

BEACON IN A BOX

(10 meter auto beacon)

By Jim Southwick, N7JS

I've always been fascinated with HF beacons. Listening for them is a great way to find out if a particular band is propagating and from what direction. The 10 meter band especially interested me because the FCC will allow a licensed operator to set up an unattended beacon. Care however should be exercised to check on your beacon regularly. The agreed upon segment is from 28.200-28.300 Mhz. When the band is open, you can generally hear beacons throughout this range from all parts of the world using very little power and often a simple vertical or dipole. Conversely, you can also transmit a beacon to all parts of the world with the same criteria.

My goal with this project was to forgo dedicating an HF radio for the beacon and instead make a nice complete all in one unit that could fit in your hand and be portable, yet have the look of a nice little base station unit. I also wanted to keep the cost for everything under \$100.

This project features a control interface that will store the CW message and key the transmitter automatically at intervals you determine. I love bells and whistles, therefore for the front of the beacon unit, I incorporated an RF meter, a switch to turn on the system of course, a switch to change between 2 different frequencies (in case one is busy or taken), a switch to turn the monitor speaker on and off (who wants to hear that 24 hours a day), and a switch to turn a light on for illuminating the meter. I needed the last item to save power in case of portable use.

For the back of the case, I have a power jack that can be used for a 12 volt power supply or auto - or able to run 9 volt portable (complete with a 9 volt battery holder). I also have a DB9 connector for connecting this item to a computer for programming the beacon message and intervals easily. I also decided to use a SO-239 for the antenna (not an RCA or BNC jack). At this frequency, we will be just fine with this much more convenient connector. This will also allow me to connect a portable back of set antenna to the back if I desire for a complete all in one setup. For portable use I simply purchased a back of set CB antenna from Radio Shack. The miraclewhip antenna would also work nicely in this case. Well, with all the external hardware planned out, it was time to plan out the guts for this item. Namely a beacon interface and a transmitter.

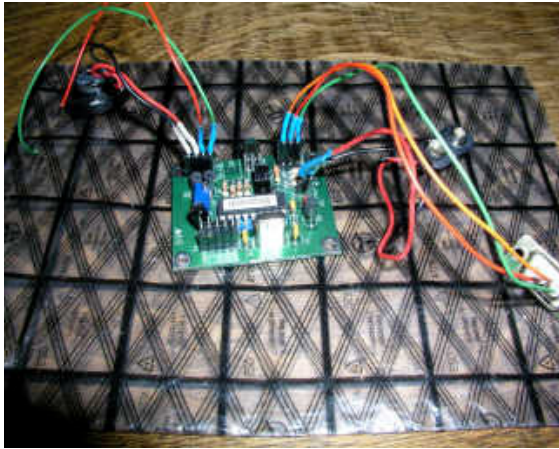
So it's time to begin!

Start off with the interface called the Freakin Beacon. This kit is available from <http://www.expandedspectrumsystems.com> for \$30 plus shipping. The reason I went with this interface over others is the easy ability to program it from a DB9 connector as well as the included LED feature for the visual I wanted for my item. It is a very high quality interface that goes together easily and can be completed in just a few hours.

If you are going to build a kit like this, you need to spend a few dollars at the local radio shack or other parts store. You are going to need 4 toggle switches (2 DPDT and 2 SPST), 9 volt battery clip holder, DC input jack and plug, SO-239 chassis mount connector, DB9 computer cable and connector, a couple of chassis mount LED's (NOTE: the interface kit comes with the LED's, however they are circuit board mounted types and I wanted chassis mount LED's), wire clips, hookup wire, mini speaker, 9 volt battery connector, heat shrink tubing, rubber feet for the case, and of course the metal case itself.



Well here is the beacon interface. Put together very carefully including using heat shrink tubing around all connectors. It's all tested - all programmed with my callsign and a plead to qsl if you hear it...works perfectly...so 1 hurdle completed.



As you can see, I have the completed unit sitting on an anti-static bag now that the IC has been installed. Nothing is a bummer like walking around on the carpet, admiring your work, (beating on your chest) and then picking it up and zapping it with electrostatic. Always make sure you are not carrying around thousands of volts in your body and then touching your circuit board as the first thing when you sit down (I've done it)...just find the closest ground (or person!), give it a zap, and then get back to work on your project.

At this point, I decide to do some metal work and put together a very compact case that will hold everything. I go the smallest case possible. You can get this small metal case from Radio shack for a couple of bucks. Be sure to lay everything out with pencil before drilling - taking into account switches are much bigger than just the toggle part, etc. Watch out for that lip of the case also as it covers space also.



If you don't have a dremel tool, you shouldn't even be thinking about this especially when it comes time to do the cutouts for the meter and DB9 connector. It's the handiest tool you will ever own

and they are relatively inexpensive now. Grab your dremel and some good sharp drill bits and go to town. Keep everything as straight as possible. As you can see I have placed the hole for the meter in the middle with two switches on each side and the LED's between the switches. The back will need the hole drilled for the SO-239 and DC connector as well as the DB9 cutout. You will also need to drill one small hole for the 9-volt battery holder. Having done that - it's time to paint it! Sheet metal is ugly!



Grab yourself some 320 sandpaper and work your way down to 600 sandpaper...leaving a nice prepared piece of steel for painting. Then lay down some gray primer for a base as shown here. We are going to do a classic MFJ 2 tone paint job on this item (not a bad color scheme I figure)...so get your semi flat black and beige spray paint ready. On the bottom of the case you will be drilling some holes as can be seen in this picture for the small speaker.



Several coats of paint later...you have a case that you can be proud of. Let it all cure before installing all the mounting components.



Now it's time for some fun stuff. I mounted all the switches and the RF power output meter. The meter was pulled from an old CB. I put just a little crazy glue on the lip edges in order to affix it. The beacon control interface is all wired in. All works correctly so far. Now to spruce things up on the inside so I am ready for the next stage.



I can't stand a rat's nest, so I do some organizing with the help of some small wire clips. The bottom of the metal case is lined with electrical tape to prevent shorts. You can see I have also mounted the RF connector and the computer data connector on the back as well. I'm over half way done now. The 9-volt battery works great for testing. I will now wire up the power permanently. All there is left to do is hook up the keying lines to the transmitter, the crystal switch, coax line, power and the most important item - the transmitter.



10-meter stand alone CW kits are next to impossible to find. It seems like you can find 20, 40 and 80 meter ones all day long, but good luck finding a 10 meter one. After searching and searching I finally located just the ticket. The transmitter is a kit called "the little Joe". You can get the whole works from www.danssmallparts.com for right around \$25. Again, this can be built in just a few hours. You will need to specify the 10-meter version. The toughest part of this kit is the 3 torroids, but don't let them intimidate you. They go quite easily. As you can see, I have added a heat sink around the amp transistor. Running a beacon 24 hours a day is going to get this puppy hot...so use something to cool it down.



Well, the transmitter was bigger than I planned on! Soooooo things got really cramped and it wouldn't fit in the place I had planned on the left side of the case...so I had to put the transmitter upside down in the case. Lucky for me, I'm able to pull this stunt off. Time to Light This Candle!



And here is the finished product back and front...including help from a handy label machine. I connected the RF output meter to the interface status LED so every time it blinks when sending CW, the meter moves. In order to calibrate it, I added a resistor in line so it swings just under a watt.



(Front View)



(Rear View)

I think it turned out pretty sharp and it's already been heard all the way to Poland and several states as of this writing. I even created a web site at <http://weatherstation.tripod.com/beacon.html> in order for others to see where it has been heard and learn a little more about it. It currently is on 28.225 so if you hear it...send me a report and I will send you back a card. If you want to know if the beacon is running locally - you can tune my on-line tuner located at www.jimandleah.com to the frequency of the beacon. For a very good list of beacons worldwide I have found G3USF's website of worldwide beacons helpful located at <http://www.keele.ac.uk/depts/por/28.htm>.

By the way, a feature I didn't include that you may want to incorporate would be to add a key jack. That way your project could double as a portable or base QRP CW transmitter.

I hope you enjoyed this project and I look forward to possibly hearing your 10-meter beacon on the air.

73,
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(Jim Southwick has been licensed since 1976 at the age 12. In addition to this project, he also runs a free User Controlled Online Tuner for the benefit of hams at www.jimandleah.com.)