

LW-MW-SW Relay Tuned 15' Noise Reducing Vertical Antenna

Dallas Lankford, 1/11/07

This is a continuation of the development of a 15 foot noise reducing vertical antenna which was begun in my article "Some of my favorite small antennas for LW and MW;" see [The Dallas Files](#). The antenna there specified a 4 foot ground rod; an 8 foot ground rod, indicated on the schematic at right, may give better noise reduction at lower frequencies. Output signal levels of this antenna are the same below 8 MHz (low band), while output signal levels above 8 MHz (high band) slowly increase as frequency increases up to about 10 dB more at 30 MHz compared to the original antenna.

The first obstacle to making a small noise reducing vertical antenna with excellent signal output from 150 kHz to 30 MHz was impedance matching. After much theoretical and experimental work I found that excellent signal output over such a wide frequency range could not be obtained with a single matching transformer. Fortunately, when I tested three different matching transformers optimized for 0.1 – 2, 2 – 10, and 10 – 30 MHz they were more than adequate, and it turned out that two matching transformers, 0.1 – 8 and 8 – 30 MHz, were optimal. A single matching transformer with a tap performed as well as two separate matching transformers, so that is what I used.

The second obstacle to making a small noise reducing vertical antenna with excellent signal output from 150 kHz to 30MHz was a satisfactory method of band switching at the antenna. A hermetically sealed mechanical relay with a wide temperature operating specification (well below freezing) and a high cycle contact life specification should be used. But try finding any. After weeks of searching a few showed up on eBay. They were small, the same size as TO-5 transistors, and manufactured by [Teledyne](#), model 712-12. I bought some. Later I discovered that Mouser had just started carrying the same (and other) Teledyne relay(s), catalog # 881-712-12. They are not cheap, about \$22 each. But the specs are excellent: operating temperature range -55C to +85C, contact life rating of 10,000,000 cycles at low voltage levels, interconnect capacitance of 0.4 pF, and so on. The -12 means that the relay coil is 12 volts (16 volts absolute maximum). Other coil voltages are available. For some voltages there are D models with built-in diodes for transient suppression. At first I was inclined to omit the transient diode suppression D in the schematic above, but after discussions with Terry Fugate I saw the error of my thinking.

Operation of the antenna is straightforward. When listening to signals above 8 MHz the relay is turned on. When listening below 8 MHz the relay is turned off. At low noise locations with somewhat insensitive receivers a 10 dB gain push-pull Norton amplifier may provide a better signal to noise ratio for weak signals.

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