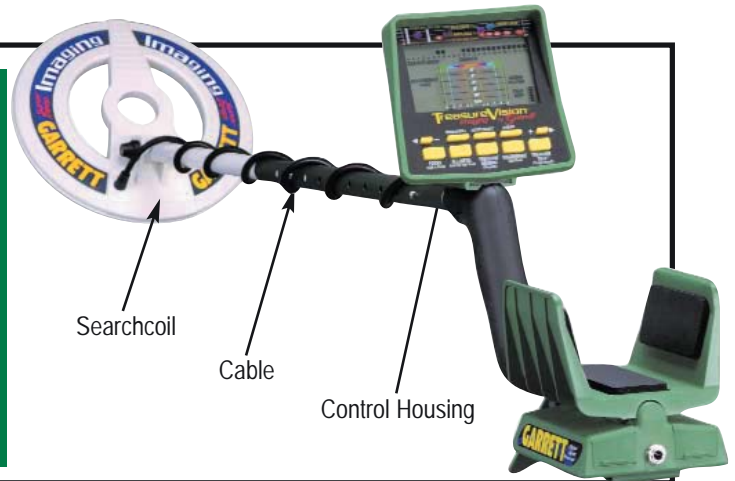


SEARCHCOIL BASICS

The searchcoil is a vital part of your metal detector. It is the flat, typically circular disk, which generates a magnetic field and senses metallic targets in the surrounding environment. It is located at the end of the stem and is connected to the control housing via a cable that is wound around the stem. The size, depth and energy output (power) of the magnetic field is determined by the shape and size of the searchcoil. Understanding the purposes behind the various sizes and shapes of searchcoils will empower you with the ability to choose the best searchcoil for the right application.

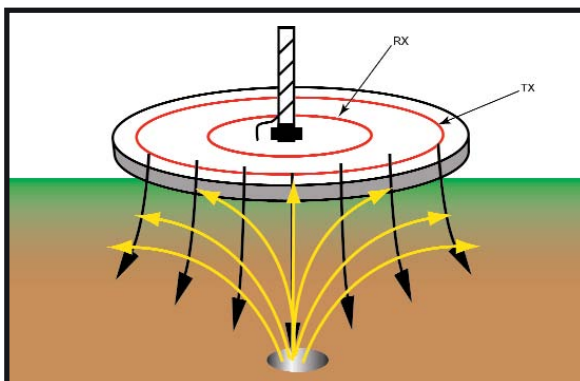


HOW SEARCHCOILS WORK

Searchcoils generally consist of two internal sets of coiled wires, a Transmit Coil (TX) and a Receive Coil (RX). Mono coils can be different in that one coil acts as both the TX and the RX. When the detector is turned on, the TX coil generates a magnetic field in the surrounding space.

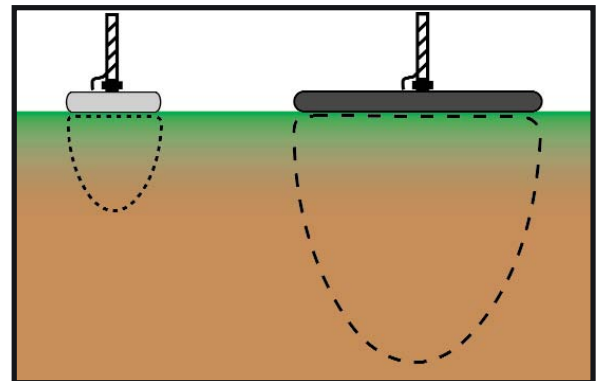
When a metallic object is within this generated magnetic field, it will create a distortion in the magnetic field. The RX coil will sense this distortion and send a signal to the control housing.

A searchcoil's detection pattern is determined by the combination of the TX's generated field pattern and the RX's sensing field pattern.



The transmit coil (TX) creates a magnetic field while the receive coil (RX) senses distortion in this field and signals the control housing.

SEARCHCOIL DEPTH



Generally speaking, the larger the searchcoil, the larger the magnetic field.

The detection depth of a searchcoil, as a rule-of-thumb, will be approximately equal to its diameter, for a coin-sized object. However, as a searchcoil's size increases and its field pattern becomes larger, the field pattern becomes less concentrated and begins to miss small objects. For a coin-sized object, this effect becomes noticeable when using searchcoils larger than about 15" in diameter. Since the field generated by a large searchcoil is larger, deeper and less concentrated than a small searchcoil, it is the best choice when hunting for targets that are usually large and deeply buried, such as caches or relics.

SIZES & SHAPES

There are a variety of searchcoil sizes and shapes. The correct one to use depends on the environment and applications it will be used in as well as the targets you seek. A change in any one of these variables may require a different searchcoil.

Generally, searchcoils are circular or elliptical in shape. An elliptical searchcoil, considered more maneuverable than a circular searchcoil because its narrow width actually provides greater coverage than a circular coil due to its elongated length. However, a circular searchcoil has slightly more detection depth and sensitivity in non-mineralized soil, so it is still the most commonly used shape. Searchcoils also come in a 2-box configuration, which are used for detecting deeply buried targets.

Searchcoils range in size from a few inches to several feet. Those which are less than 6" in diameter are generally considered small, 6-11" in diameter are considered medium and over 11" is considered large. As noted earlier, there is a direct relationship between the size of a magnetic field and the size of a coil. The bigger the coil, the larger the magnetic field. Therefore, larger searchcoils generally detect deeper than smaller searchcoils.



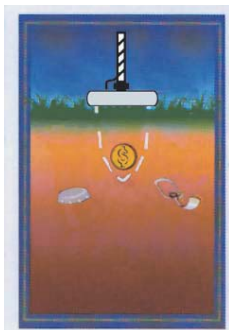
Circular



Elliptical



2-Box



The magnetic field of a small searchcoil is not as deep as a large coil, but is more concentrated

Small Searchcoils

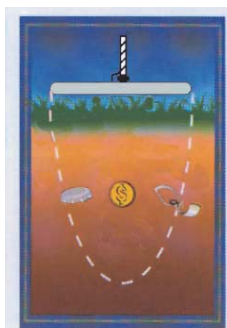
The magnetic field of a small searchcoil is concentrated within a small volume, therefore is the best choice for hunting in areas with a lot of metal debris. This allows you to maneuver through and around trash to locate good targets, especially when searching in tight places where large searchcoils cannot go. In addition, because of their concentrated detection field, small searchcoils are the best for detecting very small objects. However, a small searchcoil provides less coverage per sweep, so more scans are required to cover a search area.

Medium Searchcoils

For general-purpose hunting, which typically includes coins and coin-sized targets, a medium sized searchcoil (8 - 9") is the best choice. A medium sized searchcoil provides the best combination of magnetic field concentration, detection depth and capability to detect the greatest range of target sizes within the detection area. In addition, it's lightweight and easy to maneuver, which is why it's the standard searchcoil on a vast majority of detectors.

Large Searchcoils

Large searchcoils have wider and deeper magnetic fields than small coils and consequently provide greater depth and coverage. This means that scanning a search area requires fewer sweeps with a large searchcoil than with a smaller coil. This larger scan area, however, can become a problem in trashy areas where the searchcoil is detecting several targets at once.



CONFIGURATIONS

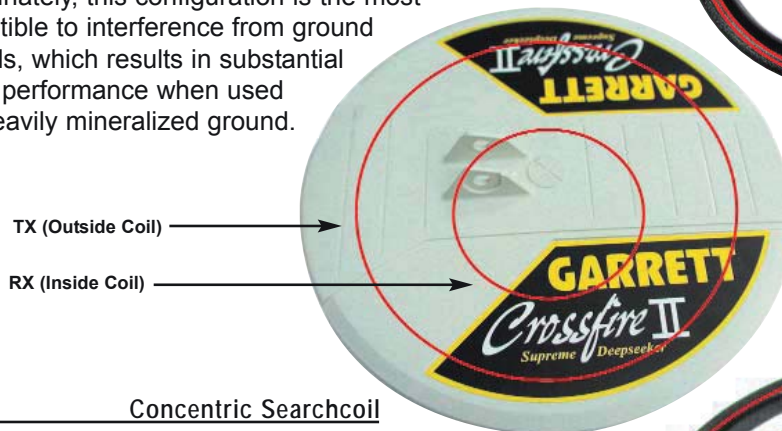
In addition to searchcoil sizes and shapes, there are also a variety of searchcoil configurations available, each proving to be the best choice depending on hunting applications and ground conditions. The configuration of a searchcoil refers to the arrangement of the TX and RX coils within the searchcoil shell. There are basically 5 configurations: Concentric, Mono, Imaging, Double-D and 2-box.

Concentric

The concentric configuration consists of a TX coil and RX coil which are usually circular and arranged as shown at left. The advantage of this configuration is that both the TX and RX coils are wound as large as possible within a given searchcoil diameter. This provides the largest possible detection field and greatest detection depth, which means the concentric coil is potentially the most sensitive configuration available.

In addition, concentric coils also provide the most symmetrical detection field, allowing ease in pinpointing and consistency in target identification. For these reasons, it is the most commonly used searchcoil and will provide the best overall performance in most environments.

Unfortunately, this configuration is the most susceptible to interference from ground minerals, which results in substantial loss of performance when used over heavily mineralized ground.

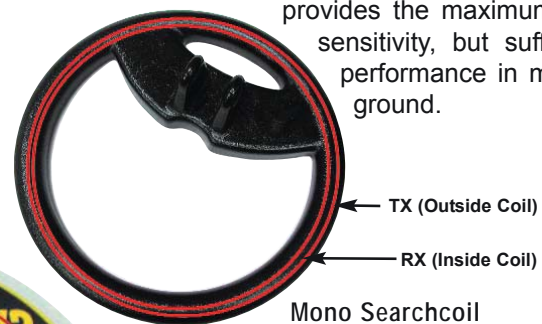


Concentric Searchcoil

Mono

A mono-coil is available only on Pulse Induction detectors and is a variation of the concentric configuration. The mono-coil can be manufactured with the TX and RX coils located together or as a single coil acting as both TX and RX.

The detection and performance characteristics of the mono are essentially the same as the concentric in that it provides the maximum possible sensitivity, but suffers some performance in mineralized ground.



Mono Searchcoil

Imaging

An Imaging searchcoil is an enhanced version of the concentric configuration that features an additional RX coil. This extra coil provides the detector with additional target information necessary for true target-depth perception and true target-sizing capabilities.

With this additional information, the detector can more fully characterize a target and for the first time distinguish between trash and good targets of the same conductivity (e.g. a quarter vs. a soda can). Only Garrett's GTI series offers this technology; no other detector in the world has this capability.



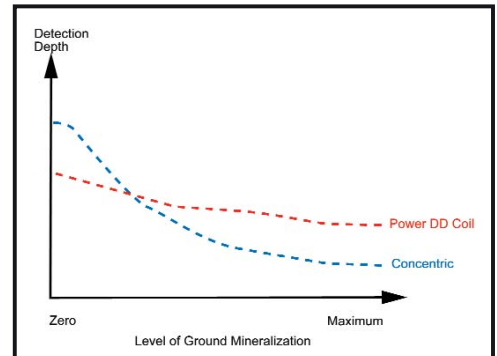
Imaging Searchcoil

Double-D

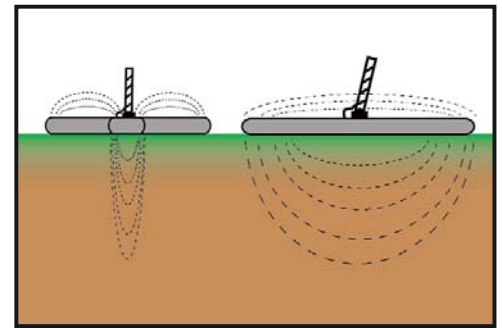
The Double-D configuration is designed to significantly reduce ground interference and, thereby, recover the performance lost by a concentric coil over mineralized soil. With the Double-D, it is the arrangement of the TX and RX coils that produce a canceling effect of ground signals.

This configuration is called DD because both TX and RX coils are in the shape of a "D". The positive detection field of the DD runs beneath the overlapping center section from front-to-back. The remaining portion of the coil actually produces negative (i.e. canceling) detection fields. It is this canceling field that allows the DD coil to maintain performance over mineralized ground.

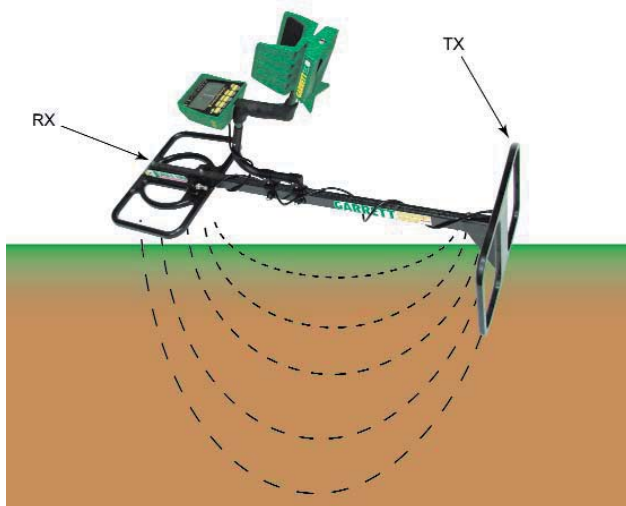
Because of its small positive detection field, the DD is inherently less sensitive than a concentric searchcoil of the same size, over non-mineralized ground. The Double-D will, however, significantly outperform the concentric over mineralized ground. For this reason, it is highly recommended when hunting over mineralized ground commonly found when prospecting and relic hunting.



The Double-D outperforms the concentric searchcoil in highly mineralized soil.



The Double-D Coil has a different detection field than the concentric search coil



2-Box

In a 2-box configuration, the TX and RX coils are physically several feet apart. This configuration provides a lightweight, manageable means of achieving the performance of a 3' to 4' diameter searchcoil. Because of its large size, and consequently large detection field, the 2-box is the best choice for detecting large, deeply buried relics and caches. Also, because of its large detection field, it ignores objects smaller than about 3" in diameter. This characteristic is advantageous when hunting in areas heavily littered with small surface trash.

There's also an enhanced version of the 2-box, only available from Garrett. It is the Treasure Hound with Eagle-Eye pinpointing. This version incorporates an additional pinpointing coil for precise target location.