

PULSE **STAR II**

Professional Metal Detector

OPERATING MANUAL

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Introduction

You have purchased one of the most powerful metal detectors available at the time. The PULSE STAR II metal detector was especially developed for detecting and locating large objects (all metals) buried deep. It incorporates a one meter by one meter (40 inches by 40 inches) search coil as standard equipment. Different size and shape coils are available as well.

The PULSE STAR II is the result of a consistent development of the pulse induction principle. Latest high tech components and circuit design has been used to achieve high performance and reliability and to introduce some important improvements. This concerns a very simple operation as well as extraordinary detection depths.

The PULSE STAR II can be operated effectively in highly mineralized soil areas, beaches, salt water, and areas where conditions are unfavorable using other metal detectors.

The metal discrimination feature is a great help while searching and allows you to discriminate between low-conductiv objects (like iron, foils or small bits of metal) and high-conductive objects (like gold, silver, copper, bronze, aluminum, etc.). This feature requires a minimum size of object and only works in the discrimination range (60 to 80 % of normal range).

We offer various accessories such as different search coils, a cigarette lighter adaptor for charging the PULSE STAR II from an automobile, boat or truck, and a solar panel, so that you are always perfectly equipped for any kind of job.

Please read this manual attentively and completely. Even if you are not interested in the function of the PULSE STAR II, you should not leave out chapter 1 (Function). You will find important information about the unit's respond to different metals and other features which are helpful to know while searching.



Fig. 1: Included with your purchase

Standard equipment of the PULSE STAR II

- Solid plastic case with padding
- Electronic unit with leather case (adjustable shoulder strap, belt holder, lockable protection cover)
- Charger (230 or 120 V available)
- Lightweight stereo headphones
- Operating manual (German or English version)
- Detachable one meter by one meter search coil with carrying straps, complete with artificial leather bag with adjustable shoulder belt, large enough to store additional accessory coils


We wish all owners of the PULSE STAR II metal detector great success! We would appreciate hearing from any of you personally on your experience and recoveries made. If you have any problems, please do not hesitate to give us a call.

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Chapter 1 

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1 Function

The PULSE STAR II is a PULSE-INDUCTION (PI) system which incorporates a large search coil (one meter by one meter as standard equipment) for the main purpose of finding large objects at great depths. These detection depths can almost be compared with those of magnetometers, which can detect nothing but ferromagnetic objects. Another great advantage of using the PULSE STAR II together with the large search coil is being able to cover a large area in a short period of time. The actual search coil is encased in a square plastic frame (PVC tubing) and can be carried by one or two persons.

Using the PI-principle offers some decisive advantages. First, the search coil is not part of a resonant circuit as it is the case with VLF detectors and can, therefore, be of almost any size and shape. This is absolutely necessary in order to increase the location depth considerably. In the second place there is a timely decoupling between the transmitting and the receiving phase which makes it possible to work with far greater transmission power.

A further advantage is that small objects like bottle caps, pull tabs, pieces of aluminium foil, but also single coins are naturally rejected while using the large search coils.

But still the PULSE STAR II is an easy-to-operate metal detector: you only have to deal with four simple controls, of which you need just one while normal operation.

Objects are simultaneously indicated by a meter and by an audio signal which increases in frequency while approaching the object. The audio response has a very wide frequency range in order to avoid signal saturation when the search coil approaches a very close object. This makes it easy to pinpoint the exact location.

The function of the PULSE STAR II is divided into two time intervals:

Transmission Phase

A strong duty current is flowing through the search coil about 600 times per second. The linearly increasing current builds up a primary magnetic field which radiates as shown in Fig. 2. The current is abruptly cut off after a certain time, so that the primary magnetic field collapses quickly causing so-called eddy currents in the metal object. Strength and duration of these eddy currents depend on the electrical conductivity, size and shape of the object. After a short time delay the search coil is connected to the receiver input.

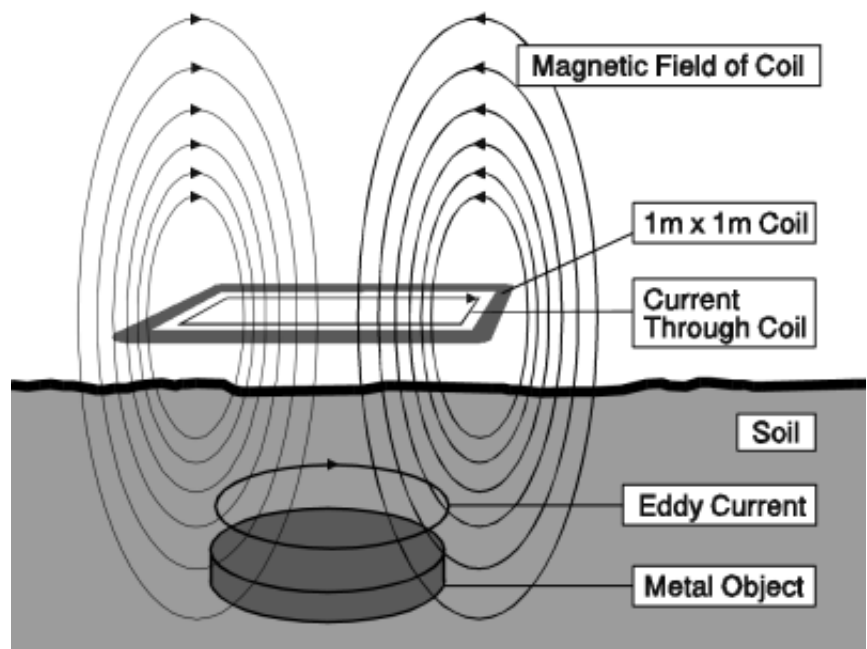


Fig. 2: Transmitting Phase

Receiving phase

The decay of the eddy currents in the object produces a secondary magnetic field, which is radiated by the object (Fig. 3). This secondary magnetic field has its effect also on the coil and here induces very low voltages, which are amplified and displayed by a meter and an audio signal. Obviously the detection range has physical limits, because these voltages are extremely weak and can be obscured by external magnetic fields.

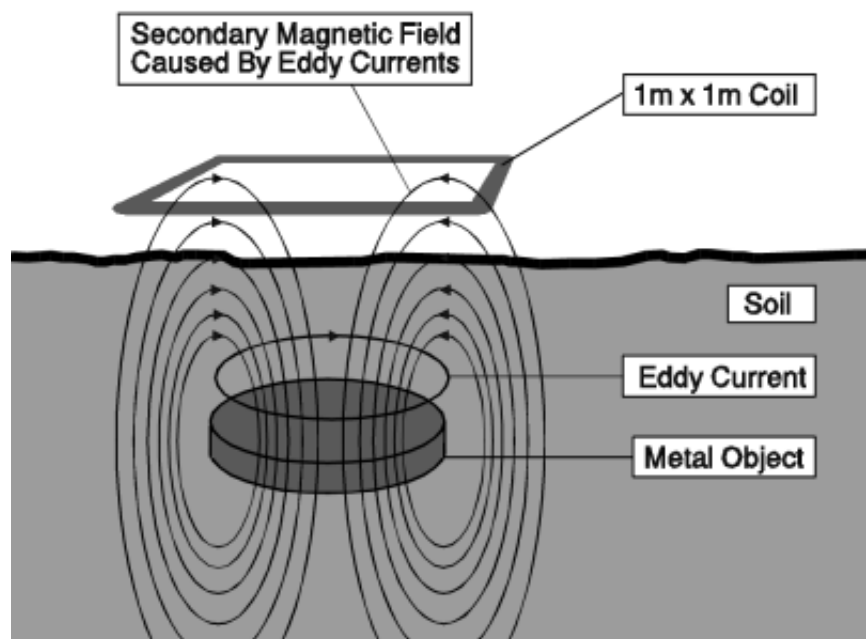


Fig. 3: Receiving phase

In general, the possible detection range will increase quickly with increasing target size. This is especially true for the PI-principle. But the electrical conductivity and the shape of the object are also important factors.

Related to this, ferromagnetic metals take a special position. If these metals are exposed to the magnetic fields of a PI-detector, they will be momentarily magnetized. Although the electrical conductivity of these metals is poor and, therefore, the decay of the eddy currents is very short, the strength and the slow decay of the magnetization causes a strong signal. This is why PI-detectors are very sensitive to even small ferrous objects. The PULSE STAR II offers you the possibility of reducing the sensitivity to these

objects (some smaller ferrous objects can even be completely rejected), while still being sensitive to most non-ferrous metals.

With a rather complicated electronic analysis of the decay of the objects magnetic fields we were able to provide the PULSE STAR II with a metal discrimination. Since the signals that have to be analyzed are even smaller than the normal detection signals, the discrimination range is limited to about 60 to 80 % of the normal detection range. Additionally, motion of the search coil is required in order to receive a ferrous or non-ferrous indication.

Also, the discrimination can only function with objects of a minimum size of about 10cm (4 inches) in diameter. The influence of shape and position is too large when detecting small objects. The PULSE STAR II measures the electrical conductivity of the metal object. As ferrous metals have, compared to most non-ferrous metals, a poor conductivity it is possible to differentiate. However, you have to pay attention to the following: almost all objects smaller than previously mentioned will cause a ferrous reading. The same applies to thin foils (e.g. large aluminium foils). An accumulation of several smaller non-ferrous objects (for example some silver coins) have not the same characteristics as one bigger single piece, so that again a ferrous metal may be indicated. Additionally, the conductivity of some non-ferrous metals, like lead or tin, as well as of some alloys is even lower than that of iron, so that they may be classified as ferrous objects. However, for large objects there will rarely be an anomaly effect (a non-ferrous indication although it is a ferrous metal) which plagues most VLF/TR detectors.

If there are both ferrous and non-ferrous metals in the detection range (e.g. non-ferrous metals in an iron box), usually the larger one of these objects will be indicated.

VLF/TR detectors do offer excellent discrimination features for small objects. The PULSE STAR II has the greatest advantage of detecting and discriminating medium and large size objects.

Brief summary of the advantages and capabilities of the PULSE STAR II metal detector:

- The PI-principle allows to enlarge the search coils and to use a high transmission power in order to achieve extraordinary detecting capabilities.
- Using large search coils will allow the operator a fast search covering larger areas.
- Many different coils (various sizes and shapes) can be connected to the PULSE STAR II (1m x 1m is standard equipment):
- The 25cm (10 inches) search coil is very effective for exact location and can also be successfully used in overgrown and bushy areas.
- The cylindric coil may be used for cracks, gaps, drilling holes, wells and also works with metal discrimination.
- The 2m x 2m (80 inches x 80 inches) search coil covers four times as much ground as the standard coil and achieves even 30 to 40 percent more depth on large objects. However, sensitivity to smaller objects will be reduced.
- The Universal Search-Loop can be used to build up coils of different shapes and sizes. Additional, a compensated coil is possible which eliminates interferences.
- All search coils are waterproof and can, therefore, be used in shallow water.
- The PULSE STAR II offers a metal discrimination for larger objects.
- Operation is very simple and the internal adjustments are performed automatically each time the PULSE STAR II is turned on.
- Retuning during operation requires nothing more than pressing a switch.

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2 Controls and Connectors

Description of Controls and Indicators on Front Panel



Fig. 4: Front Panel

PWR VOLUME

With this control knob you can switch the PULSE STAR II **ON** and **OFF**. Simultaneously you can adjust the volume of the ticking-rate of the built-in speaker as well as for the connectable headphones.

When the PULSE STAR II has been switched on, both LED lights (green and red) come on for approximately five seconds. During this time the PULSE STAR II will automatically adjust itself. The needle of the meter is set to zero and the preset ticking-rate is recalled.

The **MODE** toggle switch must be positioned to **NORMAL** in order to hear any ticking noise. You will not hear any ticking noise in the **SILENT** mode position.

AUDIO TUNE

With the **AUDIO TUNE** knob the initial ticking-rate can be controlled by holding down the **MODE** switch to **RETUNE** and simultaneously turning the **AUDIO TUNE** knob.

The ticking-rate should be calibrated between one and five clicks per second.

MODE

The **MODE** toggle switch can only be locked in the **NORMAL** or **SILENT** position. The **RETUNE** mode is momentarily.

1. NORMAL

The PULSE STAR II has the highest sensitivity for detecting targets in this position. There is no motion of the search coil necessary to get a reading. Adjustment of the ticking-rate is possible in this position.

2. RETUNE

You can recall the preset ticking-rate by switching to this mode.

3. SILENT

There is no ticking noise or continuous audio sound in this mode. In order to get an indication, movement of the search coil is required. If any ferrous object*) is detected you will hear a low pitched tone with a green light response. If any non-ferrous objects are found you will hear a high pitched tone with a red light response. You will lose some sensitivity (approximately 20 to 40 % in depth) while operating in the **SILENT** mode.

*) See chapter 1 (Function) for further information about the metal discrimination.

SAMPLING DELAY

Operating the PULSE STAR II in the **NORMAL** mode with **SAMPLING DELAY** control knob in position 1 will give you the greatest sensitivity of any object detected.

In positions 3 and 4 the sensitivity to ferrous objects and thin foils are greatly reduced. Smaller iron objects as well as foils can be completely eliminated. In chapter 3 (Detection Depths) an illustration is given showing how the position of **SAMPLING DELAY** influences the detection depth of different objects. Additionally, you can minimize the effects due to highly mineralized soils when using a higher **SAMPLING DELAY** position (see chapter 6).

The PULSE STAR II also retunes itself when changing from one control position to another (both LEDs turn on). It is not necessary to press the **MODE** switch to **RETUNE** after you changed a **SAMPLING DELAY** position.

INTENSITY METER - DISC INDICATORS

The **INTENSITY METER** indication will increase as you pass over any buried object.

If you hold the **MODE** toggle switch down to **RETUNE** for more than one second, the battery condition can be checked. If the meter needle is shown near or in the black area, the battery needs recharging.

During operation a warning sound of several beeps occurring every seven seconds will alert you that the battery needs recharging. See chapter 7 for more information.

On the meter plate you will see two LED indicators, a green light for ferrous and a red light for non-ferrous. Also, both LEDs will light when the PULSE STAR II is turned on, when you use **RETUNE** and when you change a **SAMPLING DELAY** position. In each case this indicates an automatic retuning of the PULSE STAR II.

A detailed description will be given in the following chapters of how to use the PULSE STAR II in actual practice.

Description of Connectors and Indicators on Rear Panel



Fig. 5: Rear Panel

COIL/CHARGER

Different size coils can be connected to this jack. Push the connector plug in all the way before turning the sleeve on the plug. Locking the plug will keep the connector from pulling out.

Furthermore, the built-in battery can be recharged via this jack.

STEREO HEADPHONES

You can connect any type stereo headphones with a 1/4 inch (6.3mm) phono plug to this outlet. One set of stereo headphones is provided (which includes an adaptor). The built-in loudspeaker is automatically turned off when headphones are plugged in.



CHARGING

The green LED light indicates that the battery is charging.

BATT. FULL

The red LED light indicates the battery has been fully charged. The charging will automatically be stopped and the charging electronic changes to holding state. However, it is recommended to disconnect the charger when the red LED turns on.

See chapter 7 (Maintenance and Charging) for detailed charging instructions.

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3 Detection Depths

When verifying detection depths reached with the PULSE STAR II, you can use the examples below which have been tested as references. These objects are easily available for confirming the depth capabilities of your PULSE STAR II metal detector. The conditions while testing and recording the below objects were as follows: The **MODE** switch was in **NORMAL** position, **SAMPLING DELAY** was in position 1 and a one meter by one meter coil was used. A clear increase of the ticking-noise and a clear meter reading had to be noticed. The largest surface of each object was measured.

Object	Detection Range in Inches (Air Tested)
Soft Drink Can (0.33 l)	approx. 40
Aluminum Sheet 8" x 16" x 1/25"	approx. 65
Iron Sheet 9" x 9" x 1/50"	approx. 70
Fuel Tank 20 Liters (Iron)	approx. 88

These depths can be far exceeded when detecting larger objects.

From the diagram "Reaction of **SAMPLING DELAY**" on the next page you will notice the discrimination capability of the PULSE STAR II. Three different kinds of metal objects were used as examples to show how they are detected at different **SAMPLING DELAY** positions.

It is interesting to note that with the **SAMPLING DELAY** control knob at position 1 or 2 the iron sheet can be detected at very good depth, while at position 3 or 4 a clear drop is shown. Many metal container lids and other small objects (made of aluminum or lead alloys) as well as even large aluminum foils can be completely rejected at these positions.

With objects made of (highly) conductive non-ferrous metals like copper and especially precious metals like gold or silver, you will lose much less detection depth (depending on size of object). The reason for this is that the decay of the eddy currents in these metals takes a lot more time. So if you are looking for large non-ferrous objects (especially precious metals) in an area which is scattered with small pieces of trash, it is advisable to operate in **SAMPLING DELAY** positions 3 or 4. But remember that the sensitivity to the wanted object may be reduced as well, depending on its size, shape, and conductivity (which can be clearly lower with alloys than with pure metals !).

All mentioned detection depths may differ either positively or negatively when using reference objects of the same size, but possibly made of different alloys.

Note: Detection depths for accessory coils can be found in chapter 8 (Accessories).

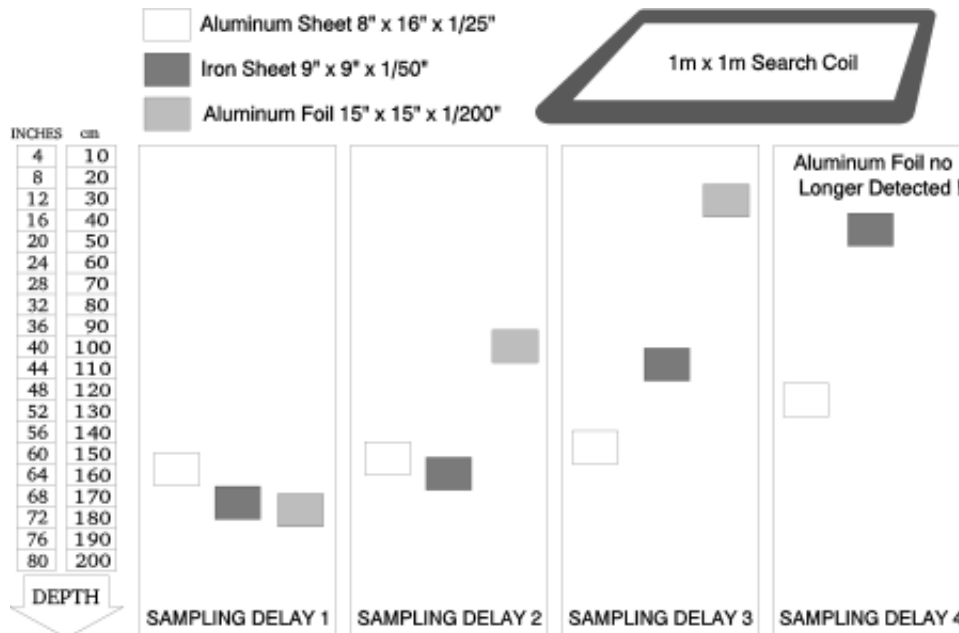


Fig. 6: Reaction of SAMPLING DELAY

This diagram shows how three different kinds of objects are detected with changing **SAMPLING DELAY** positions. The one meter search coil was used facing the largest surface part of the objects in **NORMAL** search mode. A clear increase of the ticking-noise and a clear meter reading had to be observed for proof of position of object.

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4 Operating Procedures

Now you are familiar with the controls and capabilities of the PULSE STAR II. In this and the following chapter you will learn how to operate the unit in actual practice.

To ease transportation and storage, the one meter by one meter search coil is constructed detachable.

With a few simple steps, your search coil is ready for use:

1. Unfold all four PVC tube sections.
2. Align all corners.
3. Ensure that the cable is pushed inside the tube.
4. Secure each corner with a slight nudge with palm of hand. All four corners must fit snugly so as not to come apart while searching.



Fig. 7: Coil Assembly

Coil disassembly:

To disassemble the one meter by one meter search coil, pull on each corner without twisting or bending each tube to prevent warping it. If you have any difficulties disconnecting any corner, then slightly hit inside the corner with your hand. Before packing and storing the search coil, make sure that the connector plug is clean, dry, and free of dirt. The plug should always be closed with the dust cap. The search coil should be cleaned and dried as well before it is stored. Please avoid sharp pulls on the connecting cable of the coil.



Fig. 8: Coil Assembly

Start-up and Adjustment of the Tick-rate

Connect the search coil connector plug to the **COIL/CHARGER** outlet. Turn the sleeve on the plug clockwise until it is securely fastened. Make sure connector plug is pushed in as far as it can go before rotating the sleeve.

The leather case, which contains the PULSE STAR II electronic unit, has an adjustable shoulder strap and belt loop for easy carrying.

In order to avoid interference of the metal parts of the electronic unit, be sure to carry the PULSE STAR II on the side of your body that is away from the coil.

Lift the coil with a partner by the connected adjustable straps. The search coil should be held approximately six to eight inches from the ground while searching. Do not allow one end of the coil to be higher than the other.



Make sure that no large metal objects are close to the coil for initial adjustment. Also check your shoes or boots since most of them contain metal parts and you would receive a signal response any time you step near to the coil.

Turn on the PULSE STAR II by rotating the **PWR VOLUME** switch clockwise from the **OFF** position. Both LED lights on the meter will turn on and stay on for approximately five seconds.

It is always best to check the battery condition of the PULSE STAR II first. This is initiated by holding the **MODE** Switch down to the **RETUNE** position for at least one second. The meter needle will indicate the condition of the battery.

Next, adjust the tick-rate of the PULSE STAR II somewhere between one to five ticks per second by holding the **MODE** toggle switch in the **RETUNE** position while simultaneously turning the **AUDIO TUNE** knob. Do not forget to turn up the volume. If circumstances allow, the volume should be turned up high enough for both persons carrying the coil to hear it. In this way the coordination is better when trying to locate the exact position of an object.

The PULSE STAR II is now ready to use.

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5 Search Procedures

Searching with the PULSE STAR II is particularly easy when the 1m coil is carried by two people. With the help of a special long shoulder strap, the 1m coil can be used by a single person: one hand directs the coil, leaving the other free to operate the electronics unit. Before beginning to search, select the desired switch position of **SAMPLING DELAY** with **NORMAL** or **SILENT** mode (see chapter 2 and 3). Searching in **SILENT** mode is recommended when maximum sensitivity is not really required, i.e. for objects not buried very deep.

In areas where a lot of uneven ground has to be covered, it is advisable to search systematically. You should grid large areas with poles and strings (strips approximately 32 inches wide). If using a two meter by two meter coil then grid off areas approximately 64 inches wide. It is also important that the grid areas are overlapping while searching because the search coil has its highest sensitivity in its centre.

Walk on the grid areas at a slow walking pace. Should the surface allow it, hold the search coil at a constant height of about four to eight inches from the ground. Should the tick-rate change due to magnetic soil (for example caused by large concentrations of iron oxides), move the **MODE** switch momentarily to **RETUNE**. You do not have to hold it for more than a split second. Iron oxides can cause the tick-rate to increase (see chapter 6).

<p>We would like to remind you (again) that both persons should have no metal on their shoes or boots. The person carrying the PULSE STAR II should place it on the side of the body away from the coil.</p>
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When first receiving a signal, it is advisable to obtain more information about the object detected. You can learn, with experience, if the buried object is large and possibly how deep it may be buried.

The strength and duration of the signal will give you this information. For example, a small object buried only a few inches deep, will give two signals as each edge of the coil passes (see Fig. 9). By moving the search coil higher, the small object will disappear.

With the help of the 10 inch coil you can also identify small objects shallowly buried. An object of the size of a soft drink can (for example), buried approximately 20 inches deep, will give a very clear signal (see Fig. 10).

On a large object buried deep, you will receive a longer signal indication (see Fig. 11). To determine the exact location of a buried object, walk slowly further in the direction of the strongest response. When you feel that the exact spot has been reached, place a marker on the ground, then change directions. Approach the buried object at right angles (90° to the right and left) of the original path to obtain a further optimum signal.

If you receive a very strong signal, it is advisable to momentarily move the **MODE** switch to **RETUNE** while over the object. The sensitivity will be greatly reduced and you will receive a peak signal directly over the object. Do not forget to **RETUNE** again to reset the sensitivity before carrying on searching.

You can also determine the kind of metal (ferrous or non-ferrous) of any object with 4 inch diameter or larger as long as it is within the metal discrimination range (approximately 60 to 80% of the normal detection range). See also chapter 1 (Function) for details about the discrimination feature.

In order to identify the object, motion of the search coil is required. You must walk steadily across the buried object and observe the LEDs on the meter (or you may move the **MODE** switch to **SILENT** to obtain an additional audible identification). If a weak signal is received, it is advisable to repeat the measurements several times to obtain a clear indication (ferrous or non-ferrous) of the object that has been located.

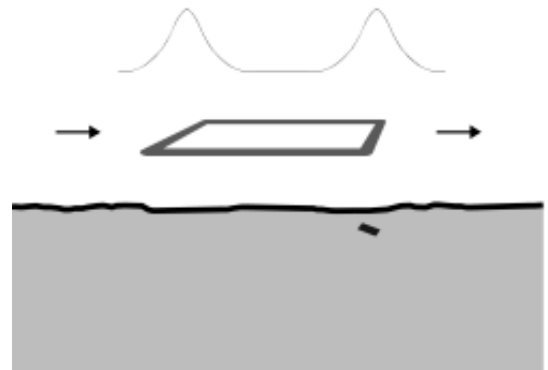


Fig. 9: Small object not buried deep

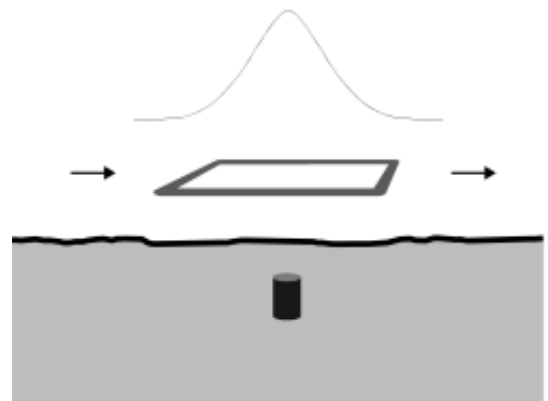


Fig. 10: Medium size object (approx. 20" deep)

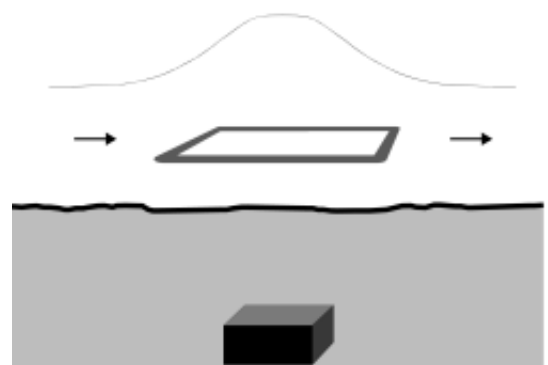




Fig. 11: Large object buried deep

IMPORTANT: Between each measurement a minimum pause of three seconds is required. The LEDs have to be off and the meter needle has to come down to zero. Only after this pause the next measurement can be made. This will allow the PULSE STAR II to retune itself.

The metal discrimination for the PULSE STAR II was developed with the 10 inch (25cm) round coil and the one meter coil. Using the large two meter coil may cause some false identifications with metal discrimination.

IMPORTANT: Do not forget to turn off the PULSE STAR II after each search! Otherwise, the battery will be completely discharged and may lose some capacity to recharge. Total damage may also occur (see chapter 7 and 10).

A further note: If you should hear short continuous beeps every seven seconds then the battery is low. You will be able to search for approximately twenty more minutes, nevertheless, you should recharge the battery as soon as possible.

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6 Interference

The PULSE STAR II has been developed to eliminate a lot of the electromagnetic interference. Land cables, railroad tracks, electric motors, water pumps etc. produce strong magnetic fields that can interfere with the PULSE STAR II. In this case you will notice unusual rhythmic audio signals being emitted from your PULSE STAR II.

Magnetic soil (iron oxides, for example) can also cause disturbances. This type of soil is noticeable when lowering the search coil. The tick-rate significantly increases even when there is no metal object below the surface. As long as the disturbing ground is level, you can hold the coil at the same distance from the ground and maintain a constant tick-rate. The PULSE STAR II can be tuned by positioning the coil at the correct searching height from the ground, and then pushing the **MODE** switch to **RETUNE**. Tuning adjustment to different areas (regardless of ground conditions) will not reduce the sensitivity.

If reduced sensitivity to iron objects and other smaller objects is acceptable, an increased **SAMPLING DELAY** will also reduce ground effects. Holding the coil higher helps to reduce ground effects as well.

Strong electromagnetic disturbances are the worst kind of interferences. Reducing the sensitivity will help greatly. For this, an **OFFSET** is stored within the PULSE STAR II.

To correct disturbances:



1. Adjust the PULSE STAR II by switching to **RETUNE** mode with the search coil at the correct height.
2. Next, hold a metal object near the coil so that the meter will show "2" (or a higher number if sensitivity needs to be reduced further). While holding the object at this particular distance, push the **MODE** switch momentarily to **RETUNE** again.
3. Take the metal object away from the coil. This should give a negative meter reading and cause the tick-rate to be lowered.
4. Next, increase the tick-rate to a few ticks per second with the **AUDIO TUNE** knob. Now the PULSE STAR II is less sensitive. An object must cause the same indication that you previously simulated with the metal object in order to be detected (the offset has to be overcome). You can go on searching now with reduced sensitivity.

To recall the highest sensitivity again, use **RETUNE** and re-adjust the ticking-noise down to a few clicks per second.

Another possibility to reduce the sensitivity is to turn **AUDIO TUNE** all the way to the left. Now the "dead area" up to the start of the ticking-noise has to be passed. However, this method does not affect the meter and the LEDs for the metal discrimination.

Using the Universal Search-Loop as a compensated coil (see chapter 8 Accessories) helps to overcome interference as well.

IMPORTANT: At times when strong interference occurs due to ground effects or electro-magnetic fields, the LEDs might turn on. A reliable metal distinction can only be made if sensitivity is reduced as per the first method (storing an offset).

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7 Maintenance and Charging

Care of Your Equipment

The PULSE STAR II requires very little service. Clean the electronic unit from dust and dirt with a soft cloth from time to time. Always clean the coil before storing it in the carrying case. Do not store any of the parts when wet. Plugs and sockets must always be kept clean and dry. Cover the plugs with dust caps (supplied with the coils only).

When functional problems occur, always check the battery condition of the PULSE STAR II first. A low battery will be indicated immediately with a noticeable acoustic beeping signal.

All search coils built for the PULSE STAR II are waterproof, however, the electronic unit is not and should never be placed in water or exposed to rain.

Recharging of the Battery

When low battery condition is indicated, you should immediately recharge the battery. It can be recharged at any time regardless of its current capacity. It does not suffer from a memory effect like NiCad batteries. The PULSE STAR II is furnished with a lead/acid battery encased inside the electronic unit. Under normal circumstances one complete charge will last for ten working hours. Battery condition can be checked at any time by holding the **MODE** switch to the **RETUNE** position. If the meter needle is near the black area, you should recharge. Because of advanced electronic circuitry, the PULSE STAR II can be charged with the 120 or 230 volts AC charger unit (furnished as standard equipment, voltage depends on country), as well as with the cigarette lighter charger (12 volts car battery) or the solar panel (see chapter 8 Accessories).

CAUTION: The cigarette lighter charging cable is only allowed to be used with 12 volts systems. If 24 volts are available only (for example boat or truck), a commercial DC/DC-converter (converting 24 to 12 volts) has to be connected first. Disregarding this advice may cause damage to the charging circuit of the PULSE STAR II.

To recharge the PULSE STAR II connect the plug of the charger cable to the **COIL/CHARGER** outlet on the rear panel of the PULSE STAR II.

Make sure the PULSE STAR II is switched off during charging.

The green LED **CHARGING** will indicate that the PULSE STAR II is being charged. It takes approximately 3 to 4 hours to completely recharge the battery (for all charging options). If the battery has not been completely drained prior to charging, then less time is needed. The red LED **BATT. FULL** will indicate that the battery is fully charged. Charging is automatically stopped and the charging system changes to holding state, however, the charger should not be plugged in any longer than necessary and should be disconnected as soon as the red LED turns on.





Fig. 12: COIL/CHARGER jack and LEDs

It is also advisable to recharge your PULSE STAR II if you have not used it for an eight week period to compensate the battery's self-discharging. Under normal conditions the PULSE STAR II can be used for approximately ten hours of searching after each full charge.

Important note:

Make sure the PULSE STAR II is turned off after each use. If you forget to turn it off, the battery will be completely discharged, causing a loss of capacity or even total damage. Damages caused by this oversight are not covered by warranty. Do not use any charger other than those supplied by the manufacturer. You must use the 120 volt charger (U.S.A), 220 volt charger (Europe), cigarette lighter charger or solar panel built specifically for the PULSE STAR II metal detector. In the event of any problems with the equipment, please contact the distributor or dealer where the purchase was made.

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8 Accessories

Additional accessories are available for the PULSE STAR II.

Small Coil

This 25cm (10 inches) coil comes complete with a telescopic pole for smaller area pinpointing. The telescopic pole also incorporates a handle and arm rest. Both coil and pole will fit into the carrying case with the one meter coil.

The 25cm coil can be used to work in conjunction with the large coil for exact localisation while digging.

In **NORMAL** mode and **SAMPLING DELAY 1** even small objects can be detected at good depths, and larger targets can be detected at the following depths:

Soft Drink Can 33cl	approx. 65cm (26")
Aluminum Sheet 8" x 16" x 1/25"	approx. 90cm (35")
Iron Sheet 9" x 9" x 1/50"	approx. 100cm (40")

2 Meter Coil

This coil (2 meter x 2 meter, 80" x 80") is especially useful for searching larger areas. More area can be searched in less time than with the 1 meter coil. Furthermore, larger objects can be detected 30 to 40 % deeper than with the 1 meter coil, but sensitivity to smaller objects will be reduced.

The metal discrimination feature is not optimized for this coil and, therefore, some false identifications may occur.

Universal Search-Loop

The Search-Loop comes without PVC-tubes. This means that it is not as quickly ready to use as the other coils since it has to be fixed to a frame of PVC-tubes or wooden laths first. But it offers some important advantages:

- very small, lightweight and inconspicuous
- different size and shape search-coils can be built up (from 0.5 to 2 meter)
- a compensated search-coil is possible which eliminates magnetic interferences from land cables etc. and reduces magnetic ground effects

For complete information see the Product Information of the Universal Search-Loop.

Cylindric Probe

This small coil has 2.5 cm (1") diameter and is 25 cm (10") long. It comes with a 5 m (16 ft) or 10 m (32 ft) connection cable and can be used to insert into cracks, gaps between rocks, wells, drilling holes, etc., where it is not possible to use larger coils. By drilling many holes next to each other it is possible to detect and locate objects that are out of range of the other coils. Also, this coil is suited to be let down in the water.

Sensitivity detection is in a 360 degree direction (elliptical form field), but greater distance is obtainable at the tip of the coil. The following detection depths can be achieved:

Soft Drink Can 33cl	approx. 40cm (16")
Aluminum Sheet 8" x 16" x 1/25"	approx. 65cm (26")
Iron Sheet 9" x 9" x 1/50"	approx. 70cm (28")

5 /10 Meter (16 /32 ft) Extension Cable

This cable is used to connect the 1 meter or 2 meter coil to the PULSE STAR II for example when either coil is pulled behind a boat (coil placed on a rubber boat).

When the connectors are plugged in and the sleeve is securely fastened, the connection is waterproof.

You should not use this cable for the small coils. The connection plug is coded, therefore, a small coil would have a slower reaction to targets detected.

Cigarette Lighter Charger

This cable has a combination plug. It fits into an automobile cigarette lighter jack. If the red plastic sleeve is removed from the top, it will fit to a standard car's power outlet.

CAUTION: The cigarette lighter charging cable is only allowed to be used with 12 volts systems. If 24 volts are available only (for example boat or truck), a commercial DC/DC-converter (converting 24 to 12 volts) has to be connected first. Disregarding this advice may cause damage to the charging circuit of the PULSE STAR II.

See chapter 7 for more information about charging your PULSE STAR II.



Solar Panel *)

The solar panel (35 by 35cm, 14 by 14 inches) can be used to charge the PULSE STAR II where no AC outlet or car is available. Connect the plug to the **COIL/CHARGER** jack of the electronic unit with the solar panel facing towards the sun. Charging is only possible in bright sunlight. The charging time is about three to four hours with constant sunshine. A padded case is also available.

IMPORTANT: The PULSE STAR II should be placed in the shade of the solar panel while charging to avoid overheating by the sun.

*) The Solar Panel is no longer available!

NOTE: All detection depths mentioned in this chapter have been measured in the same way as those in chapter 3 (Detection Depths).

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9 Technical Data

Electrical Data

Power Source	Built-in Lead/Acid Battery 12 volts, 1.2 amp hours
Power Consumption	approx. 90mA (without audio signal, LEDs off)
Usage Time	approx. 10 hours
Battery Charging	Built-in quick-charging electronic, universal charging possibilities: AC adaptor (120/230 volts), Car Cigarette Adaptor, Solar Panel
Recharge Time	max. 4 hours on empty battery
Recommend Operating Temperature Range	0 ... +55° Celsius (32 ... 131° Fahrenheit)

Dimensions

Electronic Unit in Leather Case	165 x 75 x 190 mm (6.5" x 3" x 7.5")
Carrying Case	410 x 370 x 115 mm (16" x 14.5" x 4.5")
One Meter Coil in Case	approx. 1050 x 300 x 120 mm (41" x 12" x 5")

Weight of Equipment

Electronic Unit in Case	approx. 1.8 kg (4 lbs.)
Carrying Case for Transporting (with Electronic Unit inside)	approx. 3.9 kg (8 lbs.)
One Meter Coil	approx. 1.7 kg (4 lbs.)

Construction of the PULSE STAR II

The PULSE STAR II is built practically service free. It consists of three major modules which are of plug-in type and can very easily be exchanged in case of problems or mechanical failure. A 12 volts lead/acid battery is also encased inside the electronic unit.

All parts are placed on four double-sided printed circuit boards. The main PCB's are encapsulated in plastic material. There is no "free wiring" as all connections are made via PCBs with connectors for increased reliability and easy maintenance.

All critical parts are designed to align themselves to avoid problems due to changing temperatures.

If any problems occur please contact us or your dealer who has all spare parts on stock to guarantee a quick service.

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10 Important Informations

Important! Must be read!

With the PULSE STAR II you have acquired an efficient metal detector which enables you to detect any metallic object buried. However, please take into consideration that you could possibly meet with war material which is dangerous even now. Ammunition often contains ogives of projectiles or cartridge cases made of brass and, therefore, it can be indicated as non-ferrous metal. In case that the detected object is very large, special caution is advisable: it is possible that you met a bomb. On principle, you should not try to dig out the object in case of doubt. If you still intend to do it, you should never approach to object directly with the digging implement from above, but carefully from the side. If there is any suspicion about the existence of a bomb, shell or munition, immediately call the police or the bomb disposal unit. The digging place or dangerous objects already dug out may not to be left without supervision, because they could be located by children.

Digging out and the salvage of a find is completely at your own risk. Manufacturer and seller are not liable for damages. In any case, the use of metal detectors by children must be supervised by adults. Only adult persons are allowed to dig.

By all means, observe the existing statutes and decrees. Also the search of archeological objects is generally subject to authorisation or, in several countries, strictly forbidden. Please also consider that discovered objects do not automatically belong to you but are subject to the find right of the respective country.

The PULSE STAR II produces intensively pulsed magnetic fields. For reasons of safety, persons with an implanted pacemaker should not stay in the direct near of the search coil during operation.

In the following some practical advices:

Cold

In case that the PULSE STAR II has been exposed to low temperatures, you should absolutely avoid an abrupt warming. The condensation humidity can provoke a disturbance of function.

Tube connections of the 1m-Searchcoil

If the coil should twist during operation or in case of loosening of the tube connection, the plug connections can simply be made closer:

1. Dismount the coil.
2. Warm up one of the slack connection sleeves with a hot-air apparatus for a short time (as long as the sleeve is compressible with your fingers). **ATTENTION: Do not overheat the sleeve and the coil cable!**
3. Stick the sleeve immediately over the tube belonging to it and wait until all has cooled down. Now, the plug connection should be closer.

Deep discharged battery

As already mentioned in chapter 7, the battery can be damaged if you should forget to switch off the PULSE STAR II and a deep discharge of the battery takes place. In cases that this occurs once or twice and you notice it immediately, the battery will endure undamaged.

Nevertheless, it may happen that the charging electronic stops working in case that the battery is completely discharged. If the green LED **CHARGING** does not flash when you connect the charger, then the battery is deep discharged.

In order to recharge it, you have to obey the following steps:

1. Do **not** connect the charger.
2. Open the PULSE STAR II (turn the appliance, loose and take out two screws from the lower side, turn the appliance again, detach the upper side of the appliance).
3. Pull off the upper connection (white cap) left-hand at the back from the battery.
4. Connect the charger. Now the **red** LED **BATT. FULL** must flash.
5. Still while the charger is connected, stick the white plug back on the battery terminal. Now the **green** LED **CHARGING** must flash.
6. Let the PULSE STAR II charge over 10 minutes in opened position.
7. Pull out the plug of the charging device.
8. Assemble the PULSE STAR II in conversed order. When placing the upper part of the appliance, please take care that the guiding slots precisely embrace the front- and rear panel.
9. Reconnect the charger and complete charging of the battery.

If you should state that the working periods of the PULSE STAR II decrease, although the battery has completely been charged, then the battery must be changed. In this case, please contact us respectively your specialized dealer.

Technical alterations serving the progress as well as alterations with regard to indications and illustrations are reserved.



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