

THE SOVEREIGN

MINELAB'S COMPLETE COIN, BEACH and RELIC
TREASURE HUNTING MACHINE



REG. TM

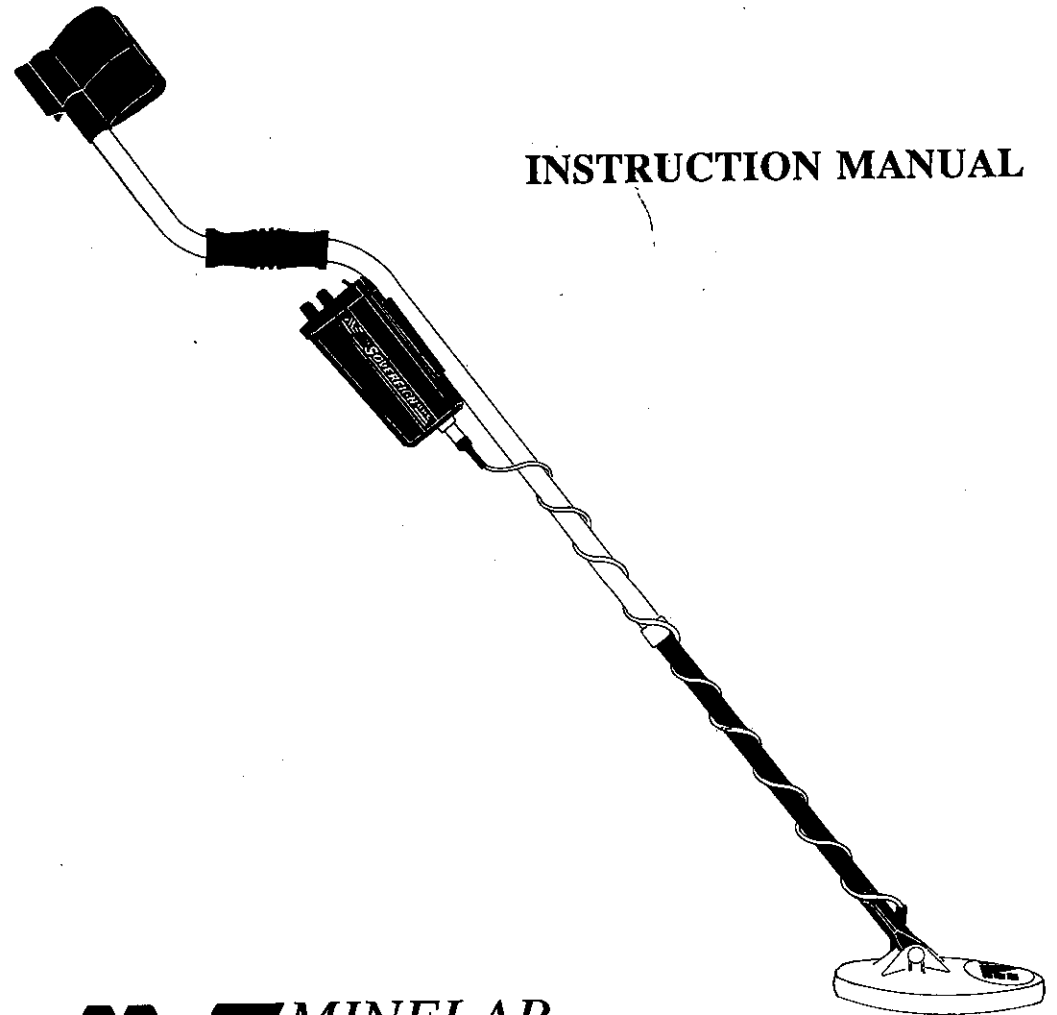
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INSTRUCTION MANUAL



MINELAB
ELECTRONICS
PTY. LIMITED

OPERATING MANUAL FOR "THE SOVEREIGN"

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1. INTRODUCTION

Congratulations for buying Minelab's new metal detector, "The Sovereign". The employees here at Minelab are confident that "The Sovereign" is the best discriminating coin/treasure detector available on the market and appreciate your decision to select our product and wish you every success and enjoyment in your searches.

"The Sovereign" is designed to be a practical detector with few false signals, particularly if you are in "Auto" and "Discriminate" mode. Hence "The Sovereign" accurately discriminates at depth in a hostile ground environment.

"The Sovereign" is the first of the latest generation of metal detectors from Minelab featuring Minelab's new technology called Broad Band Spectrum or BBS for short. This revolutionary new technology which is unique to Minelab has already been awarded patents in the USA, Canada and Australia and has several pending. Unlike other metal detectors which operate at just one frequency, or even the "newest" two frequency machines, "The Sovereign" actually transmits over a wide spectrum of frequencies. The resulting signal that is received from a target buried in the ground is processed by a microprocessor that removes interference caused by ground mineralization which limits the depth at which targets can be found, and often results in inaccurate target identification. The remaining signal can then be analysed to determine the actual composition of targets even if they are deeply buried, or if the ground is mineralized or salt water is present. Thus it is the only detector that can simultaneously reject both salt and mineralization while at the same time accurately discriminating the target, making it ideal for black sand beaches and many desert areas. In many areas that are highly mineralized and have been heavily searched in the past, "The Sovereign" will prove that many of the valuable targets are still there waiting for a Treasure Hunter with the proper detector to locate them.

Because of BBS, the features and general detecting properties of "The Sovereign" are different from conventional detectors and we recommend you read all of this manual even if you are experienced in the use of metal detectors.

2. INTERNAL ELECTRONIC OPTIONS OF "THE SOVEREIGN"

"The Sovereign" has two internally selectable options which your Minelab dealer can set for you. It is important to understand this choice so as to arrange the detector to best suit your requirements.

Option 1. Silent Search or Audible Threshold in the Discriminate Mode

While detecting in the discriminate mode (i.e. searching for coins, rings and the like), you may either wish to search with no background tone, with the detector only producing a "beep" when a target is located; or, you may prefer to have a slight continuous background tone, which will give you more information about detected targets. Minelab recommends the latter. The decision is a matter of personal preference and your Dealer can set this option for you.

Option 2. Audio Modes

"The Sovereign" has two dealer selectable audio modes:

- a) VARIABLE tone target ID
- b) FIXED tone target indication.

a) In variable tone target ID, the tone of the audio signal will change, as well as the volume, to help identify the object that has been detected, ie for a ferrous object the tone will be very low, for an Aust 5c piece or a Nickel the tone will be higher, for an Aust 10c piece or a Dime the tone will be higher again and a gold sovereign will be even higher. If the background threshold in discriminate, as described in Option 1. above is selected, then the tone will be that of the last object detected until a new object is found. The tone can be reset to a "medium" tone by switching from "DISCRIMINATE" to "ALL-METAL" and back to "DISCRIMINATE". The variable tone target ID is continuously variable from low tones of about 80Hz to high tones of about 300Hz.

b) In fixed tone target indication, the tone of the audio signal will remain constant as the volume increases to indicate a target, regardless

of the object detected. The tone frequency can be selected by the dealer.

Minelab recommends the use of Variable tone target ID as this will provide the operator with much more information on the target detected.

3. UNPACKING AND MECHANICAL SET-UP

1. Unpack your Sovereign and check that the following parts are included: Instruction Manual, Field Guide, Warranty Card, Control Box, Main Shaft, Arm-rest, Search Coil Assembly and Cable, Lower Shaft, Hipmount Bag, 2 Velcro Tabs, NiCad Battery Pack, Battery Charger and Skid Plate (NOTE: the skid plate is attached to the coil at the factory). Keep the packing carton in case you need to repack the unit at any time in the future.
2. Fill in the Warranty Card and mail it.

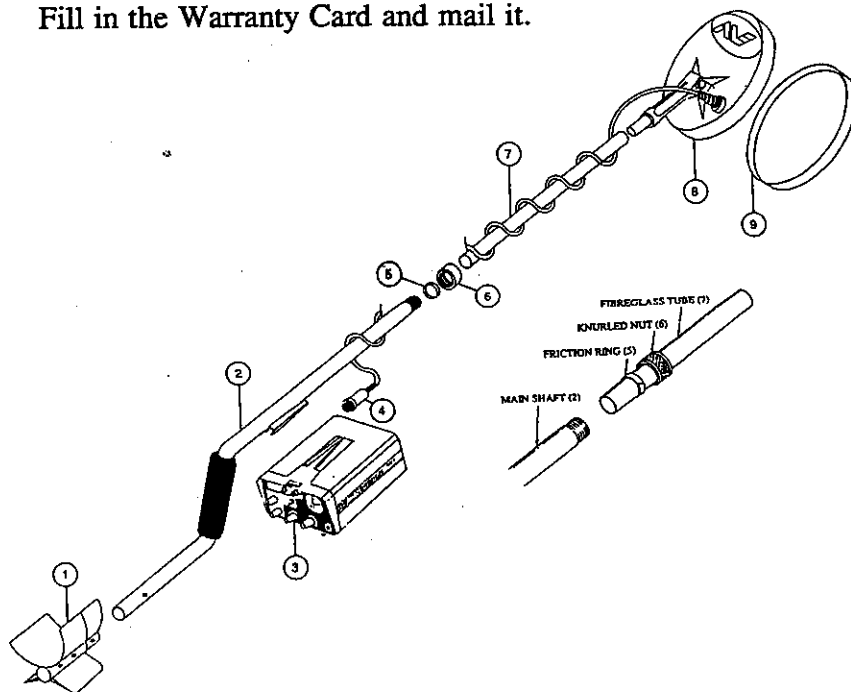


Figure 1. Sovereign Assembly Diagram

3. Slide the Arm-rest (1) (with support fins towards the rear) over the back of the Main Shaft (2) so that it "clicks" firmly at a comfortable position for the length of your arm.
4. Slide the search coil assembly (8) into the lower fiberglass tube (7), ensure it "clicks" into place.
5. Remove friction ring (5) from fiberglass tube (7) and discard tape.
6. Remove knurled nut (6) from main shaft (2).
7. Slide knurled nut (6) onto fiberglass tube (7), then slide friction ring (5) onto fiberglass tube (7).
8. Slide fiberglass tube (7) into main shaft (2) so that it clicks to a convenient length for your height. Tighten knurled nut (6) by hand so that it traps the friction ring (5) against the main shaft. (Do not use pliers to tighten the nut!).

9. Shaft Mounting

- a. Attach the Control Box (3) to the Main Shaft (2) by sliding the wedge clip on the top of the control into the receiving bracket on the main shaft. Push it firmly in until it latches into place.
- b. Wind the Cable from the Search Coil (8) around the shaft fairly tightly (but without strain) and connect and screw the Cable Plug (4) to the socket on the Control Box (3). Use the "velcro" tabs supplied to secure the cable to the shafts.

10. Bag or Hip Mounting

- a. Place the control box in the bag supplied.
- b. Wind the Cable from the Search Coil (8) around the shaft fairly tightly (but without strain), leaving enough cable free to allow the detector to be operated without straining the cable, connect and screw the Cable Plug (4) to the socket on the Control Box (3). Use the "velcro" tabs supplied to secure the cable to the shafts.

11. Install the batteries (see Section 8. Batteries and General Maintenance) and you are ready to start searching.
12. You should use high quality headphones while searching. The loudspeaker is less sensitive and without headphones your ears are not protected from stray noises. Battery life will also be extended when headphones are used.

4. THE CONTROL PANEL

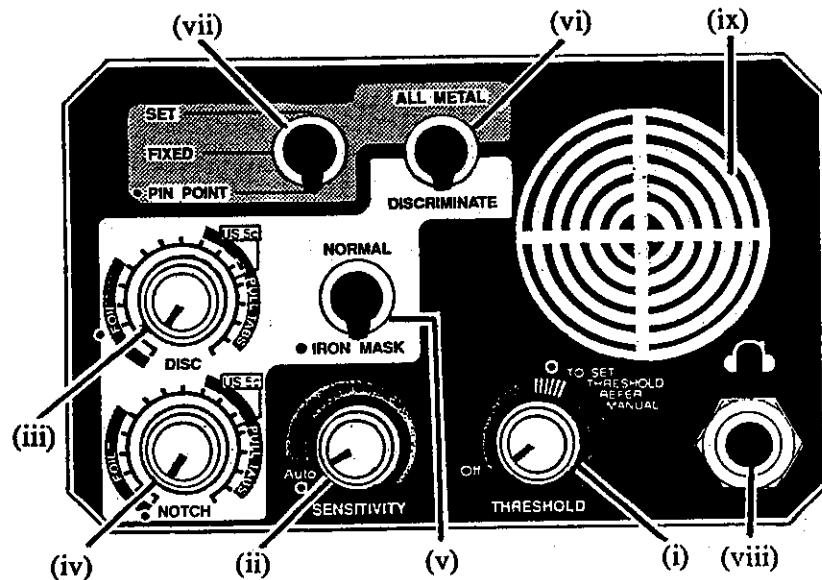


Figure 2. Sovereign Control Panel

Briefly the functions are as follows:-

- (i) **Threshold**
The threshold sets the audio volume for clear sharp signals.
- (ii) **Sensitivity**
Sensitivity increases the range of the detector and should be adjusted to suit the ground conditions.

- (iii) **Disc.**
The setting of this control determines the broad range of objects that are accepted and rejected by the detector.
- (iv) **Notch**
The Notch Discriminator rejects specific objects depending on its setting.
- (v) **Normal/Iron Mask Switch**
The Normal/Iron Mask switch determines the degree to which objects are rejected or accepted, in the presence of nearby iron.
- (vi) **Discriminate/All Metal Switch**
This switch setting determines whether or not the detector will detect all objects including iron or selectively reject objects.
- (vii) **Set, Fix and Pinpoint Switch**
These switch settings apply when the detector is in the all metal mode for pinpointing or all metal searching.

In addition the headphone socket (viii) and the speaker (ix) are located on this panel.

A full description of the battery container, which is located on the underside of the box, is given later and describes battery charging and replacement.

The operation and setting of each of the controls located on the panel will be discussed in the section on the basic operation of the detector.

5. QUICK SET-UP GUIDE

"The Sovereign" has been designed to be a very easy detector to use, without compromising its performance. This is achieved through the use of microprocessor control and the unique features of BBS. A quick set-up procedure is as follows:

Turn the "THRESHOLD" knob clockwise until the detector "clicks on" and then adjust the knob as follows.

First make sure the search head is kept still during this setting, and turn the "SENSITIVITY" knob fully clockwise. Switch to "ALL-METAL" and "PIN POINT", and turn "THRESHOLD" control clockwise until the background audio tone is just heard.

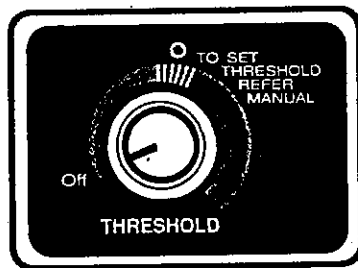


Figure 3. Threshold Control

Now the threshold is correctly set up. Note: a small twist of the "THRESHOLD" knob counter-clockwise from the threshold setting will turn the sound off, whereas a small clockwise twist will increase the loudness of the background tone; that is, the knob is set at the "threshold" between the background tone being audible and not. Note also that the preset marks near the threshold position are only approximate. This setting may need to be adjusted from time to time. For the silent threshold option, the background tone will be present when the switches point to "ALL-METAL" and "PIN POINT" but the detector will become silent when you switch to "DISCRIMINATE". For the background threshold option, the background tone will change very little when you switch between "ALL METAL" and "DISCRIMINATE" (with "PIN POINT" selected). Details of how the detector behaves in these two modes will be given later.

Turn the "SENSITIVITY" control fully counter clockwise until it clicks into the "AUTO" position, or if using at the beach turn the "SENSITIVITY" control as counter clockwise as possible without causing excessive false signals. •

If you want to find coins, set the remaining switches and knobs at the preset marks (red dots on the front panel). However, for best results

and to locate other objects such as gold nuggets, we recommend you read the rest of this manual carefully.

6. "BENCH" TESTING

After you have assembled your new metal detector, you should perform a bench test to see how "The Sovereign" responds to various targets that you may experience in the field. In order to check the response of "The Sovereign", you will need to obtain the following items:

- Iron nail - 2 inches long
- Small ball of tin foil (called "tin" but it is actually aluminium)
- Pull Tab with the wing attached
- Nickel
- Gold Ring (wedding band, class ring etc)
- Copper Penny (pre-1982)
- Zinc Penny (post-1982)
- Quarter.

Place "The Sovereign" on a table with the search coil at least 3 feet away from any metal objects. SET ALL CONTROLS TO PRESET MARKINGS and then turn SENSITIVITY knob clockwise until no false signals occur. Turn both the DISCRIMINATE and NOTCH controls fully counter clockwise. As each of the test items are passed in front of the search coil, "The Sovereign" will produce a positive response, except for the nail. Turn the DISCRIMINATE control to the PRESET mark, and you will notice that the iron nail and the tin foil will be rejected. As the Discriminate control is turned clockwise, more targets will be rejected; however, as pull tabs are rejected, so will be nickels and possibly gold rings as well. In order to avoid this from happening, the NOTCH DISCRIMINATE circuit has been added to "The Sovereign".

To bench test the NOTCH DISCRIMINATE of "The Sovereign", turn the Discriminate control to the preset mark, and slowly turn the Notch control in a clockwise direction while passing a pull tab past the search

coil. As described in section 7.0, the Notch control will move a window which can be set to reject pull tabs while still accepting nickels and most gold items such as rings. When the pull tab no longer produces a positive response, pass a nickel or a quarter past the search coil. Notice that the pull tab does not produce a response while the other targets still do. You can use the same technique to selectively reject any target that you may wish to ignore in the field. This is done by leaving the Discriminate control at PRESET, and increasing the Notch control while passing the search coil over the target to be ignored until a response is no longer heard.

During the bench testing, note the response "The Sovereign" produces when a specific target is passed by the search coil. The response to a target in the ground will be similar to the response you experience in the bench test. Note that the response to a nickel will be lower in pitch than a zinc penny which will be lower than a quarter. The more conductive or higher the target falls on the scale shown in Section 7.0, the higher the pitch it will produce when detected by The Sovereign.

Repeat the testing of the various items at different distances from the search coil and note the difference in the responses received. The response to actual targets in the field will be similar, and becoming familiar with the type of response that "The Sovereign" produces for a specific target now will greatly enhance your success in the field.

7. BASIC OPERATION OF "THE SOVEREIGN"

7(a) USING THE DETECTOR

"The Sovereign" consists of an electronic control box and search coil attached to a shaft. You hold the shaft and sweep the search coil over the ground in order to find buried metal. The control box may be either mounted on the shaft or carried on your hip in the bag supplied with the detector. Make sure the cable is not excessively strained. The control box houses a loudspeaker which makes a sound when you pass the search coil near a piece of metal within its detection range. We strongly recommend that headphones are used instead of the loudspeaker, as this increases the battery life and also improves the

operator's ability to critically analyze the sound. The loudspeaker becomes disconnected when the headphones are plugged in. "The Sovereign" is a "motion" detector which requires you to move the search head in order to detect metal objects; a stationary head will not cause an audio response. The search coil should be moved from side to side in a sweeping action with the bottom of the search coil parallel to the ground and AS CLOSE TO THE GROUND AS POSSIBLE. Maximum depth will be achieved when the search coil is touching the ground.

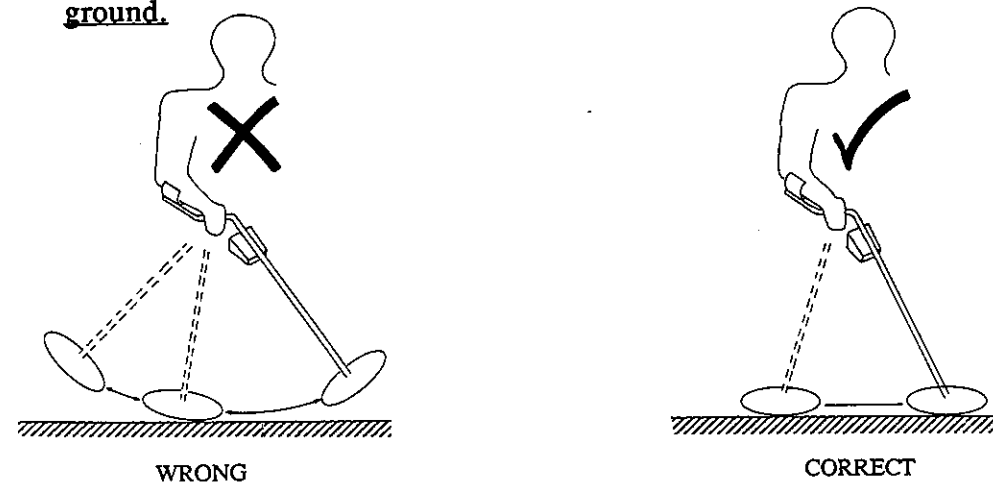


Figure 4. Coil Sweep Action

Those new to metal detecting sometimes make the mistake of passing the search coil several inches above the ground without following the contours of the ground, thereby reducing the detection depth during the sweep of the coil. Also make sure that the search coil does not come off the ground at an angle at the end of each sweep as you will not be searching the area effectively at this point. (See Fig. 4). Each sweep of the search coil from one extreme to the other should be 4 to 5 feet (1.5m) and should take about 2 to 4 seconds. If you pass the head over a piece of metal, the loud-speaker (or headphones if used) will make a sound which will be loud and strong when the metal is close to the head (e.g. a coin an inch away from the search coil centre), and softer when the metal is further away (e.g. a coin 8 inches away from the head). With practice you will be able to determine the approximate depth of targets, which will make recovery easier.

The depth below the ground's surface at which you can find metal entirely depends on the type of metal, its size and orientation in the ground, and the composition of the ground. For example a small coin such as a US 10 cent may be found and identified at between 0 and 8 inches, whereas a US 50 cent between 0 and 10 inches. Under favourable soil conditions the US 10 cent may be found and identified at 9 inches.

Ground containing complicated chemistry which interferes with the detector's ability to sense and discriminate objects is called "mineralized ground". All ground is, in fact, mineralized, but the degree of mineralization can vary considerably from one place to another. "The Sovereign" is particularly good in eliminating the effects of this mineralization.

Note that the search coil is sensitive in all directions, and thus metal moving near the search coil whether above, near the side or below will produce a response.

7(b) CONTROLS OVERVIEW

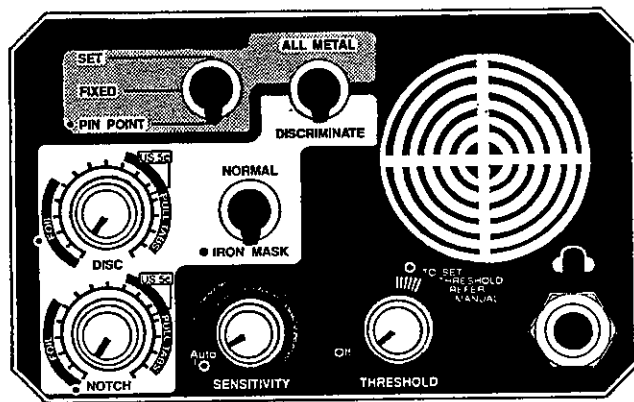


Figure 5. Sovereign Control Panel

Note that the controls on the panel are arranged in groups which are layed out on grey, white and black backgrounds. This layout is used to indicate the interaction between the controls which is as follows:-

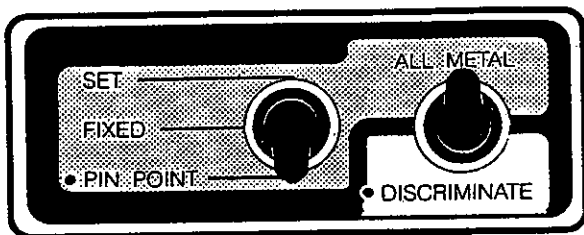
- (i) The SENSITIVITY and THRESHOLD controls operate at all times and independently of any of the other control settings.
- (ii) The DISCRIMINATE and NOTCH control knobs together with the NORMAL and IRON MASK switch operate when the ALL-METAL/DISCRIMINATE switch is set in the DISCRIMINATE mode. THEY ARE INOPERATIVE WHEN THE ALL-METAL/DISCRIMINATE SWITCH IS SET AT ALL-METAL.
- (iii) The SET/FIX/PINPOINT switch operates when the ALL-METAL/DISCRIMINATE switch is set in the ALL-METAL mode. THEY ARE INOPERATIVE WHEN THE ALL-METAL/DISCRIMINATE SWITCH IS SET AT DISCRIMINATE.

"The Sovereign" operates like no other detector on the market, therefore the function of the SET/FIX/PINPOINT switch and the DISCRIMINATE mode is unique to this detector. "The Sovereign" is NOT simply a GT or FT16000 with discriminator added, it is an entirely different machine.

The detector GROUND CANCELS in the DISCRIMINATE mode and its operation is essentially the same as the setting ALL-METAL and FIX with discriminate added. However, the requirement that it must discriminate in an environment where there may be a large number of buried objects in the ground means that the detector must not ground track in the usual sense of other ground tracking detectors such as the GT or FT16000. If it did, these objects (because of the large number) would upset the ground balance setting. THIS IS A FUNDAMENTAL PROBLEM WHICH HAS NEVER BEFORE BEEN SOLVED, and it is the reason there has never before been a discriminating ground tracking detector on the market. "The Sovereign", however, has overcome this problem in a unique way using the BBS technology, which recognises the ground signals as opposed to object (target) signals and removes them. This is why "The Sovereign" has such a smooth background sound even in mineralized ground. The detector is essentially "ground tracking" in the DISCRIMINATE MODE.

In the following section a detailed description of the operation of each of the controls is given.

7(c) ALL-METAL MODE

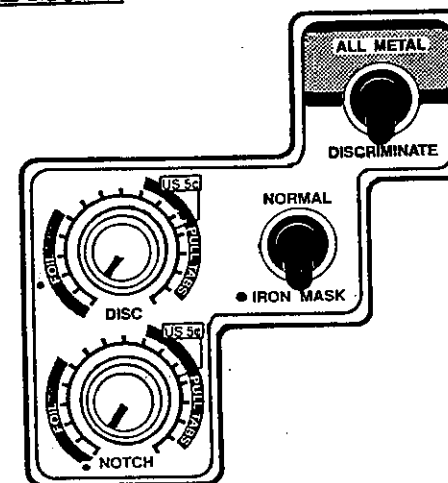


There are three "ALL-METAL" settings selectable by the toggle switch, namely "PIN POINT", "SET" and "FIX". "PINPOINT" as the name implies is the correct setting for accurately locating an object. It is designed to give a clear pinpointing signal as the head passes over the target. "PIN POINT" behaves in a very similar way to other conventional automatic ground balance detectors, such as Minelab's GT or FT16000, though electronically it is entirely different. In essence, with conventional ground balance it is possible to approximately cancel ground mineralization at a particular location but the automatic ground balance setting is readjusted as the conditions for ground balance vary from one location to the next. Competing with the ground are signals from buried metal targets. These target signals are distinguishable from signals produced by the ground through being significantly louder and shorter in duration; that is, they produce sharper "blips" rather than the typically slowly varying ground signals. Hence you need to get used to the types of sound produced by the ground, and be alert for uncharacteristic sounds which may indicate metal targets. Shallow buried targets produce obvious loud responses, but objects buried deep are often very difficult to detect and require a great deal of practice before becoming adept at locating them.

"The Sovereign", however, through BBS technology, has a feature not found on any other detector, namely the "SET" and "FIX" settings which eliminates ground mineralization but respond normally to metal targets. First set the switch to "SET", then pass the search head over ground not containing metal targets until the mineralization sounds are reduced (within a few seconds), then flip the switch to "FIX" and now the detector is ground balanced for the soil in the area in which you are searching with no loss of sensitivity!

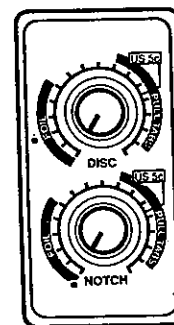
In the "ALL-METAL" modes, best results are obtained if the background threshold is just audible. The THRESHOLD may need to be adjusted from time to time to ensure optimum performance.

7(d) DISCRIMINATE MODE



DISC

Figure 6 shows the "DISC." knob setting that will determine which types of objects respond. In the fully counter-clockwise direction, the detector does not "beep" on ferrous objects but does on all non-ferrous objects. At the fully clockwise stop, the detector will "beep" only on non-ferrous metal objects that are made of good electrical conducting material approximately the size and weight of a US dime or AUS 1 cent piece or above. Unfortunately you cannot tell which metal is a good conductor and which is poor just by looking at it; however, with time and experience with the detector you will "get to know" how various objects respond and build up a library of experience with various objects.



As the knob is turned counter-clockwise, the detector will respond to more non-ferrous objects. For example, a piece of aluminium more than a centimetre long and wide and more than 2mm thick will cause a "beep" at all settings, because it is reasonably large and thick and conductive enough not to be discriminated against.

At the opposite extreme a small piece of fine cigarette packet aluminium foil of a few centimetres wide and long will only cause a "beep" at counter-clockwise settings of about 5 or less in Fig. 6.

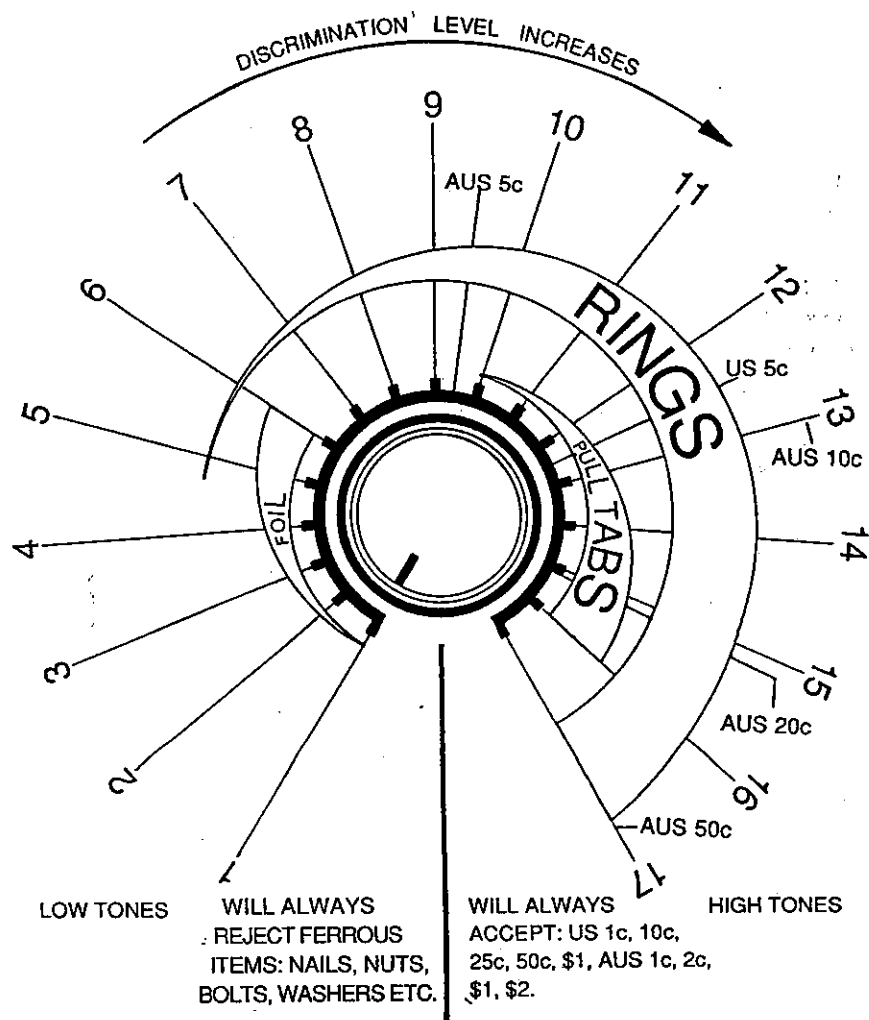


Figure 6. Discrimination Range

Aluminium pull-tabs, rings and various coins fall between these extremes. For example, a pull-tab will not cause a "beep" with the "DISC." knob set fully clockwise but as the knob is turned counter-clockwise, there is a critical setting (between 10 and 16 depending on

the type of pull-tab) for which the tab will "beep" for settings counter-clockwise of this but not for settings clockwise of this critical setting.

As aluminium foil and small bits of metal are commonly found trash objects, the "DISC." knob may be set so the detector ignores these at a setting of about 5. This is shown in Figure 7A. However, if you are looking for solid gold coinage, for example, the discriminate knob should be set fully clockwise.

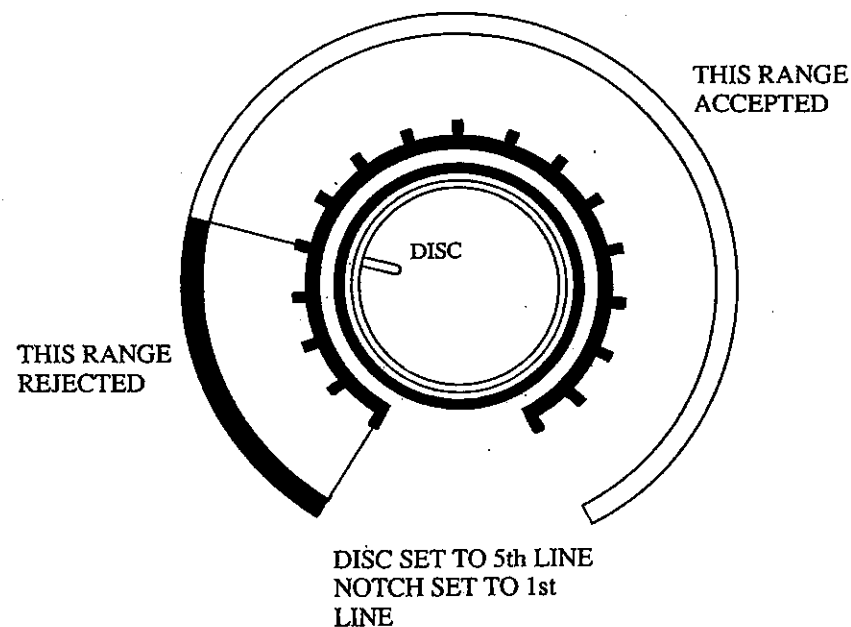


Figure 7A.

NOTCH

The "NOTCH" knob has the same scale as the "DISC." knob but its function is different. Instead of ignoring all objects counter clockwise to the setting and accepting all objects clockwise to the setting, the "NOTCH" only cuts out a small range of metal objects with properties corresponding to the setting of the "NOTCH" knob. For example, if the "NOTCH" knob was set to 13 and the "DISC." knob was set fully counter-clockwise, then aluminium foil, most coins, most rings and

some pull-tabs will cause the detector to "beep", but some types of tabs will not cause a "beep". All highly conductive coins such as Australian 1 and 2 cents, US dime, quarter, half dollar and dollar, and all coins made of solid gold will produce a "beep" for all settings.

Thus if you want to ignore certain pull tabs and aluminium foil, set the "NOTCH" knob to ignore the tab and the "DISCRIMINATE" knob to ignore the foil. Objects more conductive than the tabs will still be detectable as well as metal pieces which lie between the "DISC." knob setting and the "NOTCH" knob setting. This is illustrated in Figure 7B.

It is very important to realize that potentially valuable metal targets may have the same properties as tabs or foil and therefore will be missed for certain settings of these controls. For example, rings cover a huge range and some have similar electrical properties to pull-tabs.

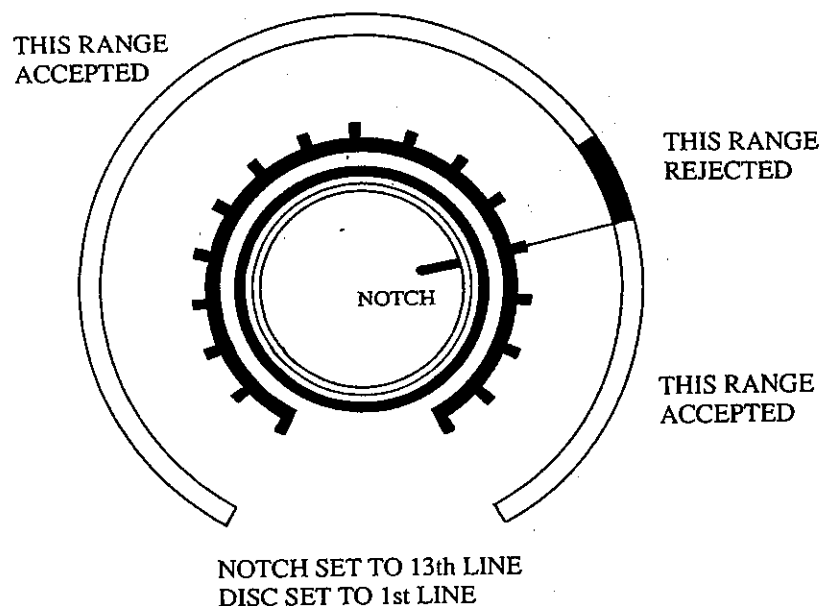


Figure 7B.

Thus if the "NOTCH" is set to ignore certain pull-tabs, then some rings may also be ignored. Thus these controls should only be shifted from their counter-clockwise stops if non-ferrous trash proves to be significantly troublesome. Unfortunately most of what has been written about discrimination and notch rejection often does not even acknowledge this shortcoming or is written in a way that implies 100% accurate discrimination is possible where in fact this is not the case, and some diagrams are misleading and grossly oversimplified; e.g. indicating rings as occupying merely a single location on the discriminate scale.

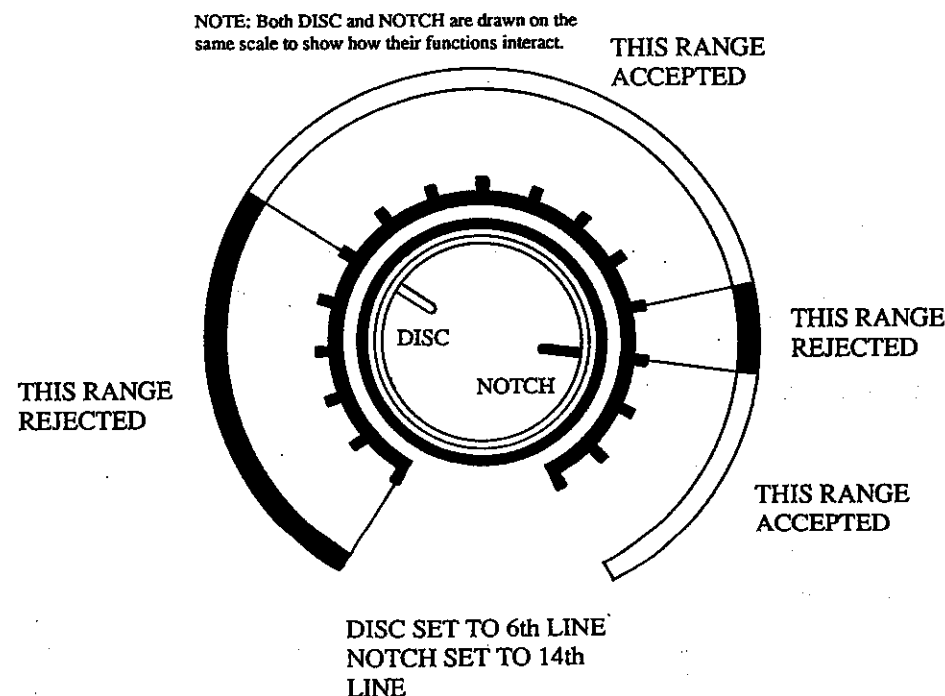


Figure 7C.

In the "DISCRIMINATE" mode with the variable tone pitch option selected, "The Sovereign's" sound pitch varies according to the type of object detected. The pitch corresponds to the scale in Figure 6. The higher the corresponding number, the higher the pitch. For example, a US quarter, half or 1 dollar piece will give a high pitch (number 17), whereas aluminium foil will produce a low pitch (number 1 to 5). Pull-tabs, rings and certain coins will produce an intermediate pitch

depending on the actual object being detected; an Australian 5 cent piece will produce a lower pitch than 10 cents which will be lower again than 20 cents etc. Similarly a US nickel coin will produce a lower tone than a dime. With practice you will become good at guessing the object detected when the detector "beeps". Ferrous objects may cause the background pitch to change to a low pitch, and cause the threshold to momentarily disappear. Discriminated or notched objects will also cause the background tone to momentarily disappear but the returning threshold pitch will indicate the target's normal pitch. At worst they may produce a short "broken up beep". If the silent threshold option is selected, you will not be aware of iron or discriminated or notched out targets - only those targets that are accepted.

If when searching in the "DISCRIMINATE" mode, the detector gives a staccato rapidly pulsed sound, then the detector is being overloaded by a substantial piece of metal extremely close to the search coil. Raise the coil a few inches, and pass over the patch of ground again to check the target. Continue your search normally with the head as close to the ground as possible.

IRON MASK SWITCH



A fundamental problem for all conventional detectors is the recognition of a (valuable) target when located near a piece of iron. If the detector is set to reliably reject the iron under a variety of mineralized ground conditions, then it is likely to reject non-ferrous objects close to iron objects. An example of this would include a coin buried amongst some rusted nails.

If the setting is changed to accept the target and iron combination then it will often respond to the iron with no target present. "The Sovereign", through BBS technology, is particularly good at making this distinction between non-ferrous target and iron, but even here circumstances may arise when in the normal mode the target is "lost" due to the presence of iron. The iron mask switch is designed to overcome this problem depending on the switch setting and the search conditions under which the detector is operating.

In the "IRON MASK" position, the search depth is a little greater and non-ferrous targets may be located more reliably amongst ferrous junk. However, very occasionally, the detector may give a partial "beep" on large ferrous objects.

Most experienced operators will find this quite acceptable given the extra depth and target response of this mode. However, beginners may prefer the "NORMAL" mode which will only give "beeps" on very clearly identifiable non-ferrous objects. Thus, "NORMAL" is recommended for beginners, "IRON MASK" for experienced operators.

7(e) CONTROLS COMMON TO ALL-METAL AND DISC. MODES

Threshold On/Off:

See Section 5 on page 7 of this manual.

Sensitivity/Auto:

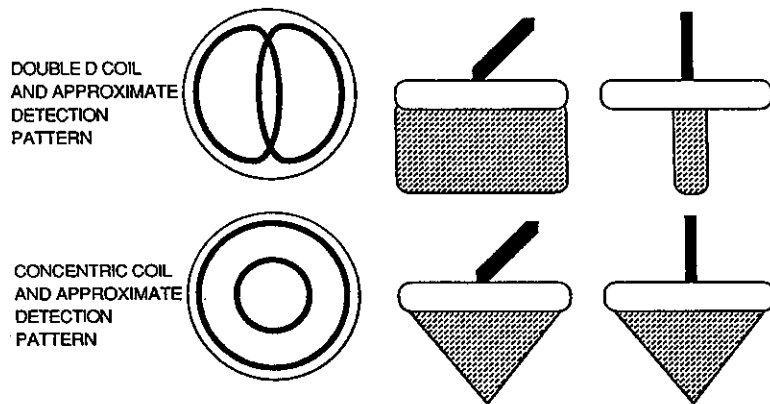


The sensitivity knob increases the sensitivity of the detector as it is turned counter-clockwise. The more mineralized the ground or the higher the electrical interference (if any), the more clockwise this knob needs to be turned in order to reduce false "beeps". For best results and maximum depth the knob should be turned as counter-clockwise as possible WITHOUT causing too many false "beeps" as the coil is swept across the ground.

In the extreme counter-clockwise position, the "SENSITIVITY" knob is clicked onto the "AUTO" position. This position automatically sets the sensitivity setting to the optimum setting for the conditions present. Minelab recommends the "AUTO" setting except for salt water beaches not containing black sands and areas containing high concentrations of metal junk.

7(f) PINPOINTING AN OBJECT

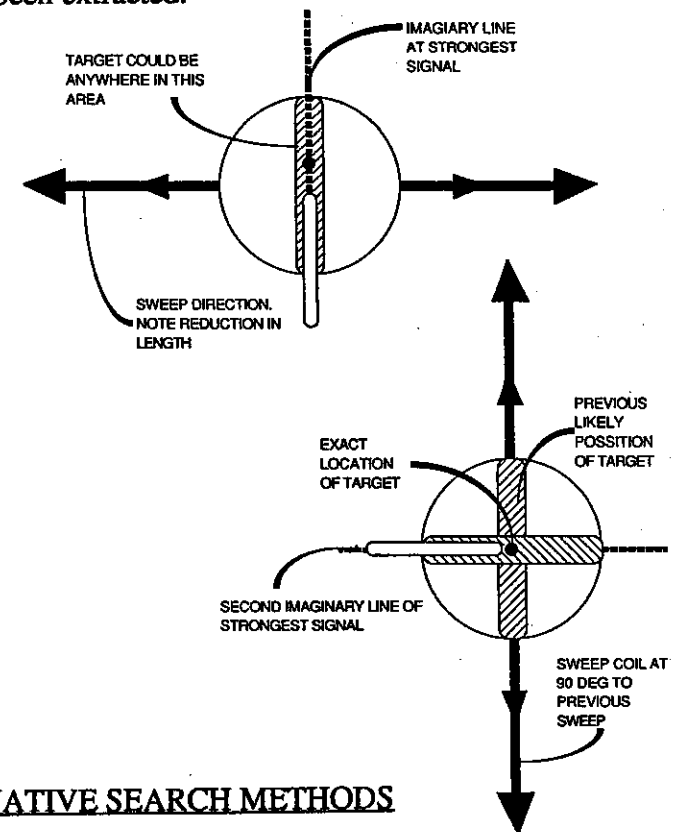
After an object has been indicated by "The Sovereign" it is necessary to accurately determine its position to enable it to be recovered in the shortest possible time and causing the least damage to the environment by digging the smallest possible hole. "The Sovereign" is equipped with a "double D" coil. The Double D coil is sensitive across its complete length, unlike concentric coils which have a cone shaped sensitive area. This allows more ground to be searched in a shorter time as each sweep does not have to overlap the previous one by as much as a concentric coil to ensure all ground is effectively searched.



With a Double D coil we recommend the following technique to pinpoint the exact location of an object.

Note: "The Sovereign" is a motion detector, that is the search coil must be moving to detect the presence of metal. Select "ALL-METAL" and "PIN POINT". Sweep the coil over the approximate position of the target. While looking at the ground note where the strongest signal occurs as the coil is moved over the target. By decreasing the length of the sweeps it should be possible to determine an imaginary line on the ground where the strongest signal is located. As described above, the Double D coil is sensitive across its entire length, so the object could be anywhere on the imaginary line that passes under the coil. To define its exact position repeat the above process but at 90 degrees to the previous sweep. Where the two imaginary lines cross will be the exact position of the object. This enables an object's position to be determined accurately so only very

small holes need to be dug to retrieve the object. Use of special retrieval tools is recommended. Remember to fill in all holes after the object has been extracted.



7(g) ALTERNATIVE SEARCH METHODS

Some operators, when searching an area, feel more secure if the detector responds to all objects in the ground. "The Sovereign" controls are well suited for this search method. Set the detector in ALL-METAL and SET position and pass the head over a patch of ground, which is free of objects, for a few seconds and then switch to FIX. Continue searching in this mode. When an object is detected flick the mode switch to discriminate to test the detected object. If the sound disappears, or at best becomes broken or irregular then you know that the object is rejected (depending on the DISCRIMINATE and NOTCH setting you have pre-arranged). If, however, the sound remains clear then the object has been accepted and the pitch will indicate the nature of the object. To pinpoint the location flick back to

ALL-METAL and PINPOINT and follow the pinpointing procedure given in 7(f).

We suggest you try all the different search methods and decide which suits your method of detecting, in the various conditions encountered, the best.

7(h) TIPS FOR WHERE AND HOW TO SEARCH

There are basically two different areas where coins and valuable artifacts may be found depending on whether you are interested in locating old or modern day metal objects. Old artifacts are likely to be found in places which were once frequented but are now deserted and recent metal objects are to be found where there is current activity. At all times avoid areas saturated with metal trash, for example sites such as old rubbish dumps or scrap metal yards, areas near metal foundries or metal work shops, and industrial sites. Of course it is still possible to find valuable objects at these sites but the rewards are unlikely to be worth the effort; and old rubbish dumps are often full of non-ferrous trash which has been discarded as useless.

For older artifacts, there is no substitute for researching the location of abandoned places; the sources of such information can be from old maps (such as town plans) or from speaking to "old-timers". Try to find old dwellings, ghost towns, abandoned sports playing fields, particularly where the spectators stood, etc.

Modern day artifacts can be found in any place people congregate out of doors, such as beaches, parks, in the spectator regions around sports playing fields etc.

Remember the golden rule, "If you are not locating any trash, you are missing some valuable targets". Discrimination should be used only when the amount of unwanted targets far exceeds the number of good targets being located. If you have the time and patience, reduce the level of discrimination and you will be amazed at what still remains in many "worked out" sites across the country.

Take your time while searching an area. Do not expect to cover an entire site in a short period of time, as the end result will be that you have not covered any of the area effectively. Remember, for

maximum coverage of an area, move the search coil at a sweep speed of 2 to 3 feet per second, and overlap each sweep by at least 50 percent. For complete coverage, turn 90 degrees and re-search the area to ensure no targets have been overlooked. While this may seem time consuming, would you like to see the treasure hunter behind you find a gold coin that you just missed?

8. BATTERIES AND GENERAL MAINTENANCE

"The Sovereign" comes equipped with nickel-cadmium (NiCad) rechargeable batteries. These batteries can be recharged which can save you a considerable amount of money instead of replacing the standard alkaline batteries.

Before initially using "The Sovereign", it is recommended that you charge the batteries for 10 to 12 hours in order to ensure they will provide peak performance in the field. To charge the batteries, open the battery case which is located on the bottom of the control housing. This is done by gently pressing down on the back end of the cover and pushing the cover towards the rear of the housing. Unplug batteries from detector, plug charger into batteries, then plug charger into the wall outlet. (See Fig. 8).

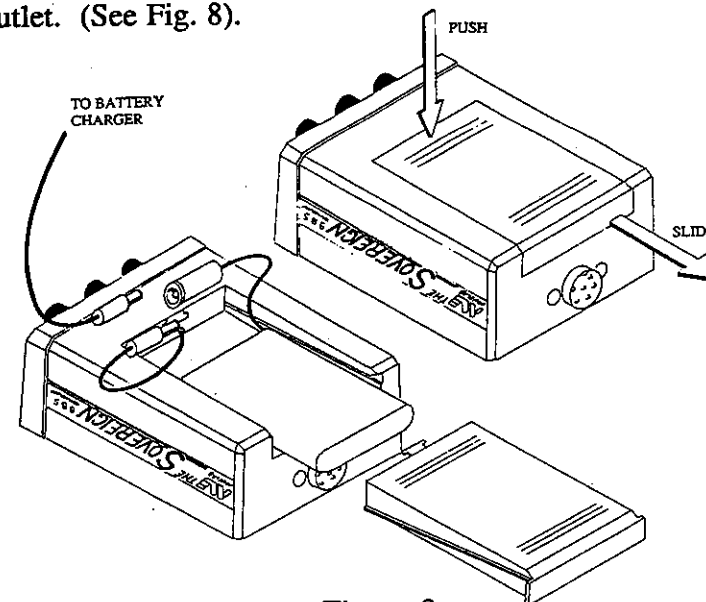


Figure 8.

NiCad batteries can develop a memory and require replacement if not used properly. The NiCad batteries that come with "The Sovereign" will provide you with 10 to 15 hours of use per charge. If you go out searching for 30 minutes or one hour, do not recharge them as soon as you return. If you do recharge them often after only a partial discharge, the batteries will start to provide only a short operating period. It is recommended that at least once every five recharges, you leave the detector turned on overnight in order to fully discharge the batteries prior to recharging. This will prevent a memory from developing and provide you hundreds of recharge cycles.

If you are in the field and the NiCad batteries lose their charge, you can replace the battery pack with AA penlight batteries in the holder. (Optional accessory item). High quality alkaline batteries should be used instead of standard carbon batteries. Alkaline batteries will provide you with between 5 and 8 hours of use, and you should only use headphones while using alkaline batteries.

When either the NiCad or alkaline batteries are reaching the point at which they will no longer operate "The Sovereign", a short tone will be heard through the speaker (or headphones) every 30 seconds. When this tone is heard, you have approximately 15 to 20 minutes of life left in the batteries. It is recommended that the batteries be replaced as soon as possible to avoid missing any targets.

If you are planning on storing "The Sovereign" for a period longer than 3 weeks, it is recommended that the batteries be removed from the detector to avoid damage to the circuitry in the event the batteries leak.

9. FURTHER INSIGHTS FOR ADVANCED USERS AND THE THEORY OF BBS

What is BBS?:

The innovative Broad Band Spectrum technology employed in "The Sovereign" is the next technological step forward in metal detectors. In essence, the magnetic responses from a wide spectrum of frequencies, all multiples of 1.5 kHz, that is 1.5, 3, 4.5, 6,25.5 kHz

are measured, not just from one frequency as is the case with conventional detectors or at most two frequencies available in some of the most recently released detectors. A BBS detector transmits a complex multi-period sequence of pulses which yields a host of information, about the object and the ground which is not available in any other detector. The information obtained from the broad band spectrum is sent to a microprocessor which determines which part is due to the ground mineralization, and which results from metal objects. Thus the ground mineralization is genuinely cancelled, unlike even the best manual or automatic ground tracking detectors, and **FOR THE FIRST TIME, THE GROUND DETECTION DEPTHS ARE SIMILAR TO THE AIR TESTS AT FULL SENSITIVITY IN THE ALL-METAL MODE.** Unlike conventional detectors, BBS allows metal objects to be analysed with little ground signal contamination. Thus BBS technology yields far greater accuracy as to whether or not a non-ferrous detected metal object is, say, a 5c piece or aluminium foil etc. Conventional detectors have great difficulty with this determination as is often apparent by the highly inaccurate meter, discriminate and notch operation when objects which are deeply buried are detected. **THE BBS TECHNOLOGY WILL YIELD UP TO 95% ACCURACY AT DEPTH EVEN IN MINERALIZED GROUND.** As well as ignoring ground mineralization, BBS detectors are insensitive to salt water, making the detectors ideal for use on the beach even in the presence of magnetic black sands. BBS also has significant advantages in determining whether or not the object is made from ferrous metals. The BBS technology is protected by several patents granted and pending.

Sound Pitch In The "Fix" Mode

In the "FIX" mode it is possible, to some extent, to determine the nature of the object being detected. To test this, place a piece of aluminium foil (tin foil) on ground free of other metal objects and a few feet away a coin that is "always accepted" in Figure 6. Now pass the detector search coil a few inches above each object and listen to the way the pitch changes. For the coin the pitch will first increase on approach to the coin and then decrease as the coil moves away from the coin. For the aluminium foil the exact opposite will happen. Thus "The Sovereign" behaves one way for highly conductive metal targets like the coin and another way for the smaller less conductive metal objects such as aluminium foil.

Ferrous Discrimination

Unlike most other detectors, ferrous discrimination is treated separately to the "DISC." circuitry in "The Sovereign". In conventional detectors, small ferrous pieces may produce a "beep" even if the "DISC." knob is set at the border between ferrous and non-ferrous. This does not happen in "The Sovereign". "The Sovereign" can identify ferrous objects at a greater depth than other detectors because of the novel way it processes the signal from the target.

10. TROUBLE-SHOOTING

If the detector is used in "DISCRIMINATE" and the detector randomly issues "beeps" even though the search coil is either far from any metal objects or the ground and is being held still, then either the batteries are faulty, or there is excessive electrical interference from power lines or another metal detector is operating nearby.

First make sure there is no metal detector operating nearby and also that the search coil is at least 3 feet away from the control box - these can interfere with each other.

To check for poor battery performance, plug in the headphones and if the detector then becomes stable, the battery needs replacing or recharging.

If, however, the random "beeping" continues, then electrical interference is probably the cause. Now turn the "SENSITIVITY" knob fully clockwise and then slowly re-orientate the coil. If for all search coil orientations, there are still continuous random "beepings", the electrical interference is severe at your location or the detector is faulty. Try new locations - away from power lines etc. If the random "beeping" still persists, then the detector is faulty and should be returned for service.

If, however, the random "beeping" ceases once you have turned the sensitivity clockwise, then electrical interference is the problem. Turn

it counter-clockwise as far as possible to allow searching without false "beeping".

If there is no sound at all check that threshold is set correctly. If there is no threshold, make sure the connectors to the battery holders are plugged in and clean. If using headphones, unplug them and check for loudspeaker sound or visa versa. If there is still no sound check or replace batteries. If still no sound, send the unit in to be serviced.

If the threshold sound is O.K. but there is no target response, check in the "ALL-METAL" mode. If still no response, check the search coil connection. If O.K. make sure the battery low indicator is not activated (wait 30 sec. to make sure there is no "beep"). If no battery low "beep", then send the unit to be serviced.

Basic Sovereign Electronics Check

Go to an area where there is little likelihood of electrical interference. Set the threshold according to Section 5. Turn the detector to "DISCRIMINATE" and "IRON MASK". Turn "DISC." and "NOTCH" knobs fully counter-clockwise. Keep the control box at least 3 feet away from search head. Now turn the "SENSITIVITY" knob fully counter-clockwise BUT "NOT" ALL THE WAY TO "AUTO" (click position). The detector should be stable, if not you are in an environment with too much electrical interference for this test; move to another area, see above. Now wave a dime or Australian 5c piece parallel to the search head fairly rapidly. The coin should be just detectable at 9 to 10 inches for the dime and about 9 inches for the Aust. 5c piece from the centre of the search coil. Now locate some ground containing reasonably mineralized hematite. Follow the instruction given in "ALL-METAL MODES" for ground mineralization elimination. Check that the detector is reasonably ground balanced in the "FIX" mode from one object free location to the next. These tests will show if the detector is basically functioning correctly. Note: in areas containing very high concentrations of magnetite, the detector will not entirely cancel out ground signals.

11. ENVIRONMENTAL CONCERNS

Detector users have developed a poor reputation in some areas, because they have either not filled in dug holes or have left obvious

untidy disturbed earth around filled in holes. Laws have been passed prohibiting detector use in some instances. We should look after our hobby and "do the right thing" by filling in our dug holes neatly. Special tools for coin removal with minimum soil disturbance can be purchased.

It should be pointed out that metal detecting for gold nuggets is by far the most environmentally friendly method of gold recovery. Other methods either pollute with poisons such as cyanide or Mercury, or use large quantities of water which can end up "muddied".



Figure 9.

12. WARRANTY AND SERVICE

There is a two-year parts and labour warranty on "The Sovereign". Refer to your Warranty Card for details. The Search Coil is

warranted for one year. Refer to supplier or Minelab for service, either in- or out-of-warranty.

NOTE: This warranty is not transferable, nor is it valid unless the enclosed warranty registration card is returned to Minelab Electronics Pty Limited or an authorised Minelab Electronics Pty Limited Regional Distributor within 14 days of the original purchase, for the purpose of recording this date, which is the actual commencement of the warranty.

The Minelab warranty does not cover damage caused by accident, misuse, neglect, alteration, modifications or unauthorised service.

For specific details of the Minelab warranty, please refer to the machine's "Product Warranty Card".

13. SPECIFICATIONS AND PATENTS

These are subject to modification without notice.

Options	Silent/Background threshold in discriminate. Fixed Tone or Tone ID in Discriminate.	
Uses	Coins, Treasure, Archaeological, Forensic and Military; ideal inland or beach. A genuine "all-rounder".	
Length	Extended	1400mm (55")
	Un-assembled	840mm (33")
Weight	Complete (excluding batteries)	1621g (3lb 9oz)
	Control Box (excluding batteries)	550g (1lb 3oz)
	Shaft and Search Coil	935g (2lb 1oz)
Mounting	Shaft or Hip.	
Transmission	Broad Band Spectrum; multiple simultaneous frequency transmission 1.5, 3, 4.5, 6,25.5 kHz.	

Search Modes	All-Metal -	Mineralization Cancel which can be fixed or allowed to track, and Conventional Automatic Ground Track which is used for pin pointing.
	Discriminate -	Ferrous reject, Notch and Disc. with 2 switched levels of ferrous/non-ferrous rejection.
Control Knobs	Discriminate -	Variable from all non-ferrous to highly conductive metal.
	Notch -	Variable from all non-ferrous to highly conductive metal.
	Sensitivity -	Auto or manually selectable.
	Threshold -	Sets threshold and turns power on and off.
Search Coil	Type	203mm (8") Double-D.
	Weight	562g (1lb 4oz)
	Cable length	2.4m (7'9")
Audio Output	Built in loudspeaker and 1/4" headphone socket. Sound pitch continuously variable and indicates nature of detected object in disc. mode, and modulated in all-metal mode to enhance perception.	
Overload	Staccato sound alert in discriminate.	
Batteries	NiCad	12V, 600mAHr or more
	Duration	10-15 hrs.
	Battery Low Alert	High pitched beep for 1/2 sec. every 30 sec. when becoming flat.
Warranty	Control Box - 2 Years parts and labour.	
	Search Coil - 1 Year parts and labour.	
	NiCad Battery Recharger - 3 Months parts & labour	
Patents	US4942360, AUS593139, US4890064, US4894618, AUS595835, CAN1260146 and several pending.	