Natural Radio

News, Comments and Letters About Natural Radio

December 2000

Putting The Fun Back In Listening For at least 99% of us, natural radio listening involves considerable effort. There may be only one or two (if any) who can listen to whistlers and other phenomenon from the comfort of home. Judging by the scarcity of whistler reports lately, the frustration of not being able to hear anything but sferics that I often hear about in my monthly correspondence, and my own difficulties of hearing anything beyond sferics and tweeks, I sense that not many of you are listening on a regular basis. Let's face it, natural radio listening gets old fast if all you hear is sferics. (After all, anyone can do that by tuning to a dead spot on the AM dial, or anywhere on the AM dial during thunderstorm season.)

For what it's worth here are a few observations and some suggestions on things that I have done to improve my own results.

Location, Location, Location As discussed many times before being out in the open and away from power lines is critical in being able to hear anything at all. This is much more difficult in the metropolitan areas that many of us live in. One method I have tried lately to find some quiet areas, is to draw the location of high voltage transmission lines on an area map.

Briefly, power lines come in two types – transmission and distribution. Transmission lines carry the power from the generating station to substation and between substations, and are at a very high voltage, typically at 100 kV and up. These are typically the lines on the big metal towers, but between substations they can be on wooden poles – the big, multi-ribbed insulators are the giveaway. It is best to be a couple of miles away from these lines. Distribution lines go from the substation to transformers that feed homes and businesses. These lines are typically in the 7 - 14 kV range and cause less trouble than the transmission lines.

Aeronautical maps usually show the large transmission lines as visual landmarks for pilots. You can find these maps at the shop at your local airport, and I've had good luck finding them at used bookstores, as they are updated fairly often. Also check out the website for your local utility, they may have some maps available. This is a good starting point for locating the lines, and if you use a highlighter pen to outline them on your map, you will see that they form a grid across any metropolitan area and unfortunately discover why the listening is so bad in the city and the suburbs.

Don't give up yet, because as you reach the edge of the suburbs, the grid spreads out and areas will appear that show some promise. You will also discover that rural areas that appeared to be potential quiet sites are right along the path of some nasty transmission lines. In any case it's a lot easier to do a search for general areas on a map and then drive out to promising areas and do some listening.

Make It Easy I wrote several months ago about having all your gear packed and ready to go, but setting up to listen and record is still time consuming, especially when all the time you have is maybe 15 minutes on the way to work. What I did was semi-permanently install my equipment in my van. I built a carrier that holds the receiver, recorder and the WWV receiver and is mounted on top of the console between the front seats as shown on the left. To go to listening mode, I drive to my semi-quiet location, clip the antenna with the receiver front end on the window, ground it to the car body and turn the units on. I can be listening and recording in less than a minute. With the receiver so easy to set up, my typical procedure is to drive to a semi-quiet location a few blocks from home and listen for five minutes or so. If I am hearing anything interesting, I drive to a quieter location a few miles away and do some recording. Unfortunately, the quiet locations that I can drive to are accessible only during the day, but I am still hearing chorus on a fairly regular basis.

Finally, Turn Up The Volume In an unscientific comparison of several receivers that I have been doing lately, I have found that some of the more compact receivers such as the WR-3 and Brian Lucas's Atmoss Receiver have significantly less gain than my homebrew unit, and when I hear chorus on my receiver it is almost inaudible on some of these others. Now, I'm not knocking these units. All receiver design is a compromise and these receivers were designed to work under all conditions without feedback and not damage your hearing when loud sferics.

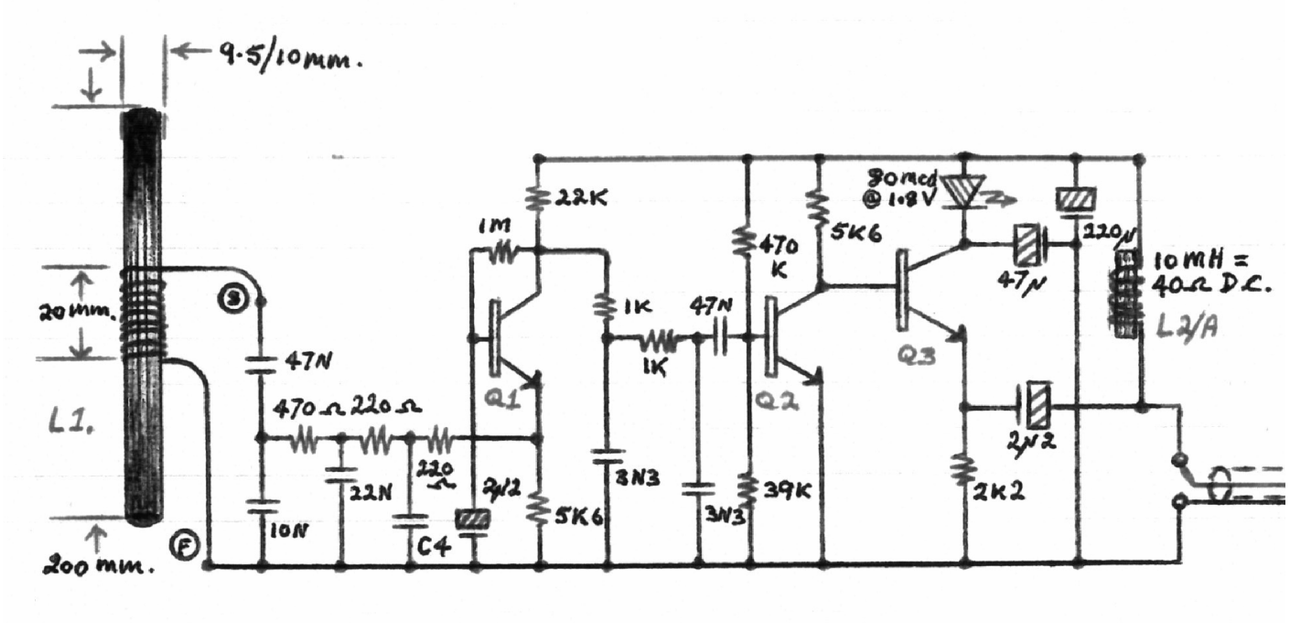
There is a reason why some of our more successful listeners will use 500 foot wire antennas. So if you do have a quiet location, boost the gain. If you can add a longer piece of wire, do so. If you can't, or if you have a loop receiver, monitor off of your tape recorder and crank up the gain. Just be careful of your ears if there are loud sferics present.

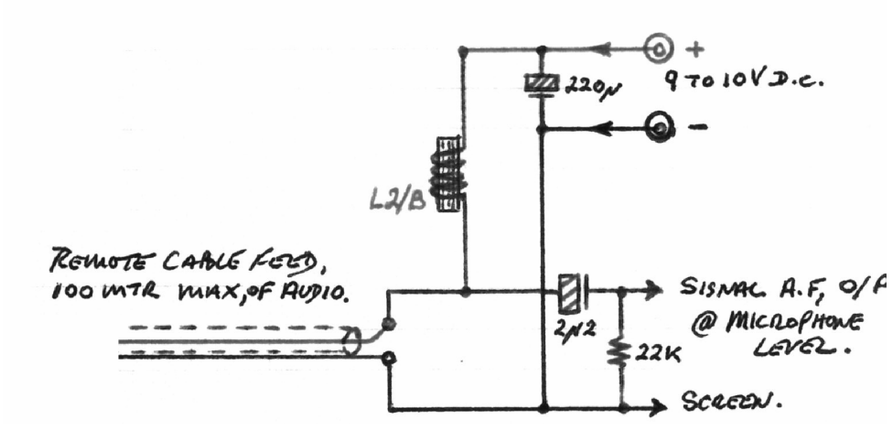
In Closing May all of you have a peaceful and happy holiday season. Thank you for your support and kind words throughout the year.

Your Much Appreciated Correspondence

•**Brian Lucas, No. 5 Manor Court Flats, Undercliffe Road, St. Helier JE2-3PS, Jersey, Channel Islands.** The Mk9-RP receiver probably marks the final episode of experimental work, to design a monitor for use within the home environment near 50/60 Hz power systems... With a good ratio of Signal to Noise for Whistler and

Spheric monitoring, the design idea was for remote outside location. The D.C. power is fed up the audio cable from the indoor unit -- the single shielded audio cable run has a maximum length of 130 yards.





NOTES:

1. All transistors are BC-109C. Select Q2 for an hfe of 600+.

2. L1 is 500 turns of 40 swg wound over a thin film former and centreed on the ferrite rod. Inductance with rod is approx. 29.3 mH.

3. L2 A&B are each 10 mH at 40 ohms DC resistance.

All my designs use the Ferrite Rod and coil aerial assembly. I found that 500 turns of 40 S.W.G. over a 20 mm area produced high gain around 40 kHz, before tuning to resonate near 5 kHz. The same technique is used for the Mk9-RP receiver. However, it is a juggling act to produce a broad pass band and a sharp low frequency roll-off point, while the top frequency end remains intact all within the aerial stage buffer section.

With that said, the aerial input stage has two sections; a 47N and 10N cap resonates the coil around 6-4 kHz. The second stage comprises a low pass ladder filter network reducing the H.F. roll-off point, via the 22N caps; also the 470 and two 220 Q resistors produce in part, H.F. band pass width.

A low impedance input into Q1 emitter provides a low noise first stage and buffer. The signal is further restored via two lK's and 3N3 caps, that lift the L.F. end, giving a 3 kHz response, combined with the aerial input ladder network, for a total signal band-pass of 10 kHz at the 9dB threshold level. Q2 is high gain stage that couples into Q3

emitter follower to drive the signals for a microphone level input, or monitor amplifier. The load is 1K or greater.

In Jersey, I have a problem with low frequency beacons around 13 kHz. Without C4, 13 kHz bleeds through, but put C4 in circuit and the beacon reduces into the background, but at the expense of reducing the bandpass slightly. If you don't have a beacon problem leave out C4, and replace the two 220 ohm resistors, with a second 470 ohm device.

If you build this receiver, make sure the ferrite rod is mounted onto soft foam rubber, like door seal strips, to dampen microphonics from external noise, particularly if you intend to remotely site the receiver outside. Align the rod in a North-South direction sealed within a Tube or Box.

The current consumed at 9 Volts is only 4 ma, so a dry cell battery could last a good while in intermittent use, however I recommend using a plug-in low cost regulated power supply for continuous monitoring. One caution here – The upper limit of the supply voltage should not exceed 9.5 volts or a reduction in audio will result because the increased bias will begin to saturate Q2.

There's room for personal options to extend its use, so I leave construction to those who can.

A number of inquiries have come my way regarding current receiver developments to date. Since the response has been good, I have decided to produce a Mk9-RP System.

For further details, Lowdown readers please supply a S.A.S.E., and full information will be supplied on ready built system units.

•**Dave Laida, Delta Lake, NY.** My new home construction near Delta Lake, NY (FN23) is proceeding slower than I had hoped thus my natural radio equipment is still in long term storage. I wish I could have been active to hunt the recent whistler storms being reported but for now I've got to be a bystander.

I am very encouraged by the quality and quantity of technical correspondence reaching your Natural Radio column. John Davis, Mike Mideke, Jim Stoughton, and Shawn Korgan have shared some of their valuable insights. I am looking forward to Scott Fusare's article on receiver design. The recording Shawn caught of a whistler train that was published in the INSPIRE journal is absolutely incredible.

I think there is a fair number of natural radio listeners out there but they have been too shy to report in or ask questions. Once I get my house built I'll have the ability to stretch out a long horizontal wire antenna. My questions to the group are what wire gauge do people generally use and is the wire bare or insulated?

• **Michael Mideke, WB6EER , Benson, AZ** I just got back from travels that kept me close to the hum of power at all times. On Oct. 4 I was camped at Valle Tio Vinces, NM, on the Continental Divide about 25 miles south of Pietown. Despite chilly winds

and scattered rain showers I was doing some antenna and receiver tests so that when I finally crawled into my tent I had 500 foot wires extending to the North and Northwest and an active whip in the semi-clear. Around 0800 UT I began to hear a few whistlers among the tweeks. By 0830, on the North wire, there were hundreds of whistlers, long pure notes, overlapping, with bits of "barkey" chorus in the background. The event continued through the night with ups and downs, probably reaching its peak listening quality around 1200. It was still going on, though the whistlers had become rather diffuse, at 1340 when I decided to take advantage of a gap between showers and pack up. This was not a "whistler storm", just an awesome display of exceptionally long, clean whistlers. 2 hop whistlers which, from the initial sferics and the weather reports, I speculate were originating from heavy thunderstorms in the Chicago area and north. There was audible hum on the wire antennas but at a quite low level - buried under sferics until the dawn quiet period. I shared the small campsite with a couple who were doing a mountain bike trip down the Continental Divide (they had departed the US-Canada border back in July).

Something I recently came across relating to the VLA has triggered my interest. Several years ago it was observed that occasionally small but consistent errors were appearing in the regular calibration readings during which the array is aimed at a known target, as if some sort of diffraction was happening. The possibility came under consideration that the source of this diffraction might be whistler ducts. I don't know whether anyone followed through with research to check this out, but it certainly would be do-able research. It seems like there are two possibilities: Either someone has got a good VLF listening post established in the general vicinity of the VLA or someone should set one up!