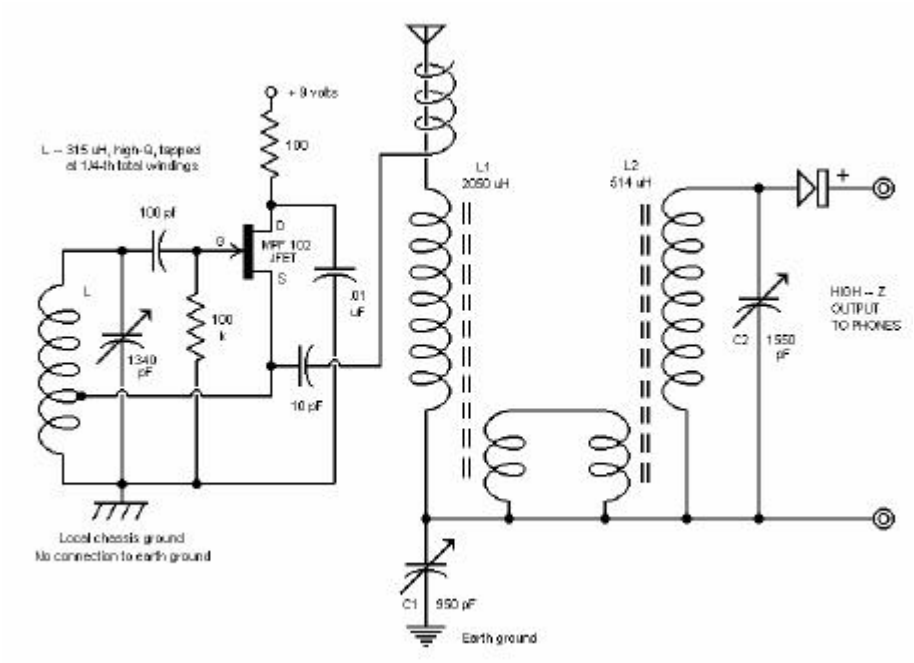
Extract from Mike's article about 10 years ago:

Minimalist Approaches to NDB DXing
By Mike Tuggle WY3B

In recent years I've had a lot of fun combining my interest in NDB DXing with the concept of simple "One Active Device" (1AD) receivers. These came about several years ago as the basis for an annual contest for medium- and shortwave broadcast band DXers using home-built radios that with only one tube (valve), transistor, or some other device such as a tunnel diode. The objective was to build the most effective receivers possible that are limited to just one active device. This prompted a lot of ingenuity in designing 'simple' receivers, as you will see at the 1AD Contest website: http://www.crystalradio.us/contests/index.htm. There you'll find a 1AD direct-conversion receiver, a regen-reflex design, and even a 1AD superhet.

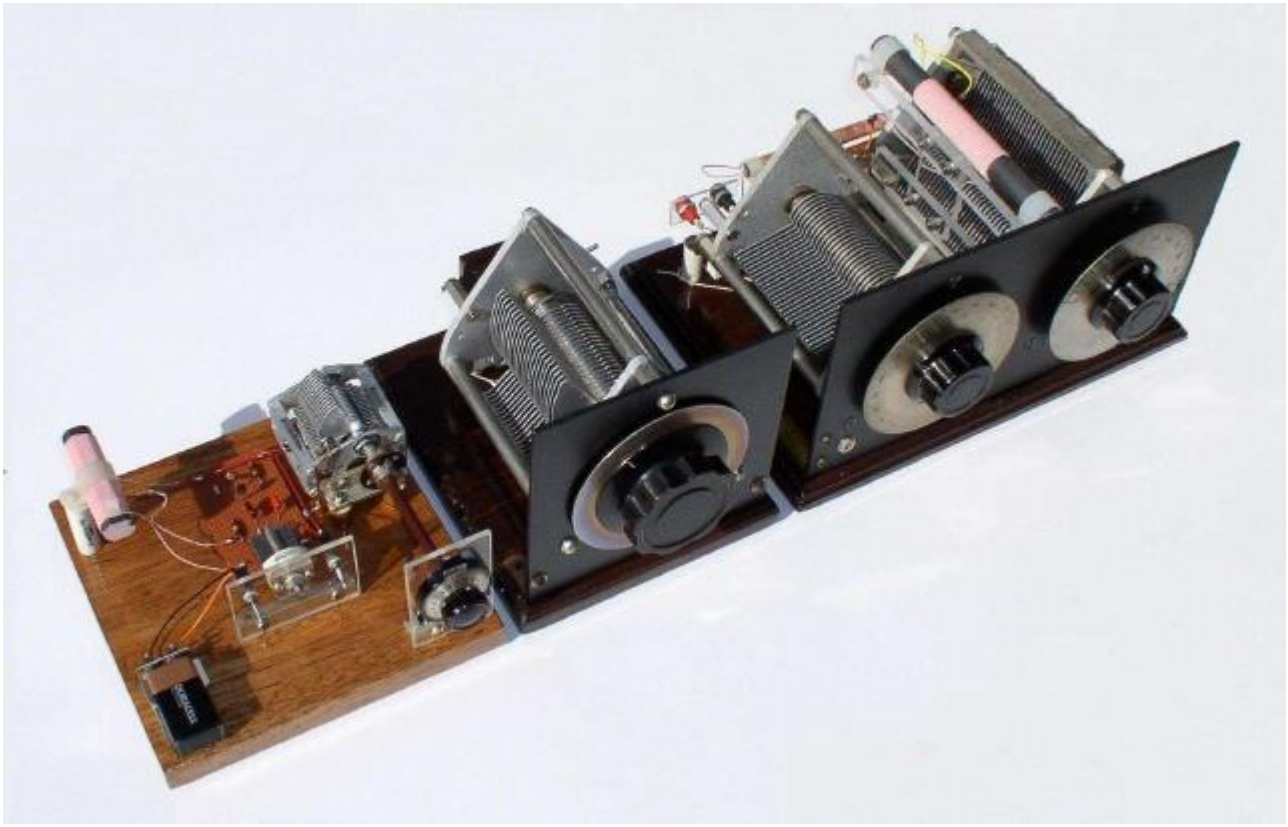
Two applications of a single active device that appealed to me are the beat frequency oscillator (BFO) for exalted carrier reception, and the good old regenerative receiver. At one time I was convinced that the BFO approach was the most effective use of a single active device possible. Now I'm not so sure.

There are two 1AD approaches that have worked well for me in NDB DXing. The first is the Long Wave (LW) BFO Receiver. I started casual NDB listening with my favorite kind of receiver, a crystal set, but the results were disappointing. Three local beacons could be heard but no DX. By loosely coupling the output of a small signal generator and tuning it to the same frequency as the LW crystal set, many more beacons were heard. In keeping with 1AD tradition the signal generator was replaced with a 1-FET Hartley BFO. It is connected to the crystal set by a clip lead loosely wrapped around the antenna lead-in wire. The BFO tank should be high "Q" to keep the oscillations as sharp as possible. You'll see the 1-FET BFO on the left and a double-tuned crystal set on the right in this circuit diagram.



Applying the BFO this way is called exalted carrier reception. Crystal sets by their nature are inefficient in detecting weak DX signals. Tuning a BFO to the carrier of a weak DX signal raises the voltage of the signal to a region of much more efficient detection. Exalted carrier is amplification of sorts but it is different from regeneration or "reflexing" – here, the set is continuously in oscillation. In the case of an isolated weak DX signal, use of an exalted carrier raises the signal to the level of readability. When the DX is

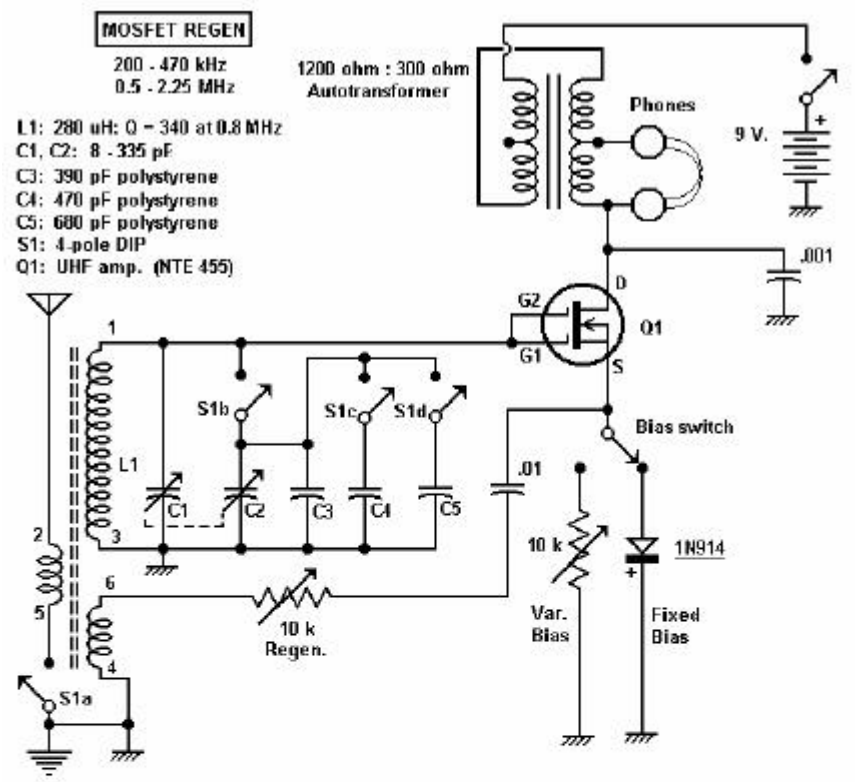
buried by a strong interfering signal, the exalted carrier selectively raises the level of the weak signal. The hope is that will raise it to a level at which the brain can select the desired DX despite the QRM. There must be more technical explanations but that's the gist of it.

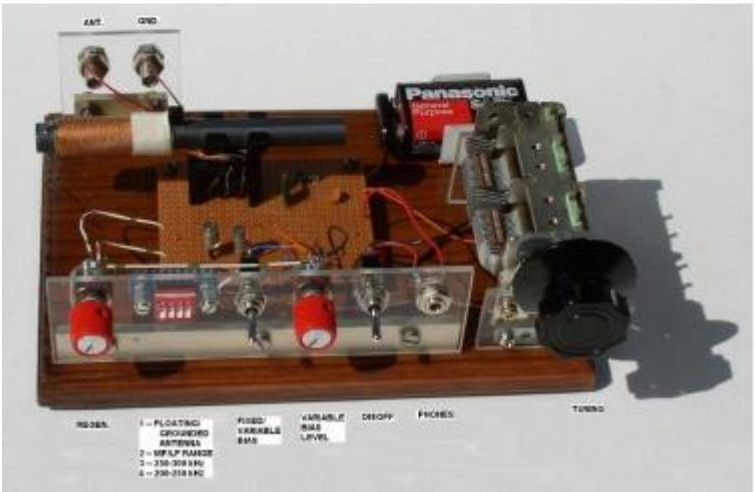


In this photo, the 1-MPF 102 JFET BFO is on the left. At center is a 1000 pF variable capacitor shunted across the BFO's tuning capacitor to get to low frequencies (the BFO was originally designed to cover the mediumwave band). The two-dial unit to the right is a double-tuned LF crystal set. It is a series-tuned front-end design loosely coupled to a parallel-tuned secondary detector section.

Of several designs I have tried, this one seems to work best. From my location in Hawaii this set has received NDBs throughout the Pacific from New Zealand to central Alaska, west to Japan, and even as far east as Quebec in Canada. In mid-winter months when propagation is best, 'local' beacon LLD on the island of Lana`i, provides a very powerful signal. In fact, LLD's carrier is so strong that it can exalt the weaker signals of other beacons on adjacent frequencies. Stations heard with the local BFO turned off include some in British Columbia in Canada, the U.S. states of Alaska and Montana, and the Cook Islands in the South Pacific. All it takes is some careful listening in the silence between the loud LLD idents. This is crystal set operation with a remote BFO that's 70 miles (113 kilometers) away!

The second "one active device" approach to LF/MF DXing I've had success with is the MOSFET Regenerative LW Receiver. This set started out by replacing the tube in the "Hellenedyne" set (1) with a MOSFET. Distinctive, but not unique, features of this receiver are source-derived positive feedback link and use of the forward drop across a silicon diode to establish gate-to-source bias. The diode bias works particularly well on LW. The ferrite rod coil and variable capacitor were salvaged from a junked Pioneer tuner. Along the way a few tweaks were needed to get regeneration, most notably very light antenna coupling. And, the question arose, what to do with gate two? I tried grounding it and applying positive bias from a voltage divider, but the best results were obtained by simply tying it to gate one.





With the extra gang on the tuning capacitor it took little effort to rig it up for longwave. Unlike with mediumwave, LW reception is much better when the antenna is connected through to the ground. Extra Mylar capacitors are used in shunt to get down to 200 kHz. It has now become my primary LW set.

The MOSFET used is a Siemens "1216" obtained from an old rusty UHF tuner out of a Zenith TV set - after some prying and de-soldering. I can find no info on this device but suspect it may be an NTE455 equivalent. Provenance aside, this MOSFET is orders of magnitude more sensitive than a BF960 which was marginally more sensitive than the 3N211 that I started out with. The moral of the story: don't be too proud to scrounge!

NDB DXing is a somewhat different game with these minimalist receivers. Selectivity is relatively low so several NDBs are usually heard at the same time. They can be separated by mentally focusing on tone pitch, something that Dan Petersen W7OIL has labeled "synaptic audio filtering." Of course there's no provision for determining offsets, but cycle times can be noted for confirmation. On-line lists such as RNA/REU are indispensable.