How to know what filter setting to use.

Adjusting the filters and recovery delay will influence how the detector identifies a Target. Set a coin to a depth where the target signal is just being detected. Then try the different filters to see which filter gives the best response. Unless the target is at its limit, all the filters will probably give a good response.

Most programs use the 5Hz Band pass filter as the default. This is the best overall choice for low-to-moderate mineralization, has good EMI rejection, and allows for a slower sweep speed while still working well with faster sweep speeds.

Modern VLF detectors use filters to separate the target responses from the ground response. Filters are also used to minimize EMI noise. The best filter to use depends on the strength of ground mineralization plus other factors. Modern VLF metal detectors use electronic filters both to remove unwanted noise such as electromagnetic interference (EMI) from radio signals and power lines and to remove the portion of the received signal due to ground mineralization.

Different filters offer trade-offs in performance. Severe mineralization usually requires more filtering and this extra filtering can affect depth. High EMI likewise requires more filtering. The type and amount of filtration will usually affect loop sweep speeds. Most programs use the 5Hz Band pass filter as the default, especially the VX3. In extreme or highly variable mineralization the V3I can have more chatter when sweeping the loop; in this case a higher filter may help.

The ground filters are adjustable between 5 Hz and 12.5 Hz typically the lower filter should be selected for slower sweep speeds. There are also adjustments between band pass and high pass filters. For areas that have high electrical noise interference a band pass filter may be the optimal filter to use as it will reject both the ground effects and the higher frequency electrical noise. If there is very little electrical noise present the high pass filter may be desirable to get a little deeper due to less signal being discarded.

All metal mode uses none of these filters and is therefore a deeper mode.

Less filtering = more signal.

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More on the subject from Mike Hillis Find's Treasure Forums

Posted by: Mike Hillis
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I haven't liked anything I've read about the V3 filters....The manual and the engineers have left this as a dark subject....So I have decided to turn the light on.

Ground filters are used to separate out and block the slower changing ground signal and pass the faster changing target signal. White's engineers are using hertz to designate how fast a target signal needs to change in order to pass through the filter. They are measured in 'rate of change'.

In addition, they have provided two types of filters for each speed; a 'Band Pass' filter and a 'High Pass' filter.

A 'Band Pass' filter is exactly what it says it is. It will pass a certain signal "rate of change" that falls within or between the lower and upper ranges or boundaries that have been defined for that 'band'. It will block all signals that fall below or above that Band's range. It will pass ONLY the signals whose 'rate of change' falls inside the acceptance band. It is like using "Notch Accept" only instead of notching in a metal target's phase response, you are notching in a particular signal "Rate of Change".

A "High Pass" filter is different than the Band Pass filter the same way the notch feature is different from the discrimination feature. High Pass is like setting the Disc on your detector. Targets below the Disc Setting are blocked; targets above the Disc setting are reported. High Pass Filters block the signals whose 'rate of change' is less than the lower range defined for the filter and pass ALL signals whose 'rate of change' is above that range.

I would suggest that the upper end of all the available "Band Pass" filters are the same and that the filter speed selections allow you to raise or lower the lower limit of the Band Pass filter.

To say it another way, the Band Pass filter's high limit is fixed. The filter speed selected moves the lower limit toward or away from that fixed upper limit.

I would suggest that a certain hertz High Pass filter and its related Band Pass filter share the same lower limit of the filter. The High Pass filter is only removing the upper limit of the Band Pass.

So…with the basics out of the way….let's look at the filter selections…

5 kHz Band Pass = This filter is used for very low mineralized ground. Since there really isn't a very big ground signal to block, this filter's lower limit will allow

very slow changing signals to pass. It has a high limit in place that a signal's "rate of change" has to fall below. At this point…the mineralization effect of the ground does not significantly affect a target signal.

5 kHz High Pass = Same as the 5 kHz Band Pass except there is no upper limit.

7.5 kHz Band Pass = Now I'm starting to get some low to moderate ground response, more ground signal is received. At this point the ground signal is starting to have an effect on the target signal. This speed raises the lower limit of the Band Pass filter to compensate and requires a little faster "rate of change" from the target signal to report it as compared to the 5 kHz filter. It still has the same upper limit in place.

7.5 High Pass = Same as the 7.5 kHz Band Pass except there is no upper limit.

10 kHz Band Pass. = Now I'm into moderate to high ground mineralization. The ground response is significant. Surface irregularities can report as a metal target. The signal is degraded and weak signals are being masked by the ground signal. To compensate, this filter raises the lower limit even higher, requiring an even faster rate of change to pull the target signal out of the ground response.

10 kHz High Pass = Same as the 10 kHz Band Pass except there is no upper limit.

12 kHz Band Pass = High to very high ground mineralization. Weak signals are invisible and even moderately deep signals will report as iron. Ground irregularities will report as metal targets. The target signal is highly degraded. This filter selection raises the lower limit to its maximum range to compensate. This is the narrowest Band Pass filter available.

12 kHz High Pass = Same as the 12 kHz Band Pass except there is no upper limit.

Next….How to select the right filter……

So after explaining how the filters work all that is left is to explain how to use them.....

Yesterday I started off my testing in a woodchip play ground, then moved to a sand playground, then moved to turf; my normal progression for testing things metal detector. In the woodchip playground I had hardly any distortion of the Spectragraph signal as compared to bench testing results. I used a 5 kHz band pass filter because 1) I had no minerals to deal with, 2) it could handle both slow and fast coil sweeps, and 3) It was quieter than the High Pass option.

When I moved to the sand playground, the sand is much higher in mineralization than the woodchips. Even though I ground balanced to the sand, the higher surface irregularities on the sand gave off a target response. The 5kHz filter "rate of change" was slow low enough to allow the mineralization "rate of change" of these surface irregularities to report as if they were a metal target. There are two ways to deal with this. One way is to do a ground balance offset. A ground balance offset can remove the false response of the surface irregularities. But the same mineralization that was causing the response at 5 kHz filtering was also degrading my Spectragraph responses. They no longer matched the ideal response I had determined from my bench testing. So while a ground balance offset would remove the false target response it did nothing to improve the signal clarity. That required a filter change to 10 kHz and some coil sweep trials to see what was required to restore clarity to the Spectragraph. The filter change also allowed a regular ground balance with no offsets.

That is the purpose of the ground filters.

Regarding sweep speed, the filter in use determines the slowest sweep speed you can use without degregating the Spectragraph signal clarity.

When you have no to low iron mineralization, you use the 5 kHz filters. Which one to select depends on the EMI and perhaps your fastest coil sweep speed. As the minerals increase, you select the filter that helps you to maintain the best Spectragraph signal clarity with the slowest sweep speed. If you tend to sweep fast to cover large areas, and slow down when you find a target I'd recommend that you use the High Pass filter option if EMI levels allow you to use this filter option.