# GOING PLACES WITH THE DFX

## *Focusing in on the adjustments for best performance.*


One man's opinions
with a little help
from my friends.

## The prologue

The complexities of the science involved in detecting metals in soil or salt water are rarely understood by the majority of detectorists. That is not a criticism, for there are many factors involved which are both complex and variable. I believe that we can all improve our understanding of what is going on, especially now multi frequency detectors are the new standard.
It is apparent that some detectorist on purchasing their new machine, assemble it and rush off, expecting it to transform their old site into an MD Theme Park. At the first hint of non-conformity to such expectations, they tend to blame the detector, rather than a possible lack of preparation in setting up its new functions. If so, then we must be prepared to help them.

This Booklet is about one special multi-frequency detector, White's new DFX. Hopefully, by reading you will be better informed about this unit in particular, and about the subject of multi-frequencies in general.

This booklet is intended to encourage users to establish a basic program format for themselves. The goal being, to start off using stable settings and not exotic 'deeper than' programs. Whites DFX is the most sophisticated and versatile detector available today. That means it is easily matchable to the owner's abilities, and to what he wishes to find wherever that may be. Ploughed land, meadow, or contaminated wet sand. Once familiarised with the new menus of additional concepts, they can exploit to the full, the exciting potential offered by the DFX. This culminates in a detector that gives its owner a freedom of choice on how he wishes to detect, and a menu of 'tools' to match his skills and grow with his expertise.

It is light. It is fast. It.is powerful. It is packed with performance.

The DFX can search and find in places that others can't, despite their claims. Some multi-frequency detectors that I know, simply 'go dumb' over heavy contamination. They null. The term they use is 'Iron Masking'.
Who said "Silence is Golden"? .....They don't know what they're missing.

Go on! Make my day. Show them the way...DFXwise

*Matt. Renshaw*

**Once upon a time....**

About myself. I am an Electronics Engineer by profession with 50 years of accumulated experience in various fields of Electronics and Physics,.... Hoovering, dish washing.etc.... (Yes.I'm now retired,).
Even though I have practised the hobby now for almost 35 years, I still find that each new day of detecting is a fresh challenge. A set-up that worked well for a site, yesterday, may not be suitable in another location.

With each tide, the beach will change, camouflaging its character. The seasons and plough will do the same for fields you've worked for years. That is the enigma, and solving it is part of this intriguing hobby.

I must admit that it is the technicalities of 'with what, and how' that interests me most. My knowledge of artefacts is weak and of history, it's shallow. But still, let me find a button or coin that some hard working peasant has lost whilst labouring in the fields, then my thoughts regress to that moment. Briefly I'm in a mental time warp. It must be that very tangible, tactile sensation of holding an item which was his or hers, centuries ago.....once upon a time...

The White's staff and I, are pleased to be sharing our thoughts with you. We will do our best to make reading worthwhile.

I believe the DFX will be the detector for 2002 in the U.K. and Europe. With excellent service support and aftercare, based in Scotland.
**Whites of Inverness have no peers in that respect**

Eagle 1986 — *Meet The Ancestors* — Eagle II 1987

Eagle II SL 1988 — Eagle II SL90 1990

Spectrum 1992 — The XLT 1996

2000

## Now,The DFX.

**The market's most intelligent detector**

Let its finds speak for themselves.

# The DFX

WE should emphasise that although the DFX looks like an XLT and has many similarities,

**IT IS DIFFERENT.**

You MUST read the manual and absorb the new powerful concepts. Whatever program you first use to familiarise yourself with your DFX, we encourage you to begin with sensible sensitivities.

**Just for starters**

| GENERAL | IMPORTANT |
|---|---|
| AC sens.....65 | BOTTLE CAP REJ.....1 |
| Pre Amp.....3 | *New functions* |
| DC to.....35 | HOT ROCK REJECT..20 |
| AUDIO DISC.....ON | SWEEP SPEED.....3 |
| TONE ID.....OFF | GROUND FILTERS.....4 |
| VCO.....ON | RECOVERY SPEED.....30 |

**DISCRIMINATION SETTINGS**

**ACCEPT -20 to +95.**
**REJECT -95 to -21**

The above advice is only intended to start you off in the 'right gear'. Once you get the feel for the machine, then you can dump the 'L' plates.

**When detecting on sand saturated with salt water,**
**You MUST use one of these two FREQUENCY MODES**
**BEST DATA or CORRELATE.**
**For Inland or Dry Sand, one can use ANY of the**
**FREQUENCY MODES.**

Below they're listed in order of relative sensitivity. (In my opinion)

(1) Single Frequency **15 kHz.**
(2) Single Frequency **3 kHz.**
(3) Dual Frequencies **Best Data.** 3 & 15 kHz.
(4) Dual Frequencies **Correlate.** 3 & 15 kHz.

## FREQUENCY MODES

**(1) 15 kHz.**

This is the frequency for Hammered coinage, or anything of 'THIN' section or LOW CONDUCTIVITY. ( Jewellery )
Gold is of low conductivity by virtue of its **Specific resistance**
15khz is excellent for **any** general coinage or SMALL THIN artefacts.
Its sensitivity to small items will have you on your knees looking for air-gun pellets!

This is a **"mean machine at 15"**.....Exploit it....Enjoy it.

**(2) 3khz.**

This frequency works best on the thicker items. An example being the old Georgian Cartwheel Penny. Another is the English Half Crown. There must be a few Roman Sestercius or Bronze brooches down there, just waiting for the DFX to give them '3khz kiss of life'.
If these are at depth, then theory says this one should find them.
Beware of the shape factor though, it can deceive detection.
3khz working certainly provides a quieter mode in terms of ground noise. That benefit may not be obvious to you whilst you're detecting, but it is very effective in allowing low level signals to be recognised

**(3) BEST DATA.** (3 kHz & 15khz)

You may possibly query why this is not the most sensitive mode.
If what I have stated in (1) and (2) is correct, then Best Data should apparently combine the best of both frequencies automatically.
Your line of thinking is rational, but my conclusion is born out of experience. My testing appears to show that on average, each frequency when used individually, generally proved more sensitive to their own class of target, than when used in a combined mode.
Maybe the DFX in Dual Frequency mode has to sacrifice a little of its 3 and 15 khz signals in balancing out the 'soil, salt and black sand' factors? This 'ground balancing process' is done whether those factors are actually present or not. It is an integral function of the Dual Frequencies mode. If you need extra sensitivity, I advise using your Pre-Amp rather than AC sens. Too high an AC provokes instability.

## (4) CORRELATE. (3khz & 15khz)

THIS is the "Trash Basher".
The mode that kills the crap.

I have dug some strange sounding signals in this mode with great success. Signals to which I would not normally have given a second thought to if occurring in other modes. WHY? Because I believed the manual when it described how strict this mode is in refusing to pass doubtful signals. If rejected signals do break through with their splatter, then I would assume you are running your DFX 'too hot' for the situation. "Cool it"

A good, clear signal needs no comment. But if one is relatively poor and still getting through in this mode, 'work it'. Watch the graph and observe if it's struggling to splatter over to the right of mid display. Numbers are not too important in tough circumstances, it is their 'trend' that may be the clue. So, if they are not conclusively negative, then give it the 360 degrees scan. If it still persists then it must be worth looking at. I have pulled modern iron filled coins from 6 inches, with lumps of rust growing on them! In our local wet silt, their VDI's can oscillate around 0 to 8 with 'ragged' but persistent sound. I generally dig any persistent target that make it through the discrimination, regardless of its poor audio quality.

I once found a ring with diamonds set in Platinum and gold. It's filigree mount and metal combination gave it a VDI of 9 maximum. Would you pass over such varying low numbers on a 'dirty' beach? I like to think that my experience with iron pennies, will keep me alert.

Don't be too zealous in your quest for depth when the evidence of ground contamination becomes apparent. Turning up the A.C. sensitivity to over - ambitious levels can be self defeating. You will be more successful with levels of gain that don't distort near-surface signals. Closer attention to developing the right 'comfortable listening' programs will improve your detection rate. It is often the 'over-amplification' of 'rejected' targets that allows them to break through your discriminator's screening process. I think the debris from this problem often ends up in the +95 slot.

**Distortion degrades Discrimination.**

## PROGRAMMING

In any program there are the IMPORTANT CHOICES and the AESTHETIC.
I will only comment on the **Important choices** and leave the aesthetic to you.
**FREQUENCY MODE.** This initially is determined by the site.

**INLAND** ..... **ANY of the four modes**

**WET BEACH**.....**Best Data or Correlate**.

**DRY BEACH** ( But no black sand )..... **ANY of the four Modes.**

### Important Operational adjustments..... ( *These affect depth*)

* SWEEP SPEED * RECOVERY SPEED HOT ROCK .
* GROUND FILTERS * * BOTTLE CAP REJECT* REJECT

**RECOVERY SPEED** 1= Longest. 40 = shortest.

This relates to the duration the for which the audio continues sounding after the target has been first reported. I use 30. Most people's choice seems to be between 20 to 30. The 'longer' rates (or lower numbers) can be used to enhance the normally short response of deep or small target. ( 20 for weak deep targets? ) Too slow, and the extended audio duration can disguise the target's true size.
If you set it too fast ( above say 33) then shallow targets cause 'double blipping'.

**BOTTLE CAP REJECT. least 1 >>>>> 20 Most.**

**Take note.....The more you use, the more you lose.**

**HOT ROCK REJECT. 1 to 20. This controls the sound accompanying +95**

**For whatever reason the DFX's analyser ' throws one into +95', then the accompanying audio signal is reported via this function. So if you decide to reject +95 you will not see +95 displayed But, but, but.....**

******** BUT YOU STILL HEAR THE AUDIO.********

**To control the +95 sound threshold ( the level at which it 'breaks through' )**
**To control the +95 sound threshold ( the level at which it 'breaks through'**
**you must adjust the HOT ROCK REJECT setting.**

**1 is maximum acceptance, >>10 is neutral,>> 20 is maximum rejection.**

**So in between settings gives a threshold at which the +95 audio signal becomes evident. Try 12 as a compromise. I normally have it at 20.**

**There are myths about the possible value of digging +95'ers. I think it's Jimmy Sierra (USA) who contends that it could be a deep coin.**
**I personally think you've got more chance of winning the Lottery!**

I think that visual +95 is in the majority of cases is often due to the DFX not being able to classify signal components that result from distortion. That can arise from relatively large or mis-shapen objects being close to the surface. Typical example are horse-shoes..wet cinders.. large or long pieces of twisted ferrous metals. Too high an AC sens. aggravates this.

Look for the 'Book-end' display, where bars at both end of screen provide a good clue to probable 'iron type' distortion, or irregular shaped rocks.

**SWEEP SPEED** 1=Slowest sweep. 20=Fastest sweep.
I personally think this is the most important function of them all.
Set this one right for your swing rate, and it can mean extra inches in depth.
Trouble is its not an easy parameter to practically appraise. It requires some patient experimentation. I'll give you my opinion for what its worth.

**Try settings between 1 and 5.** This range should accommodate most general sweep speeds, whilst maintaining good depth.

Sweep Speed's depth enhancement capability, is very closely allied to your Ground Filter settings. They are examined next.

**GROUND FILTERS..... setting 2.**
**At setting 2, personal choice of SWEEP SPEED is disabled.**
Setting 2 provides the least Ground filtering and detection depth enhancement.

Setting 2 invokes the built in parameters and excludes user intervention.

You should read page 44 of the users manual several time over on this subject. It reinforces the important relationship between Sweep Speed, Recovery Rate and Ground Filters. Get these combinations right for your style and rate of sweep and the DFX is unbeatable on deep targets.

**GROUND FILTERS settings, from 3 to 6.**

I think the higher settings enhance the ability to pull items from depth. The word depth is relative. If the soil is highly mineralised or contaminated, then deep may mean 6 inches. If the contamination is light, then it could mean 10 to 12 inches on a target of greater than 1-inch diameter

The more Ground Filters you use, the longer it takes for them to 'clear out' from the last target and report the next one. The effect audibly at a setting of 6, is that you have virtually 'passed ' the target when it sounds off. (Response delayed) I find that the delay is of no importance to me because my primary goal is simply to know a target exists in the first place. Then by pinpointing I can easily define its actual position..

The effect of Ground Filters is well worth evaluating in practice. If you get a target that sounds 'deep', then take a little time out to experiment. Go to DISCRIM. MENU, then GROUND FILTERS. We want to try the lot out (2 to 6). Set it at 2 first, and leave the function still in its adjustable state. (Black frame around it). Pull the trigger and try it out on the target. Vary the detector's head height to find maximum depth. Now hit any arrow-keypad to access the adjustment again, and choose next level. Pull trigger and repeat test. Do that for all five filter settings. Were you able to determine a best setting ? You can use that same method for Sweep Speed to optimise it to the new filter setting. In my own garden, using my dynamic test facility, with my mate Stuart helping, I was able to test locate a 'lizzy hammered silver 6d down to almost 12 inches, with the AC at 70. Pre Amp 4 and Recovery 25, Ground Filters at 6, and in 15khz mode. Stuart, using the Minelab XS2, lost it at a depth between 9 and 10 inches. He swore by his Minelab. But after that, he went away, phoned Regton and ordered a DFX. That was months before they were available in the UK.!

( That's him in the cover picture. Thanks Stu.).

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**BOTTLE CAP REJECT. Range 1 to 20 (20 Max reject)**

One simple statement. The MORE you use, the MORE YOU LOSE.

| SETTINGS | TrialProg | | |
|---|---|---|---|
| VOLUME | 50 | | |
| THRESHOLD | 0 | | |
| TONE AUDIO | 240 | | |
| AUDIO DISC | ON | | |
| SILENT MODE | OFF | | |
| MIXED MODE | OFF | | |
| AC SENSITIVITY | 65 | | |
| DC SENSITIVITY | 40 | | |
| BACKLIGHT | OFF | | |
| VIEWING ANGLE | 25 | | |
| RATCHET P. POINT | On | | |
| S.A.T. SPEED | 8 | | |
| TONE ID | OFF | | |
| V.C.O. | ON | | |
| MODULATION | ON | | |
| AUTOTRAC | ON | | |
| TRAC VIEW | OFF | | |
| AUTOTRAC SPEED | 12 | | |
| AUTOTRAC OFFSET | 0 | | |
| TRAC INHIBIT | ON | | |
| COARSE& FINE | AUTO | | |
| REJECT | -95 to -21 | | |
| ACCEPT | -20 to +94 | | |
| REJECT +95 ? | NO | | |
| LEARN ACCEPT | OFF | | |
| LEARN REJECT | OFF | | |
| RECOVERY SPEED | 30 | | |
| B.CAP REJECT | 1 | | |
| HOTROCK REJECT | 20 | | |
| SWEEP SPEED | 3 | | |
| GROUND FILTERS | 4 | | |
| VISUAL DISC | ON | | |
| ICONS | OFF | | |
| VDI SENSITIVITY | 85 | | |
| D.C. PHASE | OFF | | |
| GRAPH AVERAGE | ON | | |
| GRAPH ACCUMULATE | ON | | |
| FADE RATE | 10 | | |
| PREAMP GAIN | 4 | | |
| 2 FREQ. BEST DATA | OFF | | |
| 2 FREQ. CORRELATE | OFF | | |
| VDI NORMALISED | ON | | |
| 1 FREQ. 3 kHz | OFF | | |
| 1 FREQ. 15 kHz | ON | | |

for reference only.

| | Coin's Parameters | | Diam | Thick | Non Norm'd | Non Norm'd | Norm-malised |
|---|---|---|---|---|---|---|---|
| | COIN | DATE | mm | mm | 3khz | 15khz | Dual |
| 1 | Cartwheel 1d (worn) | 179? | 35 | 3.40 | 82 | 94 | 88 |
| 2 | One Pound | 1985 | 22.5 | 2.90 | 42 | 81 | 61 |
| 3 | Three Pence (brass) | 1964 | 21.1 | 2.48 | 57 | 86 | 74 |
| 4 | Fifty Pence (old) | 1969 | 30 | 2.30 | 25 | 68 | 40 |
| 5 | Ten Pence (old) | 1979 | 30 | 2.10 | 23 | 65 | 32 |
| 6 | Two Shillings (old) | 1956 | 28 | 2.05 | 23 | 65 | 32 |
| 7 | £2 modern | 2000 | 30.2 | 2.25 | 46 | 85 | 65 |
| 8 | Half Crown 2/6d | 1939 | 32 | 1.90 | 74 | 90 | 82 |
| 9 | Two Pence Fe. | 2000 | 25.4 | 1.85 | erratic | | 42 |
| 10 | Fifty Pence (new) | 1997 | 28 | 1.70 | 20 | 57 | 28 |
| 11 | Two Pence (non Fe) | 1976 | 25.4 | 1.70 | 74 | 90 | 83 |
| 12 | One Shilling (old) | 1949 | 24.5 | 1.65 | 73 | 90 | 82 |
| 13 | Twenty Pence | 1982 | 21.3 | 1.63 | 20 | 64 | 32 |
| 14 | Five Pence (old) | 1987 | 23.6 | 1.60 | 16 | 49 | 22 |
| 15 | One Shilling (old) | 1920 | 22.3 | 1.60 | 73 | 90 | 82 |
| 16 | Five Pence (small) | 1991 | 18.5 | 1.60 | 12 | 36 | 16 |
| 17 | One Penny (old cop) | 1917 | 31 | 1.45 | 52 | 84 | 71 |
| 18 | One Pence Fe | 1999 | 20 | 1.45 | erratic | | 20 |
| 19 | Half Pence (ship) | 1951 | 20.5 | 1.40 | 44 | 82 | 64 |
| 20 | One Pence (non Fe) | 1981 | 20 | 1.35 | 64 | 87 | 78 |
| 21 | Ten Pence (new) | 1992 | 24 | 1.25 | 18 | 52 | 24 |
| 22 | Six Pence (silver) | 1929 | 19.5 | 0.90 | 39 | 79 | 57 |
| 23 | Hammered Silver | 'LIZ-1 | 16.0 | 0.70 | 24 | 65 | 36 |
| 24 | Hammered Silver | 'LIZ-1 | 15.0 | 0.5 | 16 | 39 | 20 |
| 25 | Hammered Silver | 'LIZ-1 | 11.0 | 0.3 | 8 | 20 | 10 |
| 26 | Hammered Silver | 'LIZ-1 | 8.0 | 0.7 | 12 | 33 | 18 |
| 27 | Silver Thick | Ring | 22.0 | 2.0 | 72 | 91 | 82 |
| 28 | Wed. Thick 22crt | Ring | 18.0 | 1.1 | 36 | 78 | 52 |
| 29 | Mans Thin 9crt | Ring | 22.0 | 1.6 | 16 | 46 | 20 |
| 30 | Mans Brass | Ring | 18.0 | 1.0 | 28 | 74 | 53 |
| 31 | Child's 9crt Thin | Ring | 17.0 | 0.5 | 7 | 18 | 9 |
| 32 | Filigree 9crt Thin | Ring | 17.0 | 0.5 | 7 | 18 | 9 |
| 33 | Roman Bronze | Coin | 25.0 | 2.0 | 31 | 72 | 45 |
| 34 | Roman Bronze | Coin | 23.0 | 1.7 | 28 | 70 | 42 |
| 35 | Roman Bronze | Coin | 17.0 | 2.5 | 22 | 66 | 35 |
| 36 | Roman Bronze | Coin | 21 | 1.1 | 21 | 62 | 32 |

## Some extra comments about ground filters.

**Setting 2** is done by hardware, and provides enough filtering to allow good discrimination and sufficient smoothing of ground effects. After that the filtering comes under software control and so allows the operator to 'tune' it for best effect in the field. The benefits of added filtering, are best left to your personal assessment on site. Theory says that more filtering than say 3 stages will give proportionally reduced effect, ( in terms of smoothing ). Don't misread that as something detrimental if you use more filters. It only implies that each extra step above say three filters, has a more 'gentle' smoothing effect than the three previous steps. Understand?

It is a matter of personal judgement. I have actually formed the opinion that 6 filters have been beneficial in areas where lots of iron residue was present, and a slower sweep was required. I recall one shore line, where all the Titanic's rust must be deposited, (and some of the hull). The sand (more like rubble!) was wet and iron contaminated . There, 6 filters and Correlate appeared to work very well. It was not so much the depth from which one pulled coins, but rather the fact that you were able to pull anything at all! One should be aware, that to utilise the 'depth 'benefits of increased filters, you have to be more careful about getting your sweep speeds right to match the various settings. Otherwise depth capabilities may be not be optimised.

**Practice and experiment over deep sounding targets.** It will pay off. More filters slow down the unit's recovery time after passing over a target. Targets too close together may suffer. That implies having to sweep a little slower when using 5 or 6 filters. This may help in restoring separation. The guy who masters these techniques, will win on deep target locating

### Ground Filter selection and Sweep Speed

I have practised on various targets at their individual maximum detectable depths, and my personal opinion is this. A sweep speed of 1 to 5 should best accommodates most people's sweep rates. Combine that with a Ground Filter choice of 3 or 4 for general conditions (Ground DC Phase reading of 90 or less). If Ground DC Phase indications are above 91 then try 5 or 6 filters, and test them on a deep sounding target, To read ground you must have DC PHASE ON. Hold your DFX out to your side at 45 degrees. Sweep down onto the ground, and as you approach the surface,

PULL AND HOLD the trigger. Let the reading settle, ...or repeat the process.

**Multi-Frequency Modes of operation.**

The DFX's microprocessor monitors both detection frequencies, and the results derived from them. In any single pass of the loop over the target, the processor can produce two target parameters results per frequency, and can provide data to the operator by comparing and further analysing them both.

In one mode of operation, the processor looks to see to what extent the results agree -- that's the "correlation" method.

If they do agree reasonably well, the result is reported to the operator .

If the agreement is poor, the result will be suppressed. This should eliminate many sporadic "false targets", especially 'iron'.

Also, *this process could be a useful tool against external interference.*

So remember to try Correlate as a last resort in such situations.

In Best Data Mode the processor selects the result which is based on the stronger signal. In other words, if you pass over a small 9 carat gold ring, the processor will note that the 3 kHz data is weak and will report the target I.D. based on the 15 kHz data. If you pass over a half Crown, the processor will note that the 3 kHz data is likely to give a more accurate result and will choose that result.

Likewise with Thick and Thin items. 3khz favours the Thick, and 15khz for the Thin ones (or small / thin gold jewellery.)

White's has been very successful building general purpose detectors which run at 6.6 kHz. This frequency was chosen years ago as a standard because it provides both good sensitivity, and good discrimination, for a wide variety of targets and environments. Still, for jewellery hunters and prospectors it is too low, while for beach combers and cache hunters it may be too high. Clearly, providing the flexibility to match the operating frequency with the application is a desirable thing. The two frequencies available in the DFX are 3 kHz (actually 2.98 kHz) and 15 kHz (14.91 kHz). The detector can be configured as a conventional, single frequency machine at either of those two frequencies. 15Khz will be a better choice for finding small gold items, including most jewellery. It will provide better sensitivity to thin hammered and cupro-nickel, and provide more accurate discrimination for targets in the foil through pulltab range. 3Khz will be preferable for finding larger copper and silver coins, and will provide improved discrimination in the screwcap through Two Shilling or Half Crown range. It will also be less salt sensitive.

(Source:- Whites information leaflet, with some modification for UK related objects)

# THE SKIN EFFECT AND ITS CONSEQUENCES.

The multi-frequency detector exploits a phenomena called the Skin Effect. It is an electrical function that occurs when an alternating current is caused to flow in any conductive material. That current can be generated by:-

(1) Connection to an AC voltage generator.

(2) Or indirectly by 'induction', via a source of alternating magnetic flux enveloping the material.
Our metal detector's search head is an example of the latter source.

Now any conductive material possesses several characteristics, which together provides a unique identity of its'electrical profile'.

They are:- Its Specific Resistance
Its Permeability.
Its DC Resistance.
Its Inductance.

When an object is formed from a conductive material, its mass will have a characteristic D.C. Resistance. This is dependent on the shape and size of the object.
The characteristic of Inductance emerges under A.C. conditions, and is governed by the object's permeability and the applied frequency.

The modern multi-frequency detector with its micro-processing power can now apply its mathematical capabilities to do many things with the raw signals reflected back from such an object, (or substance). One of its first tasks is to examine the signals and determine the amount of undesirable content from substances like soil minerals, black sand or salt water etc. Then by due process, subtract them from the total signal. This leaves us with relatively clean target data. Now it can be analysed for its resistive and reactive components. By iterative mathematical processing, information can be deduced which provides for better discrimination and possible categorisation of what the object ' looks like'. Originally, with single frequency methods, one could only obtain a 'silhouette' of the target, so to speak. Now with dual frequencies they can correlate the corresponding multi data, and add an extra dimension to the results. Some manufactures are now making claims relating to these extra capabilities, but I cannot comment on the validity or practicality of such, because I have not owned those detectors.

Several years ago I did have fleeting opportunities to try one that displayed 'size'. It was quite a novel feature, but no more than a secondary aid. It never influenced my decision whether to dig a target or not, so it may have been more of an attractive 'distraction'. ( like our icon function ) (That's a thought, why not have programmable icon facilities on our DFX?)
Another well known machine claims that it can indicate an item's ferrous content, even in objects that don't contain ferrous material...?
I think their advertising spin doctors may have 'boobed' over that one. Surely they meant the object's inductance?
Good detectors don't need that kind of hype. Let their performance prove their worth. I prefer it when they explain the improvement of analysis, in more meaningful terms that a detectorist can appreciate.

Nothing I have seen so far relating to data displays can match the White's Signagraph. Even so, I have an idea that I think will enhance its informability about what is 'going on.' Hopefully, I may get the opportunity to talk to Mark Rowan, (White's Chief Engineer U.S.A.) and share my thoughts on the matter.
Over 25 years ago I discovered a phenomena relating to metal detector techniques which I think theoretically is significant. My dream is to be able to reveal it to a competent design team who are willing to examine and appraise its feasibility, and accord me any patentable rights.
Now that I'm retired and my family are grown up and independent, then maybe I can pursue that dream.

Enough of the day dreaming. Let's get back to reality.

You may have the question in your minds as to whether a detector which uses two discrete frequencies can out perform one that supposedly uses 17 or more frequencies, in terms of **capability** and **usability ?**

Sensible question.....Answered in terms of overall functionality.....**YES !**

Now, you will obviously demand that I justify my bold claim.
Well, turn the page and let's see if I can rationally do that for you by using a criteria list that should be acceptable to any detectorist.
(1Q) The machine shall be light and comfortable to use.
(2Q) The machine shall be usable on both land and wet sand

(3Q) The machine shall be versatile enough to accommodate all potential user's personal preferences of audio and visual presentation.
(4Q) The machine shall be functionally 'fast' to use on target recovery.
(5Q) The search frequencies shall be efficient and adequate for the task.

How does our DFX compare with the competition in these categories?

(1A) **The DFX wins for its lighter-weight and comfort of use.**
(2A) It **equals its top competitors** in this category in general situations. **It OUTPERFORMS them in heavily contaminated situations.**
(3A) **None can match a White's DFX accommodating capabilities.**
(4A) A DFX user can have his target out and onto the next one, whilst the opposition is still sweeping, or trying to read their small screen.
(5A) The answer to this section is involved and subjective.
Competitors claim that their use of 27 harmonics is superior.
I accept the theory, but question the practicality of such claims.
You can transmit 27 'harmonics' but that's not 27 times better.
"*You can fire a load of buck-shot at an elephant,*
*but a couple of .303's will do a better job*"
Why does such a machine null and the Whites DFX keep pulling out the targets, when both are together in heavy ferrous conditions?
The bottom line in multi-frequency usage is not to idealistically use more harmonics, unless you can **effectively** make use of them,
.....*or find a better method of processing them.*
The DFX puts its processing power into those harmonic frequencies which are sufficient for the targets sought, and the terrain searched. Then it does a better job of processing them.

The subjectivity of answering number 5's criteria is in all honesty only provable by the machine's actual performance in the field (or on shore). By that yard stick, I will give you my measured answer. Through genuine experience and trials, I personally contend that the DFX is the finest detector for overall performance, available today. I stake my reputation on that opinion. I am willing to try and prove it by the ONLY means possible,
**that is by putting the DFX over the same target as your machine.**

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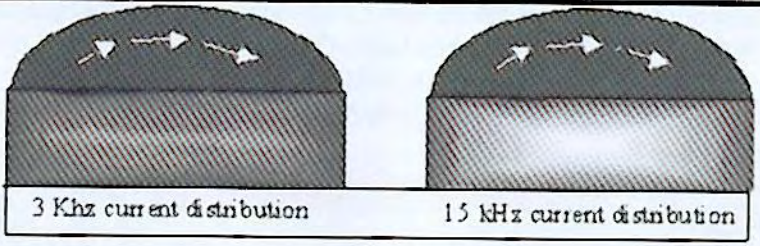
for reference only.

| | Conductance | Skin depth | Skin depth |
|---|---|---|---|
| Frequency hertz | >>>>>>>> | 2,980 | 14,910 |
| Substance | @ 20C | in milli-metres | in milli-metres |
| Silver | 6.10E+07 | 1.18 | 0.53 |
| Copper | 5.70E+07 | 1.22 | 0.55 |
| Gold | 4.10E+07 | 1.44 | 0.64 |
| Aluminium. | 3.50E+07 | 1.56 | 0.70 |
| Tungsten | 1.80E+07 | 2.17 | 0.97 |
| Zinc | 1.70E+07 | 2.24 | 1.00 |
| Nickel | 1.30E+07 | 2.56 | 1.14 |
| Brass | 1.10E+07 | 2.78 | 1.24 |
| Phosphor bronze | 1.00E+07 | 2.92 | 1.30 |
| Tin | 9.00E+06 | 3.07 | 1.37 |
| Lead | 5.00E+06 | 4.12 | 1.84 |
| German silver | 3.00E+06 | 5.32 | 2.38 |
| Silicon steel | 2.00E+06 | 0.15 | 0.07 |
| Cast iron | 1.00E+06 | 0.13 | 0.06 |
| Carbon | 3.00E+05 | 16.83 | 7.53 |
| Graphite | 1.00E+05 | 2.06 | 0.92 |
| Sea Water | 4.00E+00 | 2061.56 | 921.65 |




DARKER areas are meant to show the STRONGER currents, whilst the the LIGHTER areas imply a REDUCED current flow.

The simple illustrations above are intended to convey some exaggerated semblance of what happens say to a Georgian copper Cartwheel penny when subjected to the two frequencies of interest, from the many contained in a DFX's pulse transmission train. The object could equally be a silver Halfcrown ( large coin, thick ,and of high conductivity). The picture would differ if we substituted a hammered copper or silver coin, because although made of the same metals, they would be much thinner in cross section.

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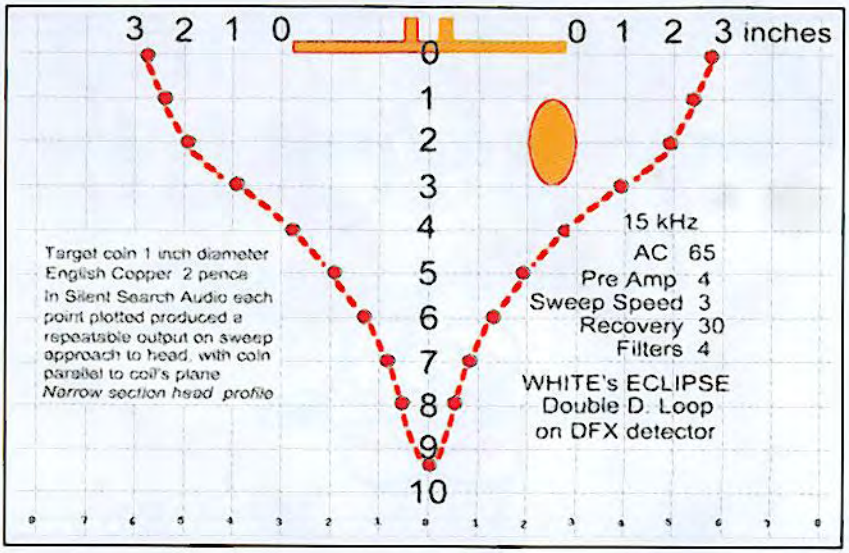
## The Double D Eclipse Loop

This is the loop that has found great favour with DFX owners, especially in the USA. Indeed it is an excellent tool and complements the 950 standard loop. It provides good coverage 'fore and aft' and fine target separation. In their enthusiasm to praise its performance there are those who are making comments to the effect that it is a better loop than the 950. This generality should be tempered with some thought. On sites that are contaminated with undesirable targets or ferrous contamination then the Elliptical coil is the best compromise for overall efficiency. In 'cleaner' situations then the 950 should outperform the Elliptical for raw depth.. It is the ground condition which basically is the critical factor, with target size and trash contamination only adding to complicate matters.

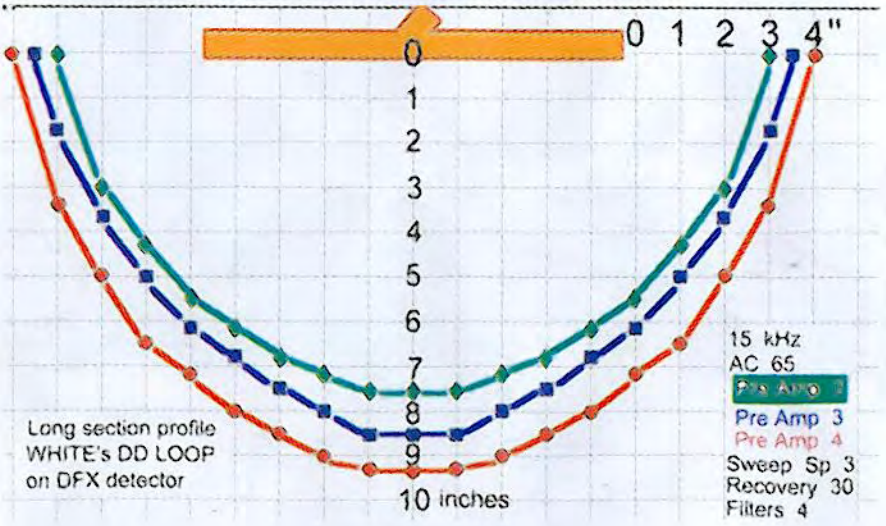
Using the Elliptical certainly errs on the better side of uncertainty, for who has ground-radar vision ? But in the case of relatively 'clean' U.K. agricultural soils the 950 should be the one for outright depth.
In this area of comments on these two heads one hears the phrase "that the elliptical is more stable than the 950". Now the majority may view that as a criticism of the 950, whereas the more astute may accept that simply as a fact of functionality. Obviously, the larger the area of a head the greater its capture of area and theoretical depth. Whilst a target's size remains constant, any unwanted sources of ground or electrical signals will increase, to our disadvantage.
Also, a 'wide band' head will be relatively more susceptible to 'interference'.

My personal experience with both coils has been uncomplicated and without criticisms. Presently I do favour the Elliptical simply because raw depth is not my priority, but rather the need for target separation on our badly contaminated shorelines. It is impossible to be adamant about what the outcome would have been if I had used the 950 head instead of the elliptical, but the latter has performed brilliantly. I can tell you one thing, that is when hunting in pools on the beach the 950 is easier to swing in water, and I believe I get more depth in 'clean' situations. Also, if I know that I will be heading off shore to hunt, I would certainly be using my 950....no doubts about that.




Look at the narrow profile response of the Elliptical Head and realise how it can be so effective at separating targets. Any multiple targets in the 3 to 4 inch range can be sorted out by raising the head appropriately. Realise also, that targets in the 3 to 4 inch range will produce a 'wider' audio than those at 5 to 9 inches. The compromise may be to 'lengthen' the deeper targets by lowering your 'Recovery Rate' adjustment, and compensating that on shallow targets by raising the head after initial location.

Below, you can see the 'coverage' provided by the broadside profile.



# Congratulations to the White's Team


*Only the best will do.*
*Only the best for You.*
*Better than all of the rest.*
*Yes*
*That's the DFX.*

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With grateful thanks to my wife Betty, for all the cups of tea and biscuits that sustained me whilst preparing this booklet. Also to my friends whose comments on their DFX experiences, were invaluable. They prove that Whites have built a winner. A unit matchable to each individual's aspirations, and style of detecting. Stuart Rainford, Wirral. Ian Hinton, Norfolk. Jeff Cohen, North Wales. Dave Conner, Oxford.
Thanks also to all those in the U.S.A. and U.K. for their e-mails. Maybe one day we will meet by chance, and share a tale or two. "In a corner of some foreign field, or that place that is forever.... England." ... Matt.

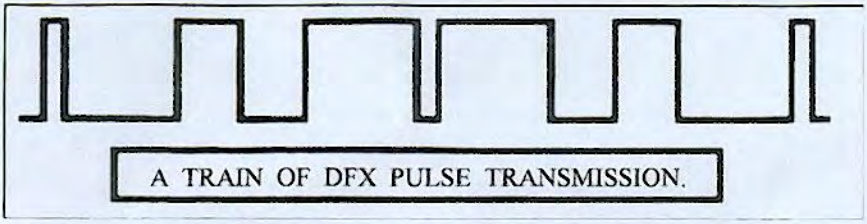

Some enchanted evening, you may find your....

*Together again. The old wedding ring and the engagement ring, recovered on separate evenings, from ten inches of black silt. Probably early 1900's. Rolled gold.*

**The DFX's performance in wet sand is proving to be awesome.** *Matt R*

## WHAT DRIVES THE DFX SEARCH HEAD ?

The driving waveform for the DFX is a repetitive square-wave pulse train as illustrated below

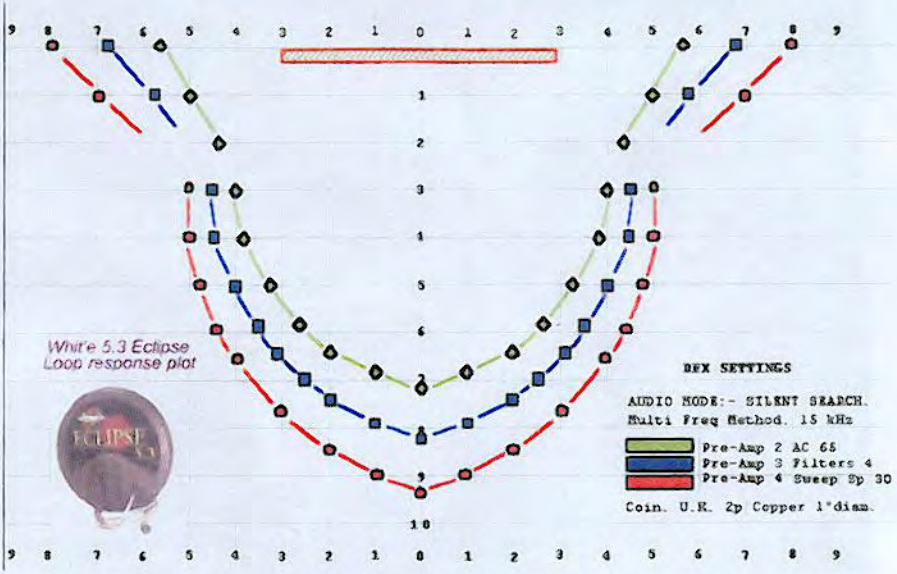


A TRAIN OF DFX PULSE TRANSMISSION.

This complex power signal is the result of mixing two basic frequencies. They are 3 kHz and 15 kHz (approximately). The resulting transmission contains many harmonics, but Whites only process two of these. The two chosen, are very effective for the targets normally of interest to the majority of detectorists. By choosing two discrete frequencies, White's designers are able to program their microprocessor to not only balance out the Salt water / sand effects and general ground mineralisation, but also mathematically analysis the target's returned signal and glean information about its characteristics. I suspect that the process deduces such things as target dc resistance, inductance and skin depth. With such factors resolved, the target data can be compared to stored data, and a reasonably assessment made as to what material is involved. This procedure requires the data resulting from at least two known frequencies relationships.
Ferrous targets can more easily be recognised by their poor data / frequency relationship. This is due to the high permeability factor involved. ( the relative permeability of iron is often in the hundreds compared to one for most non ferrous metals). Some ferrous targets can still fool even these techniques. This is due to their shape factor, and compounded by the objects orientation to the search head's plane. So don't criticise your detector when it positively identifies nails, long thin twisted steel wire or ferrous items with length to breadth ratios that exceed 10 to 1. ALL present detectors suffer this effect to some degree.

MULTIPLE FREQUENCY TRANSMISSIONS.
A non technical person may find the concept of being able to transmit more than one frequency at the same time, difficult to understand. One can relatively illustrate this by the action of tapping a wine glass. This causes it to mechanically vibrate, generating a fundamental tone and several 'overtones' or 'harmonics'. The richness of the sound ( the timbre) is due to the extra harmonic tones. Likewise we can electrically pulse our search head with a square wave and generate a fundamental frequency, and many related harmonics.

## White's 5.3 " Loop search pattern




If you were to examine the tool box of a real craftsman, you would find more than a big hammer and screwdriver. He complements his skills and experience with a variety of tools, all of which makes him more efficient and productive. I believe the same approach can be applied to metal detecting. One solitary search head for all occasions can find you disadvantaged when situations like rocky beaches or heavily trash contaminated areas shield the treasures beneath them. I have both the Elliptical DD and the round 5.3, so now detecting is really becoming a more absorbing and fascinating challenge. Not only is my DFX allowing me to hunt anywhere, but I can exploit the ability to tackle areas that are not physically or electrically accommodating to the standard 950 loop. The 950 is like a big thoroughbred horse, it likes the clean, open situations to show its power and pace. But when you need to search the crevices and 'creeks' of many contaminated sites then a smaller 'horses for the coarse' approach will prove more beneficial. I have found that with this 5.3" head, I am still able to punch down depthwise with little loss compared to the size-ratio of it with the 950. My special need is for a head that I can skim over and between the rocks on the beach. Despite forced stand-off conditions, this head allows me to run the DFX extremely 'Hot' and so greatly compensates matters. Equally important in trashy conditions I have a more focused search pattern. In heavily mineralised ground the 5.3" should provide at least a four fold improvement in signal to ground effect factor.....As the lady says, "Size matters"


The above picture shows how the DFX reached down into a deep black gritty layer on one of our local beaches. Note the Frequency Method. CORRELATE and the head being used. The Double D. Elliptical. Below , another deep find

*That old White's magic*

Beach. 6 inches of sand on a clay base / boulders. GEB 134 or DC phase -40

CORRELATE

Audio Disc. & VCO on. AC 65. DC 40. Pre-Amp 4. ACCEPT +1 to +95 Sweep 3. Recovery 30 Filters 4. Pre-Amp 4. Bottle 4. Hot Rock. 10. Target embeded in clay, with 4 " of sand over it. Good sound. VDi 65 solid. Silver body is eroded but all stones intact.The centre 'ruby' is very firery.