THE WEST RAND AMATEUR RADIO CLUB

May 2011
Volume 11, Issue 11

# ANODE

Inside this issue:



## Anode Editor's Comments

**May 2011**
**Volume 11, Issue 11**

**ZS6WR Awards**
[A very late submission from Phillip our Chairman]
It was with great pride and a privilege to receive the following four awards on behalf of the West Rand Amateur radio Club - ZS6WR during the SARL Gala Dinner Awards.

- Silent Keys Memorial Trophy CW
- SARL 80 m Club Contest Trophy
- Club Participation Award
- HOS Trough Trophy

Well done to all club members. You did the club proud.

I would (also) like to congratulate OM Joop ZS6C for the his Jack Twine award received during the SARL gala dinner Awards.

OM Joop was nominated for his unselfish labour and time given to the West Rand Amateur radio club as well as the CW contacts made on behalf of the club the 1000 plus QSO made with the 2010 World cup soccer special call - ZS10WCS.

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## Beating the Untraceable Buzz

Man-made interference doesn't have to destroy reception. Not when you use W1GV's buzz-beating antennas.
Stan Gibilisco W1CV/4
PO Box 561652
Miami FL 33156

You've just moved into a new apartment or a new house for rent and the landlord has given his okay to your putting up a four band trap vertical on the roof. (Miracles do happen!) So you blithely install your new station console, trying to improve the layout still further over what you had the last time; you painstakingly solder every PL-259 onto the interconnecting cables. You ground your equipment with a bus bar of 1/4 inch copper tubing running to a cold-water pipe only three feet away. You install 20 radials on the roof for each band (80 in all, and with the best stranded No. 16 wire). Finally, everything is ready to go.

You turn on the receiver. A solid installation. this, you proudly think to yourself. Not a DX killer, to be sure, but it's well built and there should be plenty of good hamming ahead. The S-meter reads a steady S9 + 20. You turn up the volume: ZZZZZZ! Up and down the band you tune. The noise limiter does no good; the pulses must be too broad. ZZZZW So much for 20 meters.

Switch to 40. Peak up the preselector. ZZZZZZ! S9 + 30. Damn. Switch to 15. Peak it up. ZZZZZZ! Only S9. Oh, great! Why even try 10? Why make yourself depressed needlessly?

**The Search Begins**

The next step, of course, is to switch off

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**Special points of interest:**

- Contact details on back page (corrected & updated July 2010)
- Ham-Comp Latest on web site.

[I promise to have this updated ASAP. JB]

# Beating the Untraceable Buzz

*(continued from page 1)*

everything in the place except the rig. Thwack! Thwack! Thwack! One circuit breaker after another. And from the shack, several rooms away, you can hear the receiver with the volume up to 3:00: ZZZZZZZ-it stops! Your heart leaps. Whoops, that was the shack. Thwack! ZZZZZZZ …

The XYL shouts, "Will you turn that thing down and stop fussing with the lights? I'm trying to watch TV and iron!"

All your clocks were set to WWV from your watch, which you had to set at a friend's QTH because you can't even hear WWV at yours. Now all the clocks are out of whack since you played with the breakers.

You run all over the yard, using a little, plastic 6-transistor AM radio your Aunt Jenny gave you for Christmas back in `65 and you've hardly used for anything until now. Some places the noise is louder, some places softer. But there is no logical pattern. It's everywhere, but it's centred nowhere.

You try to DF (direction find) using the ferrite loop stick in the little radio. There is a sharp null in the direction of either the elm tree out front, or else 180 degrees opposite, from somewhere under the driveway. Move into the backyard. It's either coming from the rising full moon or else from the base of the swing set.

No power transformers of any consequence in the area. The noise is constant, around the clock. You get up at 5:00 am: ZZZZZZ! You come home for lunch (actually, instead of lunch). ZZZZZZ! Your stomach growls.

You'll never get rid of it.

**You Could Search More**

Oh yes, eventually, if you search long and hard enough, you'll find it. Maybe it's an electric blanket in a neighbour's house. But, then, who uses an electric blanket for 24 hours out of every day? A refrigerator? Maybe, but they don't run continuously, unless ... unless there is not enough of that coolant stuff in them. Hmmm.

It's not a street lamp starter, since it happens during the day. A fluorescent lamp starter, maybe? Well, who leaves a fluorescent lamp on for 24 hours a day? You might snoop around the neighbourhood at 4:00 am or so and see if anybody has any fluorescents on. But, no, you might get arrested or mugged or something.

Maybe it's a thermostat mechanism. God help you.

**What Can You Do?**

Although I've made light of all this, it's not exactly funny when it happens. And sometimes you just will not, by any reasonable means, be able to locate and/or eliminate a source of man-made noise. If it's somebody's refrigerator without coolant, maybe it will burn up some day. A noisy fluorescent light starter will eventually fail and have to be replaced. Lot of good that does you now.

The situation is not hopeless, though. Noise has different characteristics than signals. There are ways of getting your antenna system to favour those single frequency signals that you want to hear, while discouraging that wide-band hash that you can't stand to hear.

There are basically three methods of doing this. You can use them in combination if necessary. They will almost always provide significant improvement. These methods are: 1) Shielded-loop antennas; 2) High-Q antennas; 3) Noise cancelling antennas. Let's look at these one by one.

Incidentally, these antennas are for receiving only. If you have a transceiver, some sort of switching device, such as a relay, will have to

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# Beating the Untraceable Buzz

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be used. These antennas will all prove quite lousy for transmitting.

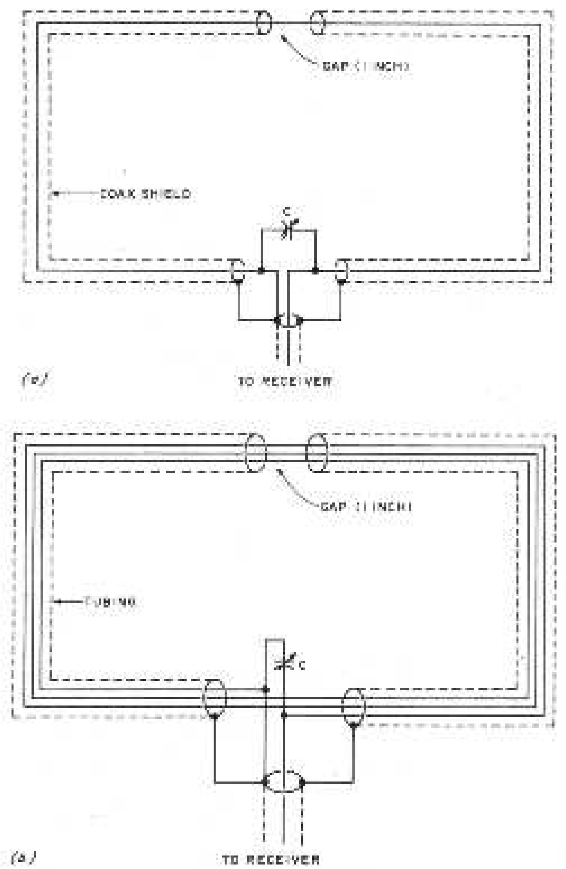


*Fig. 1. Two versions of the shielded loop. (a) A single-turn version may be constructed using tubing and heavy wire or by using coaxial cable. The value of C will have to be determined by experimentation, although a 365-pF receiving-type variable usually will suffice. (b) A multi-turn loop is shown. Circumference of the loop should be about 0.15 wavelength in either case, although it may be considerably less if a preamplifier is used. See text.*

**The Shielded Loop**

Fig. 1 shows two types of shielded-loop antennas. Fig. 1(a) is a schematic diagram of a single-turn loop, which may be constructed from coaxial cable. The loop is tuned to resonance by capacitor C, which may be a common 365-pF receiving type variable available at most Radio Shack stores. It may be necessary to parallel this capacitor with a 330-pF fixed capacitor if resonance cannot be obtained with the variable by itself.

The loop should have an overall circumference of about 0.15 wavelength. Essentially, it is a single-band affair. If used on a band much lower than where it is 0.15 wavelength, the antenna will not pick up signals very well. If used on a much higher frequency, the antenna will pick up more noise. Nevertheless. you
can probably get away with using it at half the design frequency and still get fair results. The loop may be placed on an " X " brace made out of wooden dowels or 2 by 4s, taped to an inside closet wall, or even put up in a tree.

The "shielding" of the loop obviously is not complete. Actually, it is electrostatic (Faraday) shielding, which shorts out the electric component of the signal while letting the magnetic part pass. For some reason, man-made noise seems to be transmitted mostly by capacitive coupling, as an electric field. But signals have both a magnetic and electric component. The result is that the noise gets attenuated more than the signals.

At Fig. 1(b), we have a multi-turn shielded antenna. The overall physicals circumference should still be 0.15 wavelength. The shield may be constructed out of copper or aluminium tubing. The loop should have four to six turns; too many turns will lower the Q of the antenna and this will adversely affect its noise performance. (Part of the noise attenuation of the shielded loop is the result of its high Q, which we will discuss later.) Several turns, however, provide for more "sensitivity" than just one. One word of warning: It is a physical contortion of considerable difficulty to find a way to get several turns through the tubing without a good deal of cussing and high blood pressure.

Table 1 gives the circumference of an 0.15-wavelength loop at various frequencies. The loop may be a square, pentagon, hexagon, octagon, or perfect circle. The circle is geometri-

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cally best. A long, skinny rectangle will not work too well. You should try to get the largest possible area for the circumference allowed, and keep it all in the same plane.

A shielded loop does have a directional pattern. The antenna will respond to signals in any direction except right along the axis. There is a sharp null in the line of the axis. The null is so sharp that signals propagated via the sky wave will never fall into it because of their multipath nature. Local signals might possibly fall into the null; just move the antenna a little and they'll come up. Of course, the noise can be nulled out if the antenna is oriented just right. This will provide even more attenuation to an already weakened foe.

| Frequency MHz | Circumference Feet | Meters |
|---|---|---|
| 1.8 | 78 | (24) |
| 3.5 | 40 | (12) |
| 7 | 20 | (6.1) |
| 10 | 14 | (4.3) |
| 14 | 10 | (3.1) |
| 18 | 8 | (2.4) |
| 21 | 7 | (2.0) |
| 24 | 6 | (1.8) |
| 28 | 5 | (1.5) |

*Table 1. Circumference of a shielded loop for various frequencies. These circumferences represent 0.15 wavelength for the indicated bands. If a preamplifier is used, the loop may be used at frequencies below that where it is 0.15 wavelength.*

[BTW That should be Metres but I can't change it now.]

**Nulling It Out**

The noise that is causing you so much frustration may originate in a single device, but it is probably being transmitted all over the place by the AC power lines. Therefore, it may be coming from all around. However, noise will always have a focal direction. Mathematically, all the noise combines in such a way that it may be considered to be coming from one single direction. (it's sort of like gravity. Even parts of the Earth that aren't straight under you are pulling at you, but it all averages out to a straight down force.) This axiom holds true as long as it's *Only one fluorescent light, thermostat, or elm tree that is responsible. If there are two independent culprits, each one will have its own focal direction. and you won't be able to null them both out at

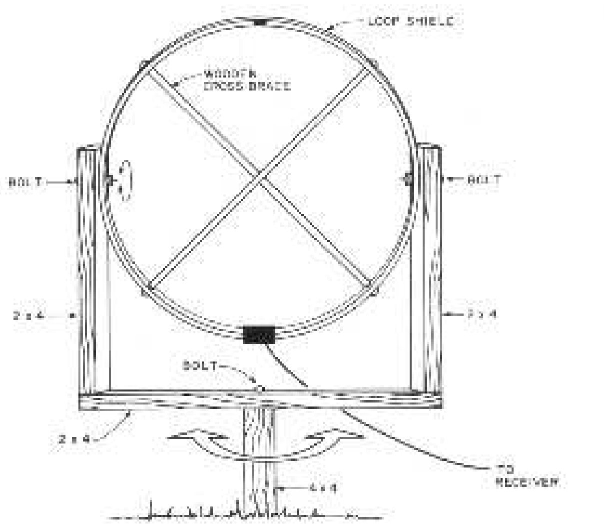


*Fig. 2. A method of azimuth/elevation mounting that allows the shielded loop to be pointed towards the focal direction of a noise source. This kind of mount is practical only up to a certain size—about an 8-foot-diameter loop. The loop shield should be constructed from copper tubing if this kind of mounting is used.*

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once. But chances are that there is only one source of noise. (it is just too horrible to even consider that there might be more!)

Fig. 2 shows a method of mounting a shielded loop so that its null can be pointed in any direction. The focal direction might even be straight overhead, so the antenna must be capable of pointing in the vertical as well as the horizontal plane. The XYL won't let you put such a contraption in the living room? Well, try the attic or the backyard, then. Or even the roof.

It may take some time to find the focal direction of the noise, since the antenna null is so sharp. But once you've found it, there may be as much as a 20-dB drop in the noise level - and this is in addition to the improvement that results from the electrostatic shielding. Now you should be able to hear some signals. Let that guy's refrigerator run until it burns itself out.

**High-Q Antennas: The Ferrite Loop stick**

Man-made noise differs in another way from signals. The signal you want to hear is never more than 3 kHz wide on the HF bands (unless you want to listen to AM short wave music broadcasts, which take up about 10 kHz). The noise, however, is hundreds or even thousands of kHz wide.

The higher the Q (the narrower the bandwidth) of the antenna system, the smaller the total amount of noise that gets into the receiver. But that little 3-kHz signal will all be passed. This effect is shown in Fig. 3. The less total noise that gets to the receiver front end, the less noise that will appear within that 3-kHz signal window," since there will be a lower level of high order mixing products. Thus, the signal-to-noise ratio will be better.

The shielded-loop antenna, discussed earlier,

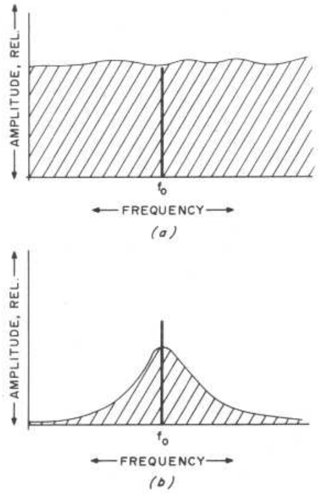


*Fig. 3. Effect of increasing the Q of an antenna system. (a) The antenna system has essentially no selectivity. The signal, at frequency $f_0$, is buried in the noise. (b) A selective circuit is used in the antenna system. The total amount of noise (area under the curve) is smaller and this results in fewer high-order mixing products, which actually reduces the noise level at $f_0$. But the signal level remains unchanged, improving the signal-to-noise ratio.*

has a fairly high Q. It can be maximized by using a single turn of very heavy wire inside a piece of tubing, or else by using RG-8 coaxial cable for the loop section. A pre-amplifier with r.f. tuning may be added at the receiver input with any antenna in order to increase the Q. There are several commercially made units available. Ameco Equipment Company (12033 Otsego Street, North Hollywood CA 91607) makes one called the PT-2 that tunes 160 through 6 meters.

An antenna with very high Q can be constructed using a ferrite rod. just wind several turns of enamelled copper wire on the ferrite core from the antenna in Aunt Jenny's at-last-useful AM transistor job. Ferrite sticks are

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available commercially from Amidon Associates (275 Hillside Avenue, Williston Park NY 11596). The coil should be tuned to resonance using a variable capacitor. Fig. 4 shows a multi band ferrite antenna system with multiple taps. The exact number of turns that will provide resonance on the desired band using a 365-pF

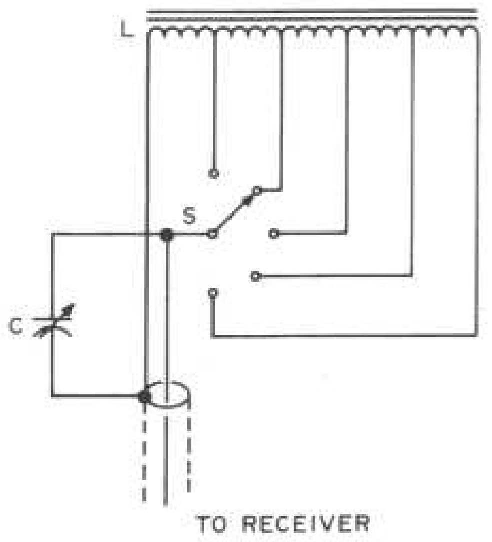


*Fig. 4. A ferrite loopstick antenna with multiple taps. The taps should be chosen so that C may be adjusted for resonance on each band used. See text for discussion of inductance values.*

variable capacitor at C will have to be found by trial and error, unless there is data included showing inductance vs. number of turns for your particular stick. Table 2 shows the values of inductance that will provide resonance with 200 pF of capacitance (about the middle of the range of a 365-pF variable) at various frequencies.

A ferrite antenna, complete with azimuth/elevation mount and a built-in pre-amplifier, is available from Palomar Engineers (Box 455, Escondido CA 92025) at the time of writing.

The ferrite loop stick is not electro statically shielded, but it does tend to favour inductive coupling over capacitive. It is easier to work with mechanically, especially at lower frequencies. Simply orient the. loop stick until a null occurs in the noise background. The null will be very sharp.

Need this last comment be made? Let's not take any chances. Don't try using a toroid core for this antenna. I t won't work.

| Frequency MHz | Inductance µH |
|---|---|
| 1.8 | 39 |
| 3.5 | 10 |
| 7 | 2.6 |
| 10 | 1.3 |
| 14 | 0.65 |
| 18 | 0.39 |
| 21 | 0.29 |
| 24 | 0.22 |
| 28 | 0.16 |

*Table 2. Inductance required to resonate with 200 pF of capacitance (the middle range of a 365-pF variable) at various frequencies. This data may be used in conjunction with data provided with commercially available ferrite rods, for the purpose of making a ferrite loopstick antenna.*

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**Noise-Cancelling Antennas**

There's still another characteristic of noise that makes it different from signals. Oddly enough, this is the very resemblance of noise to a signal, with a unique focal direction. You hear the noise on the same frequency as a given signal; the noise may be thought of as a local signal. As such, using two antennas to combine the noise in opposite phase, the noise can be "cancelled out."

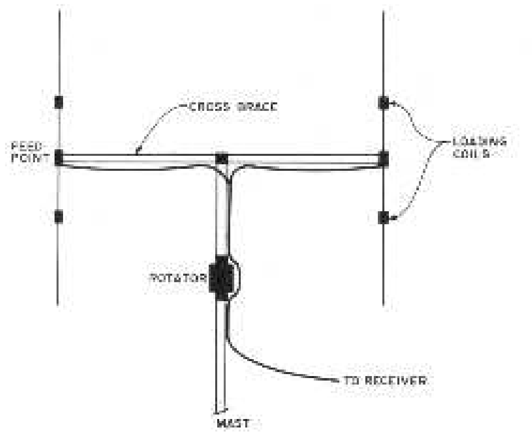


*Fig. 5. Using two antennas to obtain phase cancellation of the noise. This particular system uses two inductively-loaded vertical dipoles. This system is illustrated primarily to demonstrate the third difference between signals and noise; this antenna by itself will not work as well as a shielded loop or a ferrite antenna.*

Fig. 5 illustrates one such system. The spacing between the two inductively loaded vertical dipoles need not be very great, but it should be as large as practical without exceeding a quarter wavelength. The elements themselves may be very short. In fact, shortening them increases the Q, which will add to the noise reducing effectiveness.

One antenna is fed 180 degrees out of phase with respect to the other. The easiest way to do this is to make the phasing lines the same length, but feed one of the antennas upside down with respect to the other. That is, if one antenna has the feed line centre conductor going to the top section, the other antenna should have its feed line going to the bottom. In the plane equidistant from the two antennas, phase cancellation will occur. This is a vertically-oriented plane, and by rotating the entire system through 180 degrees, any focal direction can be put into the null plane.

It is possible, but not likely, that a signal will arrive from a direction that lies in the same plane as the noise, once the noise has been cancelled out. Sky-wave signals, since they arrive from a varying direction (ionospheric shift), may fade more if this happens. local signals will be attenuated considerably.

This particular kind of antenna is mentioned here to illustrate the third way that signals can be distinguished from noise. As described, it will not work as well as the shielded loop or the ferrite antenna. But this scheme could conceivably be used with two shielded loops or ferrite antennas! Actually, pointing these two types of antennas at the focal direction of the noise is a means of phase cancellation. But even more cancellation could be obtained by using two such antennas. both pointed at the focal direction of the noise and then combined so that the small amount of remaining noise from each antenna arrives at the receiver in opposing phase.

**Which One?**

In a noisy environment, probably the best choice is the shielded loop. Using a selective pre-amplifier, one shielded loop can be used on several bands; it should be constructed for the highest band used. On lower frequencies, the value of capacitor C will have to be increased by paralleling it with fixed capacitors. The pre-amplifier will allow reception on lower bands because of its gain.

Perhaps there is no good place to put a shielded loop with azimuth/elevation mounting, and you can't get enough noise attenuation unless the an-

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tenna can be oriented towards the focal direction of the noise. Then, the next best choice is the ferrite loop stick. It can be put right at the operating desk! The ferrite antenna will probably not be quite as effective as a shielded loop. The null will not be as well defined (though still quite sharp) and its discrimination against electrostatic coupling will not be quite as good. But it can still be used to advantage.

**Conclusion**

Noise differs from signals in three ways: 1) Noise is transferred mostly by electrostatic coupling, but signals are transferred by electromagnetic fields; 2) Noise is broad banded, but signals occupy only a small part of the spectrum; 3) Noise has a unique and usually constant focal direction at a given frequency, and it will usually be in a different focal direction than desired signals. These three differences are taken advantage of by: 1) Faraday shielding; 2) High-Q antenna circuits; 3) Phase cancellation.

These three methods of dealing with noise may be used individually or in combination. A shielded loop with azimuth / elevation mounting takes advantage of all three of the differences between signals and noise. It has electrostatic shielding, has a high Q, and may be oriented to null out the noise. A ferrite loop can be used when the shielded loop is impractical because of space limitations, either in reality or in the imagination of an XYL or landlord.

Good luck! Carry on the search for the noise source by all means. But at least get on the air in the meantime.

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Taken from 73 Magazine January, 1983

# The 'Montreal' FOX

**Build the Montreal Fox Controller**

Have you started building your fox boxes yet? Last month's "Homing In" showed you how obsolete business-band transceivers, discarded medical batteries, and military surplus ammunition boxes can slash the cost of making transmitters for international-style radio-orienteering (also called foxtailing and ARDF). Now you can save some serious cash on the control circuits, thanks to two generous hams in Montreal.

A controller board is the brains of a fox transmitter. For radio direction finding (RDF) contests under International Amateur Radio Union (IARU) rules, it makes the fox transmit for exactly one minute at its correct point in the sequence of five transmitters. It generates the appropriate CW message (e.g., MOE for fox # 1) throughout the transmission and the station callsign at the end. Delayed starting and automatic shutoff after the hunt are other desirable, controller features.

In 1970. 1 built my first solid state CW callsign generator for a UHF repeater. It was a big improvement over a mechanical code wheel. It didn't seem like a big drawback that it had 20 discrete transistors and 80 diodes and required almost a square foot of perforated board to hold everything. If I hadn't spent several hours manipulating logic maps of the dits and dahs in my callsign, it would have taken over 200 diodes. Today, one IC and a handful of other parts will do all that, plus provide transmitter control and timing to meet IARU rules.

One-chip microcontrollers using reduced-instruction-set architecture are revolutionizing the design of logic circuits. CMOS technology minimizes current drain, while EEPROM or flash memories retain data through power-off peri-

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ods and permit simple reprogramming in the field. Peripheral Interface Controllers (PICs) by Microchip Technology Incorporated are among the most popular microcontrollers for amateur radio home construction projects.

When I visited Montreal last October, I was shown a nifty little PIC controller for mobile T-hunts. I encouraged its developers (Jacques Brodeur VE2JX and Francois Tremblay VE2EMM) to make a special version for IARU radio-orienteering standards. They soon did just that. By eliminating the DTMF controlling/programming feature, it became a simple one-IC project. Raw parts cost for five controllers is about $15 each, not including shipping, circuit board. and programming of the PIC.

**Two controllers in one**

The Montreal Fox Controller uses a 16F84 reprogrammable PIC with non-volatile flash memory. An inexpensive 4.194304 MHz microprocessor crystal (X1) provides timing accuracy and synchronization through long hunts. with about one second variation in six hours. The MCW output is a keyed tone to drive the mike input of a two-metre FM rig. The CW output is an open-collector pull down for on-off keying of an A1 transmitter per IARU rules on 80-metre foxhunts.

MOx messages are sent in slow code, but station ID is sent at about 20 WPM, to avoid hunters confusing the callsign with the fox number. You can put out your foxes in advance and have them come on automatically at hunt time. Delayed start up is programmed with DIP switches in 30-minute increments from zero to three-and-a-half hours.

Fig. 1 is the complete schematic of the Montreal Fox Controller. Most of the parts should be locally available. Digi-Key Corporation [701 Brooks Avenue South, P.O. Box 677, Thief River Falls MN 56701; (800) 344-45391 carries all components, including the unprogrammed PIC IC.

VE2JX and VE2EMM are making the PIC program for this project available to all hams for ARDF and other non commercial purposes. They don't want to go into the circuit board or parts. business right now, so I am arranging for circuit boards to be sold by FAR Circuits [18N640 Field Court, Dundee IL 60118; (847) 836-91481. As of this writing, the FAR boards are not yet fully checked out and ready to go. There may be additional sources of boards in Canada and Australia by the time you read this.

My original plan was to include all the circuit board and programmed PIC sources in this article. However, the development of this project was slowed greatly by the monstrous ice storm that struck Montreal in early January. Four inches of ice formed on everything," Jacques wrote when his Internet access resumed. "Just imagine the weight! The downtown Montreal area was closed for removing the ice on the tall buildings-it was falling on the people. Hundreds of pylons for the transport power lines are down, tens of thousands of poles are broken, and the distribution network is so damaged that they say it cannot be repaired. It will have to be rebuilt to new completely. People could not use their cars, because the streets were littered with poles, trees, and electric lines. All business, industry and farming in the area stopped. Cows were dying, many farmers could not milk them."

As I write this two weeks later, 250,000 homes are still without power in the Montreal area. Not surprisingly, Francois and Jacques have been busy with emergency communications and their ham projects have been on hold. So check the "Homing In" Web site, where you will find an up-to-date list of sources for circuit boards and pre-programmed PICs for this project. At this site you will also find the source code and hex

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files for the firmware, which you can use to program your own PICs. The source code file includes the table of values for CW characters that you will use to change the callsign in the field.

programming PICs yourself. Microchip [2355 West Chandler Boulevard, Chandler AZ.85224; (602) 786-72001 has a full line of development tools and software for programming PICs and debugging micro code including SPASM, a free-

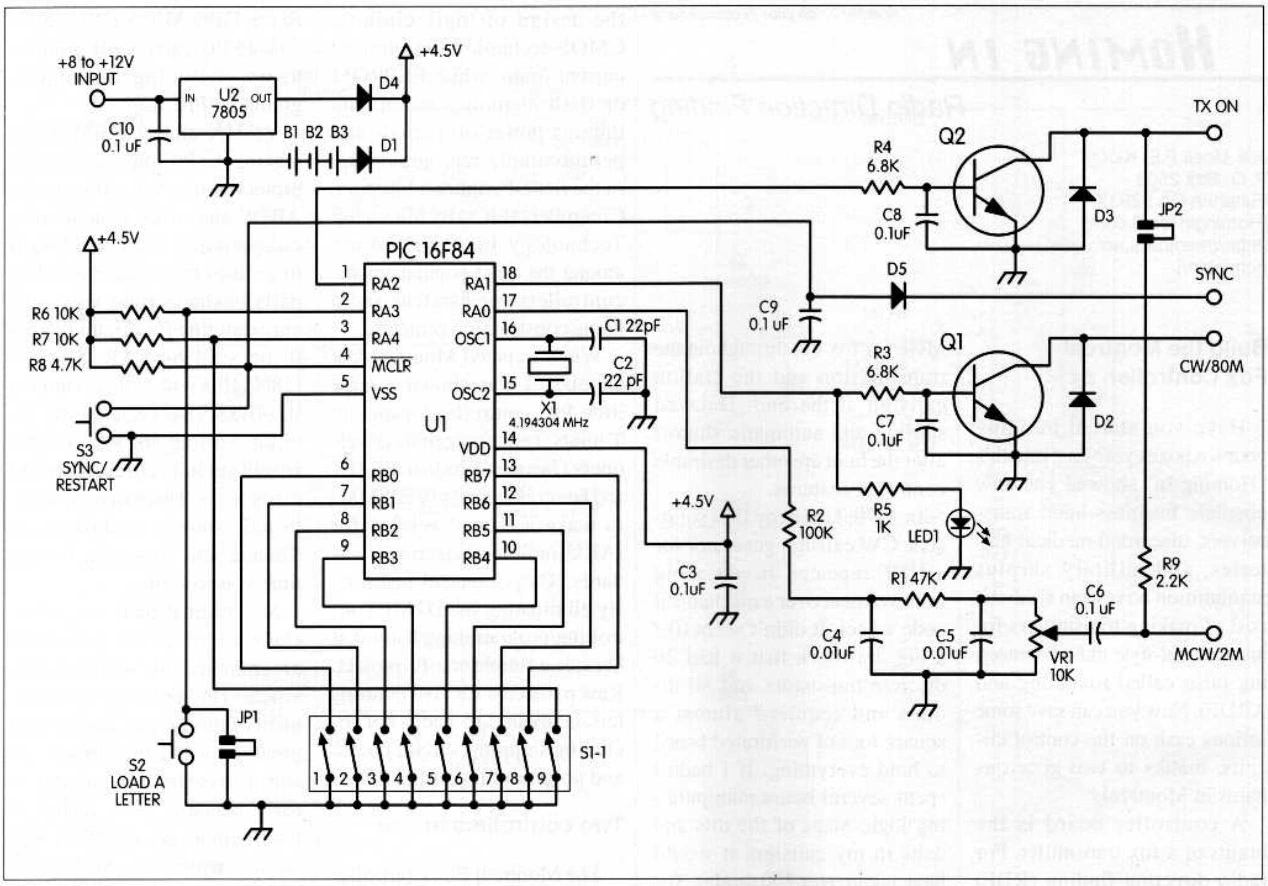


*Fig. 1. Schematic diagram of the Montreal Fox Controller. Unless otherwise indicated, resistances are in ohms, decimal capacitances are in microfarads, and diodes are silicon signal types such as 1N4148. Transistors are common switching types such as 2N2222A.*

If you do not have Web access, send E-mail to me and I will send you the files via return E-mail. If you are not E-mail or Web-equipped, send me a five inch by seven-inch self-addressed stamped envelope with three ounces of postage and I will send you hard copies. If you get the program via postal mail, you will have to enter it by hand from the hard copy, a rather tedious task.

You may discover, as I did that it's useful to have the capability of assembling PIC micro code and

ware DOS assembler program. Several other companies also make such tools. Plans for building your own PIC programmer from scratch can be found on the Internet.

For programming my PICs, I chose the PIC-1 + from IT Technologies [3704 Cheviot Avenue, Suite 3, Cincinnati OH 45211; (513) 661-7523)1. It is available in kit form for $39, including power supply, DB-25 data cable, and DOS software. The old 286 computer next to my work-

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bench runs it just fine. I recommend spending $9 more to get the 18 pin zero-insertion-force PIC socket. The PIC-1 + can program the Pica's program memory, set configuration fuses, verify programs, and read PIC memory to a file. Its software also performs data memory programming, reading of data memory. and bulk erasing of EEPROM-based PICs. Links to Microchip. IT and the freeware PIC programmer are at the "Homing In" Web site.

| Setting | Cycle | Message | Delay |
|---|---|---|---|
| x,x,x | S1-9,8,7 | S1-6,5,4 | S1-3,2,1 |
| 0,0,0 | Continuous | MO | None |
| 0,0,1 | Continuous | MOE | 0:30 |
| 0,1,0 | 2 minutes | MOI | 1:00 |
| 0,1,1 | 3 minutes | MOS | 1:30 |
| 1,0,0 | 4 minutes | MOH | 2:00 |
| 1,0,1 | 5 minutes | MO5 | 2:30 |
| 1,1,0 | 6 minutes | MON | 3:00 |
| 1,1,1 | 7 minutes | MOD | 3:30 |

***Table 1.*** *DIP switch settings for transmit cycle, fox message, and start delay.*

Perforated board construction is fine for this project, as Photo A shows. High frequencies are present only near X1, C1, and C2. Keep the leads of these components short and place them close to the PIC. Put C3 near U1 with short leads to provide good high frequency bypassing. Be sure to use a socket on U1 to facilitate any firmware changes or upgrades.

S1 is a nine-section DIP switch. VE2JX suggests marking it backwards on the board, with S 1-9 on the left. This places the least significant bits of each function on the right, the normal convention. An open switch section represents a logic 1; a closed switch is a logic zero. I discovered the hard way, as did Jacques, that surplus rocker style DIP switches can have high enough contact resistance to make callsign and function programming unreliable. Look for high quality slide-type DIP switches with gold-plated contacts.

Keying transistors Q1 and Q2 are pull downs for transmitter keying circuits requiring grounding of a positive voltage, as typical VHF/UHF mobile rigs do. With JP2 in place, the MCW/2m output provides both keying and audio to most handie-talkies. If your radio requires keying current greater than 40 milliamperes like some older mobile sets, you may need to change the value of R4 and/or provide a beefier transistor at Q2. The same is true of R3 and Q1 on the CW/80m output. The RA1 and RA2 outputs of the 16F84 will source up to 20 mA.

Francois and Jacques added several components for "insurance" purposes. C7, C8, and C9 prevent problems from spikes and noise, so they may not be mandatory in your application. D2 and D3 protect Q I and Q2 from the inductive kick of relays and are needed only if your transmitter has them. If you will use your controllers only on two meters with MCW audio. you can delete R4, C8, Q2 and D3. Conversely, if your unit is only for an 80-meter CW fox. leave out R1, R2, R45 R9, C4. C5. C6. C8, Q2, D3, VR1, and JP2.

U2, D4, and C10 are optional. Maximum current drain of the PIC circuit is only eight milliamperes, half of which is indicator LED1. Three AAA alkaline batteries will power it for over 150 hours. U2 and associated components allow you to eliminate the batteries and power the board from the same +8 to +14 V source that powers your fox transmitter. Remember that any power interruption resets all the PIC timers. so don't disconnect power after you synchronize the foxes for a hunt. Using batteries in addition to the regulator provides backup to carry the timer through any external power interruptions. Schottky diodes D1 and D4 (IN5817) prevent the batteries and regulator from damaging one an-

(Continued on page 12)

# The 'Montreal' FOX

(Continued from page 11)
other.

**Ready to test?**

Before installing the PIC in its socket, check your workmanship. Make resistance measurements to verify that one terminal of each push-button and DIP switch section is connected to circuit ground. Close all DIP switches and jumper JP1. The emitter of each transistor and pins 2, 5, 6, 7, 8, 9, 10, 11, 12, and 13 of U 1 should show continuity to ground.

If you included regulator U2, apply +12 volts to the input and verify +5 volts at the output. With JP1 removed and power applied from fresh batteries or U2, verify that about +4.8 volts is present at U1 pins 2, 3, 4, and 14, but not other pins.

If everything checks out OK, then remove power, install JP1, plug in U1, and try it out. Set the DIP switches for continuous cycling, fox #1, and zero delay per Table 1. Apply power, press SYNC/RESTART (S3), and view LED1 to verify that the unit sends MOE nine times in slow CW, then identifies rapidly as DE FOXBOX.

Besides flashing the CW characters, the LED provides other operational indications. During the delayed-start wait time, it flashes once per second. If you set the DIP switches for an improper combination, such as fox #5 cycling once every three minutes, it flashes rapidly to signal your error.

DIP switches S1-1 through S1-9 determine the fox number and message as shown in Table 1. In accordance with IARU regulations, fox #1 sends MOE continuously at about 8 words per minute. Fox #2 sends MOI, fox #3 sends MOS, and so forth. Even if you don't know CW, you can determine which fox you're hearing by counting the dits after MO (which is "dah-dah, dah dah-dah").

The IARU does not prescribe the message for fox numbers greater than five. In the VE2JX design. fox #6 sends MON (ending in "dah-dit") and fox #7 sends MOD (ending in "dah-di-dit"). For foxtailing events in a very large park where contestants can get lost, there is usually a fox on a separate frequency - sending MO continuously at the finish line, which is usually at the same place as the start. Such a mode is provided in this unit.

Pressing the SYNC/RESTART push-button (S3) with JP1 in place causes the microcontroller to read the octal code settings of S1 and commence operation in accordance with these settings. Press S3 when you power up, when you change modes, and when you begin a delayed start cycle. To operate a set of IARU-style foxes in sequence, set the DIP switches in each one to its unique fox number. The setting for number of foxes and start delay must be the same for each fox. Now press S3 on each unit simultaneously.

You don't have enough fingers? OK, connect the SYNC terminal on each unit together and short this connection to circuit return (ground) momentarily to perform the restart. Of course, the circuit returns of each board must also be connected together to do this. If you will be synchronizing several fox boxes regularly, make up a wire harness just for this operation.

Station identification remains in data memory when power is removed. Changing it from FOXBOX to your own callsign is a simple procedure. Monitor the CW tone output at RAO (U1-17) with headphones or a speaker amplifier. (Computer speakers work well for this.) Alternately, you can watch the CW flashing of the LED. With power on, remove jumper JP1 and press SYNC/RESTART.

The processor will send the callsign presently in

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# The 'Montreal' FOX

*(Continued from page 12)*

data memory in slow CW Set S1-1 to S1-8 for the binary code representing the first character of your callsign, then press the LOAD A LETTER button (S2.). Repeat for the remaining characters of the callsign. The unit sends the character in CW when S2 is pressed, for verification. Now set S1-1 through S1-8 to 11111111 (End of Message) and press S2. Set S1-1 though S1-9 for the start delay. fox number and number of foxes. remove jumper JP1 and press S3.

An automatic shutoff is included in the program to stop transmissions after four hours. This feature is used in European hunts to signal the end of a practice session. It also prevents complete discharge of the fox batteries if the box isn't recovered immediately. Shutoff time cannot be programmed in the field. If you anticipate very long hunts, you can change the shutoff timer values in the source code and reprogram your PIC.

**Plan some hunts now**

Spring is here, so your club should be scheduling its warm weather foxhunting activities. Since announcement of its formation was made in "Homing In" for January. the North American ARDF Organizing Task Force has received inquiries from many hams in the USA and Canada about plans for national and international foxhunting championships. We want to hear about activities in your area, too. To become an ARDF Point of Contact for your locality, please send E-mail or postal mail to me.

"HOMING IN" Taken From: 73 Amateur Radio Today - April 1998

Joe Moell P.E. KOOV
P. 0. Box 2508 Fullerton CA
92837
"Homing In" have their own web site. Its here:-
http://www.homingin.com/

# Anode Editor's Comments

*(Continued from page 1)*

Well done Joop! You're a inspiration to us all.

TU VY
73
De ZS6PVT

**ZS6WR at "Scopex".**
[See picture on right:]
It was a rainy, cold day at the War Museum. ZS6WR operated a station from the grounds there. The banner can be seen on the far left. Well done guys!

JB 2011

**The West Rand Amateur Radio Club**
Established in 1938
KG33XU 26.14122 South - 27.91870 East

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Weltevreden Park
1715

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**Email**: **zs6wr.club@gmail.com**
**Web page: www.zs6wr.co.za**

**Bulletins** (Sundays at …)
11h15 Start of call in of stations
11h30 Main bulletin start

**Frequencies**
439.000MHz 7.6MHz split
Input: 431.4MHz (West Rand Repeater)
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

# Radio Amateurs do it with more frequency!

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See Club website at www.zs6wr.co.za for all ANODE back issues.

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