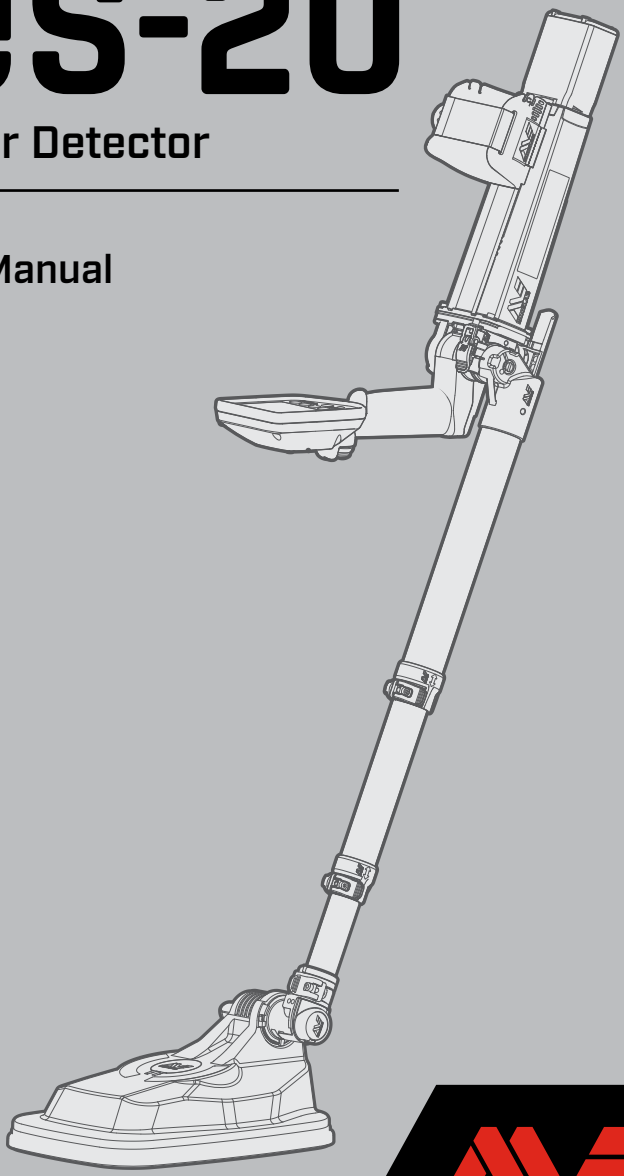
MDS-20

Dual Sensor Detector

Operations Manual



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MDS-20

Dual Sensor Detector

Operations Manual

Item Number: 4901-0525-EN-3

Contents

CRITICAL WARNINGS AND SAFETY

Signal Word Definitons 6
Summary of Safety Messages 6
Regulations and Code of Practice 7

SYSTEM OVERVIEW

MDS-20 Overview 8

MDS-20 Kit Contents 9
Standard Items 9
Optional Items 9

MDS-20 Main Detector Parts 10
MDS-20 Detector 11
Webbing Attachment Points 11

Operating Modes Overview 12
Dual Sensor Mode (Default) 12
MD Mode 12
GPR Mode 12

Additional Settings Overview 13
Setup Screen 13
Additional Functions and Settings 13

GETTING STARTED

Assembly 14
Unfolding Procedure 14

User Interface 16

LCD Screen 18
Detect Screen 18
Setup Screen 20
Setup Pages 21
Pause Screen 21

Quick Start 22

MD Test Piece 24
MD Test Piece Procedure 24

GPR Test Target 25
GPR Test Target Procedure 25

SETTINGS ADJUSTMENT

LCD and LED Indicator Settings 26
LCD and LED Brightness 26
Turning the LCD On or Off 26
Night Vision Mode 26

Sensor Feedback Settings 27
Confirmation 'Heartbeat' 27
Changing Sensor Feedback Settings 27
Visual Feedback 28
Audio Feedback 28
Vibration Feedback 28
Tactical Mode 28
User Interface Feedback 28

Detector Audio 29
Volume 29
Audio Output Modes 29
MDS-20 Earset Audio 30
3.5 mm (⅛") Audio Adapter Cable 30

MD OVERVIEW

MD Sensor Overview 31
Enabling the MD Sensor 31

MD Trace 31

MD Sensor Modes 32
Detection Mode (Default) 32
Pinpoint Mode 32
Interrogation Mode 32
MD Sensor Overload 32

MD Ground Balance 33
MD Sensor Calibration 33
MD Ground Balance Procedure 34
Ground Balance Mode 35
Changing the Ground Balance Mode 35

MD Noise Cancel 36
MD Noise Cancel Procedure 36
Nearby Detectors Procedure 36

MD Sensitivity 37
Setting the MD Sensitivity 37

GPR OVERVIEW

GPR Sensor Overview 38
Enabling the GPR Sensor 38
GPR Sensor Calibration 38
GPR Search Overlap — Shallow Targets 38

GPR Sensitivity 39
Setting the GPR Sensitivity 39

Advanced GPR Settings 40
Accessing the Advanced GPR Settings 40
GPR Start/Stop Gates 40
Setting the Start/Stop Gates 41
GPR Depth Gain 42
Adjusting GPR Depth Gain 42

GPR Imagery Overview 43
Basics of GPR Imagery 43
Parts of the GPR Imagery 43
Play/Pause 44
Pausing the GPR Imagery/MD Trace 44
Detection Sweep-Speed Effect 44
Example GPR Imagery 45

OPERATING PROCEDURES

Search Technique 46
Search Speed 46
Search Overlap 46
Sweep Height and Angle 46

Locating the Target 47
Mapping the Target 47
Target Mapping Procedure 47

MD Search Tips 48
MD Edge Mapping Procedure 49
Mapping Multiple Targets 49
MD Pinpointing Procedure 50

MD Interrogation Mode 51
Interrogation Mode Audio 51
Interrogation Mode Procedure 51
MD Target ID 52
Target ID Examples 52
Parts of the Target ID Field 52

ACCESSORIES

Detector Battery 53
Battery Status Indicator 53
Low Battery Alert 53
Lithium-ion Battery Charger 53

TROUBLESHOOTING, SAFETY, AND MAINTENANCE

Troubleshooting 54

Error Codes 56
Critical Errors 56
Advisory Errors 57
Fatal Errors 57
System Error Codes 57
MD Error Codes 58
GPR Error Codes 58

Factory Presets 59
Factory Preset Settings 59
Factory Reset 59

General Safety Advice and Maintenance 60

COMPLIANCE

MDS-20 Detector Compliance 62
Restriction of Chemicals (REACH) 62
Simplified EU & UKCA Declaration of Conformity 62

SPECIFICATIONS

MDS-20 Specifications 63
General Specifications 63
Metal Detection Sensor Specifications 64
GPR Detection Sensor Specifications 64

Critical Warnings and Safety

Before Operating the MDS-20, read the warnings and advice in the following sections:

- 'Summary of Safety Messages' on page 6.
- 'General Safety Advice and Maintenance' on page 60.

Signal Word Definitons

Signal words are used throughout this manual to identify safety messages and highlight the level of risk associated with specific hazards. Each signal word has a precise meaning and is used consistently to alert the operator or maintainer to potential injury or equipment damage. The definitions provided here must be read and understood before using the detector.

⚠ WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE Indicates a situation that may cause equipment damage.

Summary of Safety Messages

⚠ WARNING

- If the Test Piece fails to be detected, the detector must be considered faulty and MD Mode must not be used. The MDS-20 may still be used in GPR Sensor Mode. (page 24)
- If the Test Target fails to be detected, the detector must be considered faulty and **GPR Mode must not be used.** The MDS-20 may still be used in MD Sensor Mode. (page 25)
- Conventional Mode is less sensitive to certain IED threats including wires and carbon rod switch components. The Operator must always take the threat environment into account when deciding on a suitable Ground Balance Mode. (page 35)
- It is the responsibility of the Operator to test and ensure that the chosen sensitivity setting is safe and correct before beginning live operations. Where practical the Operator should bury an FFE (Free From Explosive) target that represents the local threat to confirm the detector and the sensitivity setting is correct. (page 37)
- It is the responsibility of the Operator to test and ensure that the chosen GPR Sensitivity setting is safe and correct before beginning operations. (page 39)
- When the GPR Imagery/MD Trace are paused, the MD and GPR sensors cease operation. **Do not actively detect while paused.** (page 44)
- Do not select Pinpoint Mode when the Sensor Head is above the target. This may result in the target being masked. (page 49, page 50)
- **If the Low Battery Alert occurs, the Operator must immediately STOP operations.** Recharge or replace the battery before recommencing de-mining operations. (page 53)

⚠ CAUTION

- The supplied Lithium-ion Battery Charger is only designed to work with the supplied batteries. Attempting to charge a battery with the wrong chemistry can lead to an incomplete charge, battery damage, fire or explosion. For full battery charger operation instructions, specifications and safety information, refer to the instructions included with the charger.

NOTICE

- Do not attempt to remove mud with a sharp tool. This may cause damage to the speaker. (page 55)

Regulations and Code of Practice

Before operating this device, the operator must comply with all relevant local and national regulations. In some regions, a license or permit may be required to use Ground Penetrating Radar (GPR).

Use of GPR is generally prohibited within 7 km of astronomy sites. If operation is necessary in such areas, the appropriate permits must be obtained in advance.

The GPR must only be operated with the sensor in contact with, or close to, the ground to ensure emissions are directed towards the ground. Do not operate the device while it is tilted sideways or pointing toward the sky.

Because GPR shares spectrum with other radio services, it must always be operated in a way that minimises the risk of interference to other users.

For detailed guidance, consult **ETSI EG 202 730:** ***Code of Practice in respect of the control, use and application of Ground Probing Radar (GPR) and Wall Probing Radar (WPR) systems and equipment.***

At extreme operating temperatures, some surfaces (e.g.: handle and armrest) become very hot. Take care when handling at such temperatures.

MDS-20 Overview

The MDS-20® combines unique Metal Detection (MD) and Ground Penetrating Radar (GPR) technologies to provide superior results in the detection of buried metal and non-metal explosive device components including:

- Improvised explosive devices (IEDs)
- Wires
- Landmines
- Unexploded ordnance (UXO)
- Cluster munitions

Dual Sensor Technology

The MDS-20 combines Minelab's patented Simultaneous Multi-Frequency Digital technology and Chelton's proven Ground Penetrating Radar (GPR) technology to detect all conductive and non-conductive targets of interest in varied soil conditions and operating environments.

Metal Detection (MD) and Ground Penetrating Radar (GPR) sensors can operate independently or simultaneously, providing selectable visual, vibration, and audio feedback to the Operator.

The MD Sensor detects metal and some conductive non-metal objects (such as carbon rod IED switch components).

The GPR Sensor is capable of detecting non-metal and metal objects appearing as sub-surface ground anomalies.

Rugged and Compact

Constructed from impact resistant materials, the MDS-20 is designed to survive in many operating environments.

Each detector is supplied in an impact resistant hard transit case that contains the MDS-20, a tough nylon carry bag, and accessories.

MDS-20 is compact and lightweight to reduce fatigue during extended operation.

Safe

MDS-20 achieves safety through superior sensor performance, functions and capability. For example, it is not possible to accidentally disable both sensors or all detection feedback modes.

It includes a Built-in Test (BIT) capability to monitor and confirm that the detector is operational.

Ease of Use

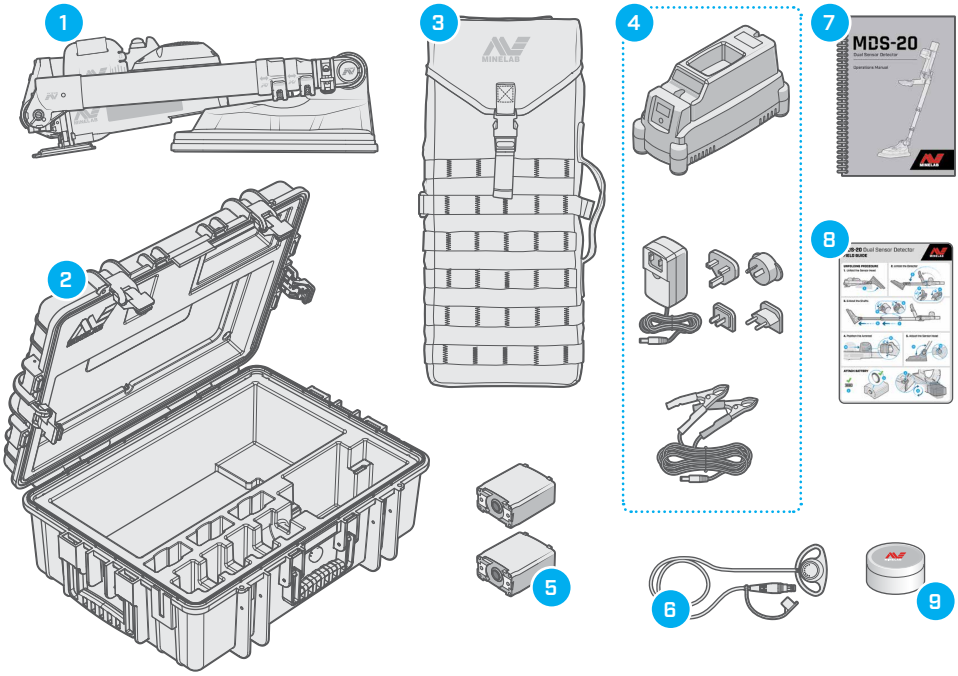
The User Interface features a versatile colour LCD screen and is designed for intuitive operation and minimising Operator training requirements.

Additional Features

- Continuous real-time display of MD and GPR detections with the ability to pause graphical imagery for scrutiny of potential targets.
- Adjustable MD Sensitivity and GPR Sensitivity with Volume control.
- Target Classification for MD Sensor targets (Conductivity, Ferrous/Non-ferrous, Carbon Rod indications).
- Fully enclosed and protected cables.
- Screen is viewable in bright sunlight.
- Tactical Mode for night operations.
- Waterproof to 3 m/10'.
- Compatible with Night Vision Imaging Systems (NVIS).

MDS-20 Kit Contents

The MDS-20 is supplied as a complete kit packed in a hard transit case for storage and transportation.



Standard Items

1. **MDS-20 Detector**
2. **Hard Transit Case**
3. **Carry Bag**
4. **Battery Charger**
5. **Lithium-ion Rechargeable Battery (×2)**
6. **MDS-20 Earset**
7. **Operations Manual**
8. **Field Guide**
9. **GPR Test Target**

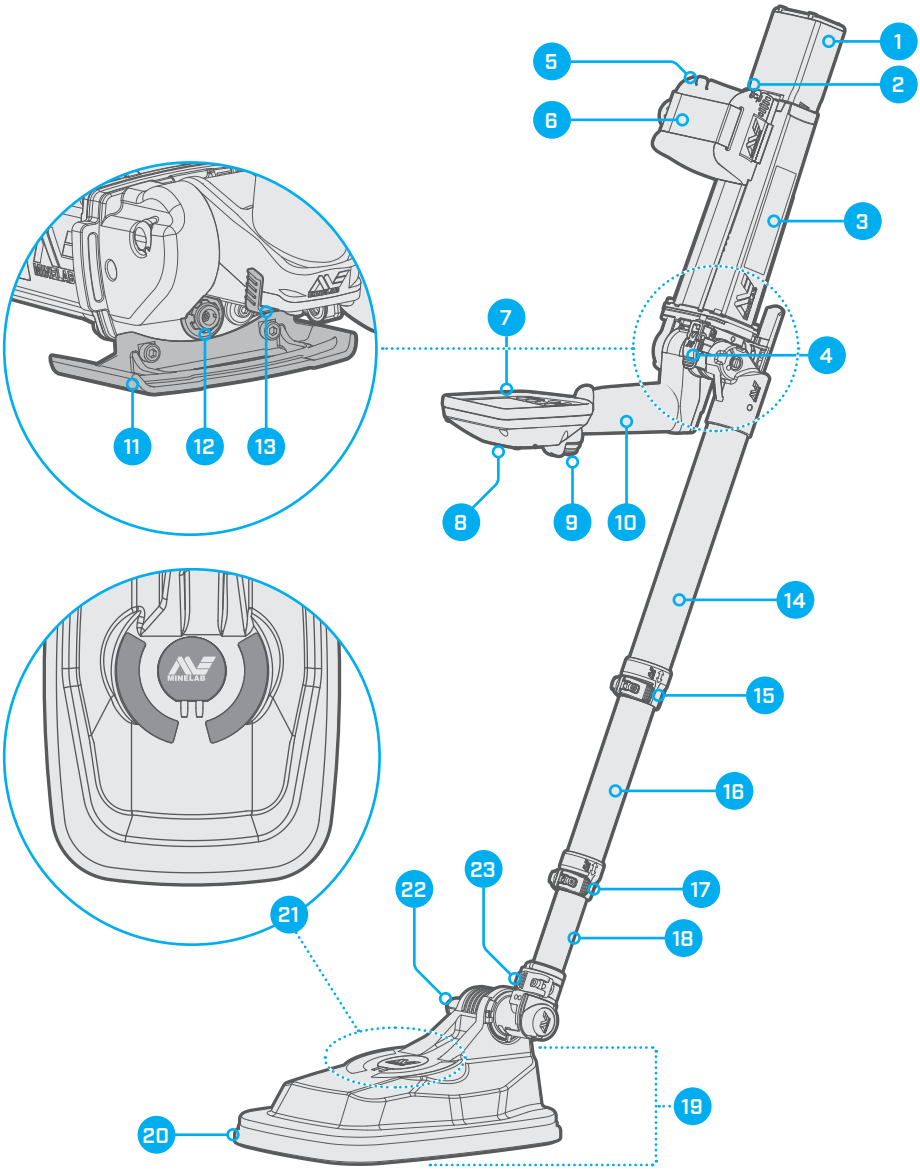
Items and specifications may vary slightly from those shown and may be subject to change.

Optional Items

Contact Minelab for additional headphone options and battery accessories.

MDS-20 Main Detector Parts

The major parts listed are referred to throughout this Operations Manual.

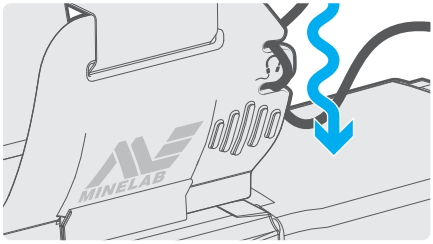


MDS-20 Detector

1. Lithium-ion Rechargeable Battery
2. Battery Release Lever
3. Control Box
4. Lateral Shaft Camlock
5. Adjustable Armrest
6. Armrest Strap
7. User Interface
8. Speaker
9. Trigger Button
10. Folding Handle
11. Stand
12. Earset Connector
13. MD Test Piece
14. Upper Shaft
15. Upper Shaft Camlock
16. Middle Shaft
17. Lower Shaft Camlock
18. Lower Shaft
19. Sensor Head
20. Metal Detection Coil
21. GPR Detection Area
22. Sensor Head Pivot Tension
23. Sensor Head Rotation Camlock

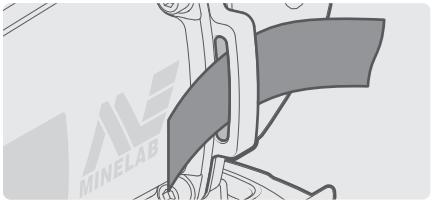
Earset Cable Retention

Notches on each side of the armrest allow for the Earset's cable to be looped through to manage excess cable length.



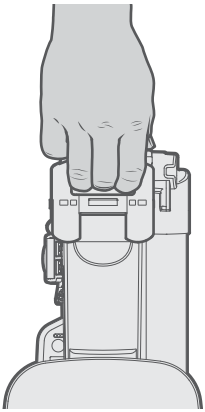
Webbing Attachment Points

Sturdy attachment points are located near the front of the Control Box, and on the Stand. These suit standard 25 mm (1") webbing straps for attachment to load-carrying equipment.



Stand Carry Handle

The stand can be used as a carry handle.



Operating Modes Overview

The MDS-20 has three main operating modes: Dual Sensor Mode, MD Mode, and GPR Mode.

Dual Sensor Mode (Default)

In Dual Sensor Mode, both MD and GPR Sensors are operational and provide detection feedback to the operator.

To operate in Dual Sensor Mode, enable both the MD and GPR Sensors.

To differentiate between sensors, there are different audio tone responses for each sensor.

Each sensor has separate colour coded Target Indicator LEDs for visual response (MD LEDs are red, GPR LEDs are yellow). However, the vibration response is indistinguishable between sensors.

MD Mode

In MD Mode, the MD Sensor is enabled, and the GPR Sensor is disabled.

The following functions are available in both MD and Dual Sensor Mode:

- **MD Detection Mode** (page 32) – optimised for maximum detection performance and is the primary MD Sensor Mode
- **Pinpoint Mode** (page 32) – provides a static detection response that is useful for localising targets
- **Interrogation Mode** (page 32) – provides additional information regarding probable target characteristics

The following additional MD functions are also available in both MD and Dual Sensor Mode:

- **MD Ground Balance** (page 33) – a calibration function that reduces MD false detection responses caused by ground mineralisation
- **MD Noise Cancel** (page 36) – minimises MD interference from nearby electronic sources
- **MD Sensitivity** (page 37) – allows the Operator to set MD Sensitivity

GPR Mode

In GPR Mode, the GPR sensor is enabled and the MD Sensor is disabled.

The following GPR Sensor functions are available:

- **GPR Sensitivity** (page 39) – this function allows the Operator to set GPR Sensitivity
- **GPR Advanced GPR Settings** (page 40) – these functions allow the Operator to set GPR Start and Stop Gates and the GPR Depth Gain.

Additional Settings Overview

The MDS-20 has a Setup Screen accessible in all operating modes enabling the Operator to access more settings.

Setup Screen

The Setup Screen (page 20) is accessible from Dual Sensor Mode, MD Mode and GPR Mode by a short-press of the Setup Button (page 16).

The Setup Screen allows the Operator to adjust the following settings:

- **MD Ground Balance Mode** (page 35)
- **Audio Output Mode** (page 29) – for speaker and earset
- **MD Sensor Feedback settings** (page 27) – Visual, Audio and Vibration
- **GPR Sensor Feedback settings** (page 27) – Visual, Audio and Vibration

Additional Functions and Settings

The following additional functions and settings can be accessed from Dual Sensor Mode, MD Mode, or GPR Mode:

- **Volume** adjustment (page 29)
- **Play/Pause** – pause the GPR Imagery and MD Trace (page 44)
- **LCD On/Off** (page 26)
- **LCD/LED Brightness** adjustment (page 26)
- **Night Vision Mode** (page 26)
- **Tactical Mode** (page 28)

Refer to the referenced pages for more information.

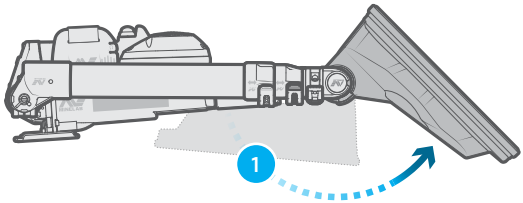
Assembly

Follow these steps to unfold the MDS-20 ready for operation.

Unfolding Procedure

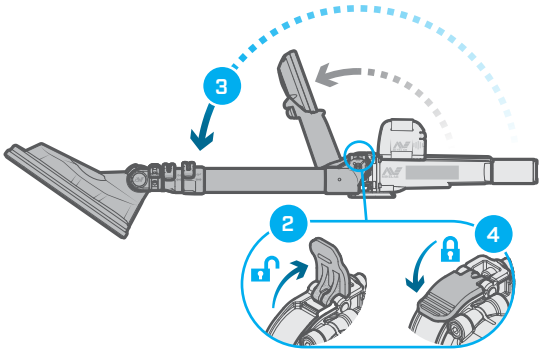
Unfold the Sensor Head

1. Pivot the sensor head out.



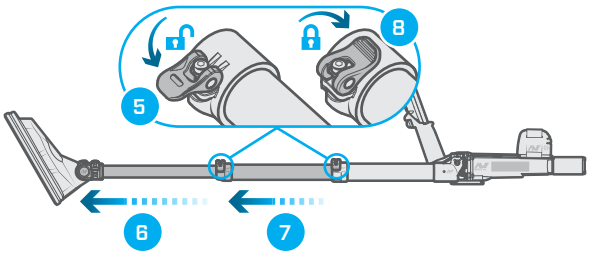
Unfold the Detector

2. Open the lateral shaft camlock.
3. Holding the control box, rotate the Sensor Head and shafts 180° until the end-stop is reached. The handle will follow the shafts.
4. Close the lateral shaft camlock.



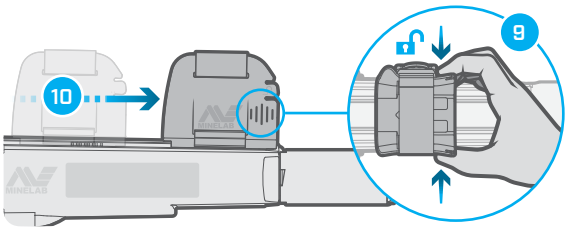
Extend the Shafts

5. Open the camlocks on the upper and middle shafts.
6. Fully extend the lower shaft.
7. Extend the middle shaft to a comfortable detecting length.
8. Close the camlocks on the upper and middle shafts.



Position the Armrest

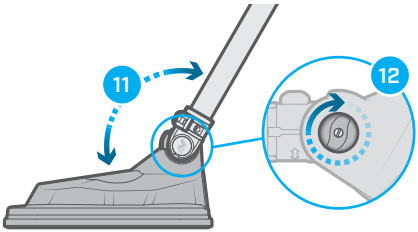
9. Squeeze the finger grips on the rear of the armrest to release the locking mechanism.
10. Slide to a comfortable position.



Adjust the Sensor Head

11. Adjust the angle of the sensor head. It should be parallel to the ground when in the detecting position.

12. If required, tighten the tension nut so that the sensor head holds its angled position.



Once the detector is unfolded, proceed to 'Quick Start' on page 22.

Folding Procedure

Repeat the unfolding procedure steps in reverse.
The MDS-20 can be stowed with the Li-ion battery attached.

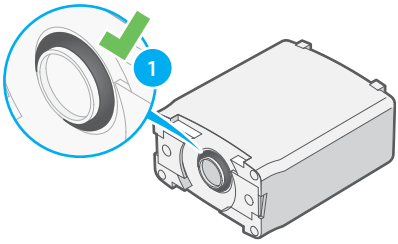
Attach the Battery

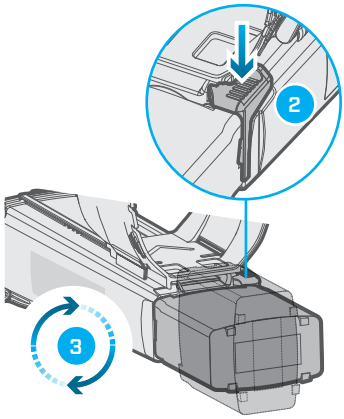
1. Check that the battery has an O-ring fitted.

2. Align the battery perpendicular to its final position.

3. Depress the battery lock lever.

4. Rotate the battery 90°, then release the lever.





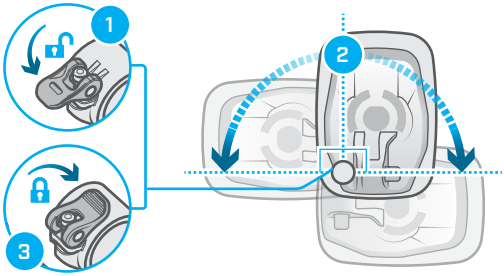
Sensor Head Rotation

The MDS-20 sensor head can be rotated 90° to both the left and right for detecting on angled surfaces such as the side of a trench.

1. Open the sensor head rotation camlock.

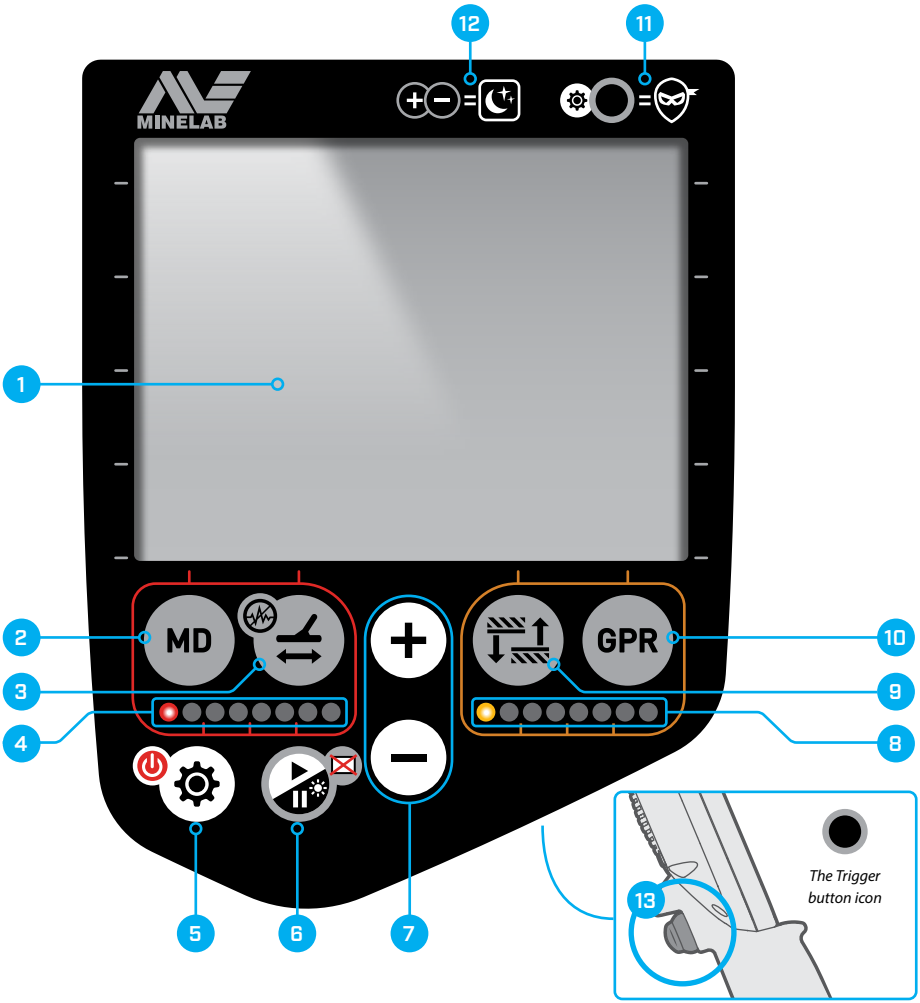
2. Rotate to the sensor head preferred position.

3. Close the camlock.



User Interface

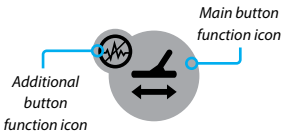
The MDS-20 User Interface has a large LCD Screen, a backlight, and a keypad. The User Interface displays and controls all of the detector functions.



Additional Button Functions

Some buttons are used for more than one function, indicated by a small icon adjoining the button.

Short-press (< 0.5 s) the button to access its main function.
Long-press (> 0.5 s) the button to access its additional function.



1. LCD

Displays detector settings, options, and detection information (page 18).

2. MD Button

Short-press from the Detect Screen to display MD Sensitivity adjustment (page 37).

Short-press from the Setup Screen to display the MD Sensor feedback settings (page 27).

Long-press from the Detect Screen to Enable or Disable the MD Sensor.

3. Ground Balance Button

Short-press to initiate MD Ground Balance (page 34).

Long-press to initiate MD Noise Cancel (page 36).

4. MD Target Indicator LEDs (Visual and IR)

Red LEDS indicate MD detection signal strength, increasing from left to right.

The LEDs can transmit both visible light, and Infra-red for compatibility with Night Vision Imaging Systems (NVIS).

5. Setup Button

Short-press to display the Setup Screen to adjust the general detector settings and MD and GPR Sensor Feedback settings.

Long-press (1.5 s) to turn the detector On and Off.

6. Play/Pause Button

Short-press to Pause/Play the GPR Imagery and/or MD Trace (disables both MD and GPR Sensor transmitters temporarily when paused.)

Long-press to turn the LCD On and Off.

7. Plus/Minus Buttons

Short-press from the Detect Screen to adjust the detector Volume (page 29).

Short-press the Plus and Minus buttons at the same time to enable Night Vision Mode (page 26).

Short-press from the Pause Screen to adjust the LCD brightness (page 26).

Short-press to adjust settings values.

8. GPR Target Indicator LEDs

Yellow LEDS indicate GPR detection signal strength, increasing from left to right.

The LEDs can transmit both visible light, and Infra-red for compatibility with Night Vision Imaging Systems (NVIS).

9. Advanced GPR Settings Button

Long-press to access the Advanced GPR Settings menu (page 40).

Once in the menu, short-press the button to cycle through the settings: Start Gate and Stop Gate (page 40), and GPR Depth Gain (page 42).

10. GPR Button

Short-press from the Detect Screen to display the GPR Sensitivity adjustment (page 39).

Short-press from the Setup Screen to display the GPR Sensor Feedback settings (page 27).

Long-press from the Detect Screen to Enable or Disable the GPR Sensor.

11. Tactical Mode Buttons Reference

Quick-reference showing the button press combination to enable Tactical Mode (page 28).

Press the Setup button and the Trigger at the same time.

12. Night Vision Mode Buttons Reference

Quick-reference showing the button press combination to enable Night Vision Mode (page 26).

Press the Plus and Minus buttons at the same time.

13. Trigger *(at rear of User Interface)*

Press-and-release to toggle between Interrogation Mode and Detection Mode.

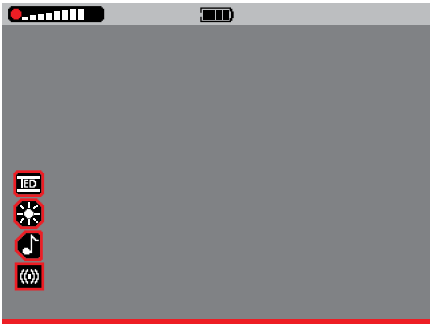
Press-and-hold to enable Pinpoint Mode (page 50).

LCD Screen

The MDS-20 LCD displays detector settings, options, and represents target detections visually. Key screens include the Detect Screen, the Setup Screen, and the Pause Screen.

Detect Screen

The Detect Screen displays the real-time detection information for enabled Sensors.



Detect Screen in MD Mode

Most MD information is displayed on the left side of the LCD.

Key functions are colour-coded red so they can be easily differentiated from the GPR functions.

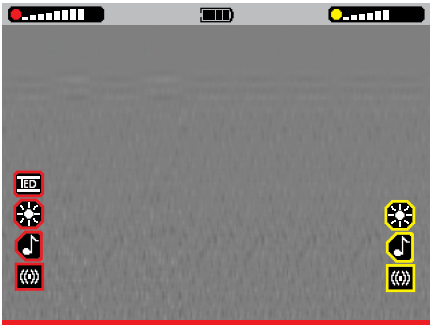
When the MD Sensor is disabled, none of the MD functions are displayed on the Detect Screen.

Detect Screen in GPR Mode

Most GPR information is displayed on the right side of the LCD.

Key functions are colour-coded yellow so they can be easily differentiated from the MD functions.

When the GPR Sensor is disabled, none of the GPR functions are displayed on the Detect Screen.

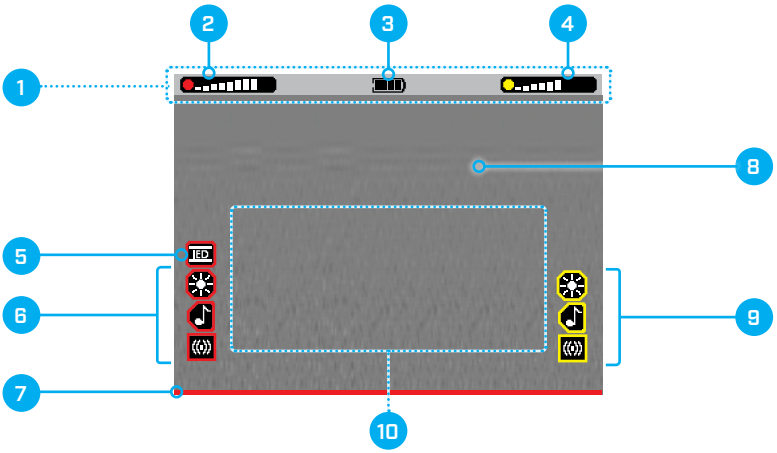


Detect Screen in Dual Sensor Mode

Both MD and GPR information is displayed at the same time. This is the default Mode.

Parts of the Detect Screen

The example below shows the Detect Screen with Factory Preset settings. By default, Dual Sensor Mode is enabled, therefore both MD (red) and GPR (yellow) information is displayed.



1. Status Bar

Displays importants detector information.

If an Advisory Error occurs, the Advisory Error icon will be displayed (page 57).

2. MD Sensitivity Level Indicator

Displays a visual indication of the MD Sensitivity level (page 37).

3. Battery Level Indicator

Displays the battery level (page 53).

4. GPR Sensitivity Level Indicator

Displays the GPR Sensitivity level (page 39).

5. MD Ground Balance Mode

Displays the current Ground Balance Mode (page 35).

6. Enabled MD Feedback Indicators

Indicates enabled MD Feedback settings; Visual, Audio, and Vibration (page 27).

7. MD Trace

Visually represents the responses from metallic targets (page 31).

8. GPR Imagery

Visually represents buried objects and sub surface structures (page 43).

9. Enabled GPR Feedback Indicators

Indicates enabled GPR Feedback settings; Visual, Audio, and Vibration (page 27).

10. Pop-up Indications Area

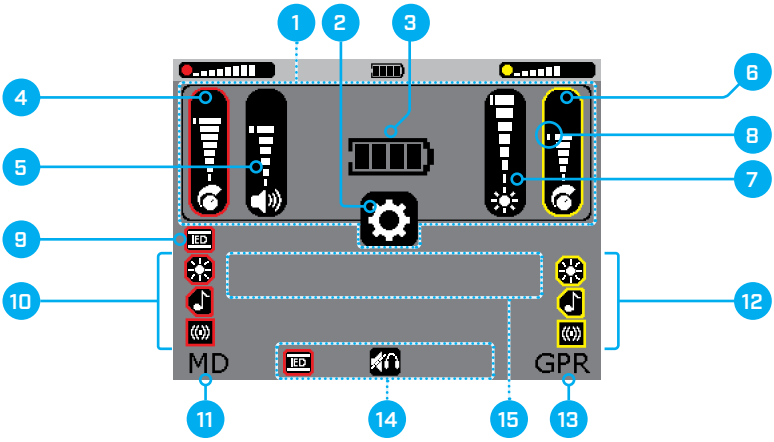
Displays the status of MD Ground Balance and MD Noise Cancel.

Displays Critical System Errors (page 56).

Indicates when MD Pinpoint and Interrogation Modes are enabled.

Setup Screen

Short-press the Setup button to display the Setup Screen. The example below shows the Setup Screen with Factory Preset settings.



1. Settings Overview Area

Displays the current detector settings. They cannot be adjusted from the Setup Screen.

2. Setup Menu Icon

3. Battery Level Indicator

Displays the battery level (page 53).

4. MD Sensitivity Level

Displays the MD Sensitivity level (page 37).

5. Volume Level

Displays the Volume level (page 29).

6. GPR Sensitivity Level

Displays the GPR Sensitivity level (page 39).

7. LCD/LED Brightness Level

Displays the LCD/LED Brightness level (page 26).

8. Default Setting Markers

The MD Sensitivity, GPR Sensitivity, Volume, and Brightness adjustment bars display a marker to indicate the default setting.

9. MD Ground Balance Mode

Displays the current Ground Balance Mode (page 35).

10. Enabled MD Feedback Indicators

Indicates enabled MD Feedback settings; Visual, Audio, and Vibration (page 27).

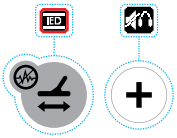
11. MD Setup Page Indicator

12. Enabled GPR Feedback Indicators

Indicates enabled GPR Feedback settings; Visual, Audio, and Vibration (page 27).

13. GPR Setup Page Indicator

14. Soft Key Options



Short-press the button directly below each Soft Key option to select or toggle the available options.

15. Error Code Display Area

In the event of an MD, GPR, or System Error, an Error Code will be displayed (page 56).

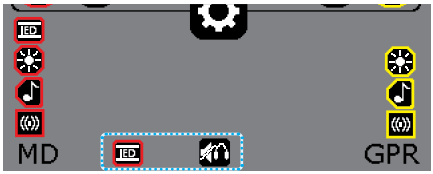
Setup Pages

Within the Setup Screen, there are 3 Setup Pages: the General Setup Page, the MD Setup Page, and the GPR Setup Page. Each Page has different Soft Key Options at the bottom of the screen.

The General Setup Page

The General Setup Page displays the following Soft-Key Options:

- Ground Balance Mode
- Audio Mode

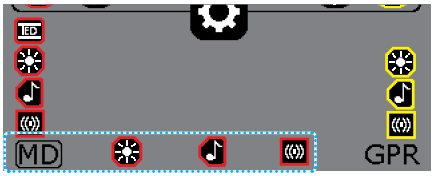


The MD Setup Page

The MD Setup Page displays the following Soft Key Options:

- MD Visual (LED) Feedback Setting
- MD Audio Feedback Setting
- MD Vibration Feedback Setting

MD A border appears around the MD Setup Page Indicator when the MD Setup Page is active.

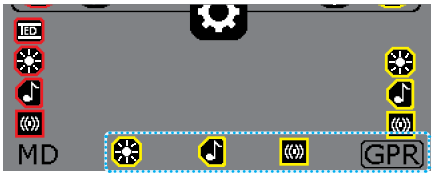


The GPR Setup Page

The GPR Setup Page displays the following Soft Key Options:

- GPR Visual (LED) Feedback Setting
- GPR Audio Feedback Setting
- GPR Vibration Feedback Setting

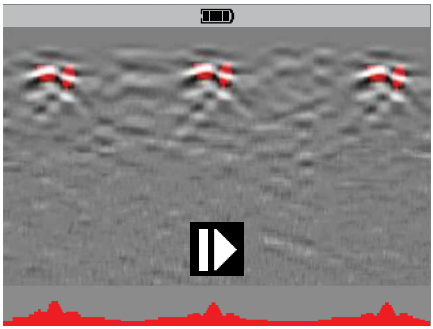
GPR A border appears around the GPR Setup Page Indicator when the GPR Setup Page is active.



Pause Screen

The GPR Imagery and/or MD Trace can be temporarily paused for scrutiny of detections.

See 'Play/Pause' on page 44 for operation instructions and important safetly information.



Quick Start

Follow the Quick Start procedure to make the MDS-20 ready for operation.

Before Operating the MDS-20, read the warnings and advice in the following sections:

- 'Summary of Safety Messages' on page 6.
- 'General Safety Advice and Maintenance' on page 60.

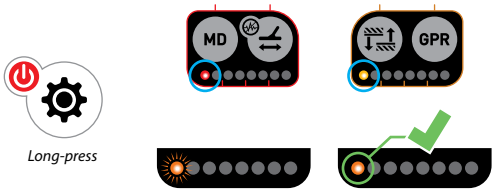
Tip: Beginning every detecting operation with a fully charged battery is recommended. For charger operation instructions, refer to the guide supplied with the battery charger.

Before you start, have the detector unfolded (page 14) and ready for use.
Consider performing a Factory Reset (page 59) if you are unfamiliar with the detector's previous use-state.

1. Turn On

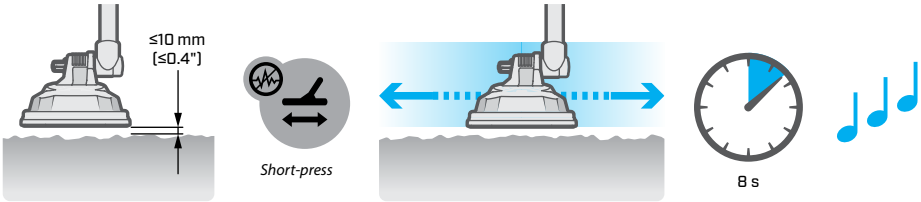
Long-press the Setup button.

Wait for the first MD and/or GPR Target Indicator LED to stop flashing.



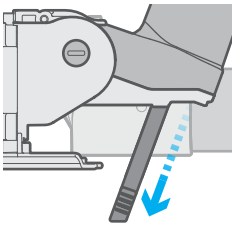
2. MD Ground Balance

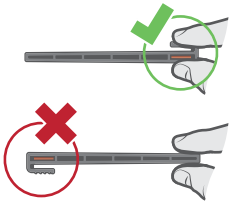
Carry out the Ground Balance Procedure (page 34).

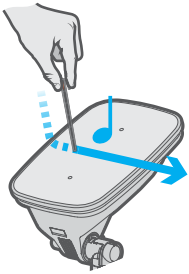


3. MD Test Piece

Carry out the MD Test Piece procedure (page 24) to confirm the MD Sensor is working correctly.

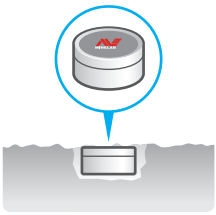


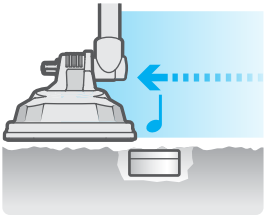




4. GPR Test Target

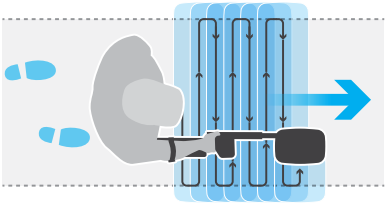
Carry out the GPR Test Target procedure (page 25) to confirm the GPR Sensor is working correctly.





5. Begin Detecting

Begin detecting using the correct search technique (page 46).



Turn Off

Long-press the Setup button.

At power-off, all changes made to modes and settings during the session will be saved, and will return to their last-used state at next use.

Note: If the battery is removed before powering-off correctly, changes will NOT be saved.

Long-press

MD Test Piece

The supplied MDS-20 MD Test Piece is used to confirm that the MD Sensor is functioning correctly.

The MD Test Piece procedure should be carried out every time the MDS-20 is powered on.

Always set an MD Sensitivity level of 8 (default) when performing the Test Piece procedure.

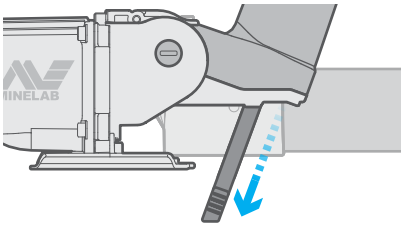
In some instances, the Operator may prefer to use inert mines or targets as test pieces because they represent the local threat. Minelab recommends that the MDS-20 always be first tested with the supplied MD Test Piece before local test pieces are used for testing.

The MD Test Piece

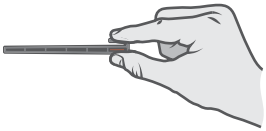
MD Test Piece Procedure

1. Ensure that hands and arms are free of metallic objects (watches, rings etc.), and that no other metallic objects are near the Sensor Head.
2. Ensure MD Sensitivity is set to 8 (default) (page 37).

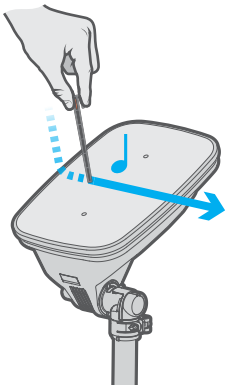
3. Remove the Test Piece from its stowed position in the base of the detector's handle.



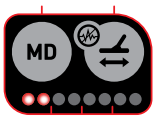
4. Hold the Test Piece by the ridged finger grip.



5. Hold the Test Piece perpendicular to the coil. Lightly touching the surface of the coil with the tip of the Test Piece, smoothly and slowly move the test piece across the coil from one side to the other.



6. A faint but clear response (a rise in volume) should be heard, indicating the MD Sensitivity level is correct.



With the MD LED display enabled, the Test Piece procedure should result in the illumination of at least one additional LED.

If the Test Piece does not produce a response, Factory Reset the detector (page 59), and then repeat the Test Piece procedure.

⚠ WARNING

If the Test Piece fails to be detected, the detector must be considered faulty and **MD Mode must not be used.** The MDS-20 may still be used in GPR Sensor Mode.

GPR Test Target

The MDS-20 is supplied with a GPR Test Target to confirm that the GPR Sensor is functioning correctly.

The GPR Test Target procedure should be carried out every time the MDS-20 is powered On.

Always set a GPR Sensitivity level of 6 (default) when performing the Test Target procedure.

In some instances, the Operator may prefer to use inert mines or targets as test targets because they represent the local threat. Minelab recommends that the detector always be first tested with the supplied GPR Test Target before local test targets are used for testing.

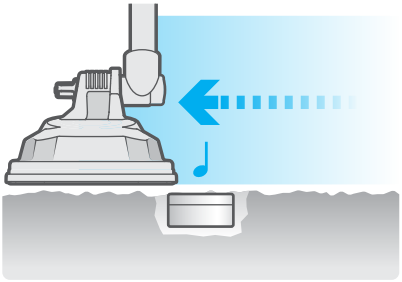
The Minelab MDS-20 GPR Test Target

GPR Test Target Procedure

1. Bury the GPR Test Target level with the ground surface in a clear, flat section of ground.

2. Ensure GPR Sensitivity is set to 6 (default) (page 39).

3. Sweep the MDS-20 Sensor Head over the Test Target while adjusting the GPR Sensitivity (page 39).



If the Test Target does not produce a response, Factory Reset the detector, and then repeat the Test Target procedure.

⚠ WARNING

If the Test Target fails to be detected, the detector must be considered faulty and **GPR Mode must not be used.** The MDS-20 may still be used in MD Sensor Mode.

LCD and LED Indicator Settings

The LCD Screen and Target Indicator LEDs have a range of settings that allow the Operator to detect in high and low light situations.

LCD and LED Brightness

The LCD is dual-mode with a backlight for daytime use and Night Vision Mode for use with NVIS.

The LCD backlight and Target Indicator LED brightness are both adjusted by the Brightness setting, and cannot be adjusted separately.

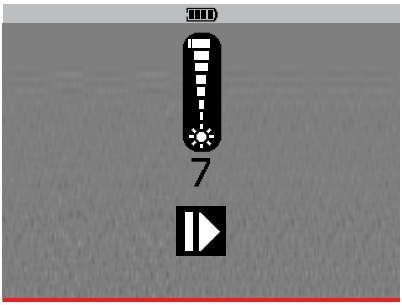
The Backlight / LED Brightness setting has a range from 1 (low) to 7 (high) with a default setting of 7.

Adjusting the LCD Backlight and LED Brightness

1. From any screen, short-press the Play/Pause button. The Pause Screen will be displayed.

The Play/Pause button

2. Short-press either the Plus (+) or Minus (–) button to display the Brightness adjustment bar at the current brightness level.



3. Short-press the Plus (+) or Minus (–) buttons to adjust the brightness level.

   The Brightness adjustment bar will disappear after 3 seconds of inactivity. Short-press the Pause/Play button to return to the previous screen.

Turning the LCD On or Off

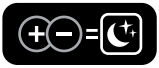
1. To turn the LCD On or Off, long-press the Play/Pause button.

The Play/Pause button

Note: The Target Indicator LEDs will remain on, even if the LCD is turned Off.

Night Vision Mode

In Night Vision Mode, the LCD Backlight switches to a low intensity mode that is visible only at night with NVIS. The Target Indicator LEDs switch to infrared (IR) which are also only visible with NVIS.



Night Vision Mode Quick Reference on the top right of the User Interface.

To Enable Night Vision Mode:

Note: If Tactical Mode is enabled, Night Vision Mode will already be active. Tactical Mode must be disabled before Night Vision Mode can be enabled separately.

1. Short-press the Plus (+) and Minus (–) buttons at the same time.
2. The LCD and LEDs will now only be visible to Operators using NVIS.
3. To disable Night Vision Mode and return to the previous LCD/LED setting, repeat step 1.

Note: If powered off whilst Night Vision mode is enabled, the detector will resume operation in Night Vision mode when powered back on.

Sensor Feedback Settings

Sensor Feedback can be configured to give the preferred combination of visual, audio, and vibration responses.

The visual, audio, and tactile (vibration) Feedback Settings for each sensor can be independently enabled and disabled via the Setup Screen.

For information on the parts of the Setup Screen and the Setup Pages (General, MD, and GPR), see 'Setup Screen' on page 20.

All Feedback Settings for the MD and GPR Sensors are On by default.

It is recommended that audio feedback for both sensors is enabled, as it is capable of conveying more detection signal information than visual or vibration feedback alone. Visual and vibration feedback is best used to supplement audio.

MD	GPR	Feedback Setting
		Visual (LED) Feedback Setting
		Audio Feedback Setting
		Vibration Feedback Setting

Confirmation 'Heartbeat'

The MDS-20 has a confirmation 'Heartbeat' that produces a periodic beep, LED flash, or vibration pulse every 15 seconds when no detections have occurred. This reassures the Operator that the detector is still powered on and operating correctly.

The Heartbeat uses whichever indicators are enabled, e.g. if LEDs are switched off, only the beep and vibration will occur.

Changing Sensor Feedback Settings

1. Short-press the Setup button to open the Setup Screen. The General Setup Page options are displayed by default on the Setup Screen.

The Setup button

2. To display the MD Setup Page, short-press the MD button (shown in example).

The MD button

Or, to display the GPR Setup Page, short-press the GPR button.

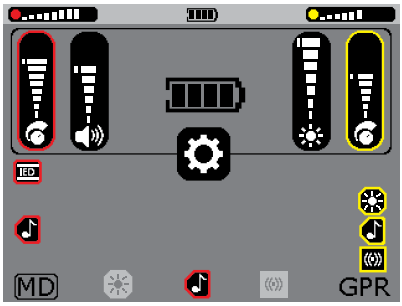
The GPR button

The Feedback Settings icons (Soft Key Options) are displayed along the bottom of the screen.

3. Short-press the button directly below the Feedback Setting icon to enable/disable it.

Enabled

Disabled



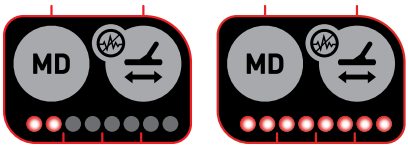
The MD Setup Page showing the Visual and Vibration settings disabled.

Note: At least one Feedback Setting must and will always be enabled.

4. When the selections have been made, short-press the MD or GPR button to return to the General Setup Page, or short-press the Setup button to return to the Detect Screen.

Visual Feedback

Visual feedback is provided in the form of two LED bar indicators that display a visual indication of MD and GPR received signal strength.



Target Indicator LEDs show a weak received signal

Target Indicator LEDs show a strong received signal

The LED indicators provide both visible light and non-visible IR indication for both sensors, allowing Operators to use NVIS when necessary.

Audio Feedback

Audio feedback should be the primary feedback used by Operators as it can convey more detection signal information than visual or vibration feedback. Skilled Operators can achieve higher detection performance using audio feedback than visual or vibration feedback alone.

The MD and GPR Sensors have distinctly different audio tones for easy differentiation. Audio can be emitted from both the speaker located on the back of the User Interface, and/or through an earset.

For information on use of the supplied earset and other audio accessories, see 'Detector Audio' on page 29.

Vibration Feedback

Vibration feedback is provided by a vibration motor located in the handle of the detector.

The intensity and duration of vibration feedback is proportional to that displayed by the Target Indicator LEDs.

Tactical Mode

Tactical Mode is provided as a quick means of configuring the detector settings for use in tactical deployment situations.

When Tactical Mode is enabled, the User Interface does the following:

- Disables speaker audio (earset audio will remain On if an earset is connected)
- Sets the LCD and Target Indicator LEDs to Night Vision Mode, i.e. LCD and the Target Indicator LEDs are only visible using NVIS.
- Enables vibration feedback.

Enabling Tactical Mode

1. Short-press the Trigger button and Setup button at the same time.

   To disable, short-press the Trigger button and Setup button at the same time again.

Tactical Mode Quick Reference on the top right of the User Interface.

Enabling Tactical Mode When Powering on the Detector

1. With the detector Off, press and hold the Trigger button and Setup button at the same time — continue to hold.
2. Wait until two short vibration pulses have been felt. These occur approximately 2 seconds apart.
3. Release the Trigger button and Setup button.

The detector will now be On with Tactical Mode enabled.

User Interface Feedback

User Interface Feedback responses (e.g. a confirmation 'beep' when a button is pressed) will occur according to the enabled sensor feedback settings. To prevent User Interface feedback of a particular type, e.g. audio, the Audio Feedback setting must be disabled for both the MD and GPR Sensors.

Detector Audio

The MDS-20 is compatible with a number of Audio accessories.

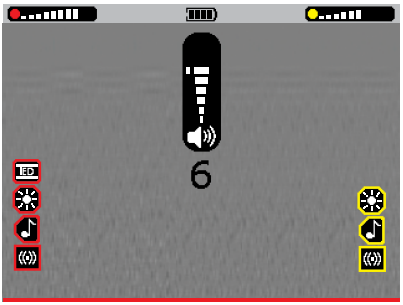
Volume

The MDS-20 has a single Volume control adjusting MD, GPR and User Interface audio responses.

The Volume setting has a range from 1 to 10 with a default setting of 6.

Adjusting the Volume

1. From the Detect Screen, short-press either the Plus (+) or the Minus (–) button to display the Volume adjustment bar.



2. Short-press the Plus (+) or Minus (–) buttons to increase or decrease the Volume level.

   The Volume adjustment bar will disappear after 3 seconds of inactivity.

Audio Output Modes

MDS-20 has three Audio Output Modes:

	Speaker Auto-Mute *(Default)*
	Speaker and Earset On
	Speaker Off

Speaker Auto-Mute *(Default)*

Speaker audio is automatically On if an earset is not connected. Speaker audio is automatically muted (Off) if an earset is connected.

Speaker and Earset On

Both the Speaker and the earset are On. This is a useful mode for training scenarios.

Speaker Off

Speaker audio is always Off, even if there is no earset connected.

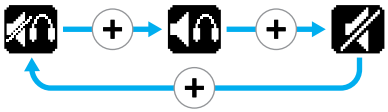
Note: Speaker Off mode overrides the MD and GPR enabled audio settings.

Selecting the Audio Output Mode

1. Short-press the Setup button to display the Setup Screen. The General Setup Page Soft Key Options will be displayed along the bottom of the screen.

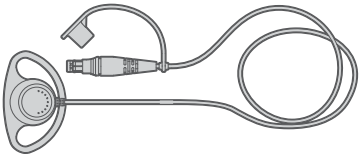
2. Short-press the Plus (+) button (directly below the Audio Output icon). The Audio Output Mode icon will change to the next Mode.

   Each short-press of the Plus (+) button will select the next Audio Output Mode.



3. Short-press the Setup button to return to the Detect Screen.

MDS-20 Earset Audio



The MDS-20 earset has a unique connector that is compatible with the earset connector on the control box.

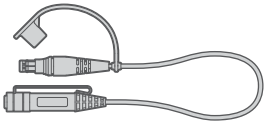
The MDS-20 earset is not waterproof when disconnected from earset connector on the control box.

To prevent dirt ingress, apply the dust cap when not in use.

Connecting the MDS-20 Earset

1. Remove the dust caps from both the earset connector on the detector, and from the earset plug on the earset.
2. Ensure that the plug aligns with the connector.
3. Press the earset plug evenly and firmly onto the earset connector.

3.5 mm (⅛") Audio Adapter Cable



The 3.5 mm (⅛") adapter is an optional accessory for connecting standard 3.5 mm (⅛") headphones to the MDS-20.

The audio adapter cable is not waterproof.

To prevent dirt ingress, apply the dust cap when not in use.

Connecting the 3.5 mm (⅛") Adapter Cable

1. Remove the dust cap from both the earset connector on the detector, and from the plug on the adapter cable.
2. Ensure that the plug aligns with the connector.
3. Press the earset plug evenly and firmly onto the earset connector.
4. Connect any set of headphones with a 3.5 mm (⅛") connector.

MD Sensor Overview

The Metal Detection (MD) Sensor detects metal (conductive) objects.

Enabling the MD Sensor

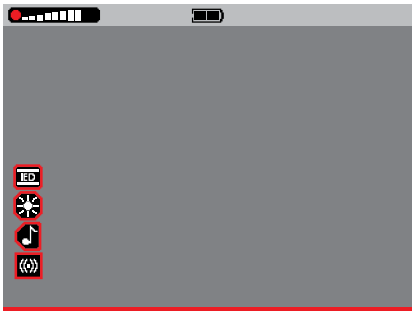
MD The MD Sensor is enabled and disabled by long-pressing the MD button.

All MD related functions are colour coded red for quick recognition.

When the MD Sensor is enabled, the MD Sensor Modes can be accessed. These Sensor Modes are unavailable when the MD Sensor is disabled.

The 3 available MD Sensor modes are:

- Detection Mode (page 32)
- Pinpoint Mode (page 32, page 50)
- Interrogation Mode (page 32, page 51)



Detect Screen with the MD Sensor enabled.

MD Trace

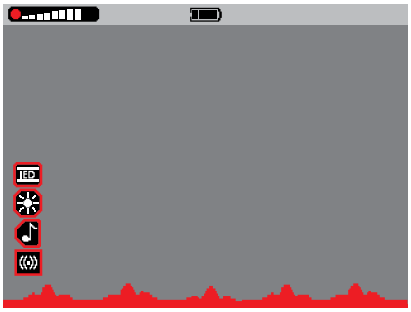
When the MD Sensor is enabled, the red MD Trace at the bottom of the Detect Screen is displayed. The MD Trace visually displays the responses from metallic targets.

Data scrolls in real-time across the screen from right to left. The imagery represents 3 seconds of data, with the left representing data from 3 seconds ago. The most recent data is displayed on the right.

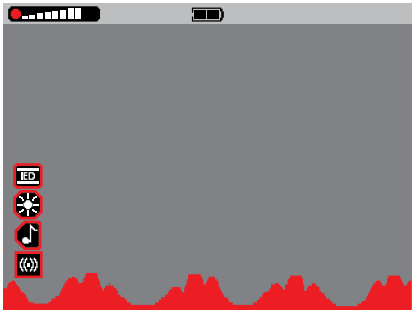
The size of peaks on the MD Trace is proportional to received target signal strength, similar to the Target Indicator LEDs.

Weak target detections will product small variations in the MD Trace. Strong target detections will produce large peaks in the MD Trace.

The MD Trace can be paused. See 'Play/Pause' on page 44 for detailed operation instructions.



Small or deep metallic targets



Large or shallow metallic targets

MD Sensor Modes

Detection Mode (Default)

Detection Mode is optimised for maximum detection performance, and is the default MD Sensor Mode used for initial searching of new ground to detect targets.

In Detection Mode, the detection signal is dynamically processed, meaning the Sensor Head must be moving relative to the target (e.g. using a normal sweeping search technique) in order to register a detection response.

In Detection Mode, audio target responses have pitch and volume that is proportional to received target signal strength. Strong targets will be loud/ high-pitched and weak targets will be quieter/ low-pitched.

Detection Mode is optimised for target detection and is more sensitive than Interrogation Mode or Pinpoint Mode. Therefore, very small targets detected in Detection Mode may not be detected when using Interrogation Mode or Pinpoint Mode. If this occurs, use Detection Mode to pinpoint a detected target, rather than using Pinpoint Mode.

Pinpoint Mode

Pinpoint Mode provides a static response such that target feedback will be heard even if the Sensor Head is stationary with respect to the target. This mode is useful for locating targets.

To enable Pinpoint Mode, press and hold the Trigger button.

When the Trigger button is released, the MD will return to Detection Mode.

Pinpoint Mode is used to map a detected metal target to discover its size and shape. For detailed information on mapping a target using Pinpoint Mode, see page 50.

Pinpoint Mode can also be used to locate the centre of a target. For detailed information on locating the centre of a target using Pinpoint Mode, read page 50.

Interrogation Mode

Interrogation Mode provides additional information regarding the probable characteristics of a target based on its response to the magnetic field transmitted by the MD, including:

- Apparent target conductivity.
- Whether the target is ferrous or non-ferrous.
- Whether the target is potentially a carbon rod switch component.

In Interrogation Mode, audio responses consist of a single 'beep' tone where the pitch corresponds to the characteristics of the detected target.

- Ferrous targets sound very low-pitched.
- Carbon Rod targets sound very high-pitched.
- Non-Ferrous targets will have a mid-range pitch response where the pitch is proportional to the conductivity of the target.

To enable/disable Interrogation Mode, press and release the Trigger button.

For detailed Interrogation Mode operation information, see page 51.

MD Sensor Overload

When operating any of the MD Modes (Detection/ Pinpoint/ Interrogation), very large metal objects close to the Sensor Head may overload the detector's electronics.

If this occurs, the Coil Overload icon will flash on the LCD, and the Overload Alarm will repeat until the Sensor Head is moved away from the source of the overload.

Overloading is not harmful to the electronics of the detector.

MD Ground Balance

MD Ground Balance reduces noise caused by ground mineralisation, allowing targets to be detected more clearly.

The MDS-20 is capable of detecting metallic objects in all ground conditions. During the Ground Balance procedure, the detector learns and adapts to the ground characteristics to reduce ground noise and false alarms due to mineralised (magnetic/lateritic) soils.

Frequent Ground Balancing will ensure maximum detection performance.

The Ground Balance setting is saved at shut-down, however it is recommended to perform a Ground Balance every time the detector is powered On.

It is recommended that Ground Balance be repeated:

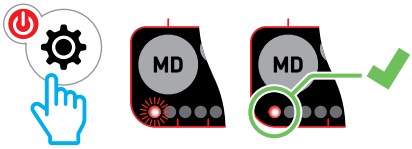
- When ground conditions change.
- When it is suspected that the detector is responding to the ground.
- After changing Ground Balance Mode, unless the detector has already been ground balanced in that mode during the current session.

The MDS-20 uses a fixed Ground Balance system that will only change during an operator-initiated Ground Balance procedure. The MDS-20 will not automatically adjust to different ground during detecting.

MD Sensor Calibration

The MD Sensor calibration occurs for approximately 5 seconds after the MDS-20 is powered On.

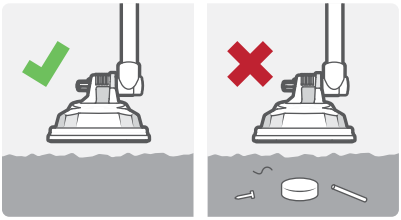
During MD start-up calibration (provided the MD Sensor is enabled) the first MD Target Indicator LED will flash. When the LED stops flashing and remains static on, a Ground Balance can be initiated.



If Ground Balance is attempted before the start-up MD calibration is complete (i.e. first MD Target Indicator LED is flashing), an invalid button press tone will sound.

MD Ground Balance Procedure

1. Ensure this procedure is carried out on ground that contains no metal targets, and is representative of the ground in the intended search area.

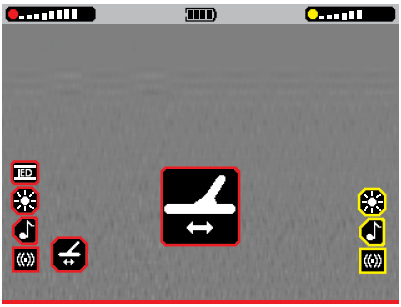


2. From the Detect Screen, with the MD Sensor enabled, short-press the Ground Balance button to initiate the Ground Balance process.

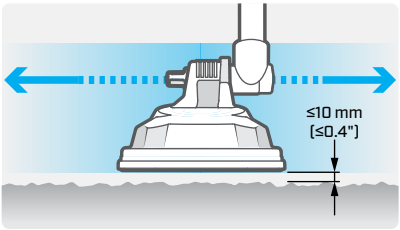
The Ground Balance button

A flashing Ground Balance icon will appear on the LCD, indicating that Ground Balance is in progress.

Ground Balance can be cancelled by pressing the Ground Balance button again.



3. Sweep the coil left and right across the metal target free ground, maintaining a sweep height of ≤10 mm (≤0.4").



4. After eight seconds, there will be a confirmation tone/vibration, the flashing Ground Balance icon will disappear, and the detector will return to Detection Mode.

5. Sweep the coil back over the metal free ground checking for any ground noise or false alarms. Repeat Ground Balance if required.

Successfully completing Ground Balance may allow the use of a higher MD Sensitivity level due to reductions in ground noise and false alarms.

Ground Balance Mode

The MDS-20 has two Ground Balance Modes:

IED	IED Mode *(Default)*
	Conventional Mode

IED Mode *(Default)*

The IED (Improvised Explosive Device) Mode for the MD Sensor is the default and recommended mode for most detecting operations.

IED Mode is sensitive to high frequency IED-like targets such as wires, carbon rods, and very fine metal parts. IED Mode can also be more susceptible to naturally conductive elements in the environment, such as charcoal fragments or salt (e.g. wet beach sand adjacent to seawater). In such scenarios Conventional Mode can be used.

Conventional Mode

The Conventional Mode behaves more like a conventional mine detector such as the Minelab F3. It is less sensitive to high frequency objects such as wires, carbon rods and charcoal. It maintains a high sensitivity to metal targets typically detectable by conventional metal detector technologies.

Conventional Mode can be used for beach locations.

Selecting an Appropriate Ground Balance Mode

Use of IED Mode is recommended except:

- When detecting on wet sand at a seawater beach or other salt environment,
- When detecting in an area known to be contaminated with charcoal fragments, fine wire or metal fragments, or
- If, after performing a Noise Cancel and Ground Balance, the MD Sensor still gives a high number of false alarms with an MD Sensitivity setting of 4 or lower in IED Mode.

In these scenarios, Conventional Mode may give better performance.

⚠ WARNING

Conventional Mode is less sensitive to certain IED threats including wires and carbon rod switch components. The Operator must always take the threat environment into account when deciding on a suitable Ground Balance Mode.

Changing the Ground Balance Mode

1. From the Detect Screen, short-press the Setup button to open the Setup Screen.

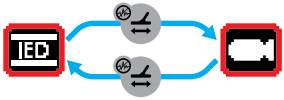
The Setup button

2. Short-press the Ground Balance button (directly below the Ground Balance Mode icon).

The Ground Balance button

The Ground Balance Mode icon will change to the next Ground Balance Mode.

Each short-press of the Ground Balance button will toggle between the two modes.



3. Perform the MD Ground Balance Procedure (page 34) in the newly selected mode.

Ground Balance applies only to the current mode. After changing Ground Balance modes, repeat the Ground Balance procedure. Once Ground Balance has been completed in both IED and Conventional modes, it does not need to be repeated when switching between them.

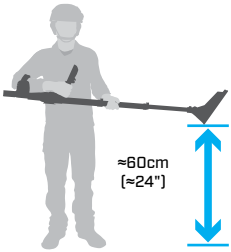
MD Noise Cancel

MD Noise Cancel adjusts the MD Sensor to reduce electrical interference.

Detectors may become noisy due to electrical interference from power lines, electrical equipment, or other detectors operating nearby. The detector interprets this interference as inconsistent, erratic detections, even when the detector is held stationary.

MD Noise Cancel Procedure

1. Hold the Sensor Head stationary and away from the ground and metal targets.



2. From the Detect Screen, with the MD Sensor enabled, long-press the Ground Balance button to initiate the Noise Cancel process.


The Ground Balance button

3. The Noise Cancel icon and progress bar will be shown on the LCD. A tone and/or vibration indicates that Noise Cancel is in progress.

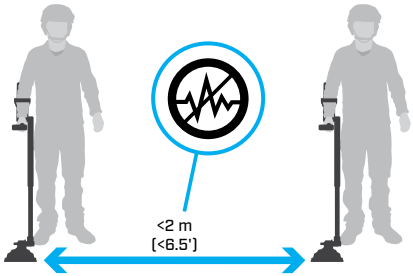
   Do not use the detector whilst Noise Cancel is in progress.

4. After 25 seconds, there will be an audio tone when the Noise Cancel is complete. The progress bar will reach 100%, and the icon and progress bar will disappear.

Nearby Detectors Procedure

If operating in close proximity with other detectors and there is interference, the following procedure should be followed:

1. Enable the MD Sensor on all detectors.
2. Perform Noise Cancel on each detector, one at a time to ensure that each detector selects a different operating frequency.
3. Perform Ground Balance on each detector after Noise Cancel, before commencing detecting.



MD Sensitivity

MD Sensitivity should be adjusted as needed to reduce false alarms arising from difficult grounds.

The MD Sensitivity setting has a range from 1 (low) to 10 (high) with a default setting of 8.

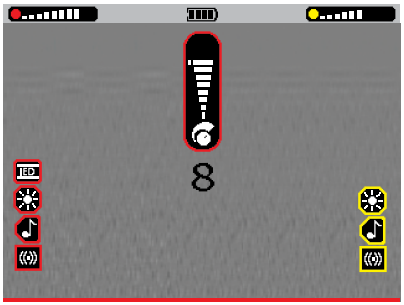
To avoid missing targets, always set the MD Sensitivity to the highest setting which does not give excessive false signals when the Sensor Head is swept over ground which is free of targets. This setting will depend on the ground being searched, and how well the detector has Ground Balanced to the soil.

The MD Sensitivity level is displayed in the Status Bar when the MD Sensor is enabled.

The MD Sensitivity Level Indicator in the Status Bar

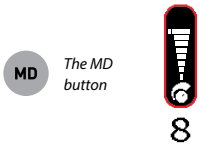
When viewing the Setup Pages or when adjusting the MD Sensitivity, the sensitivity level is displayed as a vertical gauge.

There is a default setting marker at level 8 to indicate the default setting.



Setting the MD Sensitivity

1. Ensure that the MD Sensor is enabled, and the Detect Screen is active.
2. Ensure the MD Sensor has been Ground Balanced, and (if required) perform a Noise Cancel.
3. Short-press the MD button to display the MD Sensitivity Adjustment Bar and value.



The MD button

The MD Sensitivity adjustment bar and value

While sweeping the Sensor Head over ground with no targets present, use the Plus (+) button to increase the Sensitivity until false signals begin to occur.

4. Reduce the Sensitivity by pressing the Minus (–) button, just enough that these false signals disappear.

Note: The adjustment bar will time-out (disappear) after 3 seconds of inactivity.

⚠ WARNING

It is the responsibility of the Operator to test and ensure that the chosen sensitivity setting is safe and correct before beginning live operations. Where practical the Operator should bury an FFE (Free From Explosive) target that represents the local threat to confirm the detector and the sensitivity setting is correct.

GPR Sensor Overview

The GPR (Ground Penetrating Radar) Sensor is capable of detecting both metallic and non-metallic targets as well as ground anomalies (clutter).

Enabling the GPR Sensor

GPR The GPR Sensor is enabled and disabled by long-pressing the GPR button.

All GPR related functions are colour coded yellow for quick recognition.

When the GPR Sensor is enabled, Advanced GPR settings can be accessed and modified. They are unavailable when the GPR Sensor is disabled.

These advanced settings are:

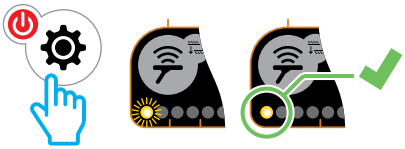
- GPR Start/Stop Gates (page 40)
- GPR Depth Gain (page 42)

Detect Screen with the GPR Sensor enabled.

GPR Sensor Calibration

The GPR Sensor calibration occurs for approximately 3 seconds after the MDS-20 is powered On.

During GPR start-up calibration (provided the GPR Sensor is enabled), the first GPR Target Indicator LED will flash. When the LED stops flashing and remains static on, the GPR imagery will start to scroll.

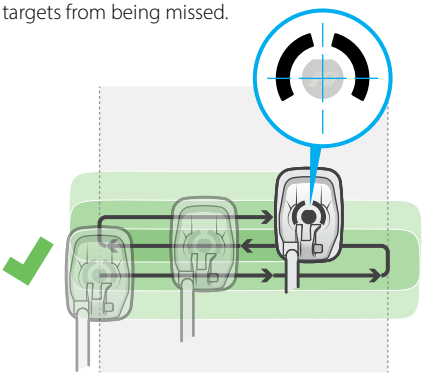


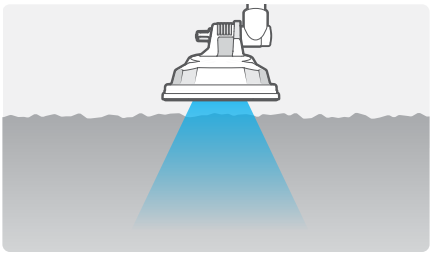
GPR Search Overlap — Shallow Targets

Refer to 'Search Technique' on page 46 for general recommendations for GPR and MD detecting techniques.

While a half-coil overlap is usually adequate to ensure full ground coverage, it is recommended to use a two-thirds overlap when searching for very shallow GPR targets.

The GPR Detection Area on the Sensor Head indicates the approximate centre of the GPR Radar, which has a narrower, more focussed field than the MD Sensor. Therefore, each sweep should be generously overlapped to prevent targets from being missed.





The GPR Sensor's sensitivity field is narrow near the Sensor Head and becomes wider at depth.

GPR Sensitivity

GPR Sensitivity amplifies all signals regardless of depth, making near-surface targets more visible without differentiating between shallow and deep objects.

The GPR Sensitivity setting has a range from 1 (low) to 10 (high) with a default setting of 6.

A higher GPR Sensitivity setting enhances signals from all objects, making small or weak features more visible. However, excessive gain can increase noise, which may obscure targets.

Lower GPR Sensitivity provides cleaner imagery but may make weak responses undetectable.

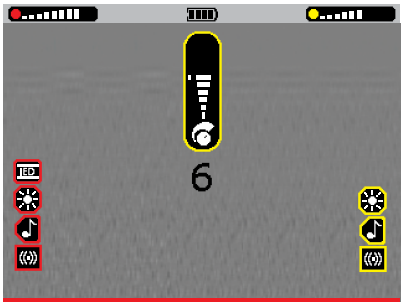
To avoid missing targets, adjust the GPR Sensitivity to the highest setting that does not produce excessive false signals (audio, visual, or vibration) when scanning target-free ground. The optimal setting will depend on factors such as soil conditions and moisture content.

The GPR Sensitivity level is displayed in the Status Bar when the GPR Sensor is enabled.

The GPR Sensitivity Level Indicator in the Status Bar

When viewing the Setup Pages or when adjusting the GPR Sensitivity, the level is displayed as a vertical gauge.

There is a default setting marker at level 6 to indicate the default setting.



Setting the GPR Sensitivity

1. Ensure that the GPR Sensor is enabled, and the Detect Screen is active.
2. Short-press the GPR button to display the GPR Sensitivity adjustment bar and value.

The GPR button

The GPR Sensitivity adjustment bar and value

3. While sweeping the Sensor Head over ground that is free of targets, use the Plus (+) button to increase the GPR Sensitivity level until false signals begin to occur.
4. Reduce the GPR Sensitivity level by pressing the Minus (–) button, just enough that these false signals disappear.

   Note: The adjustment bar will time-out (disappear) after 3 seconds of inactivity.

⚠ WARNING

It is the responsibility of the Operator to test and ensure that the chosen GPR Sensitivity setting is safe and correct before beginning operations.

Advanced GPR Settings

The advanced GPR settings allow fine tuning of the GPR detection capability.

Accessing the Advanced GPR Settings

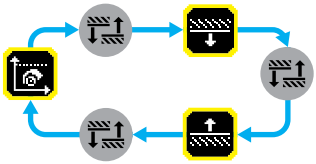
1. Long-press the The Advanced GPR Settings button once to open the Advanced GPR Settings menu.

The Advanced GPR Settings button

2. Short-press the Advanced GPR Settings button to cycle through the settings:

   - Start Gate
   - Stop Gate
   - GPR Depth Gain

   Each short-press of the Advanced GPR Settings button will cycle to the next setting.



3. Long-press the Advanced GPR Settings button to return to the Detect Screen.

GPR Start/Stop Gates

The GPR Start/Stop Gate Function allows the Operator to mask detections from layers of soil near the surface and at the bottom of the detectable depth range.

This helps to eliminate unwanted false alarms from rough or uneven soil surfaces, and shallow or very deep layers of clutter in the soil.

The GPR Start/Stop Gates setting ranges from 0 to 100. The Start Gate default is 0, and the Stop Gate default is 100.

The Start and Stop Gates are adjusted separately.

The Start Gate can be set to suppress detections from targets and clutter that appears **above** the Start Gate marker. This reduces false alarms due to rough or uneven ground, or layers of clutter near the surface such as grass or leaf matter. GPR imagery, audio, LED and vibration responses and Target Overlay Highlights will be suppressed for targets and clutter above the Start Gate marker. Note that this setting will also suppress detection responses from targets that are shallow or at ground-level, so should only be used when necessary.

The Stop Gate can be set to suppress detections from targets and clutter that appear **below** the Stop Gate marker. This may be useful to suppress responses from deep clutter layers. GPR imagery, audio, LED and vibration feedback, and Target Overlay Highlights below the Stop Gate marker will be suppressed.

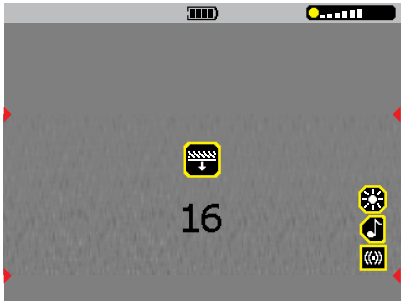
Setting the Start/Stop Gates

1. With the GPR Sensor enabled, long-press the Advanced GPR Settings button.

   The Advanced GPR Settings button

   The Start Gate icon and number will be displayed, and the Start Gate markers will flash.



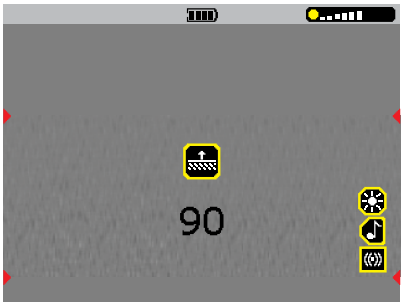
2. Press the Plus (+) and Minus (–) buttons to adjust the Start Gate. It adjusts in increments of 1 for settings below 20, and in increments of 5 for settings above 20.

   Repeat as necessary while sweeping the Sensor Head over the type of ground to be searched until false alarms no longer occur.

3. Short-press the Advanced GPR Settings button to proceed to the Stop Gate adjustment.

4. Repeat step 2 to adjust the Stop Gate.

   The Stop Gate adjusts in increments of 5, and will always be at least 5 levels lower than the Start Gate value. They cannot be the same value or be overlapped.



5. Long-press the Advanced GPR Settings button to return to the Detect Screen.

   The Start and Stop Gate Markers will remain on the Detect Screen for reference, except if they are set to either 0 or 100.

GPR Depth Gain

GPR Depth Gain works similarly to GPR Sensitivity (page 39), however it proportionally increases at depth, amplifying weaker signals from deeper objects to boost their visibility.

The GPR Depth Gain setting has a range from 0 to 100 with a default setting of 75.

A higher GPR Depth Gain setting will result in more detection feedback for weaker targets, but also more false alarms due to ground clutter.

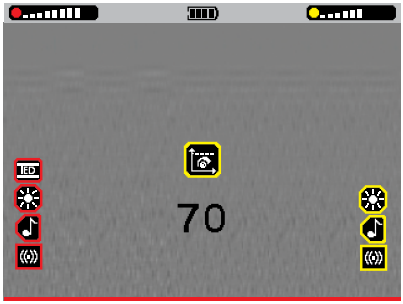
A lower GPR Depth Gain setting will reduce false detections due to ground clutter, giving 'cleaner' GPR Imagery, though it may miss weaker targets.

Adjusting GPR Depth Gain

1. With the GPR Sensor enabled, long-press the Advanced GPR Settings button. Start Gate adjustment will be displayed.

The Advanced GPR Settings button

2. Short-press the Advanced GPR Settings button twice to cycle to GPR Depth Gain adjustment.



3. Use the Plus (+) and Minus (–) buttons to increase or decrease the GPR Depth Gain level.

4. Long-press the Advanced GPR Settings button to return to the Detect Screen.

GPR Imagery Overview

Understanding GPR Imagery is a learned skill. Below are the fundamentals of GPR imagery interpretation.

The MDS-20 has a unique visual representation of subsurface imagery. This allows the Operator to distinguish anomalies visually, as well as audibly. Visual interpretation is based on soil composition and on the size, shape and density of the anomaly.

Basics of GPR Imagery

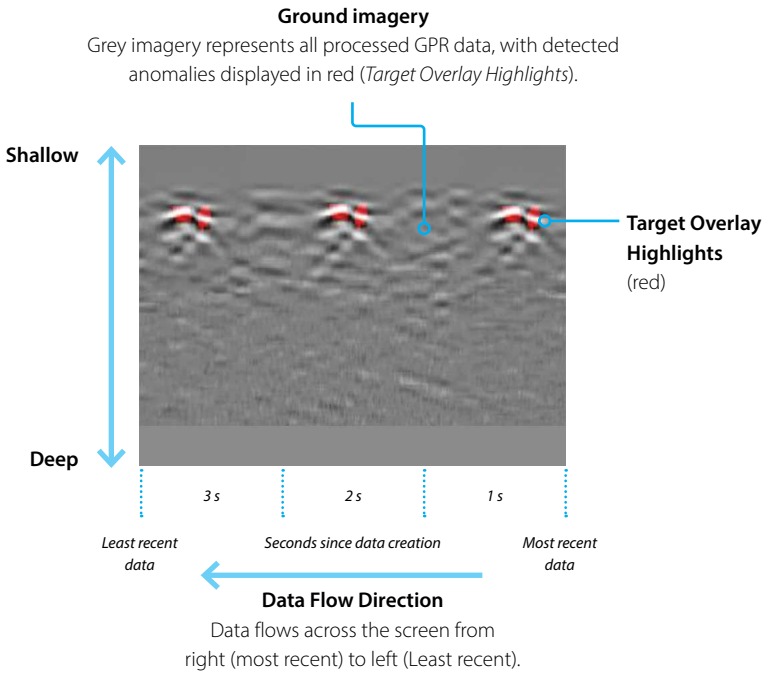
The MDS-20 displays processed GPR data which shows imagery of buried objects and sub surface structures. Data scrolls in real-time across the screen from right to left. The imagery displays 3 seconds of data, with the left representing data from 3 seconds ago. The most recent data is displayed on the right.

Shallow buried objects (close to Sensor Head) will be displayed near the top of the imagery and deep buried objects are displayed lower in the imagery.

Note that the processed GPR data imagery will change depending on GPR Depth Gain, Sensitivity and Start/Stop Gate positions.

Parts of the GPR Imagery

Note: GPR imagery varies with type, density and moisture content of soil.



Play/Pause

The GPR Imagery (and MD Trace) can be paused so that an anomaly of interest can be scrutinised.

It also disables the transmitters for both MD and GPR Sensors.

> **⚠ WARNING**
>
> When the GPR Imagery/MD Trace are paused, the MD and GPR sensors cease operation. **Do not actively detect while paused.**

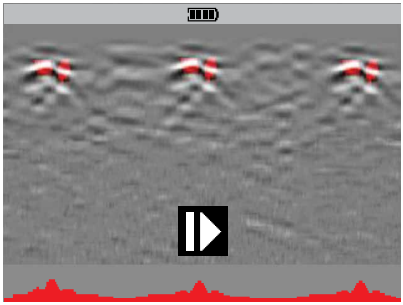
Pausing the GPR Imagery/MD Trace

1. Short-press the Play/Pause button while detecting.

The Play/Pause button

The imagery will pause, and the Pause/Play icon will flash on the LCD.

All non-essential icons and indicators will be temporarily hidden, and the MD and GPR Sensors will be temporarily disabled.

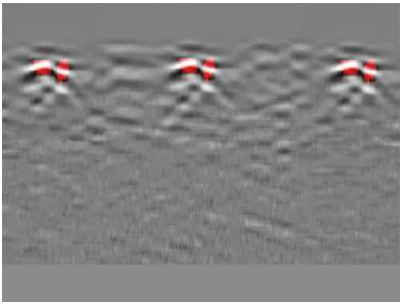


2. Short-press the Pause/Play button again to enable the Sensors and continue imagery generation.

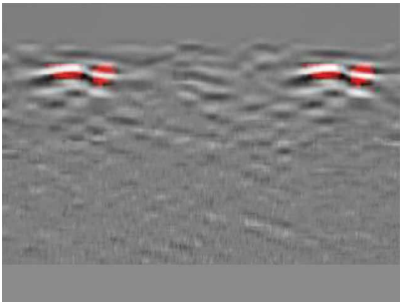
Detection Sweep-Speed Effect

The Operator can sweep the detector slowly or quickly, up to approximately 1 metre (3-feet) per second.

Sweeping the Sensor Head quickly will compress the visual imagery on the display. Sweeping the Sensor Head slowly will elongate the visual representation of the anomaly.



Large target detection with a fast sweep-speed. The imagery becomes compressed across the time period.

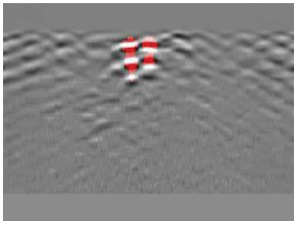


The same target detected with a slow sweep-speed. The imagery becomes elongated across the time period.

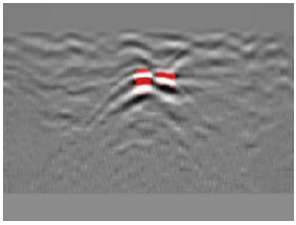
Example GPR Imagery

Smaller anomaly detected at different depths

GPR imagery examples of the same anomaly detected at different depths.



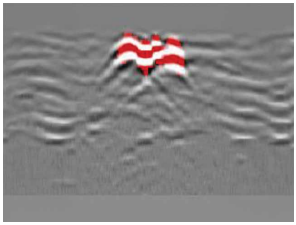
Smaller anomaly detected at 50 mm (2")



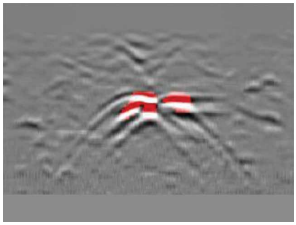
Smaller anomaly detected at 200 mm (8")

Larger anomaly detected at different depths

GPR imagery examples of the same anomaly detected at different depths.



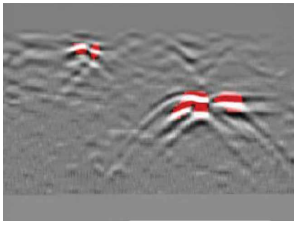
Larger anomaly detected at 0 mm (0")



Larger anomaly detected at 300 mm (12")

Adjacent anomalies at different depths

GPR imagery example of adjacent anomalies detected at different depths.



GPR Imagery showing adjacent deep and shallow anomalies

Search Technique

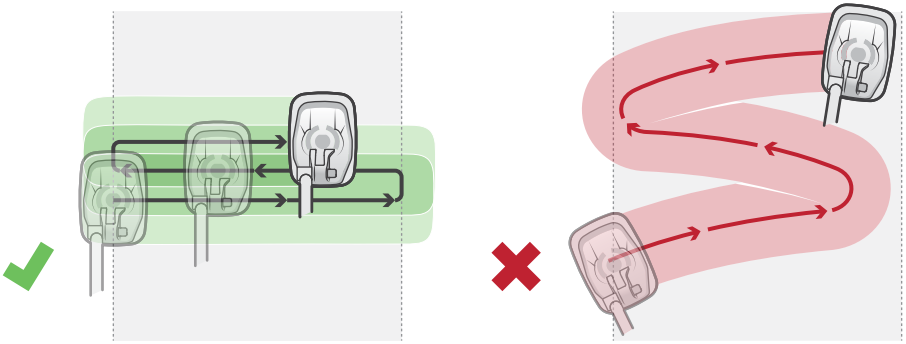
Using the correct search technique is crucial for optimum detecting.

Search Speed

Sweep the Search Head with a smooth even motion at a speed from 0.5 to 1 m/sec (1.5' to 3'/sec).
If the detector is swept too fast or too slow, small or deep targets may be missed.

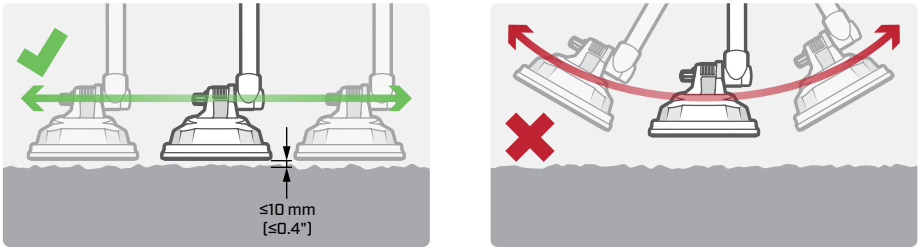
Search Overlap

Sweep using a minimum of a half-coil overlap to ensure full ground coverage.
Refer to 'GPR Search Overlap — Shallow Targets' on page 38 for GPR-specific recommendations for search overlap when searching for GPR targets.



Sweep Height and Angle

Sweep the Sensor Head as smoothly and as parallel to the ground as possible, at a height of approximately 10 mm (0.4"). To minimise false alarms, take care not to bump the Search Head on the ground, small rocks, vegetation, etc.



Locating the Target

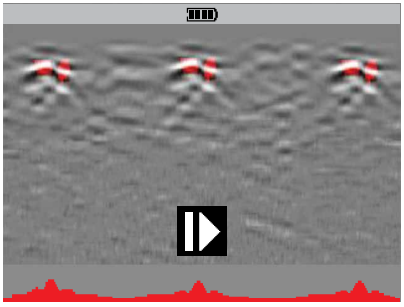
Target location techniques narrow down the exact location of a target.

Mapping the Target

Mapping a detected target is an important procedure that will allow the Operator to immediately gain an impression of the approximate location, size, and type (e.g. MD and / or GPR) of the target. Mapping the target also confirms that the target is not in close proximity to a second target.

When both GPR and MD are enabled, the detector displays responses from both sensors. Seeing aligned indications from both GPR and MD provides strong confirmation of a genuine target, as it is unlikely that both sensors will produce a false alarm at the same location. This co-location of responses is a major feature benefit that increases Operator confidence during detection.

The UI will show the GPR imagery and MD trace simultaneously while detecting. Operators should observe the alignment of the two responses on the screen as well as in the audio/visual signals.



The MD Trace and GPR Imagery both show aligned responses at the same location, giving the Operator increased confidence that the detection is a genuine target rather than a false alarm.

The Target Mapping procedure is effective for mapping targets with both GPR and MD enabled (in Detection Mode). For the MD only, the additional following techniques can be used to locate metal targets more accurately:

- 'MD Edge Mapping Procedure' on page 49
- 'MD Pinpointing Procedure' on page 50.

Target Mapping Procedure

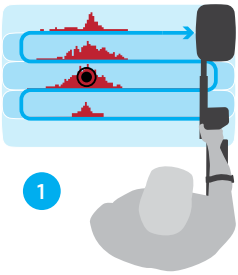
1. Maintaining the standard sweeping technique, sweep the Sensor Head over and beyond the target in an attempt to find clear ground.

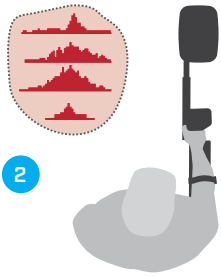
   With each sweep, the MD Trace (or GPR Imagery) will display the strongest signal when the Sensor Head is in close proximity to the target.

2. Form a mental image of the approximate bounds of the target.

Once the Operator has obtained an approximate idea of the size, relative depth, and metallic content of the target, greater target accuracy can be achieved.

Use the MD Edge Mapping (page 49) and/or MD Pinpointing (page 50) procedures to more accurately locate the target.



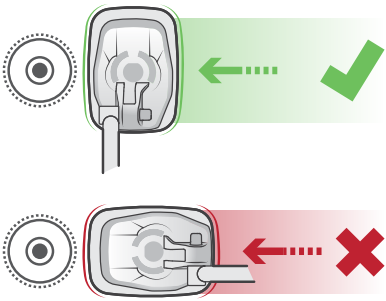


MD Search Tips

Sensor Head Orientation

Always approach targets to be located/mapped/pinpointed with the long sides of the Sensor Head.

Never use the back and front of the Sensor Head to approach a target, as the target may not be detected, or may be inaccurately located.



Pinpoint Mode Target Feedback

Activating Pinpoint Mode alters the manner in which the metal detector operates.

Detection Mode gives a dynamic response i.e. the Sensor Head must be moving over a target in order to detect it.

When Pinpoint Mode is selected, it changes to a 'static' response. This means that the detector will give target feedback when the Sensor Head is stationary/moving very slowly over a target. This assists in finely pinpointing the location of a target.

Sensor Head Null Zone

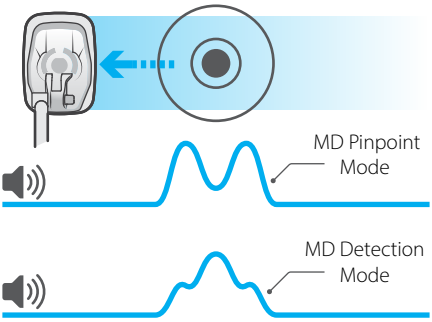
If a target contains metal, the MD audio response increases to the maximum pitch when the Sensor Head is immediately adjacent to the target centre (on both sides), with a 'null zone' precisely centred over the target.

Sweeping over a target with MD Pinpoint Mode enabled will produce a 'double-beep' response due to a characteristic of the MD figure-8 receive coil.

The coil has a precise null down the length of the centre of the coil (and corresponding peak sensitivity areas either side).

MD Detection Mode can produce a 'triple-beep' response because it is a dynamic mode that is motion-dependent.

MD Pinpoint Mode is a static mode resulting in a 'double-beep' which reflects the sensitivity pattern of the MD coil.



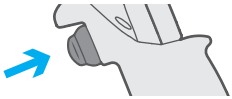
MD Edge Mapping Procedure

The MD edge mapping procedure uses Pinpoint Mode to identify the outer edges of a metal target when only the MD Sensor is enabled.

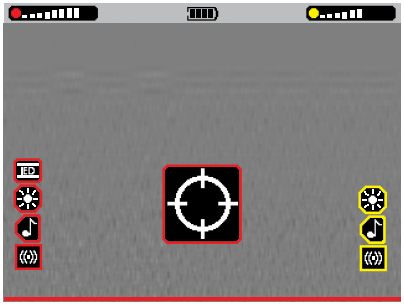
Note: Pinpoint Mode is slightly less sensitive than Detection Mode, and may not work well for extremely weak target detections. In these instances, use Detection Mode to map the target (steps 2 to 5).

> **⚠ WARNING**
>
> Do not select Pinpoint Mode when the Sensor Head is above the target. This may result in the target being masked.

1. Move the Sensor Head away from the target and enable Pinpoint Mode by pressing and holding the Trigger button.

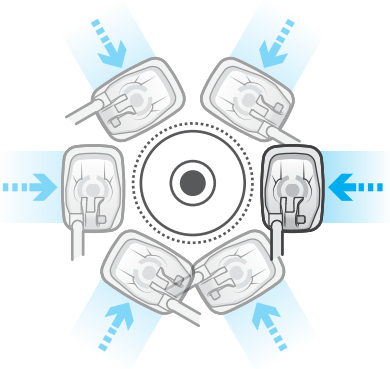


The Pinpoint icon will appear on the LCD, and the audio responses will change.



2. Move the Sensor Head to approach the target area from a variety of angles.

   Do not use the short sides of the Sensor Head (see 'Sensor Head Null Zone' on page 48).



   As the Sensor Head approaches the target, the Target indicators will indicate that the target is in close proximity.

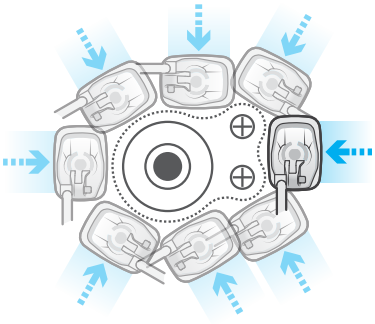
3. When there is an audio response, mentally mark the position on the ground.
4. Move the coil away, and approach the target from another angle.
5. This process continues until a clear mental picture of the target size and shape is achieved. The Operator will also be confident that the target is contained in the mapped area.

Once the target has been mapped, Pinpoint the centre of the target (page 50).

Mapping Multiple Targets

The Operator may find multiple objects of interest in close proximity but may want to locate them separately.

Use the normal target location procedures to determine the locations of multiple targets. An irregular shape may emerge, allowing the centres of individual targets to be pinpointed within it.



MD Pinpointing Procedure

After the target edges have been mapped, the MD Pinpointing procedure is carried out to precisely determine the centre of the target.

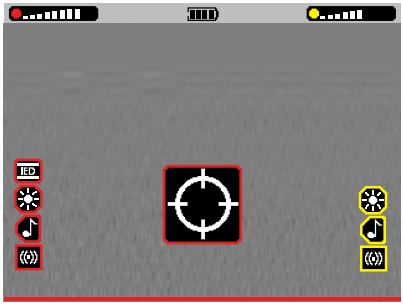
If the target contains metal, and the metal in the target is sufficiently small, the area mapped will also be small, therefore it is easier to identify the centre of the target.

Note: Pinpoint Mode is slightly less sensitive than Detection Mode, and may not work well for extremely weak target detections. In these instances, use Detection Mode to find the centre of the target (steps 2 to 5).

> **⚠ WARNING**
>
> Do not select Pinpoint Mode when the Sensor Head is above the target. This may result in the target being masked.

1. Move the Sensor Head away from the mapped target and enable Pinpoint Mode by pressing and holding the Trigger button.

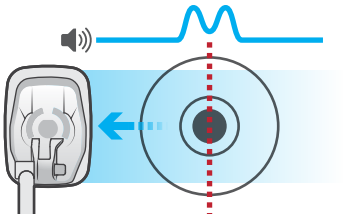
The Pinpoint icon will appear on the LCD, and the audio responses will change.



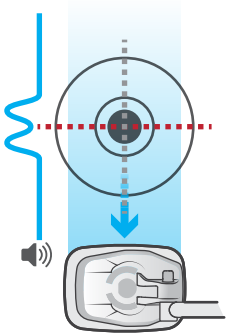
2. Sweep the coil over the target.

   If the target contains metal, the MD audio response will increase to the maximum pitch when the sensor heard is immediately adjacent to the target centre.

3. When a response is heard, mentally mark the centreline.



4. Repeat the process with the detector oriented at 90° to the first position. The intersection of the two lines will indicate the target location.



5. To disable Pinpoint Mode and return to Detection Mode, release the Trigger button.

Once the MD target has been Pinpointed, it can be Interrogated (page 51).

MD Interrogation Mode

Interrogation Mode provides information regarding characteristics and composition of a target.

When using the detector in Dual Sensor Mode, the separate MD and GPR signals may be used to differentiate targets of different types.

For example, a large metallic object will generate a high target response from both the MD and GPR, while a large non-metallic object would generate a high target response from the GPR but little to no response from the MD.

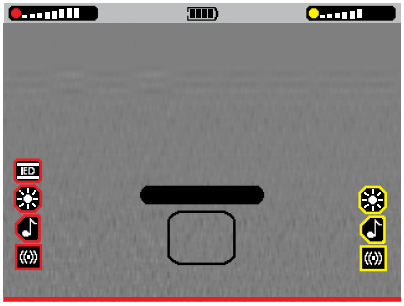
Conversely, a very small metallic target may not generate a response from the GPR, but still generate a response from the MD.

Interrogation Mode Audio

MD Interrogation Mode will provide an audio tone related to the target's ferrous content and conductivity. The detection tone in Interrogation Mode is not related to the target size and proximity as it is in MD Detection Mode.

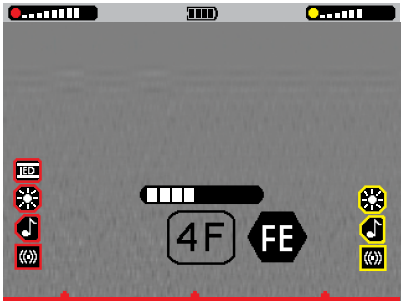
Interrogation Mode Procedure

1. Ensure that the MD Sensor is enabled. Interrogation Mode cannot be enabled when operating only the GPR Sensor.
2. Press and release the Trigger button once to enable Interrogation Mode. The Target Identification (ID) Field will be displayed (see page 52 for detailed Target ID information).



   Audio feedback will change; Interrogation Mode audio will vary in tone corresponding to the target composition (see page 32).

   A Target ID will also be displayed on the LCD corresponding to the tone emitted.
3. Pass the coil over the target to be interrogated, while paying attention to target feedback and reviewing the Target ID.



4. Press and release the Trigger button to return to Detection Mode.

Note: Interrogation Mode will provide a specific tone for a target. However, the tone is not unique and other targets may produce the same type of tone. In different types of soil, the same target may give a different tone when interrogated.

MD Target ID

MD Target ID represents the apparent conductivity and likely composition of a target. Target IDs are based on the characteristics of a detected target's response to the magnetic field applied by the MD.

The MD Target ID is an identification displayed in the Target ID Field on the LCD when MD Interrogation Mode is enabled, consisting of a single digit and letter.

The conductivity of a detected target is represented as a dimensionless number from 0 (low conductivity) to 9 (high conductivity). The number is also represented visually on the Conductivity Bar.

The likely material type of a detected target is represented as a letter.

In general, the stronger the target signal strength, the more accurate the Target ID.

Ferrous Targets

If a detected target is ferrous, the letter 'F' is displayed beside the number (0 to 9) inside the Target ID Field, and the Ferrous icon appears on the right.

Ferrous targets give a very low-pitched beep tone in Interrogation Mode.

Non-Ferrous Targets

If a detected target is non-ferrous, a number (0to 9) is displayed in the Target ID Field, but no letter will be displayed.

Non-ferrous targets give a medium to high pitched beep tone in MD Interrogation Mode, depending on their conductivity (higher pitch corresponds to higher conductivity).

Low Conductivity Targets

If a detected target has very low conductivity, the letter 'C' is displayed beside the number inside the Target ID Field, and the Carbon Rod icon appears on the left.

Low conductivity targets usually have a Target ID of 0 or 1, and have characteristics consistent with carbon rods or small wires. These can be found in particular types of IED threats.

Low conductivity targets give a distinctive very high-pitched beep tone in MD Interrogation Mode.

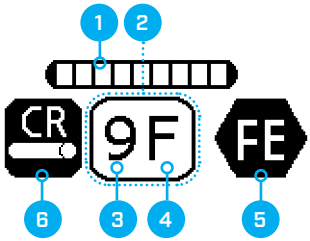
Target ID Examples

A moderately conductive non-ferrous target

A moderately conductive ferrous target

A very low conductive target (likely to be a carbon rod or wire)

Parts of the Target ID Field



1. **Conductivity Bar (0 to 9)**
2. **Target ID Field**
3. **Target ID Number**
4. **Target Composition Indicator**
   F = Ferrous C= Carbon Rod
5. **Ferrous Target Indicator**
6. **Carbon Rod Indicator**

Detector Battery

The MDS-20 is powered by a rechargeable lithium-ion battery.

Battery Status Indicator

The battery status indicator shows the current battery level, and is located in centre of the Status Bar on the LCD.

	75%–100%
	50%–75%
	25%–50%
	5%–25%
	*< 5% (Flashing, charging required)*

Low Battery Alert

The detector regulates the battery voltage so that its performance remains constant regardless of the charge remaining in the battery.

If the battery level is critically low, the Operator will be alerted in any combination of the following ways:

- If the LCD is On, the battery outline in the status bar will flash rapidly.
- If audio is enabled, there will a rapid high-low-high-low tone every 10 seconds.
- If vibration responses are enabled, there will be three rapid vibrations every 10 seconds.

When the battery is completely flat, the detector will automatically power Off.

> **⚠ WARNING**
>
> **If the Low Battery Alert occurs, the Operator must immediately STOP operations.** Recharge or replace the battery before recommencing de-mining operations.

Lithium-ion Battery Charger

The detector is supplied with a smart charger.

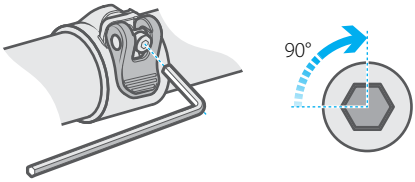
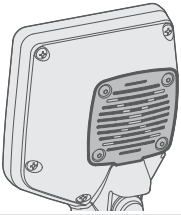
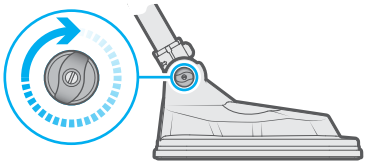
For full battery charger operation instructions, specifications and safety information, refer to the instructions included with the charger.

Troubleshooting

If the listed problems occur, perform the recommended actions first before reporting the detector as faulty.

Before performing the recommended actions listed below, perform Factory Reset (page 59).

Problem	Recommended Action
Detector will not turn On	**1.** Ensure that the battery is charged. **2.** Remove and refit the battery.
No LEDs/Audio/ Vibration	**1.** Check that the LED, Audio, or Vibration Feedback Settings are On for each sensor (page 27). **2.** Ensure that Night Vision Mode is disabled (page 26). **3.** Ensure that Tactical Mode is disabled (page 28).
LCD display is not working	**1.** Check that the LCD is On (page 26). **2.** Ensure that Night Vision Mode is disabled (page 26). **3.** Ensure that Tactical Mode is disabled (page 28).
No sound - Speaker	**1.** Check the Audio Output Mode is not set to 'Speaker Off' (page 29). **2.** Check the Audio Output Mode is not set to 'Speaker Auto-Mute' with an Earset connected (page 29). **3.** Check the Volume is set to an audible level (page 29). **4.** Check the Audio Feedback Settings are enabled for the applicable sensor (page 27) **5.** Check the applicable Sensor is enabled (MD page 31, GPR page 38).
No sound - Earset	**1.** Check the earset is properly connected. **2.** Check the Volume is set to an audible level (page 29). **3.** Check the Audio Feedback Settings are enabled for the applicable sensor (page 27) **4.** Check the applicable Sensor is enabled (MD page 31, GPR page 38). **5.** Remove the earset and inspect the connectors for contamination or damage. **6.** Replace the earset.
Excessive MD noise	**1.** Perform Noise Cancel (page 36). **2.** Move away from the source of the noise.
Excessive GPR ground noise	**1.** Adjust Start/Stop Gates (page 41). **2.** Adjust GPR Sensitivity as necessary (page 39).
Excessive MD ground noise	**1.** Perform Ground Balance (page 34). **2.** Adjust MD Sensitivity as necessary (page 37).
Shafts stuck/don't move smoothly when extending due to sand or dirt contamination	**1.** Open camlocks and extend shafts fully. **2.** Wipe the shafts clean with a clean damp cloth. **3.** Collapse and extend shafts repeatedly, cleaning as necessary until shafts move smoothly.

Shaft camlocks too loose/tight	**1.** Close the affected camlock **2.** Using a 3 mm allen key (not included), adjust the camlock screw no more than a one-quarter turn at a time.  **3.** Check that the camlock opens and closes firmly and without the need for excessive force. If it does not, repeat step 2. **4.** Check the camlock holds the shaft securely when closed. If it does not, repeat steps 2 and 3.
Speaker grill blocked	***NOTICE*** Do not attempt to remove mud with a sharp tool. This may cause damage to the speaker. **1.** Gently rinse the speaker under clean water to soften and remove mud. Rinse until the water runs clear. **2.** If the mud will not soften, the speaker grill will need to be removed and cleaned by a service technician.  *The Speaker Grill on the rear of the User Interface.*
Sensor Head does not retain the set angle	**1.** Tighten the Sensor Head Angle Tension as required. 
Error Code is displayed on the LCD	**1.** Power the detector Off then On again. **2.** If the Error Code persists, refer to 'Error Codes' on page 56.
Battery is loose/rattling when fitted	**1.** Remove the battery and check the O-ring is fitted correctly. **2.** Inspect the battery mounting interface on the MDS-20 for damage. **3.** Replace the battery if required.

Error Codes

In the event of a hardware fault, the MDS-20 will display an Error Code. Try the recommended actions first, before reporting the detector as faulty.

The MDS-20 has a Built-in Test (BIT) capability for identifying faults that can occur in the detector.

In the event of a BIT failure, the error icon will be displayed on the LCD. If audio is enabled, there will also be a distinctive audio alarm tune.

Error Codes are divided into three types:

- System Error Codes
- MD Error Codes
- GPR Error Codes

An Error Code corresponding to the fault type will usually be displayed on the Setup Screen.

Errors will normally remain active until the detector is powered Off then back On.

Operator corrective actions are limited steps required to reset the detector to determine whether the fault is a transient condition, or if it is persistent. Units with persistent faults will need to be returned an Authorised Service Centre for investigation and repair.

System, MD, and GPR errors have three levels of severity: advisory, critical and fatal.

Critical Errors

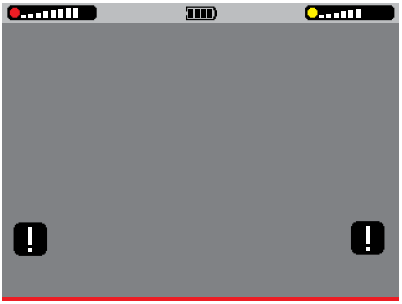
Critical errors are conditions affecting detector performance.

Critical errors are indicated by a continuous alarm in all enabled Feedback settings (audio, visual and vibrate). The MD and GPR Target Indicator LEDs will display the Error sequence (alternating between the four left LEDs and the four right LEDs).

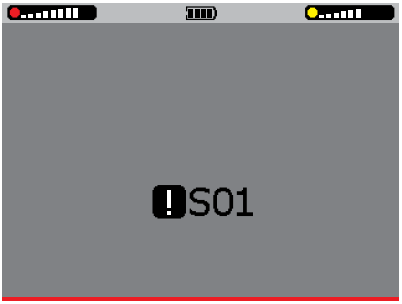
For critical MD and GPR errors, the error icon appears on either the left or the right of the Detect Screen to indicate the affected Sensor.

Critical MD and GPR errors can be silenced by disabling the affected sensor, allowing the Operator to continue detecting with the functional Sensor.

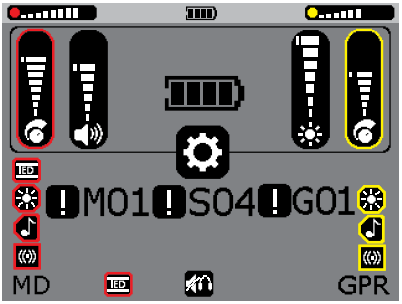
Critical System Errors are indicated by the error icon and a code on the Detect Screen. They can only be reset by powering Off the detector.



Error icons on the Detect Screen. It appears on the left for critical MD errors, and on the right for critical GPR errors.



Critical System Error Code on the Detect Screen.



Critical/Advisory Error Codes are displayed on the Setup Screen; MD errors on the left, System errors in the centre, and GPR errors on the right.

Advisory Errors

Advisory errors are conditions that will not affect detector performance.

Advisory errors are indicated by a short error tune, which repeats once every 15 seconds. The advisory error icon appears in the LCD Status Bar.

The Operator may elect to continue detecting as normal in the presence of an advisory error.

The Error Code corresponding to the advisory error can be viewed on the Setup Screen.

Fatal Errors

Fatal errors are conditions that may result in damage to the detector.

If a fatal error occurs, the MDS-20 will automatically shut down immediately, and no Error Codes are displayed.

Fatal Error Recommended Action:

1. Ensure a fully-charged, Minelab approved battery is fitted (the battery supplied with the detector).
2. Turn the detector On.
3. Perform a Factory Reset (page 59).

If the fault persists, return the detector to an Authorised Service Centre.

Code	Fault	Severity
N/A	Overcurrent condition	Fatal
N/A	Overvoltage condition	Fatal
N/A	Undervoltage condition	Fatal

System Error Codes

System Error Codes indicate a possible electronic fault with the system affecting both the MD and GPR Sensors.

For Advisory System Errors, an Error Code corresponding to the fault will be displayed in the centre of the Setup Screen.

Critical System Error Codes are displayed in the centre of the Detect Screen. All detector functions are disabled, and the only option to reset the error is to turn the detector Off and then On again.

System Error Recommended Action:

1. Turn the detector Off and then On again.
2. Perform Factory Reset (page 59).

If the fault persists, return the detector to an Authorised Service Centre.

Code	Fault	Severity
S01	User Interface module authentication failure	Critical
S02	Battery type detection fault	Critical
S03	UIM configuration load failure	Critical
S04	UIM settings load failure	Advisory

MD Error Codes

MD Error Codes indicate a possible fault with the MD coil or MD coil cable in the Sensor Head, or the MD electronics in the control box.

If an MD fault occurs, the error icon will appear on the Detect Screen, adjacent to the MD Sensor Feedback icons on the left.

The Error Code corresponding to the fault will be displayed on the left of the Setup Screen.

MD Coil Error Recommended Action:

1. Disable/enable MD Sensor.
2. Turn the detector Off and then On again.
3. Perform Factory Reset (page 59).

If the fault persists, return the detector to an Authorised Service Centre.

Code	Fault	Severity
M01	Control box incompatible error	Critical
M02	Control box comms fault error	Critical
M03	MD Tx fault	Critical
M04	MD Rx fault	Critical
M05	MD VTX out of range	Critical
M06	MD A4V out of range	Critical
M07	Coil auth failure	Critical
M08	Control box auth failure	Critical
M09	Coil calibration load failure	Critical
M10	Control box calibration load failure	Critical
M11	Control box temperature sensor 1 over range	Advisory
M12	Control box temperature sensor 1 under range	Advisory
M13	Control box temperature sensor 2 over range	Advisory
M14	Control box temperature sensor 2 under range	Advisory

GPR Error Codes

GPR Error Codes indicate a possible fault with the GPR Sensor.

If a GPR fault occurs, the Error icon will appear on the Detect Screen, adjacent to the GPR Sensor Feedback icons on the right.

The Error Code corresponding to the fault will be displayed on the right of the Setup Screen.

GPR Error Recommended Action:

1. Disable/Enable GPR Sensor.
2. Turn the detector Off and then On again.
3. Perform Factory Reset (page 59).

If the fault persists, return the detector to an Authorised Service Centre.

Code	Fault	Severity
G01	GPR incompatible error	Critical
G02	GPR comms fault error	Critical
G03	GPR voltage error	Critical
G04	GPR antenna disconnected	Critical
G05	GPR Sensor Module disconnected	Critical
G06	GPR sweep table error	Critical
G07	GPR device driver overflow	Critical
G08	GPR upgrade invalid	Critical
G09	GPR calibration invalid	Critical
G10	GPR comms protocol error	Critical
G11	GPR RF status incorrect error	Critical
G12	GPR processing spec invalid	Critical
G20	GPR temperature out of range	Advisory
G21	GPR sensor module error	Advisory
G22	GPR firmware upgrade failed	Advisory
G23	GPR interference detected	Advisory

Factory Presets

The factory preset detector settings are the default and recommended base settings for typical detecting operations.

Factory Preset Settings

Function	Default Setting
Sensor Mode	Dual Sensor Mode (MD and GPR)
Volume	6
Audio Output Mode	Speaker Auto-Mute
Ground Balance Mode	IED
LCD/LED Brightness	7
LCD/LED Setting	On
MD Sensitivity	8
MD LED Response	Enabled
MD Audio Response	Enabled
MD Vibration Response	Enabled
GPR Sensitivity	6
GPR LED Response	Enabled
GPR Audio Response	Enabled
GPR Vibration Response	Enabled
GPR Start Gate	0
GPR Stop Gate	100
GPR Depth Gain	75

Factory Reset

Factory Reset will return all detector settings and modes to factory preset values.

1. Turn the detector Off.
2. Press-and-hold the Setup (power) button.
3. After the first start-up tone, there will be a short high-pitched confirmation tone, and all settings and modes will return to factory preset values.
4. Release the Setup (power) button.

General Safety Advice and Maintenance

The MDS-20 is safe to transport, store and operate when handled with the due care. Safety hazards applicable to this equipment are identified below.

Emission of non-ionising radiation

The GPR and MD Sensors in the Sensor Head emit very low power magnetic fields and Radio Frequency (RF) energy. The radiated energy from both Sensors is significantly lower than that emitted by a mobile telephone and is safe to human health.

Electromagnetic interference

While interference with communications equipment is unlikely, consideration should be given to potential effects on other equipment in proximity.

Internal voltages

Voltages potentially capable of causing electric shock are present on some internal conductors in both the GPR and MD Sensors.

Inspect the MDS-20 shafts, Sensor Head enclosure, Control Box enclosure, and Battery for evidence of damaged or exposed cables or electrical conductors prior to use. Do not use the equipment if there is any evidence of damaged or exposed cables or electrical conductors.

Speaker/earset audio volume

Exposure to excessively high audio volumes with any audio generating equipment can cause discomfort and possible temporary and permanent hearing loss. The maximum output volume via the earset and speaker for the detector are limited to be within safe levels for peak sound pressure level exposure. Operators should also use the Volume control to ensure the audio volume is not set above their personal comfort level.

Air transport safety requirements

The MDS-20 should not be powered on while being transported by air, and all applicable safety regulations must be followed in relation to carriage of electronic equipment, including lithium-ion batteries on aircraft.

Follow all applicable safety regulations including the directions from aircrew when transporting MDS-20 equipment by air.

Ergonomic hazards

The MDS-20 is a lightweight Dual Sensor detector, designed to minimise the risk of fatigue, strain, or other musculoskeletal injury to Operators. Operators using the equipment should always observe correct detecting posture and technique.

Pinch-points

The MDS-20 has been designed to avoid the presence of pinch-points, but is a compact, collapsible piece of equipment that requires moderate care when extending or collapsing. Keep fingers clear of sliding and rotating mechanisms including shaft camlocks, and around the base of the folding handle in the vicinity of the earset connector, when extending or collapsing the detector.

Exposed fibres from damaged carbon fibre shafts

Inspect the detector shafts prior to use. Do not allow damaged or abraded carbon fibre shaft sections to come into contact with skin.

The MDS-20 middle and upper shafts are made from carbon fibre material. Damaged or abraded carbon fibre materials can expose fibres which can cause cuts and abrasions to skin, and ingress under the skin with potentially toxic effects.

Lithium-ion Battery safety and advice

The MDS-20 comes with a high capacity, rechargeable lithium-ion battery. Both the battery and MDS-20 provide internal protection circuitry to ensure safe operation of the battery. All local regulations related to the operation, handling, storage and transportation of lithium-ion batteries must be observed, including the following:

- Inspect lithium-ion batteries before use. Do not use batteries with the equipment if damaged in any way.
- Do not short circuit or reverse polarity the lithium-ion batteries. Fire or explosion may result.
- When fitting batteries to the detector, ensure the O-ring on the battery around the contacts is fitted to prevent moisture, sand or dust fouling the battery contacts.
- Do not use or store the lithium-ion batteries outside the specified operating temperature range for the Detector.
- Do not recharge the lithium-ion batteries with anything other than the battery charger supplied with the equipment.
- Do not allow the lithium-ion battery internal cells to fully discharge. (Note: batteries may be safely operated until the MDS-20 shuts down due to low battery, without fully discharging the battery internal cells.)
- Ensure batteries have at least a partial charge if prolonged storage is anticipated.
- Do not expose lithium-ion batteries to fire, explosion, solvents, corrosives or other hazardous substances.
- Do not incinerate, puncture, crush, or otherwise damage or misuse lithium-ion batteries.
- Do not transport lithium-ion batteries by aircraft except where explicitly authorised under applicable air transport regulations. Observe all applicable regulations when transporting the equipment.
- Dispose of lithium-ion batteries only in accordance with all applicable local and national environmental regulations.
- Recharge the battery after long periods of non-use to maximise battery life (approximately every 6 months)

Battery Charger safety

The charger has been constructed from quality materials and is designed to be maintenance-free.

- Do not attempt to charge batteries other than the Harris 12041-2400 series batteries supplied with the MDS-20 using the supplied charger. Attempting to charge a battery with the wrong chemistry can result in an incomplete charge, battery damage, fire or explosion.
- Do not substitute the AC power supply supplied with battery charger for any other AC power supply.
- Do not attempt to charge batteries outside of the recommended charging temperature range of 0°C to +40°C (+32°F to +104°F).
- Do not block the ventilation slots.
- Keep away from moisture. Clean only with a dry or slightly damp lint-free cloth.
- Do not remove cover. The charger has no internal operator-serviceable parts.

MDS-20 Detector Compliance

Restriction of Chemicals (REACH)

The MDS-20 complies with the European Union regulation 1907/2006/EC (as amended); Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and The REACH etc. (Amendment etc.) (EU Exit) Regulations 2019. Minelab continues to invest in reducing waste products and eliminating toxic substances in our manufacturing facilities as well as when we collaborate and work with customers, suppliers, and partners. We are committed to meeting the European REACH Regulations which mandate that we communicate information on specific substances used in our products.

Simplified EU & UKCA Declaration of Conformity

Hereby, Minelab Electronics Pty Ltd declares that the radio equipment type MDS-20 complies with The Radio Equipment Regulations 2017 (S.I. 2017/1206). Full text of the UKCA Declaration of Conformity is available at the following internet address: www.minelab.com/compliance.

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Minelab International Ltd., Penrose Dock, T23KW81, Ireland
minelab@minelab.ie

UK Auth. Representative:

Minelab Electronics UK Limited, Fusion 2, 1100 Parkway, Whiteley, PO15 7AB
compliancemanager@minelab.com.au

US Responsible Party:

Minelab Americas Inc, 3565 Butterfield Rd., Unit 121 Aurora, IL 60502, USA
ComplianceManager@minelab.com.au

MDS-20 Specifications

Minelab reserves the right to respond to ongoing technical progress by introducing changes in design, equipment and technical features at any time. For the most up-to-date specifications for MDS-20, visit www.minelab.com/countermine

General Specifications

Sensor Operation Modes	MD (Metal Detector) | GPR (Ground Penetrating Radar) | Dual
Volume Control	1 to 9
Packed Dimensions	660 × 485 × 232 mm (25.9" × 19.1" × 9.1")
Packed Weight	13.7 kg (30.2 lb)
Detector Length	Collapsed: 475 mm (18.7") | Extended: 1567 mm (61.7")
Detector Weight	2.85 kg (6.3 lb)
Audio Output	Speaker | MDS-20 Earset connector
Earset	MDS-20 Earset
Display	3.5" 320 × 240 resolution (QVGA) LCD
Display Backlight	Dual Mode backlight: High brightness transmissive 1 to 7 Brightness Levels | NVIS compatible mode
Waterproof	Waterproof to 3 m/10-feet*
Operating Temperature Range	–30°C to +60°C (–22°F to +140°F)
Storage Temperature Range	–50°C to +80°C (–58°F to +176°F)
Environmental	MIL-STD-810H
Software Upgradeable	Yes
Battery	12041-2400-02 Rechargeable lithium-ion 10.8 V, 74 Wh (7.0 Ah) (common with AN/PRC-152 radio battery)
Battery Life	8 hours (Dual Sensor Mode) | 11 hours (MD Sensor Mode) | 9 hours (GPR Sensor Mode)
Charging Temperature Range	0°C to +45°C (+32°F to +113°F)
AA Battery Pack	16 × Alkaline AA Batteries | Runtime: 3 hours (Dual Sensor Mode)

** Although the MDS-20 can withstand immersion to a depth of 3 metres (10-feet) for short periods of time, it is NOT designed for use as an underwater detector.*

Metal Detection Sensor Specifications

Key Technologies	Simultaneous Multi-Frequency Digital
Coil	Transmit Coil: 269 × 191 mm (10.6" × 7.5") Monoloop Receive Coil: Figure 8
Operating Frequencies (kHz)	4 frequencies in the range 6 kHz to 75 kHz
Output Power	<30 dBm
MD Sensitivity	1 to 10
Noise Cancel	Automatic, Operator initiated
Ground Balance	Automatic, Operator initiated
Target Identification	Conductive: 0 to 9 | Ferrous: Indicated

GPR Detection Sensor Specifications

Key Technologies	Ultra Wide-Band (UWB) Stepped-Frequency Radar
Operating Band	230 MHz to 4.5 GHz
Output Power	<1 mW
GPR Sensitivity	1 to 10
GPR Depth Gain	0 to 100
GPR Imagery	3 s live-scrolling B-scan (radargram) display of subsurface anomalies with Target Overlay Highlights

Notes

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Part Number: 4901-0525-EN