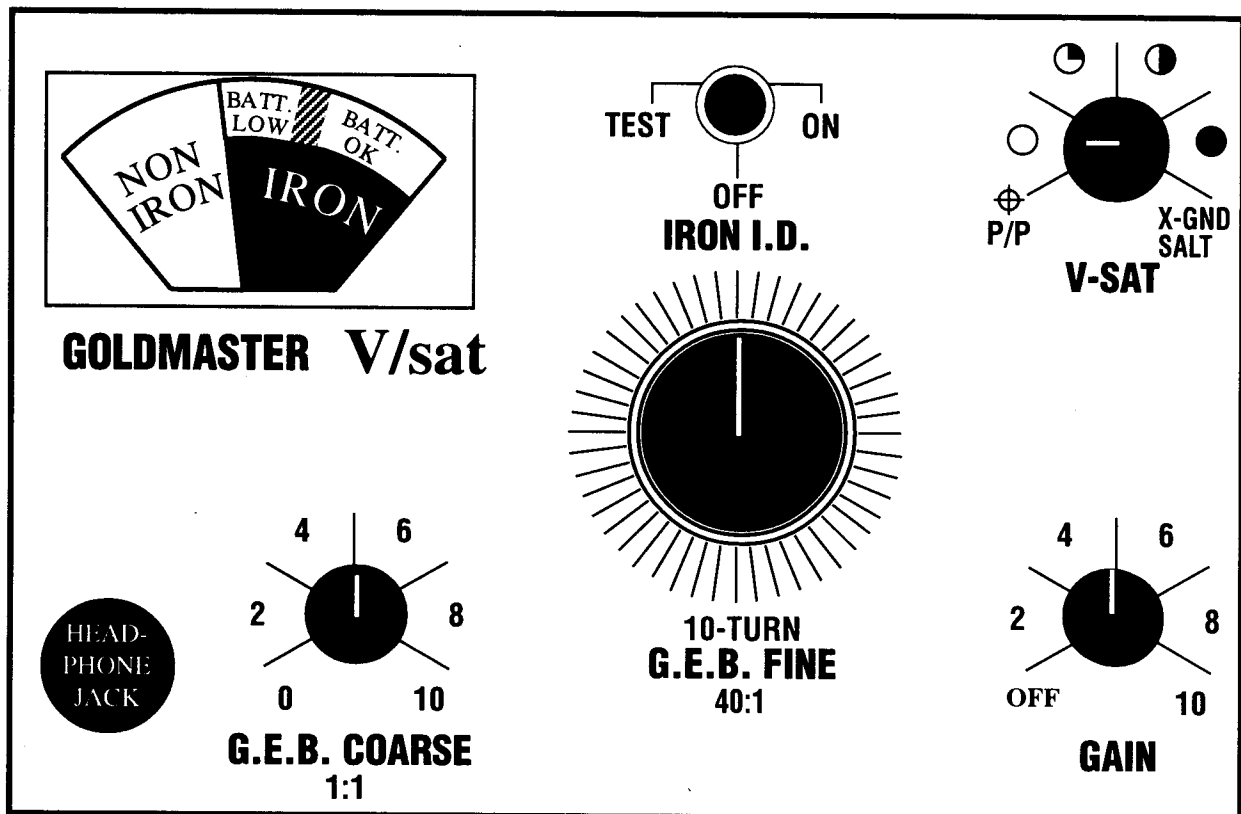
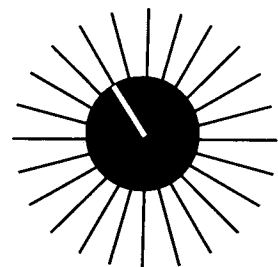


white's GM V/sat GOLDMASTER OPERATOR'S MANUAL

written by
Jimmy "Sierra" Normandi



THRESHOLD



INTRODUCTION

All White's ground canceling detectors are capable of finding gold nuggets in the ground however, none will perform as efficiently as the line of Goldmasters created especially for nugget hunting. The GM V/sat is the culmination of a series of Goldmasters, refined and improved over the years.

The reason the Goldmaster stands above all other detectors in finding gold nuggets is the care taken to accommodate the particular conditions encountered while gold prospecting. Since gold is most often found in highly mineralized soil, it is necessary to design a ground balance circuit which has the range to cancel out both extremes (+) and (-) mineralization. The GMV/sat has expanded this range even greater.

In addition, the GM V/sat has incorporated a greater dynamic range before overloading, thus it has an increased tolerance for heavy mineralization. White's GM V/sat, like its predecessors, still incorporates a unique overload-alert to assist in determining the maximum effective level of Gain to use when operating in extreme ground conditions.

All of these refinements come together by incorporating White's exclusive 40:1 ground balancing system which now uses a single true-precision 10-turn pot for the fine tune control, along with the familiar single turn Coarse ground balance tuner. This system is both accurate and easy to use.

The engineers at White's have really outdone themselves on this one, and I am pleased to have been able to work with them on its development. I can't wait to get out there and use mine more!

I wish you the best of luck with your GM V/sat.

Good Luck and Good Prospecting!

A handwritten signature in cursive script that reads "Jimmy Sierra Normandi".

Jimmy "Sierra" Normandi

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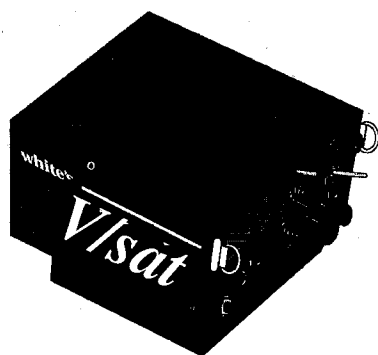
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PARTS IDENTIFICATION AND ASSEMBLY

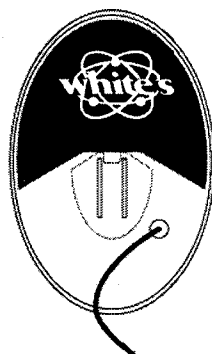
The GM V/sat can be used in three different configurations, hand-held, chest-mounted, or hip-mounted. The manner decided upon is up to the personal preference of the user. There are advantages to each style. Some users like to be able to put the detector aside when they are recovering a target, and thus get it out of the way. Also, with this method, one hand is left free - all of the operation can be done with one hand. The forefinger is used to control the fine ground balance knob and operate the IRON I.D. toggle. The only disadvantage is obvious. The detector, although extremely lightweight and well balanced, is still more tiring than when used in the separated hip-mount or chest configuration. In the hand-held configuration, be sure that the cable is tightly wound around the rod sections as illustrated, in order that it not get in the way of the loop. A cable that flops around will cause false signalling when it gets near the loop. Allow the cable to be loose enough at the lower part of the rod (where it joins the loop) so that no strain occurs when the loop is paddled back and forth.

If the off the rod option is chosen, there are several ways to mount the control box on the side or chest. There are two belt slots available, as well as camera strap hooks along the edges of the control panel. One belt slot is on the top of the control box on the bracket that connects the control box to the rod handle, and the other is a part of the detector stand and speaker grill protector. Choose the one that is most comfortable and convenient for you. Belts and camera straps are not provided by White's, although widely available from other sources. This hip or chestmount configuration ensures the least amount of arm fatigue during long periods of use. Again, coil the cable around the rod sections neatly and tightly and leave just enough extra cable from the rod to the control box to ensure ease of operation. Too much free cable will only cause tangling and tripping. Too little free cable will restrict the movement of the loop. Use the velcro straps provided to hold the cable secure. (Movement of the loop cable near the loop will cause a false response.)

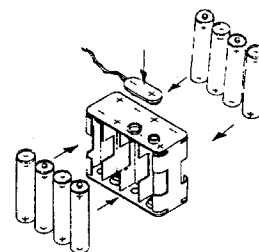
Remove all parts from the shipping carton, and make sure you have the following:



Control Box



Loop



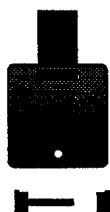
Battery Pack



Straight Rod



Parts Bag



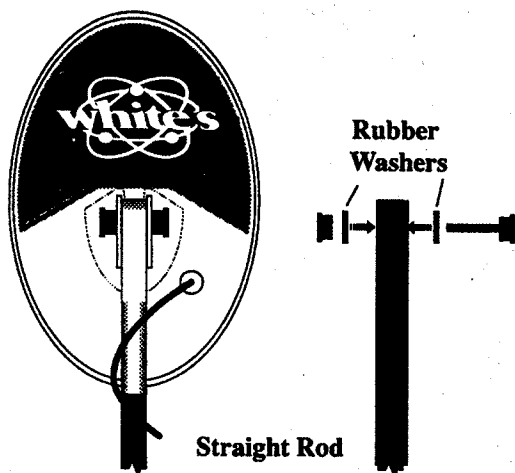
Arm Cup



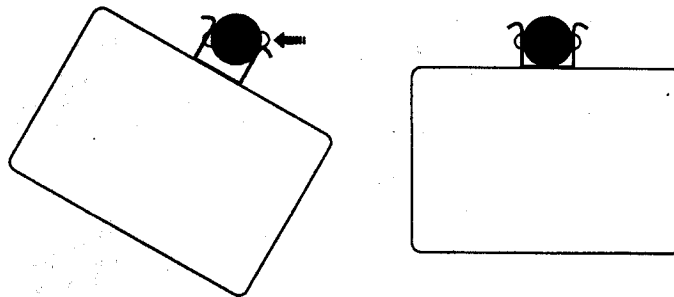
"S" Rod

Middle Rod

The GM V/sat comes partially assembled. The Straight Rod will need to be attached to the loop as shown (be sure and place the two rubber washers on the clevis end of the Straight Rod as shown before sliding between the loop ears).

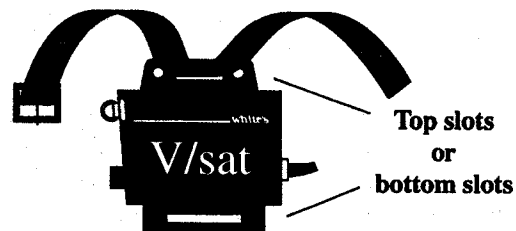
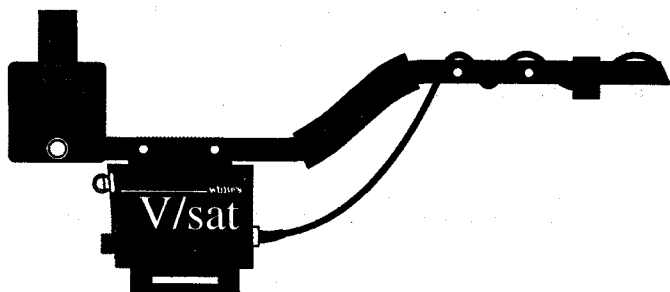


The Control Box snaps off and on the "S" rod by compressing the two spring clip buttons on one side and pivoting the Control Box.

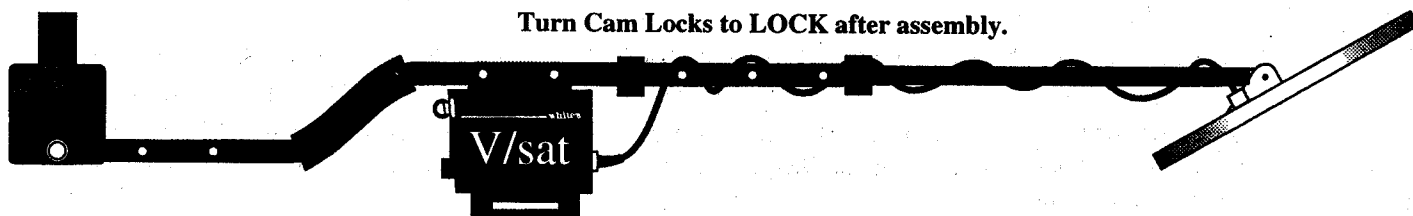


The GM V/sat can be worn as a hip-mount or chest-mount. To hip-mount, simply remove the control box from the "S" Rod, adjust the length of cable wound around the rod, and weave your belt through the slots on the control box.

Optional control box mountings are available on the "S" Rod



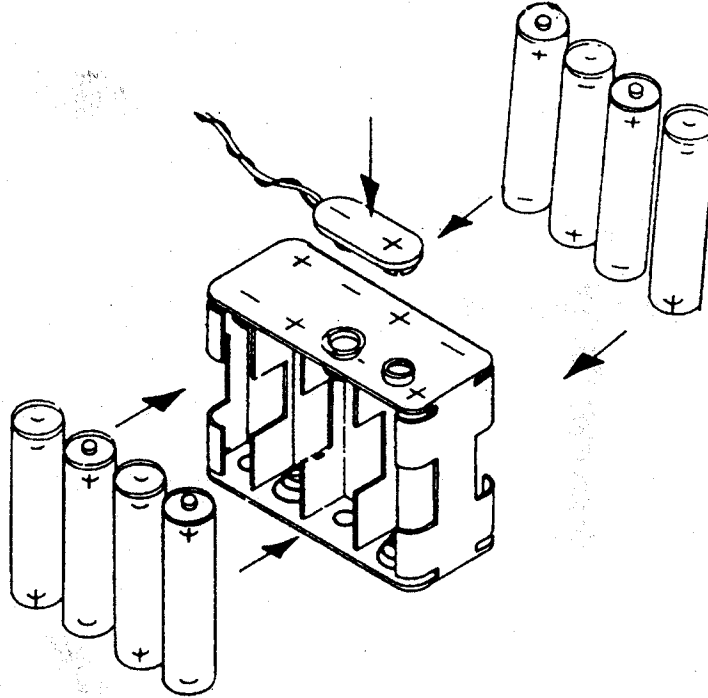
To use as a chest-mount use a camera strap around your neck and attached to the "D" rings on the sides of the control panel. Use with belt through the detector stand bottom slot for more stability.



Square foam pad can be installed inside arm cup for added comfort, velcro cable retainers are used to secure loop cable around rods.

BATTERIES

The GM V/sat is powered by eight 1 1/2 volt penlight batteries. Install these batteries in the battery holder as shown below. Note the flat side $\ominus$ of each battery rests against a spring and the bump side $\oplus$ rests against a solid contact.



Open the battery compartment by grasping the black plastic plunger and pulling. Note: The battery compartment door is located on the back of the control box opposite the control panel. Once the door is removed, attach the battery lead from the detector to the penlight battery holder. It will only fit one way. Install the battery pack into the battery compartment and close the door firmly. Note that the black plastic plunger (latch) has two positions; latched - when the door is pushed firmly closed and unlatched - when the door is to be pulled out. If out of alignment, it may be necessary to gently pull the plunger (unlatch) in order to allow it to latch when closing the door, thereby locking it in place.

A new set of recommended Alkaline batteries should provide approximately 40 hours of use. This will vary with the number of target responses, temperature and threshold level.

Headphones will increase battery life.

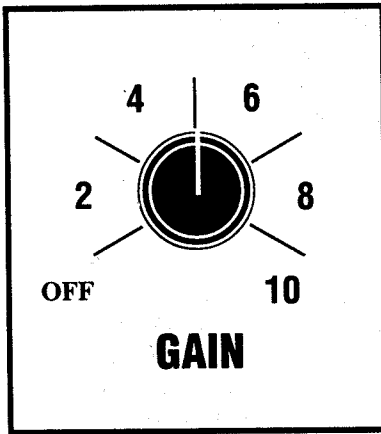
When the batteries get weak, the volume (beep) will be reduced. At a certain point, the detector will stop functioning (will not respond to metal).

When the detector is turned on, the battery condition automatically shows on the meter for several seconds before the detector becomes operational. After battery check the meter needle will automatically return to the far left, and will not move during searching, unless the IRON I. D. feature is used. The GM V/sat will operate fine when the batteries check in the BATT. LOW area. However, caution should be used and a new set of batteries should be kept on hand. Sometime between checking in the BATT. Low area and/or to the left of the BATT. LOW portion of the meter, the volume (beep) will become weak and shortly after that the detector will cease to respond to metal.

Eight extra 1 1/2 penlight alkaline batteries are always a good idea when far from civilization. An extra penlight battery holder (White's Part #523-0006) is also a good idea when traveling far from home.

Although the GM V/sat doesn't come standard with rechargeable batteries, high quality systems are available. White's non-memory nicad #512-0023 ten cell and Quick Charge/Overnight Charger #509-0024 are recommended. Contact your Dealer or telephone toll free 1-800-547-6911 for more information.

DESCRIPTION OF CONTROL PANEL



GAIN

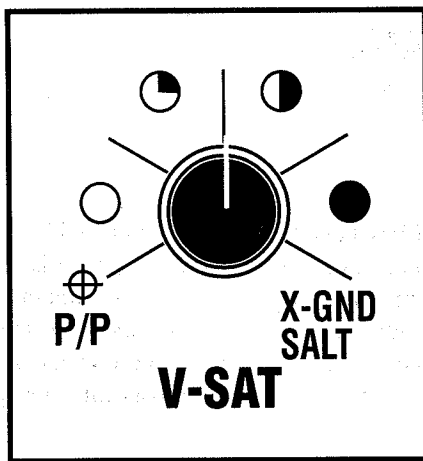
This knob controls the GAIN (preamp) of the GM V/sat and functions as an ON/OFF switch as well. Starting from the ON/OFF position and going clockwise, the power is turned on and the dial increases the GAIN from a minimum level of "1" to a maximum level of "10". When first turned on, the battery condition automatically shows on the meter and it takes a few seconds for the detector to be operational. This and the ground balance controls are probably the most important variable controls on any gold prospecting detector.

The first assumption of a novice might be that the greatest depth of detection is directly proportional to the amount of GAIN. The inaccuracy of this assumption is directly proportional to the amount of mineralization in the ground. In other words, it is very important to remember that reducing the GAIN of the detector can actually increase the detection depth if the ground is heavily mineralized. This control should be set to give the greatest amount

of GAIN without **#1. Overloading** the loop and **#2. causing an erratic or unstable behavior** of the detector which masks the difference between the sound of the ground and that of a nugget. A special overload alarm is incorporated in the design of the GM V/sat. If the loop is placed near ground and the audio emits a loud piercing squeal, the loop is overloading. Reduce the GAIN by turning the control counterclockwise (left) to eliminate this alarm and the loop will no longer be overloaded. The detector will not operate properly if the loop is overloaded. The GM V/sat incorporates internal electronic features which result in a greater dynamic range before the detector overloads on strong mineralization or large targets. This is done without any loss in sensitivity.

Unstable behavior will be evidenced by static, very uneven threshold or constant false signaling, making it impossible to search and hear (recognize) actual targets. Remember, there is a proper workable GAIN for every condition and choosing the proper level will insure the maximum depth that targets can be detected in that particular environment. This is the hardest concept to understand and accept, but once you learn to use the proper GAIN, you will increase your success in detecting in heavy mineralized areas and finding especially smaller nuggets. Even though I work in ground which does not overload my loop and therefore could actually work at a level of 10 on the GAIN control, I still reduce my level to 8 or 9. This gives better separation of ground sounds and small nuggets, producing more nugget recoveries. In addition, reducing the GAIN is also a way of making the IRON I.D. system work more effectively. If the GAIN is set too high for the ground mineralization, the IRON I.D. meter and audio may chatter excessively, and may misidentify a nugget as iron (nail). Reducing the GAIN, will make the IRON I.D. system more accurate.

Another way of knowing if you have the proper amount of GAIN for the ground mineralization is to put the IRON I.D. toggle ON and bounce the loop slightly up and down over the ground. If you hear a clicking sound, you should lower the GAIN a bit and try again. The clicking is the iron content of the ground being detected by the IRON I.D. system. If you reduce the affect of the ground by reducing the GAIN, you will make the IRON I.D. more accurate. This GAIN control will make for better separation of ground noises and target signals even if you don't use the IRON I.D. system to eliminate nails etc. Another disadvantage of using too high a GAIN for the area is that you will hear gaps or pauses in your threshold hum while detecting. During this loss of threshold, you are losing gold nuggets. Move slower and keep your threshold with you at all times. Practice will be the best teacher here. Another improvement in the GAIN control on the GM V/sat is that it is no longer necessary to re-ground balance the detector each time the GAIN level is changed. This is a very time saving device and is known as a "phase compensated gain control".



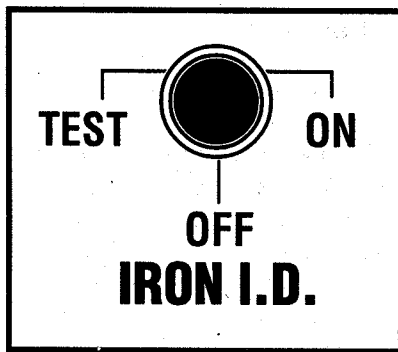
V - SAT

The V-SAT (Variable Self Adjusting Threshold) control has been moved from the back of the control box to the front (replacing the position formally occupied by the THRESHOLD control on older Goldmaster models) in order to make it more accessible for use. In its full counterclockwise position, (OFF) position, it reverts to a very slow SAT speed for pinpointing. When rotated clockwise a click indicates it is ON and it will progressively increase the recovery speed of the threshold. The V-SAT control allows the user to increase the speed of SAT from the standard factory speed up to 50 times faster.

SAT is the operational mode of the GM V/sat and is present at all times at one speed or another. As I mentioned under the section describing THRESHOLD, the hum or threshold should be audible at all times. This hum or threshold is designed to increase over a metal target as long as the loop is kept in motion. As you sweep the loop over the ground with the GAIN and GROUND BALANCE set properly, SAT will keep the

threshold humming till it passes over a metal target. As you recall, hot rocks or changing ground can produce what are known as "false signals". But for the most part a fast SAT keeps the threshold humming if everything is set right. The worse the ground conditions (quickly changing or extreme ground) the faster the SAT required to control it. So here we are with the loop moving over the ground and a target "gold nugget" is under the loop. The nugget will make a zip zip sound as the loop is passed back and forth over it (by the way, this is the title of a very fine book on prospecting written by Larry Sallee). This sound requires the loop to be in motion over the nugget. If the loop is stopped over the target, the sound will ultimately go away and only the background threshold will be heard. The faster the SAT speed chosen, the faster the ground sounds will return to threshold, and the faster metal targets will disappear if the loop is stopped over it. This is why we use a slow SAT speed while pinpointing or just crisscrossing over the target to eyeball its location.

You will probably use the normal level of SAT speed (just past the pinpoint position) for 90% of your detecting. This is a fast SAT speed and is operational when the V-SAT knob is set full counterclockwise till it stops. That is just before the click OFF for pinpoint. You will have to experiment with the setting to find out where the optimum place would be for your particular application. Remember, overall depth will be diminished with a faster SAT speed, but if the ground is too noisy to separate a good target from a false signal, it is better to operate with a little more SAT than to lose a target altogether. This is the same logic that I use in describing the GAIN control, if you recall. Lowering the gain will reduce overall depth, but by doing so you can also improve your performance and find more nuggets in the long run. I can not give an absolute formula for where to set the V-SAT control as there is no set place that fits all situations, given the fact ground conditions are different almost everywhere you might hunt. You will soon be able to recognize when you have erratic behavior after having either recovered some tiny red "hot rocks" or chased after signals that just aren't there. When these "erratic or false signals" don't disappear by reducing the GAIN, experiment with the level of SAT. One way is to place a small test nugget in the ground in an area where you have had problems with false signals and start to increase the SAT speed slightly, all the time comparing the sound of the nugget with the sound of the ground. When you reach a point of SAT speed which enhances the sound of the nugget and makes it sound different than the ground, then that is the place to leave it set for hunting that area. You may have to recheck and readjust this setting from time to time as your conditions change, you do not want to set the V-SAT speed higher than you need to smooth out the ground, or to set your GAIN too low.



IRON I.D. Control

The next control IRON I.D. is the toggle switch which activates the iron identification function. There are three positions for this toggle. The center position is marked as "OFF" and should be selected during all GAIN, THRESHOLD, and GEB tuning.

In the OFF position, the detector is functioning as any all-metal detector would. It gives a positive signal when passed over any metal target, regardless of the type of metal. This would be the normal position of the switch during the general operation of the detector. The left position is marked "TEST" and is spring loaded. If the toggle is pressed toward this position, the iron identification function will be activated and remain activated as long as the toggle is held in that position. When the toggle is released, it will spring back to the center "OFF" position. If the toggle is moved to

the right position - marked "ON", the iron identification function will be activated constantly. The toggle will remain in this position until it is physically moved to the center or "OFF" position. If ground conditions will allow, the detector can be operated in the "ON" position continually. The user will know if this can be done only by experimenting to see if the detector can be operated smoothly and whether it will detect and correctly identify test targets.

This iron identification function is unique to the GM V/sat. When activated, it is designed to modify or eliminate the audio signal of iron targets, and produce an indication in the IRON area of the meter. This modification of the audio signal is evidenced by a chattering or breaking up of the target sound. Normally nuggets produce a clear or steady signal and do not cause the needle on the meter to move. The audio signal from iron can sometimes appear to "null out" or disappear. If the signal is not understood as Iron by the detector, the signal will remain normal or steady.

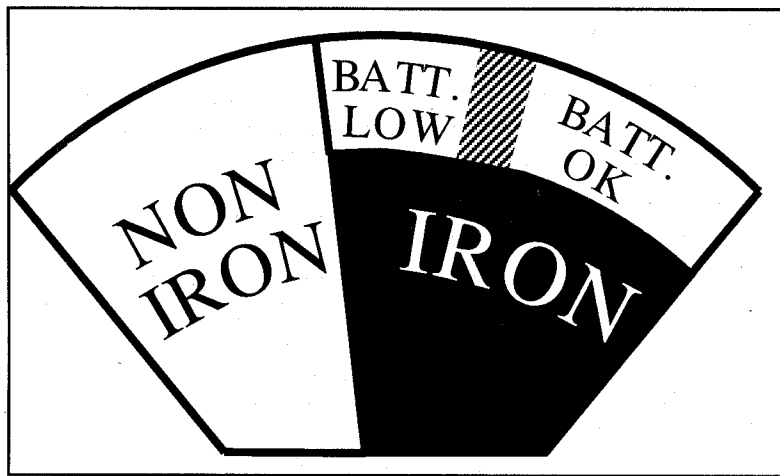
By design, if the identification circuitry is not able to determine if the signal is really an iron target, perhaps because it is either too small or too deep, it will not mute or modify the signal. In this case, the signal will remain good and the dubious target will be dug. This insures that no good target will be misunderstood as iron and ignored. A few pieces of iron dug is a worthwhile trade-off. With IRON I. D. a large amount of unwanted iron trash will be left behind and more valuable time spent on digging possible worthwhile targets. Using IRON I. D. in extreme ground conditions may cause all targets to produce the chattering sound with some meter movement toward IRON, in these areas the use of IRON I.D. is not recommended.

To function properly, IRON I. D. requires movement of the loop. Thus, it is ideally suited for use in the SAT Motion operating mode.

Remember ... no system is perfect. There may be times when Iron I.D. is not practical, such as in extreme ground conditions. In these cases, do as you would with any other unit - "dig everything". But when it is practical, use it to increase your Gold Nugget to Dug-Signal ratio.

Note again, audio chatter and meter movement on iron, only occurs when the IRON I. D. toggle is held in TEST or placed in the ON position.

I mentioned earlier under GAIN control, that a reduction in gain or the use of the PROPER gain for the existing ground conditions not only makes for better performance in the standard operating mode, but really pays off when using the IRON I.D. function of the GM V/sat. Since iron mineralized ground as well as iron nails are seen as "iron" targets to the IRON I.D. system they can distort a gold signal if the GAIN is set too high. In other words, GAIN should be set "not to see more ground than it sees targets". The way to accomplish this is to operate at a reasonable level of GAIN. Ground chatter or loss of hunting threshold are symptoms of operating with too high a GAIN. I have covered much of this in the section on GAIN. I can't emphasize enough the importance of adjusting the GAIN level. I have been able to use my IRON I.D. system in some very mineralized areas since I started watching my GAIN control. You can always use a test nugget just under the surface to see if your IRON I.D. is operable. If you do use the IRON I.D. system, you can always rely on the fact that you are not losing any depth at all over the standard mode of operation (IRON I.D. OFF). The Goldmaster type of IRON I.D. is the only one that can make this statement because it is not a normal discriminator. Normal discriminate type circuits will lose depth in mineralized ground.

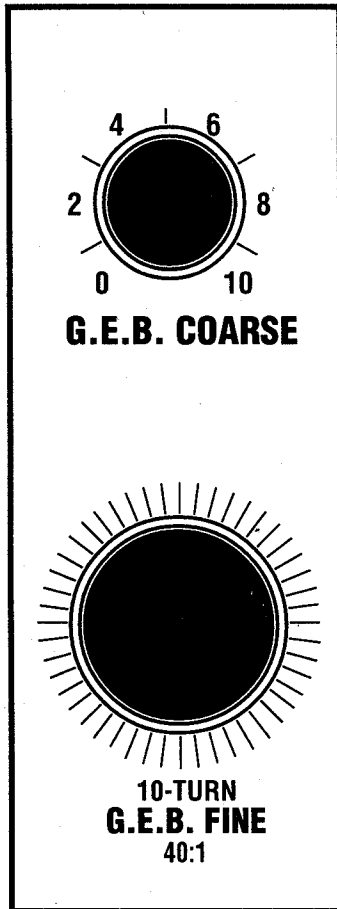


IRON I.D. Meter

The IRON I.D. Meter tests the batteries and works in conjunction with the IRON I.D. toggle. This meter operates along with the audio signal activated by the IRON I.D. toggle. When the signal is determined to be Iron by the GM V/sat, the needle will move to the right. This movement of the needle will be accompanied by the chatter or nulling of the audio signal. Like the audio identification, the meter can become confused in extreme ground conditions. The meter, as well as IRON I.D. audio, should be relied upon only when testing shows it to be working well in a particular area with test targets. In many areas, between the audio and visual response of the GM V/sat to a target signal with the Iron I.D. activated, the user should be able to accurately determine whether to dig a possible target or not.

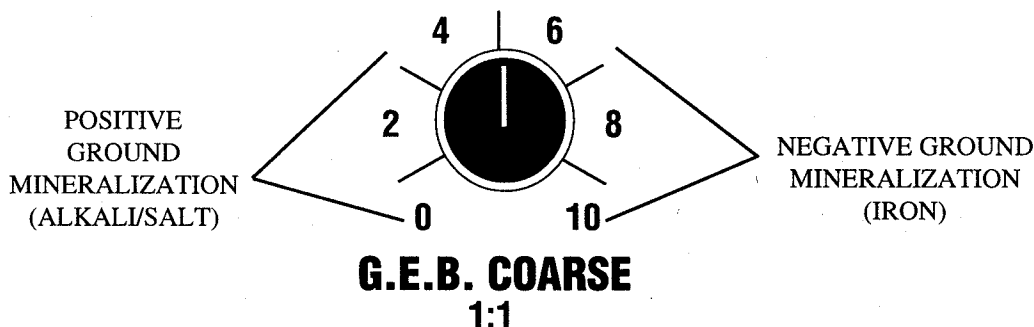
The meter also serves as a battery check. When the detector is turned on, the battery condition automatically shows on the meter for a few seconds. The GM V/sat is not operational until the automatic battery check is completed, indicated by the meter needle returning to the far left.

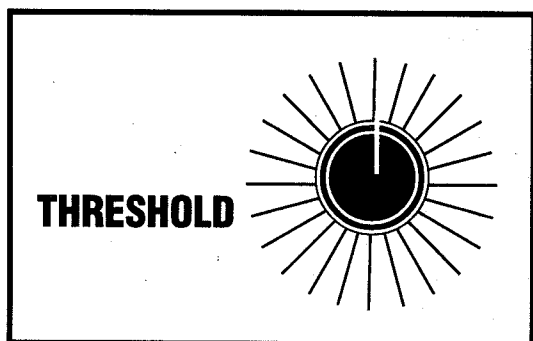
GEB Coarse and GEB Fine Controls



The two ground balance control knobs ... GEB Coarse and GEB Fine are used in conjunction with each other to cancel out the interference from ground mineralization, allowing the detector signal to penetrate the ground and detect nuggets. Until the late 1970s, metal detectors were not very effective in detecting gold, because it is usually found in heavy mineralized areas and the old TR detectors were unable to cancel out such ground conditions. Only the larger or shallower nuggets were able to be located and only in ground that was mildly mineralized. White's employs an exclusive 40:1 ground balance system which means that the resolution of the ground balance pots when working together actually give the Fine Tuner knob the effectiveness of 40 turns to just one turn of the Coarse Tuner. The resolution is measured by how many times the knob turns before the pot rotates one full turn. Thus, the Fine Tuner knob goes around 10 times before the pot rotates a full turn. This is called a 10 turn pot. By working with the Coarse Tuner electronically, we can get a resolution of 40:1 in the following way. First use the Coarse Tuner to bring the ground to as close to balance as possible (described later under Ground Balance). Then switch to the Fine Tuner and complete the ground balance procedure. The Fine Tuner knob will turn 10 times before the pot has made one full turn. If the knob comes to the end of its range, merely return the knob to its center or mid range position (five turns) and return to the Coarse Tuner to get closer to a correct balance. Then return to the Fine Tuner for more precise balancing. This can be done several times if need be, but rarely is necessary. Each 1/4 turn of the Coarse Tuner (25% of its range) can be tuned or controlled by 10 full turns of the Fine Tuner. Thus 10X4 or 40:1 ratio of ground balance. All this amounts to giving us better and smoother control of bad ground conditions by first getting us into the ball park with the Coarse Tuner, and then using the Fine Tuner to be more precise. The GM V/sat incorporates a much improved Fine Tuner pot which is wire wound, a true precision ten turn control.

Turning either of the Ground Balance controls clockwise cancels out progressively larger amounts of iron "negative" mineralization. Counterclockwise cancels out progressively larger quantities of alkaline "positive" mineralization. Since desert areas frequently contain flats of alkali (salt) and are difficult to hunt particularly when wet, White's has expanded the range of the left side of the Ground Balance controls on the GM V/sat to enhance its performance in these conditions. Since "positive hot rocks" the little red to blackish ones, and "ironstone", which ground balance counterclockwise below normal iron mineralization, the expansion of the tuning range in this area will certainly improve performance. This increase or expanded range does not affect the ability of the GM V/sat to effectively tune out "negative" or high iron mineralization, which normally tunes clockwise on the ground controls. Such iron mineralization is common in most gold bearing areas.





THRESHOLD Control

Next is the THRESHOLD control located next to the battery compartment.

The THRESHOLD control is used to set the level of the threshold hum, which must be maintained constantly while the detector is in operation. The threshold or background hum is set to the faintest comfortable level. This will allow the tiniest and deepest targets to be heard. Set the knob all the way to the left or counterclockwise and then rotate clockwise till the proper level of hum is attained. As previously stated, the threshold should be set to the EDGE of responding. This is usually described as a faint hum. It should be mentioned that there is usually some internal hum present which should not be confused

with the threshold. This is most evident when using headphones. I will mention again that using headphones while prospecting is highly recommended for the best performance. The lower the threshold setting, the more sensitive the detector becomes and headphones will permit a lower threshold level than can be heard through the external speaker. If a hum can be heard with the THRESHOLD control fully counterclockwise, rotate the knob to the right (clockwise) till you can hear a definite increase in the hum. The setting where it starts to increase is the EDGE of threshold you want. This threshold may sound a little rattly or static like, but that is OK. This faint hum should be present at all times for the best results. This precise position which will vary somewhat with temperature. Since we usually only have to set this one time at the beginning of each hunt, we have positioned this control to the back of the control box near the loop connector.

The action of the SAT (Self Adjusting Threshold) system maintains the threshold during use. If it disappears for any reason (other than bumping the control) you may be either swinging the loop too rapidly or running your GAIN control too high. As my buddy, Greg Moscini, always cautions: "Don't get ahead of your threshold". Good advice. A crackle or fading of the threshold while using the IRON I.D. function however, is a sign of passing over an iron target or extreme iron mineralization in the ground. This is OK and is what it is supposed to do.

Headphone Jack



The headphone jack on the GM V/sat is wired to receive a stereo plug from a headphone. Since most high quality headphones preferred by prospectors are wired with stereo plugs, White's has chosen this method of wiring. If you already have a set of headphones which you prefer, merely be sure that the plug is either wired stereo or you have a switch on the headphone which can be used to go from mono to stereo. If you have a mono headphone with no switch, an adapter plug can be purchased which will do the job. Use of improper wiring will merely prevent the sound from coming out of one earphone.

Another important consideration in choosing a headphone is to get one that has a volume control on it. Since there is no volume control on the GM V/sat, it is essential for hearing comfort and safety to utilize a headphone with these controls. It is important to set the headphone volume to accept a very faint threshold hum from the detector (set with the THRESHOLD CONTROL) and yet produce a strong but comfortable signal when a target is detected.

The use of headphones is highly recommended. First of all, they keep the external sounds out of the way. Other people talking, wind blowing, and various sounds distract the prospector from the immediate task of detecting the tiny signals from either small or deep targets. Most true professional prospectors and treasure hunters use headphones. The beeping of a detector can also be very distracting to those around you.

Headphones also allow the detector to be operated at a lower threshold making it more sensitive to smaller signals. Faint signals are better heard with headphones than without. Use of headphones also increases battery life.

White's has several types of quality headphones available. Full ear enclosures are best for high noise areas such as near rushing water or cold weather. Lightweight summer styles are best for snake country and hot weather.

PROCEDURES AND HINTS

At this point, you should be familiar with the various controls on the GM V/sat, what they are used for, and why they are important. If you are not sure, go back and read the first part of the manual again. You must understand what the controls do and not just how to set them. This understanding will allow you to control the various conditions you will encounter while prospecting. No two sites are identical and new challenges will always arise.

You will notice that the controls are few and the settings limited. There are no bells and whistles on this unit, all the various knobs and toggles are necessary for the operation of the detector.

I will lead you through the starting procedure for prospecting with the new GM V/sat. You will recognize the similarity with most other ground-balancing detectors.

SETTING UP THE CONTROLS

1. Set the G.E.B. COARSE knob midway "5" on the scale.
2. Set the G.E.B. FINE knob five turns from fully counterclockwise with the large knob pointing to the midway position - straight up at 12 o'clock.
3. Set the IRON I.D. toggle to the center Iron I.D. Off position.
4. Set the V-SAT to ON, just past the pinpoint "PP" position.
5. Turn the GAIN control clockwise till it clicks "ON". Look at the meter to make sure the battery condition shows in the "BATT OK" area of the meter. It takes several seconds to check the battery condition.
6. While holding the detector with the loop in the air, rotate the GAIN control clockwise to full sensitivity "10" on the scale.
7. Starting with the THRESHOLD control fully counterclockwise, turn the THRESHOLD clockwise until you hear a soft threshold hum. This hum may be slightly uneven, this is normal. The level of hum will be determined by whether or not you are using headphones. We strongly recommend headphones for all of the reasons stated in the earlier section on controls. This level should not be too loud nor too faint. Practicing will be the best way to establish the most effective level of sound.

SETTING GAIN LEVEL

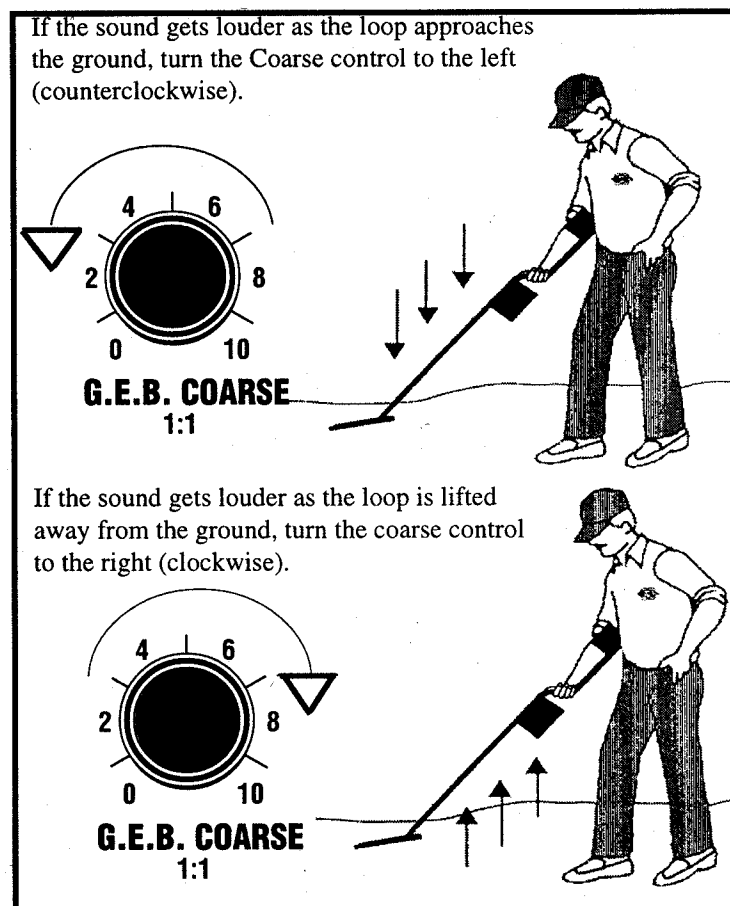
Lower the loop of the detector toward the ground. We will now determine what level of GAIN will be allowed by the ground mineralization. If you can actually place the loop on the ground without hearing the high pitch squeal of the detector, which indicates loop overload, you can operate with a GAIN of "10". However, a GAIN of 8 or 9 may produce better results while still providing ample detection depth. If you hear a high pitched squeal, back the GAIN knob off to the left or counterclockwise until the squeal disappears. Since you will rarely use the loop flat on the ground, you can carry out this process an inch above the ground. Just make sure you do not lower the loop close enough to the ground to create the high pitch squeal while you are searching. In other words, you are trying to establish at which level of GAIN you should set the detector to prevent loop overload. You should set the GAIN at the level above the ground where you will be sweeping the loop of the detector, giving yourself some leeway for a comfortable swing.

GROUND BALANCING PROCEDURE

Once the GAIN is set, you are ready to go through the ground-balancing procedure. By the way, if you should ever change the GAIN level, you do not have to ground balance again. The GM V/sat is ground balanced in the motion or pumping fashion.

It is important to note that the Iron I.D. toggle should be kept in the OFF or center position during the initial ground balancing procedure. Once this is accomplished, you may switch the Iron I.D. toggle to the ON position if desired. Small corrections in ground adjustment can be made with the Fine Tune control during the process of prospecting even if the Iron I.D. toggle is in the ON position.

Ground balance is done by pumping the loop up and down near the ground as if you were making butter in an old fashioned butter churn, except the loop need only move a few inches up and down. As you push the loop toward the ground a few inches and then pull it away from the ground a few inches, try to determine whether or not the threshold hum gets louder as you pump it on the down-stroke or whether it gets louder as you pull away from the ground (this would indicate that the sound was actually getting softer as the loop approached the ground). Once you have decided whether the sound increases going toward the ground or coming up from the ground, you can make the first correction of ground mineralization by using the G.E.B. Coarse control.



GROUND BALANCE PROCEDURE - Continued

If the sound was getting louder as you approached the ground, begin turning the Coarse control to the left or counterclockwise. If the sound was getting louder as you came up from the ground, begin turning the Coarse control to the right or clockwise. As you pump the loop and turn the control in the appropriate direction, you will ultimately find that the sound will not appear to change much in either direction. At this point, the ground balance has been achieved in a rough sort of way.

Actually, you will note that if you continue to turn the Coarse control, you will over shoot the point of balance (no sound change), and start to create an increase in the opposite direction. The trick is to stop just short of balance and go on to the Fine control. This Coarse control is really just intended to get the ground balance in the ballpark. It will probably only need to be adjusted once for a particular area. That is, unless the ground mineralization changes dramatically from one spot to another.

You will now go to the G.E.B. Fine control and roll the dial with the side of your forefinger, either right or left (clockwise or counterclockwise) to correct the sound just as you did with the Coarse control. Remember, if the sound increased as you approached the ground, roll the Fine control knob to the left or counterclockwise. If the sound seems to increase as you pull the loop up from the ground, just roll the knob to the right or clockwise. You will soon get used to this pumping action and become quite adept at quickly determining whether or not the sound is increasing on the up or the down pump. Ultimately, you will find that the sound will not appear to change in either direction. At this point the detector is tuned. However, I recommend that a very slight increase should be maintained when the loop approaches the ground. This slight over-tuning for the ground will actually enhance the signal from tiny or deep nuggets. On the other hand, often small BB size hot rocks, which tend to mimic the way small nuggets sound, can often be eliminated by under ground balancing.

You will probably use this Fine control very often during the process of prospecting. The frequency of its use will be determined by how much the ground changes from place to place while you search. You will soon get used to the level of hum that is achieved when you get to a proper ground balance, and when it begins to vary you will automatically make small corrections with the Fine control.

The SAT mode will actually correct the minor variances in the threshold hum caused by the changes in the ground mineralization. These changes may be more dramatic in some areas making the VARI - SAT desirable. Very large changes in the ground must be corrected by adjusting the G.E.B. Coarse or G.E.B. Fine controls. In extreme ground the G.E.B. Coarse control will often be used, instead of the G.E.B. Fine, to update the ground balance during searching. However, in most areas the G.E.B. Fine control is used to periodically update the ground balance setting.

For more information on ground balance see the description of the GROUND BALANCE control earlier in this manual.

GROUND BALANCE

(Low Mineral Conditions)

The GM V/sat is designed to work in an environment of heavy iron mineralization. In some instances however, there may be so little iron mineralization that the loop will never go null or blank when it is lowered to the ground. In other words, there always seems to be a faint hum when the loop is lowered to the ground. Turning the Coarse Ground Balance control fully counterclockwise doesn't change the picture. In this instance, merely set the ground balance knobs to the midpoint or at 12 o'clock and hunt. Any slight changes should be able to be corrected with the Fine Tune control.

V-SAT / GAIN

If the threshold becomes too erratic or noisy, it might be necessary to use the V-SAT feature and/or reduce the GAIN control. This noisy behavior will make it difficult to recognize a true target (possible nugget) from pieces of mineral, commonly referred to as "hot rocks". It is not wise to keep a high level of GAIN if the detector will not operate smoothly. This is a false sense of security. Recognizing a real target is the most important part of detecting. This is an example of when less GAIN will produce more nuggets. You must be the best judge of just how much noise you can tolerate and still identify nuggets, as well as the combination of V-SAT and GAIN which produces the desired results in your area. Some real Pro's can work at levels intolerable to the rest of us, because they have trained their ears over the years. Tiny hot rocks are not the only culprits. Alkali salt flats, in the desert, can also cause erratic behavior and require faster V-SAT settings or reduced levels of GAIN, or both, to handle such very extreme conditions. Wet alkali washes can be extremely difficult to work due to the sensitivity of high frequency gold detectors to dissolved salt.

V-SAT / GAIN Continued

In some instances, pinpointing is easily performed by merely "X-ing" or crisscrossing. The loudest part of the target will be under the center of the loop, just as with any detector. After the approximate location of the target is determined, take a handful of soil and check the hole again. Continue this process until the target is no longer in the hole, but in the hand. I prefer putting the handful of soil in a plastic container (pan, tray, cup, or scoop). Passing the container over the loop will determine if the target is really in it. If so, a series of separations will quickly expose the target. Some prefer to pass the handful of dirt across the loop directly. Caution must be exercised if this is done. The GM V/sat is sensitive enough to pick up the salt in your hand and respond with a signal. Try this with nothing in your hand and you will see how close you can come to the loop using this method. One way around this salt sensitivity is to pinch the soil in small amounts and wave only the fingers over the loop. You will find the way best suited to your needs. The condition of the soil - dry, wet, fine, coarse, etc. will have a lot to do with the best method for you. Until you get good at eyeballing the target in the SAT mode you can use the PP (pinpoint) position which is reached by turning the V-SAT control fully counterclockwise.

SEARCHING

Once you have achieved the initial ground balance, you are ready to start searching. Move the loop just over the ground and listen for the distinct zip-zip sound produced by a target. It is wise to plant a nugget just under the soil to practice on in order to learn to recognize what it will sound like. If you don't have a nugget, use a nickel or piece of lead (sinker or bullet). You can practice with different sized nuggets and at different depth. This is the part that I cannot help you much with. It will take practice to determine the proper search speed and technique. Do not go too fast. Try to overlap your sweep path so that you won't miss the tiny and deeper nuggets. When you hear the zip-zip, make an X over the loudest portion and eyeball the center. If you have a hard time finding the center, you can switch to the PP setting and try to pinpoint it. Don't forget to put the V/sat control back to a normal SAT setting before resuming searching. At first, I recommend that you dig all targets, until you get used to the sound of various items. As with other G.E.B. detectors, a nail or oblong piece of iron laying horizontally will produce a double beep. You will learn to recognize this. Remember now, a "good target" is considered anything that is not IRON. You want to detect lead, brass, copper, aluminum and silver. Any of these metals can simulate the sound of a gold nugget and must be dug. Keep a particular lookout for the tiny lead bird-shot so common in mining areas. If you are detecting these tiny targets, you are doing everything right.

IRON I.D. Audio and Visual Meter

Once you have the technique down pat and feel confident you can identify a real target, you can start to experiment with the IRON I.D. toggle. I feel it is best to use this in the IRON I.D. Off (center) position and then move the toggle to the TEST position in order to attempt to identify the target. Thus, search with the I.D. off and test each dubious target. Remember, this I.D. function is designed to identify a target as Iron if it is sure it is. An iron target will chatter or null out when the loop is passed over it. At the same time, the Iron meter will deflect to the right. If the I.D. circuitry cannot tell whether the target is truly iron (too small or too deep) it will not distort the audio signal and the meter will not deflect. This was designed to avoid the possibility of rejecting gold nuggets and help to identify most iron trash. It should eliminate a large percentage of unnecessary digging.

Remember that even the best systems can be thwarted in very extreme situations. It is always best to test the system in each location to see if the ground mineralization will allow it to function properly. Used properly, it will eliminate the need to dig much of the iron trash without the loss of gold nuggets. There will be many locations where the iron mineralization is not extreme and the Iron I.D. toggle can be put in the ON position. In this position, the I.D. function will be active at all times during the searching process. Iron targets (not too small or too deep) will distort the signal (chatter or break up) and deflect the meter needle to the right. All nuggets and unidentifiable pieces of iron will give the same "good" zip-zip response, and NON - IRON meter indication (no meter needle deflection).

Care must be taken when attempting to identify small targets in heavily mineralized ground. Even though IRON I.D. is designed to give a clear audio signal with no deflection of the meter when it passes over gold or any non-iron metal, it can give a confused reading, slight chatter and slight deflection of the meter caused by a combination of a target and mineralization. If the loop is extremely close to the target, a tiny nugget on top of the ground could indicate iron. When testing a small target, lift the loop a little off the ground while still keeping the target within detection range, and test it. It should then give a good reading. It is wise to carry a test nugget with you and place it just under the soil to see how the IRON I. D. Circuit reacts. In this way, you can determine the reliability of IRON I. D. in the ground you are searching. For more information on the use of IRON I.D. see the description of the IRON I.D. control earlier in this manual.

As I indicated earlier, hot rocks can be defined as a rock which contains more or less mineral content than the surrounding ground matrix. Therefore it can act as a target to the detector and can confuse the detectorist by creating either a signal or chatter (erratic behavior). This can reduce the ability to differentiate tiny nuggets from the ground sounds (hot rocks).

Negative hot rocks are ones which balance out on the ground balance control to the right (usually greater than 6 or 8). They actually produce a null or no sound when directly under the loop, making a sound once the loop passes them. This sometimes sounds like a "buoying" when the ground mineral and the rock mineral are far apart in intensity. That is when the ground might be turned at 5 and the rock at 8. At any rate, these are usually black in color and usually magnetic. They can often be tuned out by ground balancing right over them and then proceed to search with the GM V/sat "over tuned" to the ground. When using this procedure, be sure to search slowly and keep the loop close to the ground and level. This will eliminate the bother of such "hot rocks". Some people call these "cold rocks". They are usually easy to identify.

The toughest "hot rocks" are the ironstone or positive rocks. They are usually red or various shades of red to almost black. They ground balance counterclockwise on the ground controls. They are sometimes as small as BB's and sound just like nuggets. These positive "hot rocks" are almost impossible to tune out and can tune as low as 1 or 2 on the coarse ground balance control, near salt. They actually are in the range of gold nuggets and that is why they are so hard to differentiate. Reducing the GAIN and tuning with a neutral or slightly positive sound on the down stroke of the loop during ground balancing can soften their sound and help to make them less visible.

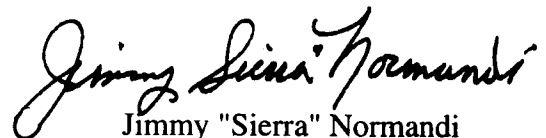
The ever-present "hot rock" will always present problems and must be contended with. It is my belief that they should be recognized and thus avoided. Most large ones are on the surface and can be kicked aside when identified. You will soon learn what they sound like. The "overshoot" or "buoying" sound will soon become familiar. You can stop and balance each one out, but I find this unnecessary. In some cases, over-ground balancing will reduce their interference. I find it best to tune to the majority of the ground matrix and learn what a "hot rock" sounds like. The fast SAT of the GM V/sat will recover quickly upon leaving the vicinity of a "hot rock" and will remain sensitive to gold nuggets. Since there are different kinds of "hot rocks", it is almost impossible to eliminate all of them with one setting. Some will be identified by the I.D. system as if they were iron. In every instance, practice makes perfect.

Some final tips on the operation of the GM V/sat in reference to the interpretation of the audio and visual iron identification function. As I mentioned earlier, I prefer to operate with the IRON I.D. toggle OFF, and to activate it when a target is detected. This seems to be a more efficient way to operate. It is less confusing and easier to determine a real target (good or bad) from a false target. Less confusing sounds and less distraction during the searching process makes it less likely to miss a target altogether. It might be good to mention at this time, however, that after becoming more experienced with the IRON I.D. function, you might prefer to operate with the IRON I.D. toggle set in the ON position. I found that I really preferred this after I got used to it. Operate in the way you feel most confident.

I would also like to mention that caution must be exercised when using the GAIN control at the upper limits. Even though the ground does not overload the loop at full GAIN "10", you might experience some false signals operating at this high level and you will best reduce GAIN to smooth out the performance. The GM V/sat has much more power than most detectors you have probably been accustomed to and I have found that lower levels of GAIN have given excellent depth in most areas.

In most cases, a definite iron target will bang the needle full scale and the audio will be distorted. However, in some instances, a good audio might be heard in conjunction with a partial movement of the needle. This can be due to a fringe response. Iron or mineral contamination can cause this meter response and thus, in cases where the audio and meter disagree, GO WITH THE AUDIO. You will soon learn to interpret the audio and meter and how they relate by digging everything for awhile. It should also be understood that once a target is located, sweeping the loop directly over the center will produce the most accurate IRON I.D. indication. Locating a target, pinpointing it, then placing the IRON I.D. in TEST, and sweeping directly over the center will actually save time when you consider the time one could spend digging iron targets. No system is perfect, but this one will greatly reduce the amount of time wasted digging iron trash in moderately mineralized areas if used properly, and will not miss the gold.

It should be understood that IRON I. D. is not a traditional discriminator. The detection depth of the GM V/sat is not reduced by operating in the IRON I. D. mode. All targets within range of the detector will be heard by the operator. In both IRON I. D. ON or OFF positions only the type of audio response changes, ZIP - ZIP sound for good targets, BROKEN for iron with meter movement. No depth is ever lost by utilizing IRON I. D., the only danger could be in misunderstanding the identification of a target. Reducing the GAIN control, and slowing the loop sweep speed, directly over the center of the target, will increase the accuracy of IRON I. D. audio and visual indications. Remember, when in doubt - DIG!


Jimmy "Sierra" Normandi

Good Luck and Good Prospecting!

GOLD

Chemistry;	Au.
System;	Cubic symmetry.
Habit;	Crystals rare, usually as grains, or dendritic (treelike structure) shapes and rounded nuggets.
Colour;	Yellowish - golden, with increasing silver content becomes much paler.
Streak;	Yellow - gold.
Cleavage;	None, (unpredictable shapes).
Fracture;	Rough, malleable.
Hardness;	Gold = 2.5 to 3.0 depending on purity. Finger nail = 2.5. Coin = 3.5 (harder than gold). Steel knife blade = 5.5.
Specific Gravity;	Gold = 15.5 - 19.3 (relative density), depending upon purity. Quartz = 2.65. Pyrite = 4.8 to 5.2.
Luster;	Metallic.
Special Features;	Colour, very high Specific Gravity, non-tarnishing, malleable, insoluble in single acids.
Formation;	Often with quartz in hydrothermal veins. Also frequently in placers and consolidated sands and conglomerates.
Distribution;	Largest quantities from South Africa, India, Brazil, Bolivia, U.S.A., Mexico, New South Wales, & Queensland Australia, Austria, The Urals (USSR), Leadhills (Scotland), North Wales, East Sutherland, and Cornwall (UK).

RECOMMENDED READING

FINDING GOLD NUGGETS II	James "Jimmy Sierra"Normandi
ZIP ZIP MASTERING YOUR NUGGETDETECTOR	LarrySallee
SUCCESSFUL NUGGET HUNTING	Pieter Heydelaar
FOLLOW THE DRYWASHERS	James Straight
WHERE TO FIND GOLD IN THE DESERT	Jim Klein
WHERE TO FIND GOLD IN THE MOTHERLODE	Jim Klein
GOLD DIGGERS ATLAS	Robert Johnson
FIELD GUIDE TO ROCKS AND MINERALS	Frederick H. Pough
MINING LAW	Terry Maley

ACCESSORIES

These accessories are highly recommended for use with your GM V/sat;

Loop Cover - Protects the bottom of the loop from abrasion / wear. Is left on the loop during searching.

Headphones - Allows finer tuning, reduces distraction from external noises, and increases battery life.

Sierra Gold Max (Large 7.5" X 13.5" Accessory Loop) - Increases detection depth (approximately 20% *NOT LINEAR*) over the standard 5" X 10" loop. Especially designed to increase depth on medium to large nuggets, and increase coverage per each pass of the loop. Higher Gain settings can often be used (depending on ground conditions) resulting in even greater depths. Some loss of very small targets is expected however, for a loop of its size the Sierra Gold Max still retains impressive sensitivity to small targets. Retains the same "zip-zip and buoying-buoying" basic sounds between nuggets and hot rocks.

These accessories offer added convenience;

Carry Case - Available in differnt versions for travel and storage.

Extra Battery Holder - # 523-0006 If you travel far from home always carry an extra battery system, holder & batteries.

Rechargeable Battery System - #512-0023 Non- Memory Nicad, & #509-0024 Overnight / Fast Charger, allows reuse if 110 Volt outlet is available.

Goldmaster Video - 60 minute VCR instructions regarding use of the Goldmaster.

As a result of the GM V/sat's popularity, a wide range of additional "after market" accessories are available that will compliment your nugget shooting adventures. Hip-mount and chest mount pouches and harnesses, digging tools with built-in magnets, special separating cups and more. Check with your Dealer or telephone within the U.S.A. toll free 1-800-547-6911 for more information.

Proper Care

I. Cleaning

- A. Both the loop and rod are waterproof and can be cleaned with fresh water and mild soap. The control box is not water proof and must be kept dry. Never lift a wet loop above the height of the control box as water can run down the inside of the rod damaging the electronics. A damp cotton cloth can be used to wipe off a dirty control box.

II. Weather

- A. Do not expose your detector to the conditions of a car trunk during winter and/or summer extremes.
- B. Protect it from direct sunlight during storage.
- C. The control box is rain resistant. However, it must be protected from heavy rain. White's weather beater rain covers are ideal.

III. Saltwater

- A. Salt/alkali is very corrosive! After your detector has been exposed to salt, rinse the loop and rods in fresh water. Wipe down the control box with a damp cotton cloth. Do not allow water inside the control box and avoid lifting the loop above the height of the control box.

IV. Storage

- A. When the instrument is not in use, make sure the GAIN knob is turned fully counterclockwise, to the OFF position.
- B. If you plan on storing your detector for long, remove the battery holder from the instrument and remove the batteries cells from the holder.
- C. Store the instrument indoors, in an area where it will be protected from abuse. Over the years White's has noted more service repairs and physical damage, on units in storage than those experiencing daily use.

V. Additional Precautions

- A. Avoid dropping your detector while attempting to set it down to dig.
- B. Avoid using your detector for leverage when standing up from a dig.
- C. Do not use any lubricants, such as WD-40, on any part of your detector.
- D. Do not modify your instrument during its warranty period.

Service

White's reputation has been built on quality products backed by quality service. Our Factory Authorized Service Centers are factory trained and equipped. They offer the same quality service as the factory. Service before and after the sale is the cornerstone of our customer relations.

For our Factory Authorized Service Center nearest you, please contact your Dealer, telephone toll free 1-800-547-6911, or toll 541-367-6121.

I. Before shipping detectors for service:

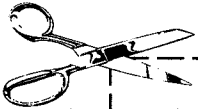
- A. Contact your Dealer. There may be a quick, simple fix or explanation that will prevent having to send the detector in for service.
- B. Double check the obvious, such as batteries, and try the detector in another area to be sure there is not interference.
- C. Be sure to send all necessary parts with your detector, such as batteries and holders, as these items can result in symptoms.
- D. Always include a letter of explanation about your concerns, even if you have talked to the Service Center by telephone.
- E. Take care in packaging instruments for shipping.
- F. Always insure your package.

■ Warranty Information

Should for any reason you sell your White's instrument prior to the warranty described on the following page expiring, the remaining warranty is transferable. **This transfer is authorized by calling 1-800-547-6911, and getting an Authorization Number.**

Simply fill out the following information, including the Authorization Number, seal it in a stamped envelope, and send it to **White's Electronics, 1011 Pleasant Valley Road, Sweet Home, Oregon 97386.** The remaining warranty period will then be available to the new owner.

The Warranty Statement (on inside back cover) applies to both the original owner as well as the second owner.



Warranty Transfer

Original Owner:

Name: _____

Address (Which appears on the original warranty card):

Instrument Serial Number: _____

New Owner:

Name: _____

Address: _____

Comments: _____

Distributor Authorization Code: _____

■ Owner Information

Serial Number: _____ (*on inside of battery compartment*)

Purchase Date: _____ (*The date on the sales receipt*)

Dealer Name: _____

Address: _____

Telephone #: _____

Payment method: _____

Personal markings: _____



White's Electronics, Inc.



Limited Warranty

If within two years (24 months) from the original date of purchase, your White's detector fails due to defects in either material or workmanship, White's will repair or replace at its option, all necessary parts without charge for parts or labor.

Simply return the complete detector to the Dealer where you purchased it, or to your nearest Authorized Service Center. The unit must be accompanied by a detailed explanation of the symptoms of the failure. You must provide proof of date-of-purchase before the unit is serviced.

This is a transferable manufacturer warranty, which covers the instrument two years from the original purchase date, regardless of the owner.

Items excluded from the warranty are non-rechargeable batteries, accessories that are not standard equipment, shipping / handling costs outside the continental USA, Special Delivery costs (Air Freight, Next Day, 2nd Day, Packaging Services, etc.) and all shipping / handling costs inside the continental USA 90 days after purchase.

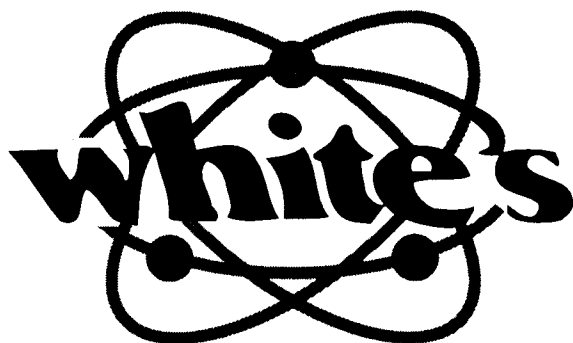
White's registers your purchase only if the Sales Registration Card is filled out and returned to the factory address soon after original purchase for the purpose of recording this information, and keeping you up-to-date regarding White's ongoing research & development.

The warranty does not cover damage caused by accident, misuse, neglect, alterations, modifications, unauthorized service, or prolonged exposure to corrosive compounds, including salt.

Duration of any implied warranty (e.g., merchantability and fitness for a particular purpose) shall not be longer than the stated warranty. Neither the manufacturer or the retailer shall be liable for any incidental or consequential damages. Some states however, do not allow the limitation on the length of implied warranties, or the exclusion of incidental or consequential damages. Therefore, the above limitations may not apply to you.

In addition, the stated warranty gives you specific legal rights, and you may have other rights which vary from state-to-state.

The foregoing is the only warranty provided by White's as the manufacturer of your metal detector. Any "extended warranty" period beyond two years, which may be provided by a Dealer or other third party on your detector, may be without White's authority involvement and consent, and might not be honored by White's.



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