Field Test

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In today's burgeoning market of metal detectors, to successfully market a new model is a very challenging business. If the designers and makers have been "reading-the-mail" and listening to the comments of the users, then they will have good prospects for their products. The hobbyist, for his part, when making demands must realise that what he desires may not always be feasible, technically possible or economically viable.

If I asked you for a list of what you think are your requirements in a detector, I wonder in which order of priority you would place them. If the factor "depth" was assumed to be top of the list by default, what then would be your other choices?

Well, here we have the Fisher F2, and I wonder how well it will fit the bill for you?

The Fisher F2 is a low budget, motion detector that aspires to perform well in the company of more expensive and heavier-weight units. Even in the hands of a novice, this machine will reward your efforts in proportion to your abilities and the availability of targets existing in the location it's applied to. As a member of the Fisher "F" range it is inherently a "fast response" unit.

Very light in weight, requiring only "programming" of the rejection notches, it is virtually a "switch-on-and-go" detector.

A brief resume of its functions is all that I intend to borrow from the handbook:-

- 8-segment visual target identification
- 4-tone audio ID
- Fast, sensitive target response
- 2-digit numeric target value
- One-touch pinpoint with numeric depth readout
- Coin depth indicator in motion search mode
- 8 inch concentric search coil
- Light weight - only 2.6 lbs, including batteries
- Ergonomic S-handle design
- Notch system for accepting or rejecting target categories

I had the opportunity to examine this unit in late December 2007. The Christmas holiday season is not the most ideal time for field testing for many reasons. Nevertheless, I did manage sufficient excursions to investigate its basic functionalities. What was most revealing was its performance on the local wet sandy beaches. I was very pleasantly surprised by the way this 6kHz unit handled the conditions. I am very aware of the conditions on one particular local beach area, and apart from the fluctuating depth of the top layer of sand, its sub strata is stable. That hidden layer is a black mineralised blanket, which certainly cuts back on a detector's penetrative power. Over the years, I've experienced the effects of such on several top-of-the-range detectors.

So this is where I did my Fisher F2 comparative testing. Initially it was a tongue-in-cheek exercise; because of the F2 being a single frequency machine, I anticipated problems. The multi-frequency units usually are able to pull coins like the copper 2ps from maximum depths of between 10-12 inches. Those units had 9.5-12 inch search heads. So, heading for the aforementioned "tough" areas, I began sweeping. The first good impression was regarding the detector's stability. At this place and time, the detector was pleasantly uncomplaining. With only the first iron discrimination segment active, there were occasional chirpings from the wetter sand ripples. There wasn't any rush of finds because this beach is searched virtually every day by a "white stick" detectorist and his dog. He uses a well known pulse unit, and I'm sure that he is by now quite proficient…. if not persistent. Eventually, it was my turn to try and claim a few targets.

The F2 with its 8 inch head was pulling out targets from approximately 7-9 inches maximum. The F2's finds depths were verifiable by the 8 inch blade of my spade, because the holes that they were taken from were stable. In the past, when recovering the deeper finds using the multi frequency units, depth was often more speculative, because excavations in the wet sand developed into slop-holes as you chased the deeper target.

I think that the depth obtained with the F2 is respectable for the size of search head, and the fact of it being a single frequency machine. What is also commendable was the lack of "fuss" from the unit. There was some response from the water-logged rippled sandy areas, but nothing that detracted from a comfortable search. You will see from the photographs, an example of the "black sand", and also the areas where the coins were located actually lying on the mineralised red rock sub strata. I suspect that the "black sand" mentioned is not a collection of pure mineral aggregate, but a conglomerate of pollution and natural material. There are coal seams several miles away, which surface up river. Whatever the source and substances, they do affect the depth capabilities of some of the detectors I've used here before. The F2 was more than holding its own on these patches.

To me, this detector's pedigree descends from the F75 line. That in turn evolved from the Teknetics T2. They form the latest breed of "fast" units. The F2 shows all the basic inherent hallmarks of speed, audio response and discrimination characteristics.

The main difference is its search frequency of 6kHz compared to 13kHz. The 6kHz frequency is the correct choice for a general purpose detector. It provides a comprehensive response to coinage metals and alloys, with good "linear"

Two cupronickel coins.

On target.

discrimination capabilities. This chosen frequency serves the average coinshooter well, for he generally wants to pick and choose what appears to be good, wasting as little effort as possible with what is numerically perceived as trash.

I'm making a bold statement when I say that I suspect most hoards of coins or artefacts are found by detectors operating in the 5kHz to 10kHz range. I cite the White's XLT as an example. I also would include the multi-frequency units, as it is their "lower harmonics" which do the business when it comes to finding targets at depth. So your Fisher F2 is working at a well proven frequency for productivity of finds.

Any serious detectorists know that to find the "good" stuff involves lowering your rejection settings, and when you are indecisive about a target then you should dig it.

The choice of a detector's frequency is a compromise involving not only the conductivity of the metals being sought, but also their thickness. Frequencies lower than 6kHz will accommodate mineralisation better than their higher counterparts, and also be more suited to recovering targets thicker than 2.5mm of the silver and copper variety. Frequencies much higher than 6kHz are best suited to thin items….typically those less than a millimetre thick, be they of silver, copper or gold and its alloys (whatever the thickness). I re-emphasise the very important fact, that soils which contain detectable levels of Fe mineralisation become less penetrable as the search frequency increases.

It is my personal opinion that the 8 inch coil is the best compromise for a detector if that unit is intended for general purpose searching. The question of which coil configuration is the best within that size constraint is dependent on what the relative parameter of usage is being considered.

Depth: An 8 inch concentric will "go deeper".

Coverage: An 8 inch 2D will cover more "fore and aft", and resolve targets better when they're displaced along the line of sweep.

Ground Effect: In its standard form the concentric coil does not handle ground effect as well as the 2D, if both have equal coil areas.

However, there is an exception to that statement. It is now possible to design a concentric that has better ground rejection than a 2D of equivalent area. The Jimmy Sierra Hotshot (concentric) is the foremost example.

The F2's circular concentric coil does not have any advertised claims of other than standard construction. So how does the machine handle bad ground? My experiences suggest: very well. That is a commendable achievement inasmuch as there is no manual ground balancing facility involved, or implied automatic ground tracking. It is factory set (slightly "positive"). In the past, preset ground rejection was synonymous with a built in loss of depth. The F2 approach to the problem appears to nullify this. This is achieved by proprietary designed circuitry both in the ground rejection channel and the target channel. Also significant is the software which controls that circuitry.

Let's look in more detail at the 8 inch circular coil (head response). Firstly, I've produced a response pattern using my standard coin, which is a 1 inch diameter copper 2p. Even though this is plotted "in-air" it is relevant, and forms a meaningful standard for this coil. Those who deride air tests are simply displaying ignorance. Why? Because air (or, more accurately, space) is a relatively standard medium in the magnetic permeability sense, whereas soil is not.

If you know the in-air pattern, you can then anticipate the modified shape of the response in soil. It is a simple exercise, reproducible by the average detectorist.

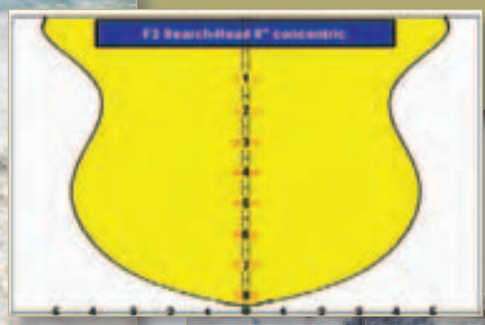
The illustration shown is the response of the coil to the transition of a 2p coin through the alternating magnetic search field. The coin itself is kept parallel and also swept parallel to the search head, at a speed comparable to that normally practiced when searching. That procedure is repeated at one inch increments of distance from the search head.

If such a coin were other than parallel to the head, then the pattern would be different. The extreme example would be of a coin swept at right angle to the plain of the head, or one orientated vertically in the ground (on edge.) This would produce a "bra shaped" response, invoking the typical off-set target dilemma when trying to pinpoint it.

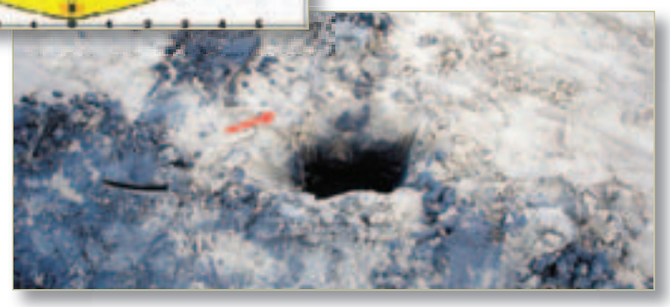
Each differently sized or orientated target produces its own unique response pattern.

So at a sensitivity setting one level below maximum, the 8 inch concentric coil on the F2 offers a depth capability of approximately 7 inches on a copper 2p (not the post-1982 copper clad ferrous type). The "datum" response level is one without any "iffyness". The detector does respond beyond that range by at least another inch in the air test, but not in a repeatedly consistent manner. It is that "extra" range that is generally "lost" when the coin is placed in lightly mineralised soil. When we talk about advertised coil sizes it is worth remembering that the actual internal coil arrangement/size is always something *less* than the dimensions describing a search head's external shell.

In the black.



The response of the coil to the transition of a 2p coin through the alternating magnetic search field.



Another coin - arrowed.

This 8 inch search head coil arrangement has a "mean" diameter of about 7.5 inches.

With a circular concentric coil operating at a frequency of 6kHz you can apply a simple "rule of thumb" formula (Matt's Law) which gives an indication of the anticipated maximum "in-air" distance at which a coin produces a consistent audio response. Please take note of the above underlined criteria, for at higher frequencies the "rule of thumb" is modified by the metal's conductivity and thickness and, pro-rata, some coins can be detected at greater ranges. The detector's sensitivity is set at the appropriate level by using your standard coin. To achieve this, you wave your coin at the range determined by Matt's Law, whereby the consistent audio deteriorates after that distance.

That level of sensitivity should not invoke any instability or random responses.

The level determined for the 2p is then maintained for checking other coin's ranges.

Distance = coil diameter multiplied by coin diameter. (All units in inches)

For example: 1 inch diameter 1981 copper 2p (1 x 7.5) = 7.5 inches.

The older 1932 copper penny of 1.2 inches (1.2 x 7.5) = 9 inches.

A Georgian 1806 copper (1.34 x 7.5) = 10 inches.

The range of detection calculated for air, is reduced in soil by a collection of complex factors, involving the interrogating search frequency, the soil's characteristics, the target's conductivity and bulk. I offer some approximate percentage loss figures for coins whose target ID were determined using the White's XLT operating in the 6kHz band.

The related percentage loss of "in-air-range" converts that to an estimation of "in soil depths".

I suggest that the maximum detectable depths, consistent with repeatable audio, in light to moderate soils, compared to their maximum in-air range, will likely be curtailed by the following approximate percentages. (NB At frequencies in the 6kHz-7kHz range).

Target ID percentage loss: 80 - 10%, 60 - 12%, 40 - 15%, 30 - 18%, and 20 - 20%.

Regarding the F2 and its circular concentric coil I think this combination provides more focused target isolation/locating capability compared to the 2D, due to its inherent 360 degree response symmetry. With Fisher's design philosophy, fast sweeping is recommended thereby eliminating the old fashioned dictate of having to sweep slowly to achieve depth.

Although the F2 doesn't carry the Fe ground monitoring function, you can obtain a relative impression of the level of mineralisation by judicious use of the pinpointing mode. The F2's ground balance point is pre-set to be slightly positive of "normal".

Consequently, if the search coil is primed several inches above the surface in pin-point mode, then when you lower the search-head over lowly mineralised ground the threshold *rises*. Alternatively, should moderate levels of soil Fe be present, then the threshold "rise" will be curtailed to some dependent degree. Ultimately, any significant Fe levels will mute the audio threshold as the search head approaches the soil.

So there you have your audible indicator regarding the ground's Fe status.

Sensible detectorists are aware that the depth capabilities of a detector are not the only criteria. The ability to resolve adjacent targets is equally important.

The F2 at 6kHz, and with an 8 inch search-head, tackles both requirements with commendable functionality. When trash density defies depth, then the 4 inch ancillary coil is available to take up the challenge. The guys on the Thames foreshores are using the 4 inch search head, with excellent effect. Our local Mersey tide line is similarly disposed. Its foreshore adjacent to its ports and shipbuilding yards is plagued with over a century of industrial scrap and its ferrous residue. It deters all but the most dedicated of detectorists. From past experience using other 6kHz detectors with a small search head suggests that the F2 with its 4 inch coil and faster response should out shine even those excellent units. Of course, it also requires an equally determined operator. Years of patience in such circumstances have given me that incentive. It is in some ways a masochistic discipline to stand in one heavily polluted spot and work it in a "nit-picking" manner, but when the good finds eventually surrender themselves, then the psychological reward can exceed the intrinsic value of the object.

Inland field trials were unfortunately limited for me because of time and poor weather constraints. That didn't totally inhibit my testing, for I have a well established test bed out there in my large garden. Also, I have a facility to realistically test any artefact's behaviour when "buried" under undisturbed soil. I even have a fabricated mineralised area to simulate the affect on a target's ID. I now use my Fisher F75 to provide me with the tools to monitor the ground's state during the testing of any other detectors.

The F2 found all my test-bed targets, confidently. Interestingly, coins tested on the "mineralise" platform, suffered less Target Identity degradation with the F2's 6kHz frequency compared to similar tests at 13kHz when using the F75. It was

Finds from the woods.

theoretically anticipated, but it was still assuring to actually see it so convincingly evident.

When I want a simple, but consistent comparison between the characteristics of different detectors, I use three "standard" coins that are commonly available to any UK detectorists. They represent targets of the upper, middle-lower and very low conductivity ranges, and so provide some degree of reference for anyone who wants to similarly examine their machine's responses.

1. A "modern" copper 2p of the type circulated prior to 1982 and the latest ferrous "copper clad" variety. (Silver and copper have closely related conductivities: 6.1 compared to 5.7).

This copper coin is of a 1 inch diameter. That size is a good "standard" for testing the "depth gauge" calibrations on most detectors.

2. Next, the cupronickel 20p. This mimics pull-tabs, and low carat gold rings of medium sizes. Also various thin hammered coins or small Roman bronzes.

3. The modern small cupronickel 5p. This acts as a marker for setting the minimum discrimination level. If your discrimination settings accept a small 5p, then you will not be missing much of great value. (Check setting if hunting a known site for tiny gold coins, etc)

Only you can determine your absolute minimum discrimination level, which is dictated by finds requirement and the condition of the site and its soil.

Just how capable the concentric and F2 combination is was only revealed when I scanned one of my established targets: a silver Victorian threepenny piece at 6 inches. With other machines I was aware that there was another minuscule target very close by. I had previously been unable to resolve it sufficiently well enough to decide on its character. The suggestions were that it was a small ferrous fragment. Now, when I used the F2 with its concentric coil, I could definitely identify a low conductive, non-ferrous target close by the silver coin! Well done the F2! Naturally, I was only able to realise this because I am aware of my test bed's vagaries. If it had been a non-familiar situation, then I doubt if I would have discovered this F2 capability in such a definitive way. It certainly boosts my confidence in this machine.

Let me expand my thoughts on the subject of 2D configured coils. Have you ever been aware of a 2D coil "flipping" a target's identity (iron, or not) as it passes from outside to inside the coil's boundaries? I feel pretty sure that I have.

Now I suspect that can't happen with a concentric coil, so long as the target is relatively smaller than the coil. This could be the main "unrecognised" advantage of using a concentric on a "fast-recovery" detector. Now let's move on to other matters.

On the cover of the F2's little manual it emphasises that you should not use rechargeable batteries in preference to the standard alkaline PP9s.

The ordinary alkaline PP9 is indeed a good, tight fit, and I also noted that the ones supplied were working okay even at a potential of 7.8 volts. The reason for the non-recommendation of rechargeables must then be related to their variability of size, and consequently possible fitting difficulties. Rechargeable PP9s are known for their variability in their overall size. The "connection buttons" being compressible, means that they are variable in length. That can be compounded during their life-time by the possibility of the metal case swelling, as a result of prolonged charging. For economical reason, I purchased four new nickel hydrides and checked their sizes with a micrometer. After a small adjustment (compression) of the metallic rim at their base, I was able to fit them with no more effort required than that involving the alkaline ones. During the long testing sessions, the detector ran well, and their use did not invoke any observable affect on performance.

As for any comments on the unit in general terms, there is little to say on the actual setting up of the F2, for it is simplicity itself to prime and begin searching efficiently.

The foam hand-grip on the model supplied was free to slide up and down the stem, so I temporally taped it into a comfortable position for ease of accessing the control pads.

The headphone socket is sensibly placed beneath the control box to reduce the chance of the headphone lead feeding water into the unit. But then you may need to fit a right angled plug onto existing headphones to relieve any resulting stress on the lead. The actual cord also needs to be reasonably long to avoid dragging on your head-set.

So what was my overall impression of this new entry level detector? I found the F2 was a pleasure to use, and very capable at resolving targets. Its lightness of weight and quiet efficiency makes you that much more aware of such bonuses, and their benefits - especially during prolonged sessions of detecting. It is good value for your money, even in today's competitive market.

The images supplied with this article are illustrative of beach testing and an outing to a wooded area for some general coinshooting.

I have avoided spending several pages to simply regurgitate the manufacture's handbook; that's not my style. I prefer to try to "Shake it to see what makes it rattle."

My thanks to Joan Allens for the loan of this unit.

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