the 3.5-Hz band, and 144.500-144.845 kHz in the 144-Hz band. The power output of transmitters is to be 3-5 W and the stability of frequency not worse than 0.05%.

After a start signal one minute before the keying of the first transmitter, competitors in five-man groups run along alleysways 50-250 meters in length. When they are at the ends, their radio receivers are switched on and they begin to look for the transmitters. The sequence of detection is optional; however, transmitter number 5 must be found obligatorily and as the last. Transmitter number 5 ends its keying when all the competitors reach their goal. The time of the race and the number of detected transmitters determine one's place in the contest.

PORTUGAL

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It is with great pleasure and personal satisfaction that I write this first column for 73. I will emphasize some aspects of the oldest association of radio amateurs we have in Portugal, known as REP—Rede dos Emissores Portugueses.

REP was first founded in December of 1926 by Mr. D. Eugenio de Avillez, formerly CT1AE, and other enthusiasts. It has now approximately 1900 members, more than 50% of the Portuguese hams. In 1986, it was recognized as a public utility by the government.

According to REP's constitution, we hold elections every two years to elect our Diretor Board, and an Annual General Meeting is held to present and approve reports of the past year, including the accounts.

Being a member of IARJ, REP offers a lot of services to its members. These are a few of them: reception and shipment of QSL cards and correspondence, to name a few.

Every year, we celebrate our anniversary and have a regional contest on VHF and HF with all the Portuguese regions (CT1H, CT2, CT3).

On Mondays at 2230 local time, a radio bulletin is transmitted by CT1REP through the repeaters and also on 80-meter phone. In addition to this, REP gives assistance to all foreign hams who wish to operate from this country. For those interested, we only need a letter requesting this service.

Owing to the existence of reciprocal agreements with some countries, it is very easy to operate from Portugal. At this time, we have reciprocity with the following countries: West Germany, Austria, Belgium, Denmark, Holland, Switzerland, Sweden, United States of America, England, Canada, Morocco, Brazil, Venezuela, South Africa, and Bolivia. More details about this will be given in the future.

The station that we have in REP is composed of a Yaesu transceiver FT-902 DM, an FG-902 antenna coupler, an SP-901 external speaker, and an FV-901 DM, all offered by Yaesu Musen in Japan. We also work on VHF using a Kenwood transceiver.

On the air, mostly around the DX frequencies, we might hear Portuguese hams using several modes of transmission—SSB, CW, SSTV, and RTTY. Some of them (very few) are also: SSB through the satellites for ham use. It may be of interest to you to know that we have 15 repeaters on VHF and 2 on HF.

We have our weekly meeting on Monday at 2100 local time. If you are in Lisbon, you are kindly invited to visit REP's headquarters, right in the heart of Lisbon. Last November, our good friends from fellow W7TIV came to see us and signed the Honour's Book.

Our address is Rua D. Pedro V, 7-4, phone 361186. Just in case you forget the address, you may contact me at phone 2668318 during the evenings.

TAIWAN

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Republic of China

To direct the attention of our people to the contribution of communications toward world peace and social development, the Directorate General of Posts, Republic of China, have issued a stamp commemorating the World Communications Year. Also, Chinese Posts and Telecommunications Department has finally granted a special license allowing a group of hams allowing them to operate in Taiwan.

The DXpedition group, consisting of three members (instead of four as previously reported) of the IARU DX Blue Team (ZM0MQ, ZB5VB, and ZN5NIW) arrived in Taipei on September 18 via KLM Air Lines. They were settled in a new hotel, "Long Life," close to BV2A/BV28.

On September 19, Mr. Hu, secretary of the China Radio Association, lent hands to take delivery of two transceivers (IC-740, ICF-2KU) and accessories from the customs at the CKS International of CKS International and delivered from Taipei City. A deposit equivalent to US $150 approximately instead of customs duty payment was placed for warranty of shipping all import duties and customs duties.

The import duty, with a 2-element yagi and a vertical tribander were set up on the rooftop of the building on the roof of a 12-story building which is spacious for antenna installations and good for both receiving and transmitting purposes. The DXpedition station was dismantled on September 24, a half day earlier than the set schedule because of a strong developing and approaching typhoon.

This initial expedition activity was highly evaluated by us. Local authorities are glad to see that through amateur radio, we have
of the public the progressive quality and unique relations existing in this field.

All visitors were entertained by the China Radio Association at the Army Officers Club. They were introduced to many important official at the party. Before their departure for home in Milan, a sight-seeing tour was arranged for them to visit the National Palace Museum, where they found great pleasure and relaxation.

I am pleased to have contacted 1Z0QPV, 1Z2SV/5V, and 1ZNY/2V to offer them a new country credit; it also made my day to have the two-way communications domestically.

I hear a group of 1As are planning to make a DXPedition to BV-land in January, 1984. I shall report in due course.

FOX HUNTING

Eskilstuna Sandare Amateur, Club SKLXU, hosted the 1983 Swedish Championships in Amateur Radio Direction Finding (ARDF), popularly called fox hunting.

The championship is a combination of one daytime and one nighttime hunt. Winner in this competition was Christer Eriksson followed by Gunnar Svensson, a well-known name in these circles here. Neither of them is a ham; this is a sport for anybody. Leo SM5EZM was third but winner of the day event. The total number of participants was 50, of which there were two YLs. Kurt SM5SW, at 65 years of age and oldtimer in ARDF, placed 39th and is still going strong.

The "foxes" were five very-low-powered transmitters on 80-meter CW hidden in the woods. The hunters were equipped with mainly ARDF sets, V Yagi’s, and small ARDF receivers. At night, a flashlight was needed. Some hunters said that they preferred rainy weather because then they didn’t hear them and their signal from the fox was so slim, they swam since they were already wet!

DX MEETING IN OREBRO

Club SK4BX, Orebro Sandamateur, arranged the popular annual gathering of Swedish DXers. SK4BX is a very active club some 150 km west of Stockholm. The club members always participate in major contests and the QSL cards on the walls show that SK4BX is successful in the DX pileup. The club runs one repeater on VHF, 1296 MHz on UHF, 437.550 MHz, as well as a UHF beacon on 432.960 MHz.

In early 1982, the club moved into a fine building restored by the members) located just outside the city of Orebro. This GTH has great antenna possibilities and the lack of immediate neighbors minimizes the risk of TVRFIR. The antennas have a tower is 40 meters high (130 ft) with a 6 meter SM5A/M2 Market Reef is divided into segments Dee yagi for 2 meters. Other antennas are for 160, 80, and 40 meters, and in the planning stage is an EMU array for reception on all bands.

Over 50 DXers got to meet in Orebro, some coming from as far away as the most southern part of SM7, an eight-hour drive by automobile. The task attraction was the talk and slide show by Erik SM/AG, member of the DX Hall of Fame. During the last ten years, Erik has made quite a few very successful operating from the most rare spots throughout the world.

Being a top-grade CW operator, he has made contacts all over the world. During the last eight months of 1982, Erik toured the rare South Pacific islands and worked 47,260 contacts.

He tried to limit the number of slides to less than 300, but his interesting and witty comments during the two-hour talk made everybody wish he had brought more. The last slides showed his QSL manager, Joergen SM5XOLS, picturing his way to the mailbox through five feet of Nordic December snow to pick up the daily pounds of QSL cards. Joergen has now a snowplow to speed up future QSL mail.

The club’s own DXPedition last summer to OJS Market Reef was shown by a professionally made film with authentic recorded sound. Goran SM5NASID, Kenneth SM5AEMO, and Goran SM4YAO had to operate their equipment after two days because of additional paperwork requested by the Finnish licensing authorities which luckily was resolved. During that silent period, they moved their rig and antenna a few feet east on the tiny reef and worked ports and stations by knowledge of the Finnish-Swedish national border.

SK4BX had furthermore managed to get a video recording from the Heard Island DXpedition show narrated by Jim VK/JSXK himself.

SWEDISH HAMS DENIED SPECIAL WY CALL

The United Nations declared 1983 as World Communications Year. In most countries, both the telecommunications authority and the radioamatour had acknowledged the WYC by various special activities. One way of giving WYC publicity in many countries has been the issuing of special WYC call signs. For the amateur radio league, SSA, applied for this kind of a call (suffixes) to be used by club stations in each call area. However, the Swedish licensing authority, Televerket, has rejected this application.

MOTIONS TO IARU REGION 1 CONFERENCE

The International Amateur Radio Union (IARU) Region 1 Division was formed in 1950 to promote the special interests of the member societies in the International Telecommunication Union Region 1 (Europe, Africa, and parts of Asia) and to represent their interests at ITU conferences.

The Swedish amateur radio league, SSA (Sveriges Sandare Amator), has sent three motions to the IARU Region 1 Conference 1984. The first motion is about the Worldwide Grid-locator System. In Europe, one system has been used for years, primarily in VHFR/UF/ traffic. It is extremely popular, especially VH/FHF/enthusiasts to collect locator squares in a manner similar to hunting for DXCC countries. The new worldwide locator system was accepted by Region 1 at the QCall Conference in Colombia in 1983, to be used in contests and for awards. Region 3 has also accepted this. The motion from SSA suggests an acceptance by Region 1 and implementation on January 1, 1985. Basingly, the world surface is divided into fields by 16 lines longitude and 16 lines latitude. These fields are squares that are 2 degrees longitude and 1 degree latitude, which will give very good accuracy in determining QTH position.

The second motion concerns the timing system for EME traffic which is different on 144 MHz than on 432 and 1296 MHz. The SSA wants the IARU to recommend uniformity as well as a timing system with one-minute sequences.

The third motion: Because of the collision between the satellite traffic and the Region 1 VHF band plan for repeater channels R8 and R9 on 145.800 and 145.825 MHz respectively, the SSA suggests one solution: channel R9 should be moved to 145.575 MHz (output). The beacon that might be interfered with on 144.975 MHz (input) should be moved. If and when the satellite organizations move away from 145.825 MHz, R9 repeaters could move back to their original frequency.

Furthermore, the SSA suggests that each IARU member society issue an amateur-radio traffic handbook in their own language, in addition to articles about special WY calls, which should be published in the member magazines. The lack of obedi­ence concerning international telecommunication rules and regulations might partly be due to lack of knowledge and un­understanding.

The SSA membership fee for the 1984 membership fee is 195 Swedish crowns which was 25 US dollars. The league issues the membership magazine, QTC, eleven times a year, runs the QSL bureau, and serves Swedish radio amateurs in many ways. The work for the club is done voluntarily. The only salaried employees are clerks at the headquarters in Stockholm.

WESTERN GERMANY

Ralf Beyer DJ3NW

Opelkamp 14

3300 Braunschweig

Federal Republic of Germany

INTERRADIO ‘83

On the world’s largest fairgrounds, the interradio ‘83 opened its gates from October 28-30, 1983, in Hannover, Germany.

Because of the size of the exhibition area and the wide range of exhibiting place at the same time, I first found myself at a poultry show. But finally I arrived at hall 19, the place to meet radio amateurs, exhibitors by enthusiasts, and a fair number of equipment and component manufacturers.

The approximately 50 booths were occupied by a dozen equipment manufacturers, as well as a number of component manufacturers/distributors, and some firms offering software support, books, and miscellaneous material. I was able to organize the ham shack. More than a dozen institutions were represented, including the national radio-amateur organization DARC, AMAT-OLG, and others.

About 8500 people, including the presidents of national radio-amateur societies from England, Luxembourg, Sweden, Spain, and The Netherlands, visited the convention and many of them took the opportunity to join the presentations provided in two meeting rooms. Papers presented included AMTOR, EME, and OSCAR 10. An indoor "Bien-Garten" provided plenty of room for get-togethers with old friends and for the usual small talk.

The meeting of the DXers saw about 100 participants and Baidur Dr. B. D. LSJ showed a film about his earlier G3UOS and Juan da Nova DXpedition. Baidur answered questions on the ill-fated tour to Spratly, of course, but fortunately he was not allowed to dwell on the details over and over again.

About 250 young students were shown around and many of them joined classes held on fundamentals of electronics and handheld transceivers for the construction of small electronics projects. More than 100 kits for easy-to-build electronic circuits and 60 kits for experiments with a microprocessor were sold at the show.

I enjoyed the meeting very much because of the variety of stimulating impressions, but I could not find anything on the international level which really turned me on. However, at least one interesting idea in this respect was the discussion of better support for future European DXpeditions. Existing plans to form national DX foundations seem to be closer - and more and more towards a European DX foundation. A more sound financial support of DXpeditions and a better service of European needs in this field could be desirable outcomes of this move.
MINI KITS - YOU HAVE SEEN THESE BEFORE NOW. HERE ARE OLD FAVORITES AND NEW ONES TOO.

The compact size and easy-to-build nature of these kits make them ideal for hobbyists of all skill levels. Whether you're new to electronics or a seasoned builder, there's something for everyone in this selection of mini kits.

CLOCK KITS

Try your hand at building the finest looking clock on the market. Its digital design and high-quality materials give it a timeless appeal. The perfect addition to any home or office, this clock kit is a must-have for any collector.

Audio Precaler

Make high resolution audio measurements, great for musical instrument tuning, PL tones, and decibels. Multiplicates audio UP in frequency, selectable x10 or x100. Gives 01 Hz resolution with 1 sec. gain time! High sensitivity of 25.1 mV input and built-in filtering gives great performance. Runs on 9V battery; all CMOS.

Audio Prescaler

Make high resolution audio measurements, great for musical instrument tuning, PL tones, and decibels. Multiplicates audio UP in frequency, selectable x10 or x100. Gives 01 Hz resolution with 1 sec. gain time! High sensitivity of 25.1 mV input and built-in filtering gives great performance. Runs on 9V battery; all CMOS.

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Audio Precaler
THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

JUST LOOK AT THESE PRICES!

<table>
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<tr>
<th>Band</th>
<th>Kit</th>
<th>Wired/Tested</th>
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<tr>
<td>10M,6M,2M,220</td>
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Both kit and wired units are complete with all parts, modules, hardware, and crystals.

CALL OR WRITE FOR COMPLETE DETAILS.

HIGH QUALITY MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.

HIGH-PERFORMANCE RECEIVER MODULES

- R144/R220 FM RCVRS for 2M or 220 MHz, 0.15uV sens.; 8 pole xtal filter & ceramic filter in IF, helical resonator front end for exceptional selectivity, more than -100 dB at ±12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmts. Xtal oven avail. Kit only $138.
- R451 FM RCVR Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- R76 FM RCVR for 10M, 6M, 2M, 220, or commercial bands. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- R110 VHF AM RECEIVER kit for VHF aircraft band or ham bands. Only $98.
- R110-259 SPACE SHUTTLE RECEIVER, kit only $98.

TRANSMITTERS

- T51 VHF FM EXCITER for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous, up to 2½W intermittent. $68/kit.
- T451 UHF FM EXCITER 2 to 3 Watts on 450 ham band or adjacent freq. Kit only $78.
- VHFC & UHF LINEAR AMPLIFIERS. Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.
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ACCESSORIES

- COR KITS With Audio mixer, speaker amplifier, talk & time out timers. Kit only $38.
- CWID KITS 158 bits, field programmable, clean audio, rugged TTL logic. Kit only $58.
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- HELICAL RESONATOR FILTERS available separately on pcb w/connectors.
  - HRF-144 for 143-150 MHz $38
  - HRF-220 for 213-233 MHz $38
  - HRF-432 for 420-450 MHz $48

FEATU RES:

- SENSITIVITY SECOND TO NONE: TYPICALLY 0.15 uV ON VHF, 0.3 uV ON UHF.
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- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).
NEW LOW-NOISE PREAMPS

New low-noise microwave transistors make preamps in the 0.9 to 1.0 dB noise figure range possible without the fragility and power supply problems of gas-heat-st. Units furnished wired and tuned to ham band. Can be easily returned to nearby freq.

Models LNA( ) P30, and P432 shown

ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
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- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

P432 also available in broadband version to cover 20-650 MHz without tuning. Same price as P432; add "B" to model #.

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SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – ONLY $178
complete with controls, heatshink, etc.
10 Watts, 5 Channels, for 2M or 220 MHz.

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

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- Kit $29
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- Kit $54
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Important Reasons Why You Should Buy from the Value Leader:

1. Largest selection of vhf and uhf kits in the world.
2. Exceptional quality and low prices due to large volume.
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Order by phone or mail • Add S3 S & H per order
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## New from Ramsey 20 MHz Dual Trace Oscilloscope

Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit that will allow you to easily test resistors, capacitors, digital circuits and diodes, TV video sync filter, wide bandwidth & high sensitivity, internal graticule, high quality rectangular CRT, front panel trace rotator, Z axis, high sensitivity x-y mode, very low power consumption, regulated power supply, built-in calibrator, rock solid triggering, high quality hook-on probes.

### Ramsey D-1100 VOM-Multimeter

- Compact and reliable, designed to service a wide variety of equipment.
- Features include: mirror back scale, double jeweled precision moving coil, double overload protection, an ideal low cost unit for the beginner or as a spare back-up unit.
- High quality hook-on probes included

### Ramsey D-2100 Digital Multimeter

- A compact easy to use unit designed to operate like a pro.
- Featuring a 31/2 digit LCD, low BAT indicator, all range overload protection, overrange indication, auto-polarity, a transistor tester, dual-stripe integration, and a vinyl carrying case.
- New from Ramsey 20 MHz Dual Trace Oscilloscope

### Ramsey D-3100 Digital Multimeter

- Reliable, accurate digital measurements at an amazing low cost. A line color coded push buttons, speeds range selection, auto plastic tilt stand, recessed input jacks, overload protection on all ranges, 3 digit LCD display with auto zero, auto polarity, and low BAT indicator.

### Accessories for Ramsey Counters

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<th>Accessory</th>
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<td>Telescopic whip antenna — BNC plug</td>
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<td>High impedance probe, light loading</td>
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### Pricing

- ** Ramsey D-1100 VOM-Multimeter:** $199.95
- ** Ramsey D-2100 Digital Multimeter:** $549.95
- ** Ramsey D-3100 Digital Multimeter:** $599.95

### Specifications

- **CT-70 7 Digit 525 MHz Counter:**
  - Lab quality at a breakthrough price.
  - Features 3 frequency ranges each with preamp, dual selectable gate times, gate activity indicator, 50 MHz input, 150 MHz typical sensitivity, wide frequency range, 1 ppm accuracy.
  - $119.95 wired includes AC adapter
- **CT-90 9 Digit 600 MHz Counter:**
  - The most versatile for less than $300.
  - Features 3 selectable gate times, 9 digits, gate indicator, display hold, 25 nV input, 150 MHz typical sensitivity, 10 MHz timebase for VHF calibration, 1 ppm accuracy.
  - $149.95 wired includes AC adapter
- **CT-125 9 Digit 1.2 GHz Counter:**
  - A 9 digit counter that will outperform units costing hundreds more.
  - Features include: 9 digit, 150 MHz typical sensitivity, 8 digit display, 1 ppm accuracy, display hold, dual inputs with preamps.
  - $169.95 wired includes AC adapter
- **CT-50 8 Digit 600 MHz Counter:**
  - A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver.
  - $169.95 wired
- **DM-700 Digital Multimeter:**
  - Professional quality at a hobbyist price.
  - Features include: 28 different ranges and 5 functions, 3 1/2 digit, 1/2 inch LED display, automatic decimal placement, automatic polarity.
  - $119.95 wired includes AC adapter
- **PS-2 Audio Multiplier:**
  - The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency, great for PL tone measurements, multiplies by 10 or 100, 0.01 Hz resolution & built-in signal preamp/conditioner.
  - $49.95 wired includes AC adapter
- **PR-2 Counter Preamp:**
  - The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz, flat 25 dB gain, BNC connectors, great for sniffing RF, ideal receiver/TV preamp.
  - $449.95 wired includes AC adapter
- **PS-1B 600 MHz Prescaler:**
  - Extends the range of your present counter to 600 MHz. 2 stage preamp, divide by 10 circuitry, sensitivity 25 nV @ 150 MHz, BNC connectors, drives any counter.
  - $599.95 wired includes AC adapter

### Contact Information

- **Phone Orders Call:** 716-586-3950
- **Telex:** 466735 RAMSEY CT

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- Satisfaction guaranteed
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SELF STANDING COMPUTER TERMINALS

We acquired a small number of these beautifully made computer terminals which were made by a major U.S. manufacturer. We do not know all the details about them at press time, but we can tell you that someone lost over $2000 on each of them. They lose you win. The terminals feature 3 micro-processors for powerful capabilities, 106 key, Hall Effect ASCII keyboard, 10 user definable keys, EAROMs, 16K RAM, 48K ROM, serial RS 232 asynchronous data communications, (synchronous optional), selectable baud rates of 75-38.4K BPS, high resolution, 12" green screen, composite video monitor, 80 X 25 line scrolling display, built-in reverse video option, self-contained, lightweight, tightly regulated switching power supply & more than can be fit in this space. The terminals were designed to be daisy chained around a central host computer and used as individual work stations. The host system could then selectively address any machine in the network for any message it may have. All units are visually inspected prior to shipment. An operators manual is provided w/ each unit. Shpg. wt. 55 lb. model no. MT 686 $289.00

With the addition of our TP 420 dual FDD system below, you can create your own office system.

We offer the following as options: schematic pac. 3 lb. $10.00
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The TP 420 is an extremely versatile mini floppy disc drive system. It consists of 2 Shugart SA 400 5¼” floppy disc drives, associated logic, controller card, power supply, cooling fan, and case. The TP 420 has a built in controller card which features: Z 80 A CPU, Z 80A DMA, Z 80A CTC, Intel 8271 controller chip, 6K RAM, ROM, plus other goodies. We have been told that the serial interface controller card within the TP 420 will support up to 4 8” drives from the unused port on it. The controller card can be easily removed should you wish to use it on some other system. Also built in is a tightly regulated, switching power supply which runs on 115/230 v 50/60 hz. The TP 420 is shipped w/ the interface cable for the MT 686, data, & schematics. Shpg. wt. 22 lb. Stock no. TP 420 $300.00

PDR-27 NAVY RADIATION METER

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The above listed tubes are already installed in the meter.

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PROPATHION

J. H. Nelson
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Whiting NJ 08759

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A = Next higher frequency band may also be useful.
B = Difficult circuit this period.
First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor, * = Chance of solar flares.
# = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

SUN | MON | TUE | WED | THU | FRI | SAT
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FT-77 The Rig for All Seasons!

Answering the call for an HF rig that goes everywhere, sounds great, and is cost-effective, Yaesu proudly introduces the FT-77 Compact HF Transceiver System.

Computerized Design and Manufacture
The FT-77 design engineers utilized the latest computerized circuit board layout methods, resulting in a compact, reliable transceiver with maximum utilization of available space. Automated insertion techniques are used in assembly, providing improved reliability and quality control over earlier designs.

Operating Versatility
The FT-77 is equipped for operation on all amateur bands between 3.5 and 29.7 MHz, including the three new WARC bands. Fully operational on SSB and CW, the FT-77 includes a dual width noise blanker (designed to minimize the "Woodpecker" or ignition noise), full SWR metering, R.I.T., and optional CW filter with wide/narrow selection. The optional FM-77 permits operation on the FM mode, with front panel squelch sensitivity control.

Expandable Station Concept
Ideal for mobile operation because of its compact size and light weight, the FT-77 forms the nucleus of a versatile base station. Available as options for the FT-77 are the FP-700 AC Power Supply, FV-700DM Synthesized External VFO and Memory System, FTV-707 VHF/UHF Transverter, and FC-700 Antenna Coupler, providing top performance at an extraordinarily low price.

Best of All, It's a Yaesu!
With most experience in transceiver design and manufacture, the Yaesu trademark is your guarantee of quality and durability. We've got all-new technology and an all-new warranty policy to back it up.

See the FT-77 and the all new line of Yaesu HF, VHF, and UHF transceivers, receivers and accessories at your Yaesu Dealer today! It's time you tried a Yaesu!
General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

**TS-430S**

The TS-430S combines the ultimate in compact styling with advanced circuit design and performance. An all solid-state SSB, CW, and AM transceiver, with FM optional, covering the 160-10 meter Amateur bands, it also incorporates a 150 kHz-45 MHz general coverage receiver having a superior dynamic range, dual digital VFO's, 8 memories, memory scan, programmable band scan, IF shift, notch filter, all-mode squelch, and built-in speech processor.

**TS-430S FEATURES:**

- **160-10 meter operation, with general coverage receiver.**
  With 160-10 meter Amateur band coverage, including WARC 30, 17, and 12 meter bands, it also features a 150 kHz-30 MHz general coverage receiver. Innovative UP-conversion digital PLL circuit, for superior frequency stability and accuracy. UP/DOWN band switches for Amateur bands or 1-MHz steps across entire 150 kHz-30 MHz range. Two digital VFO's continuously tuneable from band to band. Band information output on rear panel.

- **USB, LSB, CW, AM, with optional FM.**
  Operates on USB, LSB, CW, and AM, with optional FM, internally installed. AGC time constant automatically selected by mode.

- **Compact, lightweight design.**
  Measures only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm), weighs only 14-3 lbs. (6.5 kg.).

- **Superior receiver dynamic range.**
  Use of ZSK125 junction-type FET's in the Dina-Mix high sensitivity, balanced, direct mixer circuit provides superior dynamic range.

- **10-Hz step dual digital VFO's.**
  10-Hz step dual digital VFO's operate independently, include band and mode information. Different band and mode cross operation possible. Dial torque adjustable. STEP switch, for tuning in 10-Hz or 100-Hz steps. A=B switch quickly shifts “B” VFO to the same frequency and mode as “A” VFO, or vice-versa. VFO LOCK switch provided. RIT control tunes VFO or memory. UP/DOWN manual scan possible using optional microphone.

- **Eight memories store frequency, mode, and band data.**
  Memories store frequency, mode, and band data. Eighth memory stores receive and transmit frequencies independently. M.CH switch for operation of memory as independent VFO, or fixed frequency.

- **Lithium battery memory back-up.**
  Estimated five-year life.

- **Memory scan.**
  Scans memories in which data is stored.

- **Programmable automatic band scan.**
  Scans programmed band width. Scan speed adjustable. HOLD switch interrupts band or memory scan.

- **IF shift circuit for minimum QRM.**
  IF passband may be moved to place interfering signals outside the passband, for best interference rejection.

- **Tuneable notch filter built-in.**
  Deep, sharp, tuneable, audio notch filter.

- **Narrow-wide filter selection.**
  NAR-WIDE switch for IF filter selection on SSB and CW when optional filters are installed. (2.4 kHz IF filter built-in.)

- **Speech processor built-in.**
  Improves intelligibility, increases average "talk-power."

- **Fluorescent tube digital display.**
  Indicates frequency to 100 Hz (10 Hz modifiable).

- **All solid-state technology.**
  Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Built-in cooling fan, multi-circuit final protection. Operates on 12 VDC, or 120/220/240 VAC with optional PS-430 AC power supply.

- **All-mode squelch circuit, built-in.**
  Noise blanker, built-in.

- **RF attenuator (20 dB).**

- **Vox circuit, plus semi break-in with side-tone.**

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**Optional AT-250 Automatic Antenna Tuner**

Designed to match the TS-430S in size, color, and appearance, functionally compatible with any HF transceiver of 200 watts PEP or lower. (Requires manual bandswitching.)

- Covers 160-10 meter incl. WARC
- ABC Automatic Band Changing System (when used with TS-430S) • SWR/Power meter • 4 antenna terminals • Built-in AC Power Supply.

**Other optional accessories:**

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m incl. WARC.
- FM-430 FM unit.
- YK-65C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-55 (8P) mobile microphone.
- MC-60A deluxe desk microphone.
- MC-80 UP/DOWN desk microphone.
- MC-85 multi-function desk microphone.

More information on the TS-430S is available from all authorized dealers of Trio-Kenwood Communications, 111 West Walnut Street, Compton, California 90220.

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