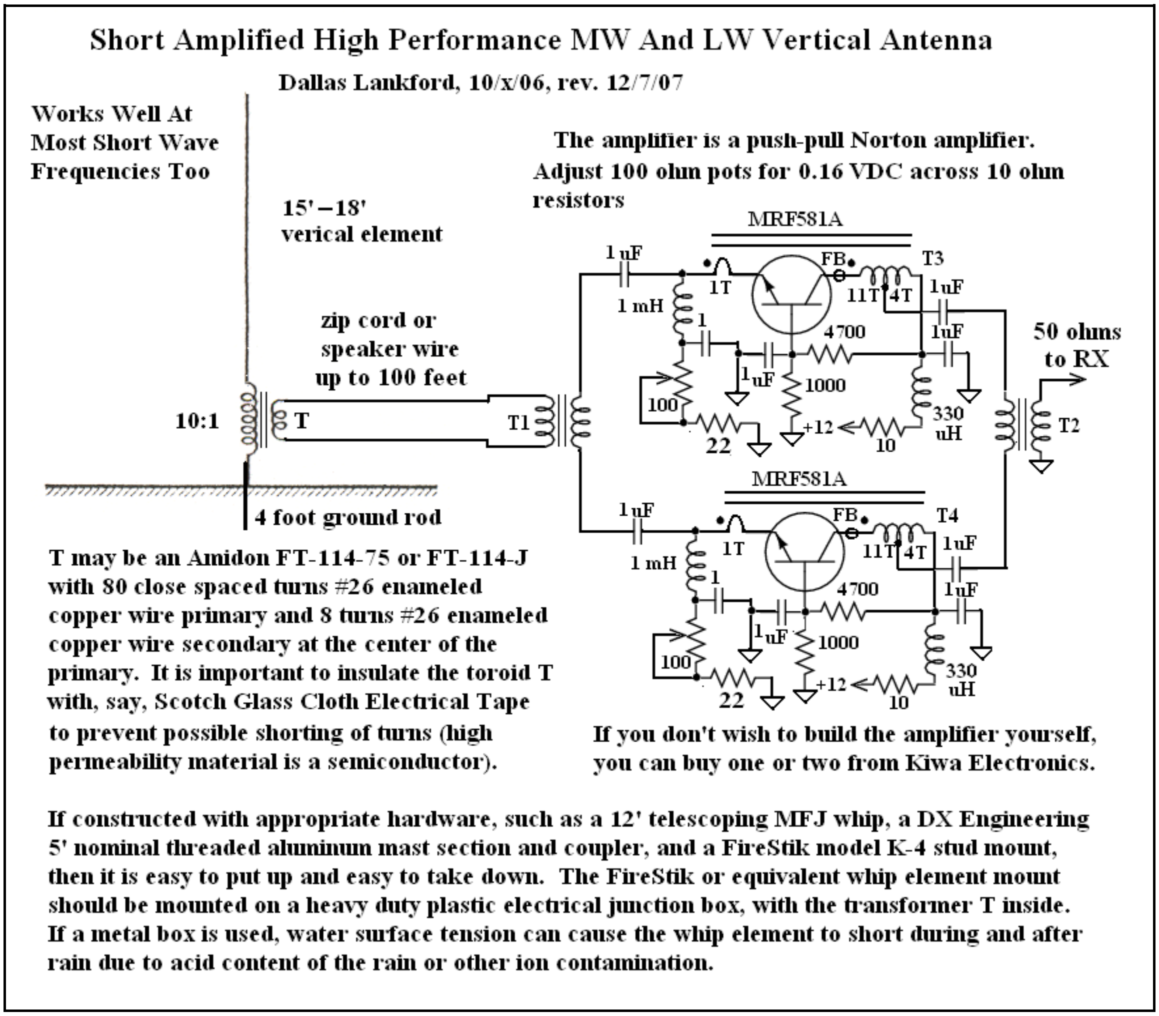
The Best Small Antennas For MW, LW, And SW

Dallas Lankford, 5/5/08, rev. 7/19/2011

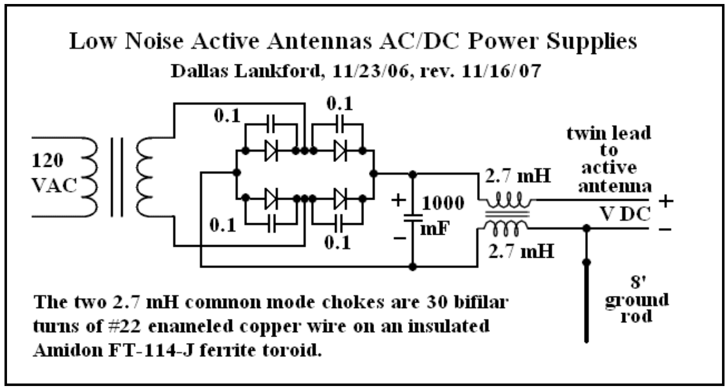


The amplified vertical antenna above was developed during experiments to see how short I could make a noise reducing vertical antenna while maintaining good sensitivity using only a 10.8 dB gain push-pull Norton amplifier to bring signal levels back up to a good level. The amplified 15 foot noise reducing vertical antenna is not an active antenna. The push-pull Norton amplifier, which is located at the receiver, is a low impedance device (as opposed to the high impedance FET's used in most active antennas) and consequently does not have the common mode noise problems which active whips and active dipoles sometimes have. This amplified short noise reducing vertical was tested with twin lead up to 100 feet in length. A pair of these separated by about 60 feet makes a good MW phased array. If you are not a builder, you can buy an equivalent Norton amp from Kiwa Electronics for about $110 plus shipping (as of May 2008). The gain of the 15 foot noise reducing vertical is about –15 dB compared to a full size noise reducing antenna. Its 2nd and 3rd order intercepts are typically greater than +120 dBm and +60 dBm respectively in the MW band. When used with a push pull Norton amplifier the cascaded input 2nd and 3rd order intercepts are greater than +95 dBm and +50 dBm respectively in the MW band. It is, in my opinion, the best small omnidirectional LW-MW-SW receiving antenna, period. A previous version used relay switching for improved performance at higher SW frequencies. Increasing the antenna transformer turns made relay switching unnecessary. I use two of them as my current phased receiving array. The antenna is now excellent for LW, MW, and SW. All of my longer and higher passive inverted L's and verticals and all of my active antennas have been permanently retired.

At least one person has claimed that noise reducing antennas are noisy. But when I quizzed him about his implementation, it turned out that he had not implemented the antenna correctly. If you do not follow the instructions, then you may end up with a noise increasing antenna like he did.

In my opinion, active whip antennas are no longer among the best small antennas, and so none are included here. The small receiving loop antennas commonly used and praised are generally insensitive at lower frequencies, and their nulls are not nearly as good as somewhat larger flag antennas, and so they are also not included here.

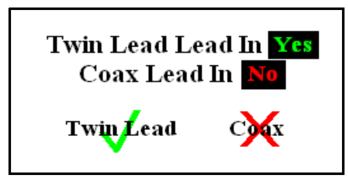
The low noise AC/DC power supply at right was originally used with active antennas. It can also be used with the Norton amplifier above (with obvious changes). The diode bypassing has been attribiuted to Doug DeMaw.



The two 2.7 mH common mode chokes are 30 bifilar turns of #22 enameled copper wire on an insulated Amidon FT-114-J ferrite toroid.

The following experiences with active whip antennas probably also apply to active mini-flag and active mini-loop antennas. At present I am using battery power for the mini-flags that I am testing. In any case, I always use twin lead with all of my antennas, active or passive. I suggest that you do too.

While studying active whip intercepts some time ago I discovered, much to my amazement, that long coax (50 feet) lead often degrades 2^{nd} order intercepts of active whip antennas by 20 dB or more and degrades 3^{rd} order intercepts of active whip antennas by up to 10 dB, depending on the type of active whip antenna. I have not studied the cases of longer coax lead in, or long coax lead in used with active dipoles, or long coax lead in used with (passive) noise reducing antennas. For active whips long (50 feet) twin lead lead in does not change 2^{nd} or 3^{rd} order intercepts. Also, I have not studied the cases for longer twin lead lead in with active whips, or for twin lead lead in used with active dipoles or (passive) noise reducing antennas. I rather expect that coax lead in will be a loser with respect to intercepts in all of those cases, while twin lead lead in will be a winner with respect to intercepts in those cases. Of course, if your antenna is not in a high RF environment, then it probably won't matter if you use coax lead in. On the other hand, more recently I have found that coax lead in can cause substantial man made noise in active whip antennas compared to twin lead lead in. It appears that the coax induced noise is via common mode, but unfortunately the noise is virtually impossible to eliminate completely throughout the MW band even with multiple common mode chokes. I am beginning to understand more clearly why active whip antennas have such bad reputations with respect to man made noise. All except mine use coax lead in as well as DC power feed.



KB7[redacted] found some the remarks above objectionable. One of his objections was due to a typo in the previous article which if he is the expert he claims to be should have been obvious to him. The other revealed him to be a coax true believer with no experience in measuring intercepts and no experience with using twin lead. In any case he did not discuss any small receiving antennas of his own with better measured performance than the 15' amplified noise reducing vertical antenna above.