# 6

Custom Audio & Discrimination

V3i is the only metal detector with fully customizable audio and discrimination. This chapter will cover the methods for setting up custom audio tones and discrimination masks.

Because both the audio responses and the discrimination settings are based on VDIs, it will be useful to review *V3i*'s VDI[1] scale. In terms of raw signals, VLF detectors attempt to identify targets based on their phase response. But different frequencies result in different phase responses for a given target, so the VDI scale was created to present a normalized response, such that detectors of different frequencies would have consistent outputs. That way, users don't have to remember a lot of different response scales.

The White's VDI scale (see Chapter 1 for prior discussion) is based on a 6.192kHz scale:
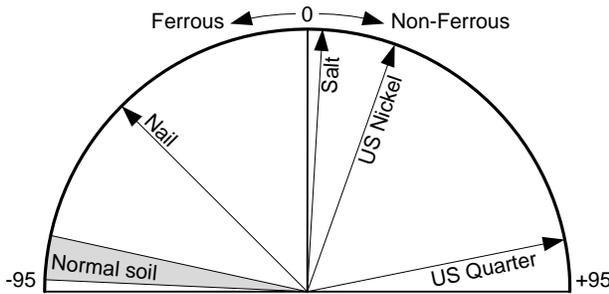
Negative numbers generally represent ferrous (iron) targets, positive represents non-ferrous. This can be redrawn in a linear fashion:
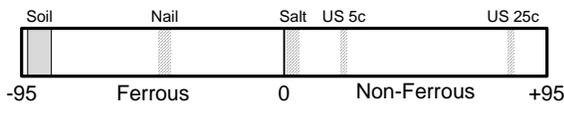
1. "VDI" stands for *Visual Discrimination Indicator*," and was originally created for metered responses. When varied tonal responses were added to later models, the tones also followed the VDI scale.

Low positive numbers correlate to thinner and less conductive targets. Gold nuggets, small jewelry, and foil will often fall in the range of 0 to 20. Medium-sized cupro-nickel coins can fall in the 20-50 range. Silver and large coins generally show up above 70.

Many modern detectors visually report the target VDI. This might be done as a VDI number, or as a group of segments which represent groups of VDI ranges. Additionally, many detectors assign varying audio tones to different VDI ranges; for example, a 4-tone response might divide the non-ferrous range into four sub-ranges and assign increasing tones to them. The pitch of the tones and the ranges they are assigned to are normally fixed; *V3i* lets you change both.

Trivia: Exactly why ±95 was chosen for the VDI scale is uncertain. In some cases other manufacturers have adopted this scale, while others came up with their own.

Custom Audio

From the Live Control Bar, highlight the **Audio level/Tone** selection and press **VIEW**. Select **Tone→VDI Tones**:
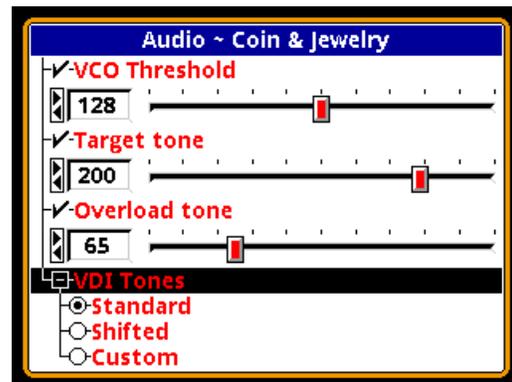
VDI Tones offers 3 selections. **Standard** assigns increasing tones to *every* VDI number, starting with tone = 65 at VDI = -95 and ending with tone = 255 at VDI = +95. The tone-vs-VDI response would look like this:
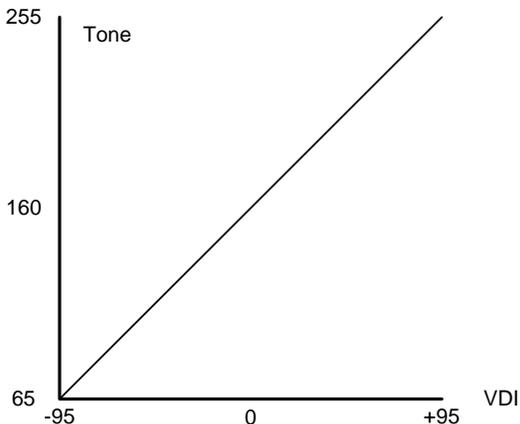
Shifted assigns one tone to all negative VDI numbers and increasing tones to every positive VDI number. This mode adds two selections:
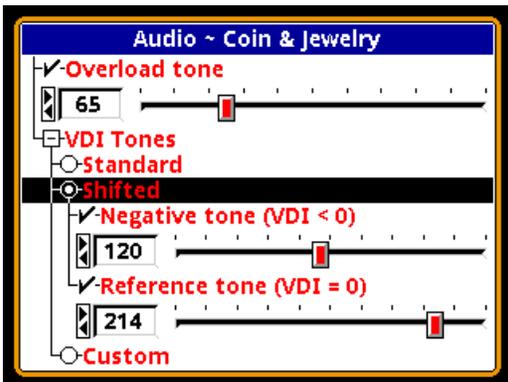
Negative tone lets you select the tone that is used for all negative VDIs. Reference tone lets you select the tone that corresponds to VDI = 0; the tones will then increment with each subsequent positive VDI. For the numbers above, the tone-vs-VDI response would look like this:
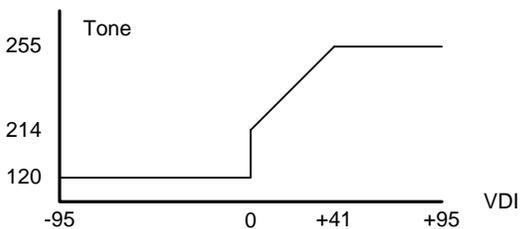

Notice that tones increase from 214 (VDI = 0) up to 255 (VDI = 41) and then remain at 255 for all higher VDIs. That's because 255 is the highest tone setting.

Tip: When any tone selection slider is active, you can hear the tone by flipping the trigger switch forward.

Finally, we get to the fully custom tone mode. **Custom** offers a single additional selection, **Edit**:

Selecting **Edit** pops up a small window which contains a list of VDIs, and each VDI has a slider for selecting a tone number from 0 to 255 (roughly 5 Hz to 1000 Hz):
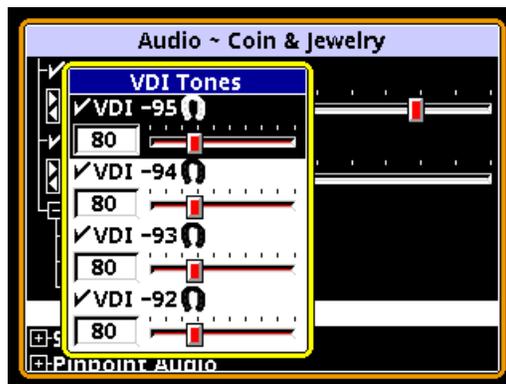

Tip: A setting of '1' is about 5Hz; a setting of '0' produces no tone at all, and is equivalent to discriminating that VDI.

At this point you can go through each of the 191 possible VDIs and set the tone for each one. However, most people will want to use a

single tone for small groups of VDIs; for example, one tone for the iron range, one tone for a foil range, etc. There is a short-cut for setting multiple VDIs to the same tone:

1. Move to the first VDI in a desired tone range.

2. Set the desired tone for that VDI.

3. Press/hold **ENTER**, then press ▼ to set the same value to subsequent VDIs. This works in either direction, so you can also start at the last VDI and press ▲.

As an example, the **Mixed Mode Pro** program has custom tones set up as follows:
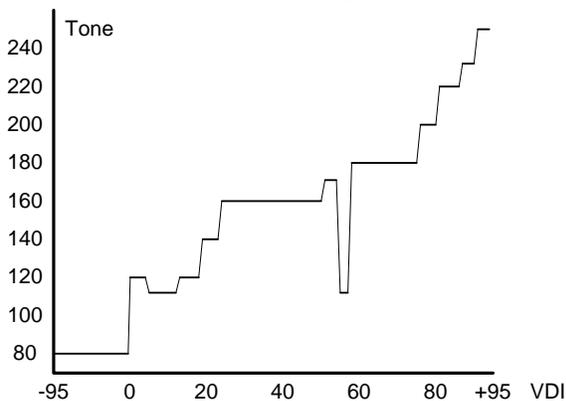
Notice that the ferrous region (-95 to 0) is compressed compared to the non-ferrous side.

Custom Discrimination

In metal detectors, discrimination is the process of accepting some types of targets while rejecting others. In many designs, this is a simple linear adjustment that sets a single rejection threshold. In more advanced designs, rejection can be selected across multiple discrete ranges. *V3i* allows discrimination at the individual VDI level, and the resulting pattern is called a *discrimination mask*.

From the Live Control Bar, highlight the **Disc.** selection and press **ENTER**. This pops up a small window which contains a list of VDIs, and each VDI has a checkbox next to it:
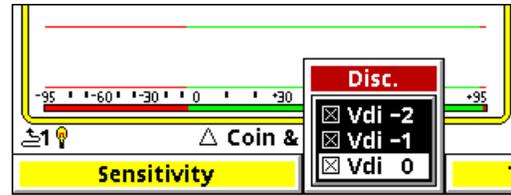

An "**X**" in the box means the VDI is accepted, otherwise it is rejected.

At this point you can go through each of the 191 possible VDIs and individually set their acceptance. However, as with audio tones, most people will want to accept and reject VDIs in groups; for example, reject the iron range, accept a cupro-nickel range, etc. There is a short-cut for setting discrimination for multiple VDIs:

1. Move to the first VDI in a desired disc range.

2. Check or uncheck that VDI.

3. Press/hold **ENTER**, then press ▼ to set the same setting to subsequent VDIs. This works in either direction, so you can also start at the last VDI and press ▲.

As an example, the **High Trash** program has the following discrimination mask:
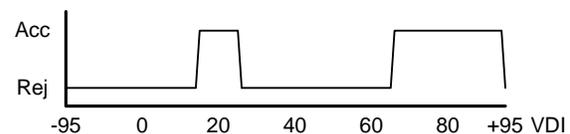
Again, the ferrous region (-95 to 0) is compressed compared to the non-ferrous side.

> **Tip:** For all factory programs, +95 is always rejected. This is the VDI that highly questionable signals — usually from hot rocks — are assigned.

Additional methods

The method just described is available from the Live Control Bar. There are additional methods of setting discrimination which are accessed in the more advanced Discrimination menu. From the Live Control Bar, high-

light the **Disc.** selection and press **ENTER**; scroll down to the **VDI Select By** entry, which contains four methods for setting up discrimination masks:
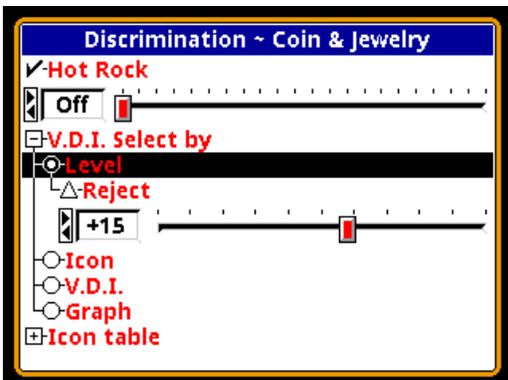
Level replicates the simple Disc knob found on many detectors. Everything below and including the setting is rejected, everything above it is accepted.

Selecting **Icon➔Edit** pops up a small box containing a list of all the currently defined icon ranges. We haven't covered icons yet, but any given program can have them defined, either using factory default ranges or custom ranges. Once icon ranges are defined, you can accept or reject those ranges in their entirety. In the example above, the foil/ring range is rejected, as is the cap/zinc-cent range. The other ranges are accepted.

> **Tip:** This method may seem superfluous but, as an example, it allows you to quickly toggle discrimination for the foil region without having to remember what the VDI range for foil is.

Selecting **VDI➔Edit** pops up a small box which contains a list of VDIs, and each VDI has a checkbox next to it. This method is identical to the pop-up box on the Live Control Bar, already covered.

Selecting **Graph➔Edit** creates a small discrimination mask graph that you can visually edit. The large number represents the current VDI at the cursor (the ↑ arrow); the symbol below the cursor tells acceptance (⌐L⌐) or rejection (⌐L⌐) for the current VDI; the icons show what icon range is currently active, per the defined icon ranges. Use the ◄ and ► keys to move along the graph, and the ▲ and ▼ keys to set acceptance & rejection. As before, you may press/hold the **ENTER** key and "drag" a selection for faster editing.