

2450GR

Operator's Manual



CE

CMW®

Issue 1.0

053-xxxx

ORIGINAL INSTRUCTION

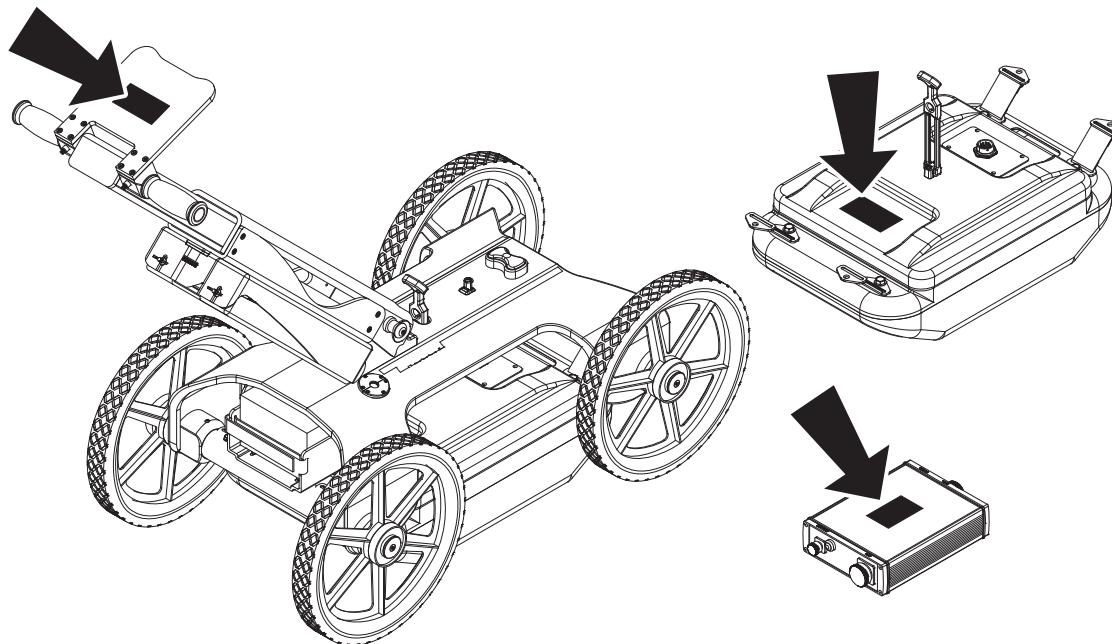
Overview

Chapter Contents

Serial Number Location	2
Overview	3
Intended Use	5
About This Manual	5
• Bulleted Lists.	5
• Numbered Lists.	5
Compliance	6

Serial Number Location

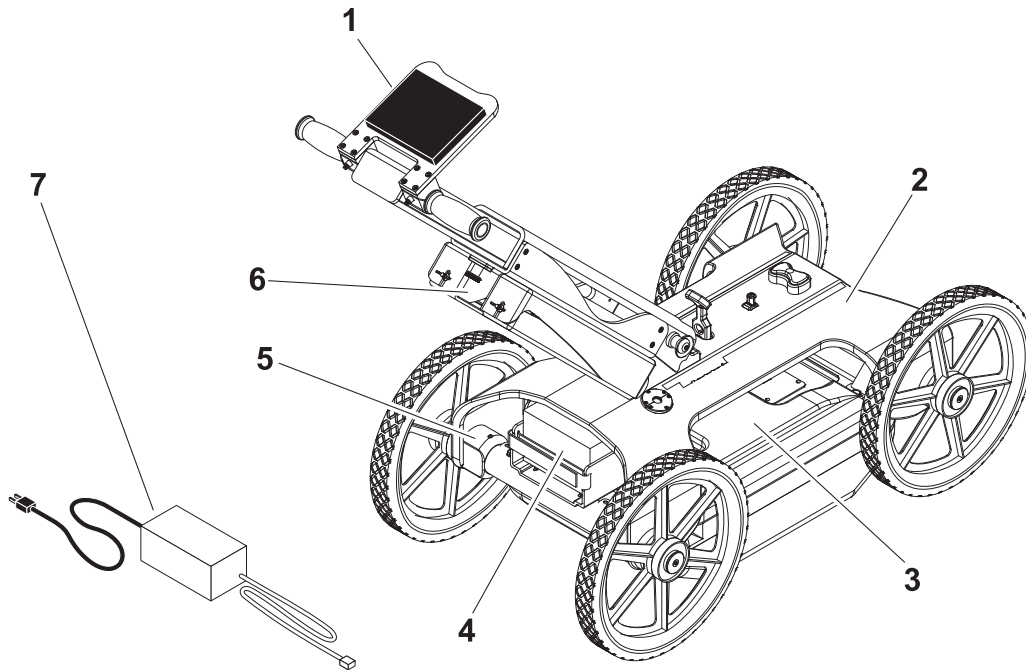
Record serial numbers and date of purchase in spaces provided. Serial numbers are located as shown.



e15om010h.eps

Date of manufacture	
Date of purchase	
2450GR serial number	
Antenna serial number	
Cart serial number	

Overview



e15om001h.eps

- | | |
|--------------|--------------------------|
| 1. Tablet PC | 5. Wheel position sensor |
| 2. Cart | 6. Control unit |
| 3. Antenna | 7. Battery charger |
| 4. Battery | |

Item	Description	Notes
1. Tablet PC	Operates the Scan Acquisition Software and receives data from the control unit.	For specific information about the Tablet PC, see the documentation provided by the PC manufacturer.
2. Cart	Carries GPR components over a variety of terrain. Collapses for easy transport.	

Item	Description	Notes
3. Antenna	<p>Digital radar transmitter/receiver that uses two frequencies to detect buried pipes.</p> <p>High frequency (700MHz) has shallow penetration. Best in conditions with good radar conductivity, such as ice, sand, concrete, or rock.</p> <p>Low frequency (250 MHz) has broad, deep penetration. Better in conditions with poor radar conductivity, such as clay, salt, or wet soil.</p>	The 2450GR scans and records both frequencies simultaneously at all times.
4. Battery	Provides 12V DC to control unit.	Recharge when battery drops below 10V, or as indicated by acquisition software.
5. Wheel position sensor	Measures the distance traveled by the cart.	Located in the left rear wheel.
6. Control Unit	Receives data from the antenna and the wheel position sensor and translates it to the tablet PC.	
7. Battery Charger	To recharge battery, connect charger to battery.	Allow about 3 hours for battery to charge.

Intended Use

The 2450GR is a ground penetrating radar system that detects metallic and non-metallic pipes and cables buried underground. Following standard radar principles, the 2450GR uses a high performance electromagnetic sensor equipped with electromagnetic transmitters and receivers to identify underground utilities and transmit the location data to a portable computer where specialized software maps the location site.

The unit is designed for operation in conditions typically experienced in earth moving and construction work environments. Provisions may be required to operate in extreme temperatures. Use in any other way is considered contrary to the intended use. The 2450GR should be used with genuine Subsite Electronics components. It should be operated, serviced, and repaired only by persons familiar with its particular characteristics and acquainted with the relevant safety procedures.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

This equipment is sensitive to the presence of external electromagnetic fields, which may reduce its performance.

About This Manual

This manual contains information for the proper use of this machine. Cross references such as "See page 50" will direct you to detailed procedures.

Bulleted Lists

Bulleted lists provide helpful or important information or contain procedures that do not have to be performed in a specific order.

Numbered Lists

Numbered lists contain illustration callouts or list steps that must be performed in order.

Compliance

This equipment conforms to the following requirements set by EC regulations, including subsequent modifications, and to the legislation set by the member states that implement these regulations:

- 1999/5/EC Radio and Telecommunications Terminal Equipment Directive
- 2006/95/EC Low Voltage Equipment Directive

WARNING: this equipment is designed for use in industrial environments (Class A apparatus). This apparatus generate radio interference in residential, commercial and light industry environments and the user may be required to take appropriate countermeasures during operation.



FCC ID: ITQ-2450GR
Industry Canada IC: 3598A-2450GR

This equipment complies with part 15 of the FCC rules. Operation is subject to the condition that this device does not cause harmful interference. Changes or modifications not expressly approved by The Charles Machine Works, Inc. could void the user's authority to operate the equipment.

Users of the 2450GR shall supply operational areas to the FCC Office of Engineering and Technology, which shall coordinate this information with the Federal Government through the National Telecommunications and Information Administration. The information provided by the user shall include the name, address, and other pertinent contact information of the user, the desired geographical area(s) of operation, the FCC ID number and other nomenclature of the 2450 GR. The geographical area(s) of operations may be the state(s) or county(ies) in which the equipment will be operated. This material shall be submitted to the following address:

Frequency Coordination Branch, OET
Federal Communications Commission
Attn: UWB Coordination
445 12th Street, SW
Washington, D.C. 20554

Users of authorized, coordinated 2450 GR systems may transfer them to other qualified users and to different locations upon coordination of change of ownership or location to the FCC and coordination with existing authorized operations.

The FCC/NTIA coordination report shall identify those geographical areas within which the operation of a 2450 GR requires additional coordination or within which the operation of a 2450 GR is prohibited. If additional coordination is required for operation within specific geographical areas, a local coordination contact will be provided. Except for operation within these designated areas, once the information requested on the 2450 GR is submitted to the FCC no additional coordination with the FCC is required provided the reported areas of operation do not change. If the area of operation changes, updated information shall be submitted to the FCC following the procedure in paragraph (b) of this section.

The coordination of routine UWB operations shall not take longer than 15 days from the receipt of the coordination request by NTIA. Special temporary operations may be handled with an expedited turn-around time when circumstances warrant. The operation of the 2450 GR system in emergency situations involving the safety of life or property may occur without coordination provided a notification procedure, similar to that contained in CFR 47, Section 1.405(a) through (e) is followed by the equipment user.

Foreword

This manual is an important part of your equipment. It provides safety information and operation instructions to help you use and maintain your Subsite Electronics equipment.

Read this manual before using your equipment. Keep it with the equipment at all times for future reference. If you sell your equipment, be sure to give this manual to the new owner.

If you need a replacement copy, contact your Subsite Electronics dealer. If you need assistance in locating a dealer, visit our website at **www.ditchwitch.com** or write to the following address:

The Charles Machine Works, Inc.
Attn: Marketing Department
PO Box 66
Perry, OK 73077-0066
USA

The descriptions and specifications in this manual are subject to change without notice. The Charles Machine Works, Inc. reserves the right to improve equipment. Some product improvements may have taken place after this manual was published. For the latest information on Subsite Electronics equipment, see your Subsite Electronics dealer.

Thank you for buying and using Subsite Electronics equipment.

**2450GR
Operator's Manual**

**Issue number 1.0/OM-11/19/10
Part number 053-xxxx DRAFT 2**

**Copyright 2010
by The Charles Machine Works, Inc.**



, Ditch Witch, CMW, AutoCrowd, Jet Trac, Roto Witch, Subsite, Fluid Miser, Power Pipe, Super Witch, Pierce Arrow, The Underground, The Underground Authority Worldwide, and Zahn are registered trademarks of The Charles Machine Works, Inc. OnGrade is a pending trademark of The Charles Machine Works, Inc.

Contents

	Overview machine serial number, information about the type of work this machine is designed to perform, basic machine components, and how to use this manual	1
	Foreword part number, revision level, and publication date of this manual, and factory contact information	7
	Safety machine safety alerts and emergency procedures	11
	Controls machine controls, gauges, and indicators and how to use them	15
	Prepare an overview for completing a job with this machine: planning, setting up, installing product, and restoring the jobsite; with cross references to detailed procedures	29
	Operate instructions for launching acquisition software, calibrating the system, acquiring scan data, marking objects, and recording target information	35
	Service how to clean the unit and replace/recharge the battery as well as details of computer system requirements and software installation instructions	41
	Specifications dimensional measurements of unit as well as system specifications including antenna performance and scanning speeds	45
	Support the warranty policy for this machine, and procedures for obtaining warranty consideration and training	49

Safety

Chapter Contents

Guidelines	12
Safety Alert Classifications	13
Safety Alerts	14

Guidelines


Follow these guidelines before operating any jobsite equipment:


- Complete proper training and read operator's manual before using equipment.
- Contact One-Call (811 in USA) or the One-Call referral number (888-258-0808 in USA and Canada) to have underground utilities located before working. Also contact any utilities that do not participate in the One-Call service. Classify jobsite based on its hazards and use correct tools and machinery, safety equipment, and work methods for jobsite.
- Mark jobsite clearly and keep spectators away.
- Wear personal protective equipment.
- Review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins. Safety videos are available from your Subsite Electronics dealer.
- Replace missing or damaged safety signs.
- Use equipment carefully. Stop operation and investigate anything that does not look or feel right.
- Contact your equipment dealer if you have any question about operation, maintenance, or equipment use.


Safety Alert Classifications

These classifications and the icons defined on the following pages work together to alert you to situations which could be harmful to you, jobsite bystanders or your equipment. When you see these words and icons in the book or on the machine, carefully read and follow all instructions. **YOUR SAFETY IS AT STAKE.**

Watch for the three safety alert levels: **DANGER**, **WARNING** and **CAUTION**. Learn what each level means.

 **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

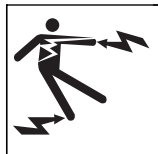
 **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Watch for two other words: **NOTICE** and **IMPORTANT**.

NOTICE can keep you from doing something that might damage the machine or someone's property. It can also alert you against unsafe practices.

IMPORTANT can help you do a better job or make your job easier in some way.

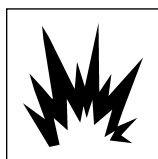
Safety Alerts



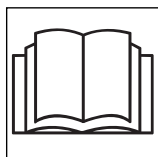
⚠ DANGER Electric shock. Contacting electric lines will cause death or serious injury. Know location of lines and stay away.



⚠ WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.



⚠ WARNING Explosion possible. Serious injury or equipment damage could occur. Follow directions carefully.



⚠ WARNING Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.



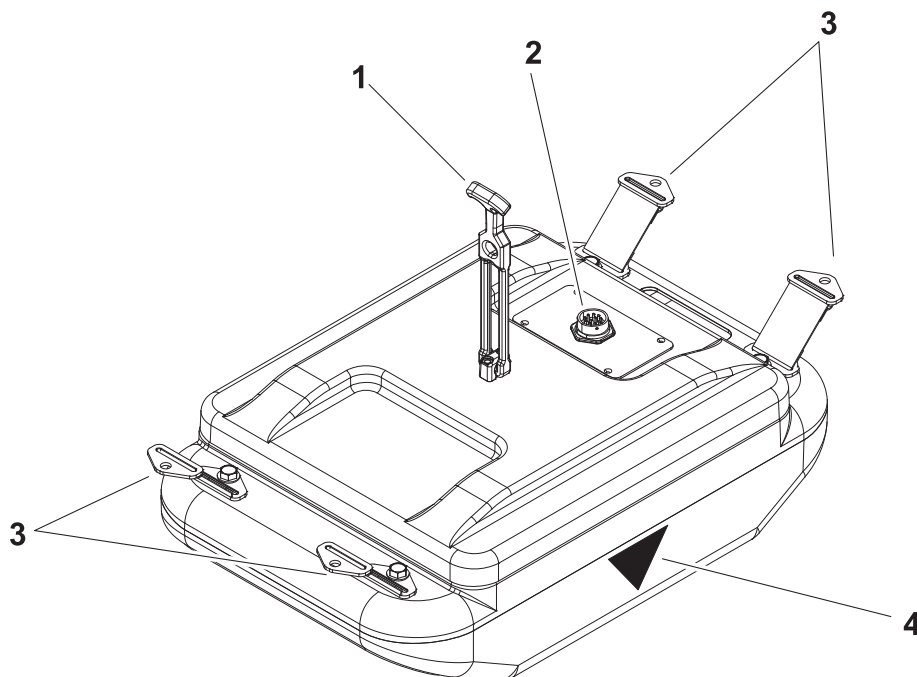
⚠ WARNING Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, post appropriate warning signs.

Controls

Chapter Contents

Antenna	16
Control Unit	17
Software	18
• Radar Setup Window	18
• Acquisition Selection Window	21
• New Acquisition Window	23
• Acquisition Editing Window	25
• Marker Window	27

Antenna

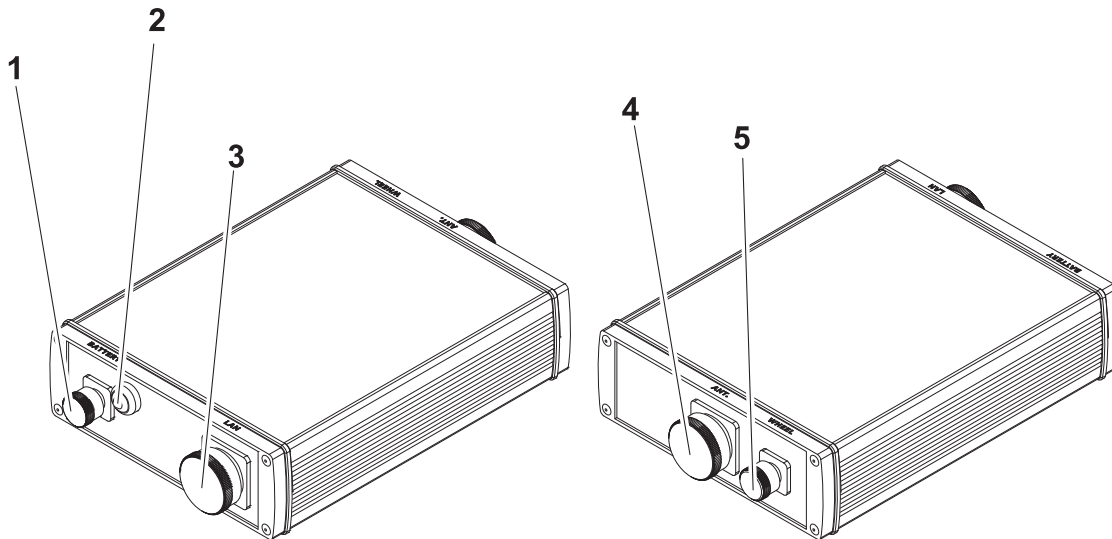


e15om002h.eps

- | | |
|-----------------------------|-------------------------------|
| 1. Antenna lift/lower strap | 3. Cart mounting pins |
| 2. Control unit port | 4. Antenna centerpoint marker |

Item	Description	Notes
1. Antenna lift/lower strap	Connects to a knob on the top of the cart to lift the antenna off the ground. During operation, disconnect strap from knob so antenna contacts ground.	
1. Control unit port	Connects to the control unit antenna port (ANT 1).	
2. Cart mounting straps	To connect antenna to cart, align cart with antenna mounts and secure with straps.	
3. Antenna centerpoint marker	Denotes the centerpoint of the antenna.	

Control Unit



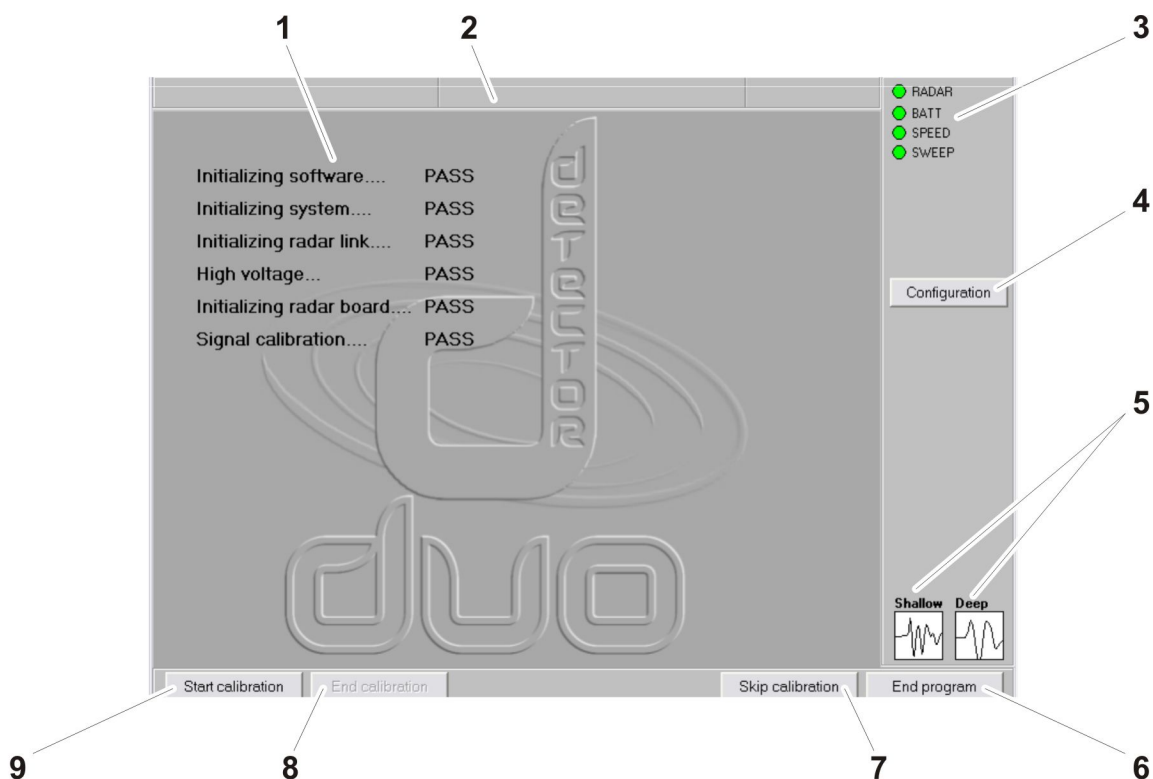
e15cm003h.eps

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Power supply port (BATTERY) 2. Network port (LAN) 3. Antenna port (ANT 1) | <ol style="list-style-type: none"> 4. Wheel position sensor port (WHEEL) 5. Power button. |
|--|---|

Item	Description	Notes
1. Power supply port (BATTERY)	Connects the control unit to the battery.	Blue indicator lights when system is powered by the battery.
2. Network port (LAN)	Connects the control unit to the notebook PC.	
3. Antenna port (ANT 1)	Connects the control unit to the antenna.	
4. Position sensor port (WHEEL)	Connects the control unit to the cart wheel position sensor	
5. Power button	To start system, press. To stop system, press again.	Blue indicator lights when system is on.

Software

Acquisition Setup Window



e150m012h.jpg

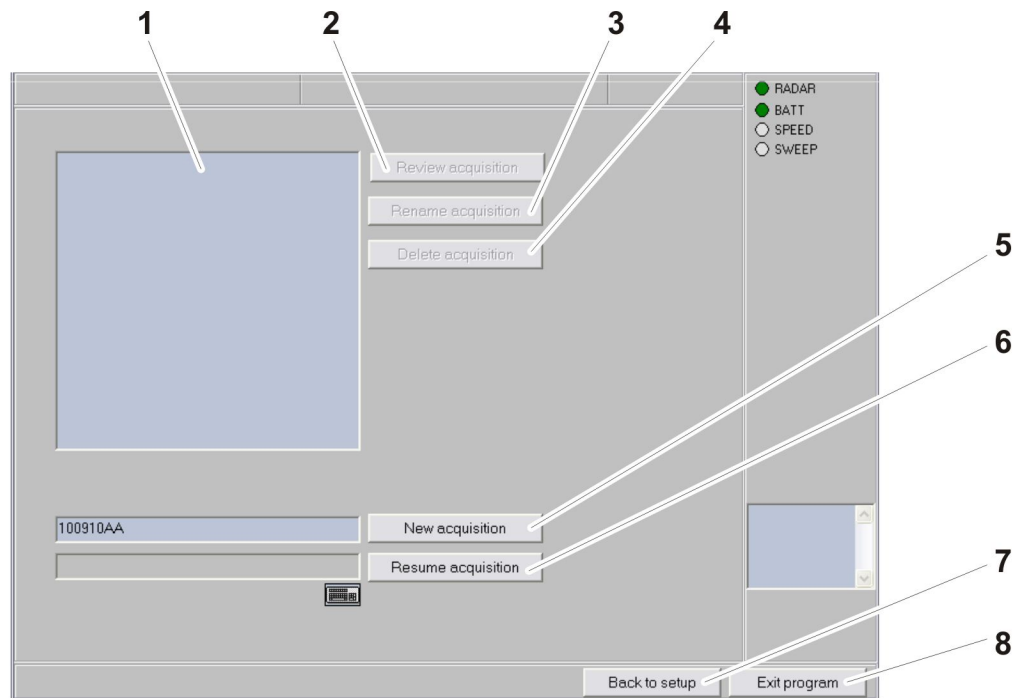
- 1. Scan display area
- 2. Advanced settings toggle bar
- 3. System status indicators
- 4. CONFIGURATION button
- 5. Frequency setting buttons
- 6. END PROGRAM button
- 7. SKIP CALIBRATION button
- 8. END CALIBRATION button
- 9. START CALIBRATION button

Item	Description	Notes
1. Scan display area	Displays radar information from the antenna.	Measurement scale on the left indicates depth below the surface.

Item	Description	Notes
<p>2. Advanced settings toggle bar</p>	<p>To open the advanced settings window, press the gray bar twice. In this window you can customize the way information is displayed.</p> <p>Wheel Setting</p> <ul style="list-style-type: none"> • Wheel driven (default): radar acquisition is set using the position sensor. • Auto stacking: Radar acquisition is set using a number you enter. <p>Ground Type</p> <ul style="list-style-type: none"> • Rough terrain: Select this setting when ground conditions cause excessive vibration. In this mode, radar data is temporarily saved on an external device during the acquisition phase. • Device: Select the computer port the external device is connected to. <p>Measure Unit: Select standard or metric measurement units.</p> <p>Swap Axis: Select m or nsec to modify the vertical scale of the radar map.</p> <p>Background Removal: Select this option to viewed radar maps with or without the Clear_x application.</p> <p>Gain Application: Select this option to view the real time radar map with or without gain applied.</p> <p>Language: Select to view the software interface in Italian or English.</p>	
<p>3. System status indicators</p>	<p>Indicators for radar, battery, acquisition speed, and acquired sweeps light when active.</p>	
<p>4. CONFIGURATION button</p>		
<p>5. Frequency setting buttons</p>	<p>Select shallow (high frequency, 700MHz)</p> <p>Select deep (low frequency, 250 MHz)</p>	<p>The 2450GR transmits, receives, and records both frequencies at all times. Use this button to view low, high, or both frequencies while scanning.</p>
<p>6. END PROGRAM</p>	<p>To exit Acquisition Software, press.</p>	

Item	Description	Notes
7. SKIP CALIBRATION	To bypass calibration, press.	If you skip calibration, you will only be able to view pre-existing radar maps.
8. END CALIBRATION	To stop calibrating parameters, press.	
9. START CALIBRATION	To start calibrating parameters, press.	Calibrate the 2450GR any time ground conditions change: ie, from asphalt to concrete, or from concrete to grass.
10. Palette selection button	To select color and resolution for viewing radar maps, press, then select the desired palette.	
11. Zoom button	To make the radar map larger, press.	

Acquisition Selection Window



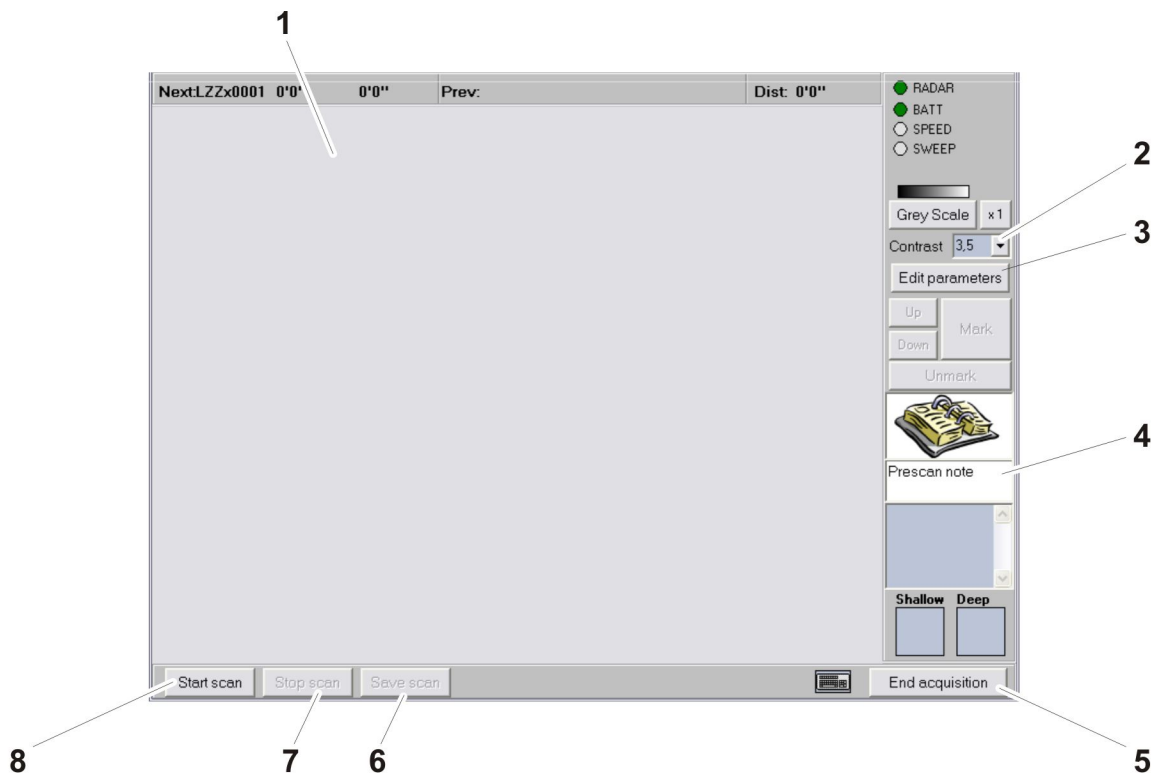
e15om011h.jpg

- | | |
|------------------------------|-----------------------------------|
| 1. File display window | 5. NEW ACQUISITION button |
| 2. REVIEW ACQUISITION button | 6. RESUME LAST ACQUISITION button |
| 3. RENAME ACQUISITION button | 7. BACK TO SETUP button |
| 4. DELETE ACQUISITION button | 8. EXIT PROGRAM button |

Item	Description	Notes
1. File display window	Displays a list of acquisitions saved at C:\2450GR\mission\directory.	
2. REVIEW ACQUISITION button	To review a saved acquisition, select file in display window, then press.	
3. RENAME ACQUISITION button	To rename a saved acquisition, select file in display window, then press. Enter new name in text box.	
4. DELETE ACQUISITION button	To delete a saved acquisition, select file in display window, then press.	

Item	Description	Notes
5. NEW ACQUISITION button	To save a new acquisition, enter a name in the text box and press. The New Acquisition Window will open.	Files are saved at c:\2450GR\mission\directory
6. RESUME LAST ACQUISITION button	To continue scanning and save the data to the last acquisition, select file in display window, then press.	
7. BACK TO SETUP button	Press to open the Acquisition Setup Window and recalibrate the 2450GR.	Calibrate the 2450GR any time ground conditions change: ie, from asphalt to concrete, or from concrete to grass.
8. EXIT PROGRAM button	To close the software, press.	

New Acquisition Window



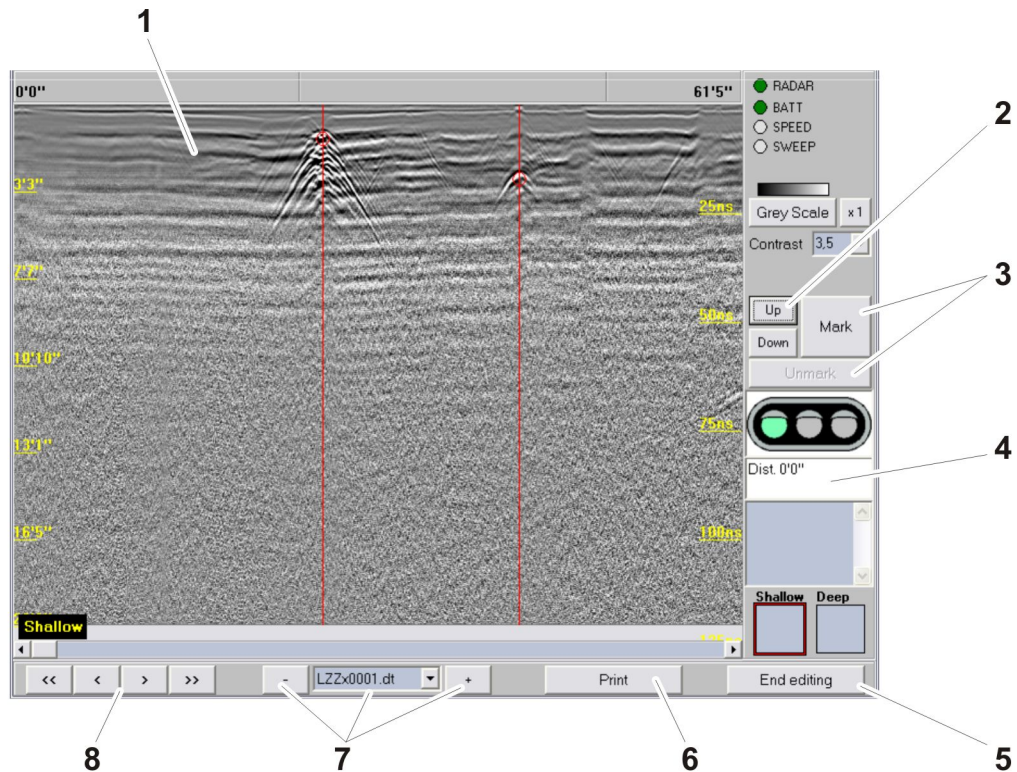
e15om013h.jpg

- | | |
|------------------------|---------------------------|
| 1. Scan display window | 5. END ACQUISITION button |
| 2. Contrast setting | 6. SAVE SCAN button |
| 3. Edit Parameters | 7. STOP SCAN button |
| 4. Notes | 8. START SCAN button |

Item	Description	Notes
1. Scan Display Window	Displays real time ground penetrating radar image. Also displays survey name, scan number, and distance traveled.	
2. Contrast setting window	To increase or decrease radar map contrast, press, then select the desired setting.	
3. Edit Parameters window	Press to open the Edit Parameters window.	
4. Notes window	To enter notes, press, then type into the text box.	

Item	Description	Notes
5. END ACQUISITION button	To end the current acquisition, press.	
6. SAVE SCAN button	To save scan, press.	
7. STOP SCAN button	To stop scanning, press.	
8. START SCAN button	To begin displaying scanned radar image, press. The Acquisition Editing Window will open.	

Acquisition Editing Window



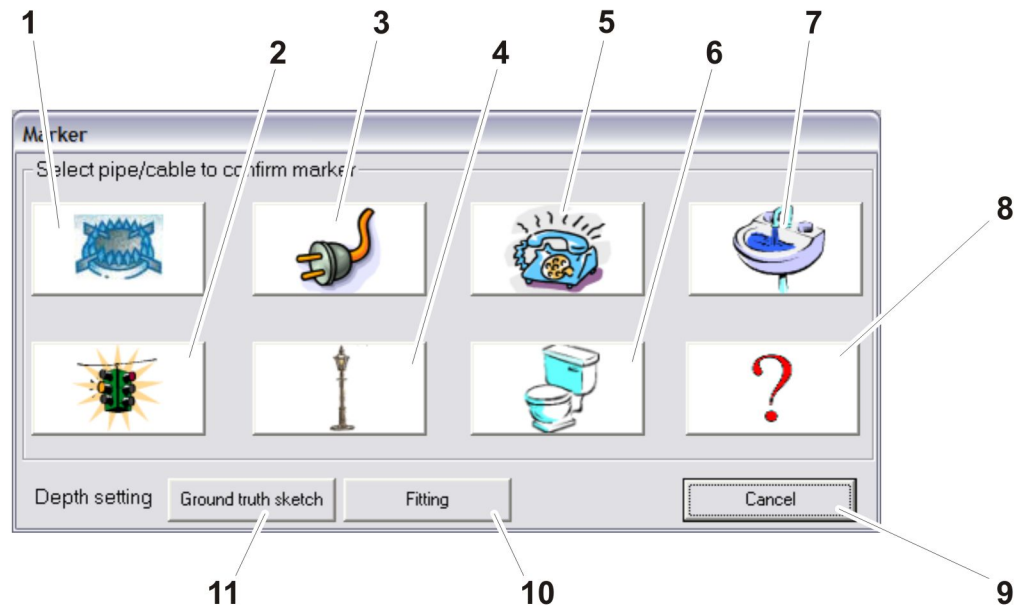
e15om014h.jpg

- | | |
|--------------------------|------------------------------|
| 1. Radar map display | 5. END EDITING button |
| 2. UP / DOWN buttons | 6. PRINT button |
| 3. MARK / UNMARK buttons | 7. - / File Name / + buttons |
| 4. Distance display | 8. Directional arrow buttons |

Item	Description	Notes
1. Radar map display	Displays real time ground penetrating radar image. Also displays survey name, scan number, depth, and distance traveled.	
2. UP / DOWN buttons	To move the cursor up, press UP. To move the cursor down, press DOWN.	

Item	Description	Notes
3. MARK / UNMARK buttons	<p>To mark an image on the radar map, position cursor and press MARK. The Mark Window will open.</p> <p>To remove a previously placed mark, position cursor and press UNMARK.</p>	
4. Distance display	<p>Displays distance traveled from starting point.</p> <p>Displays object depth of detected object.</p>	
5. END EDITING button	To close the Acquisition Editing window, press.	
6. PRINT button	To print radar map with information, press.	
7. - / File Name / +	<p>To select and load previous scans in a survey, press -.</p> <p>To go to a particular scan, press the arrow and select.</p> <p>To select and load subsequent scans in a survey, press +.</p>	
8. Directional arrow buttons	<p>To move the review line about 20" (50 cm) to the left, press <<.</p> <p>To move the review line about 1" (2.5 cm) to the left, press <.</p> <p>To move the review line about 1" (2.5 cm) to the right, press ></p> <p>To move the review line about 20" (50 cm) to the right, press >>.</p>	On touch sensitive tablet PCs, you may reposition the review line by tapping the screen.

Mark Window



e15om015h.jpg

- | | |
|---------------------------------|--------------------------------|
| 1. Gas pipe button | 7. Water pipe button |
| 2. Traffic control cable button | 8. Unknown object marker |
| 3. Electrical cable button | 9. CANCEL button |
| 4. Street light cable button | 10. FITTING button |
| 5. Phone cable button | 11. GROUND TRUTH SKETCH button |
| 6. Sewer pipe button | |

NOTICE: The 2450GR can not identify types of pipe or cable. Find this information from other sources, such as opening manholes or consulting technical maps.

Item	Description	Notes
1. Gas pipe button	To mark a radar image as a gas pipe, press.	
2. Traffic cable button	To mark a radar image as a traffic cable, press.	
3. Electrical cable button	To mark a radar image as an electrical cable, press.	
4. Street light cable button	To mark a radar image as a street light, press.	

Item	Description	Notes
5. Phone cable button	To mark a radar image as a phone cable, press.	
6. Sewer pipe button	To mark a radar image as a sewer pipe, press.	
7. Water pipe button	To mark a radar image as a water pipe, press.	
8. Unknown object button	To mark a radar image as an unknown object, press.	
9. CANCEL button	To exit the Mark Window without selecting a marker, press.	
10. FITTING button	<p>Press to open a window to enter formulated depth of a pipe or cable.</p> <p>Use the UP and DOWN button to adjust the white-line curve to the shape of the hyperbola.</p>	
11. GROUND TRUTH SKETCH button	Press to open a window to enter exact depth of a pipe or cable.	Use when information is available from another source, such as technical maps or actual measurement.

Prepare

Chapter Contents

Survey the Site	30
• Inspect Visually	30
• Acquire Utility Maps	30
Setup	31
Check Battery Status	33
• Control Unit	33
• Tablet PC	33

Survey the Site

Consider the following when preparing to work at a survey site:

- Gain permission to access pedestrian zones, interrupt traffic flow, etc.
- Determine site accessibility.
- Determine space available for cart.
- Observe traffic levels.
- Observe presence of parked cars.
- Observe presence of architectural obstacles.

Inspect Visually

Make a visual check of the site for signs of buried cables such as:

- recent trenching
- buried cable markers
- overhead lines that run down the pole and underground
- gas meters
- valve sights
- drains or manhole covers

Acquire Utility Maps

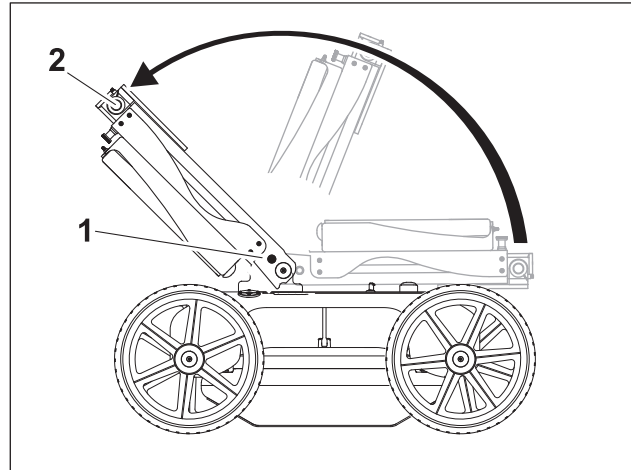
Various companies produce technical maps of existing utilities. While some maps may be very generic, they are an important tool for gathering and interpreting data at the survey site. The maps provide general schematics of the type and position of the utilities managed or constructed by those companies.

Request maps by contacting the utility's cartographic or planning office. Specify the street names and areas of interest. Request maps well in advance of the actual survey. Types of utilities to consider are:

- public street lighting
- low, medium and high voltage electric cables
- water supply
- gas
- telephone cables
- sewers

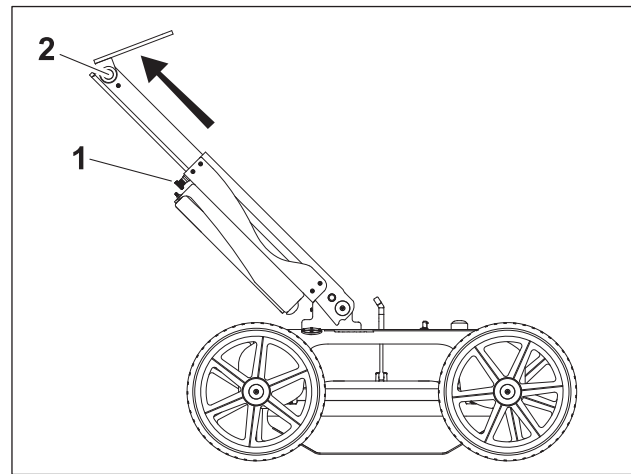
Setup

1. To open cart, remove pin (1), rotate handle (2) to upright position, and insert pin into slot.



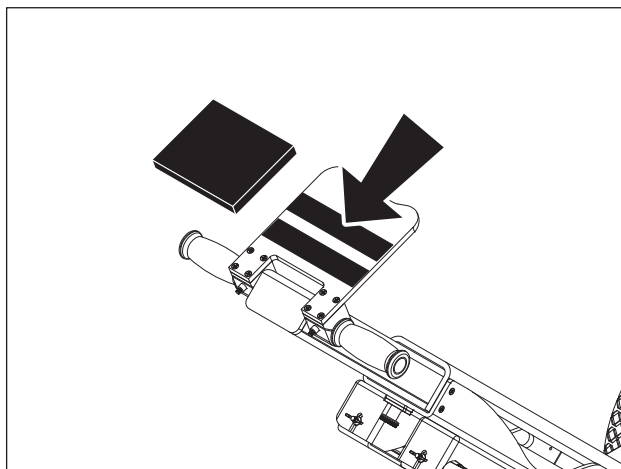
e15om004h.eps

2. To adjust height, pull knob (1) and raise or lower the handle (2) to desired height. Release knob to engage pin.



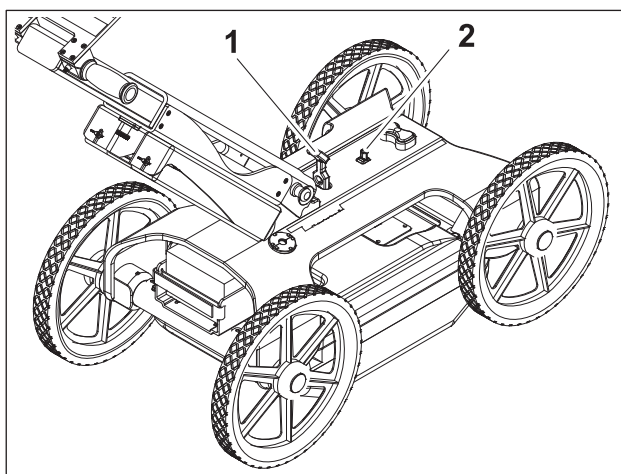
e15om005h.eps

3. To attach computer to cart, align velcro strips on bottom of computer with velcro strips on cart.
4. Connect network cable from control unit to computer.



e15om006h.eps

5. To lower antenna into scan position, pull rubber keeper (1) until it is free from pin (2).



e15om025h.eps

Check Battery Status

Control Unit

Check battery status before each use, after each battery change, and as desired during operation. In normal conditions, battery lasts about 12 hours.

To check

1. Connect control unit to battery.
2. Check battery status:

Control Unit If battery has greater than 10V, indicator on control unit will light.

Software Check battery status indicator.

- If indicator is green, battery is fully charged.
- If indicator is yellow, battery is semi-charged.
- If indicator is red, battery needs recharged.
- If indicator is not lit, check the cable for a good connection or recharge the battery.

To recharge battery

If the battery runs down,

1. Shutdown unit.
2. Connect another battery.
3. Restart the system.

Connect the discharged battery to the battery charger. It takes about 3 hours to recharge the battery.

Tablet PC

Check battery status before each use and after each battery change. See PC manufacturer's instructions for more information.

Operation

Chapter Contents

Setup	36
• Launch Acquisition Software	36
• Calibrate System	36
Scan	37
• Acquire Scan Data	37
• Mark Objects	38
• Record Target Information	39
Troubleshoot Error Messages	40

Setup

Position 2450GR at jobsite and release rubber keeper to lower antenna to ground.

Launch Acquisition Software

The 2450GR software allows scan data to be acquired, saved, and viewed directly in the field.

1. Set the control unit power switch to ON.
2. Turn on the tablet PC. (See manufacturer's instructions for more information.)
3. Click the 2450GR icon to launch the software.
4. Monitor progress of software self-tests. If one or more self tests fail:
 - Check that the control unit power switch is set to the ON position.
 - Verify that the 2450GR battery is fully charged.
 - Verify that the tablet PC battery is fully charged. (See manufacturer's instructions for more information.)
 - Check all cable connections.

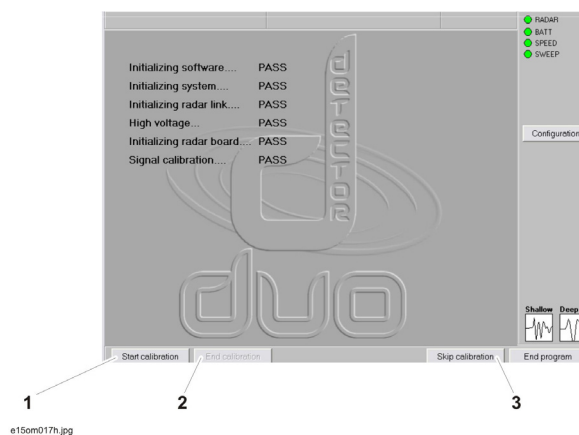
Calibrate System

IMPORTANT: For an accurate survey, calibrate the system at the start of a scan and any time ground conditions change, for example, when moving from grass to concrete, or from concrete to asphalt.

To calibrate, open the **Radar Setup Window** is open:

1. Press **START CALIBRATION**.
2. Push the cart a short distance, 10-15 ft (3-5 m). The unit will calibrate and automatically save the processing parameters and open the **Acquisition Selection Window**.
3. Enter a job name in the text window and press **NEW ACQUISITION**.

IMPORTANT: Once a new survey is named a data file is created and saved in the C:\2450GR\mission directory. All files containing acquired data will be stored in this directory.



To skip calibration, press **SKIP CALIBRATION**.

Note: If you skip calibration, you will only be able to view pre-existing acquisition maps.

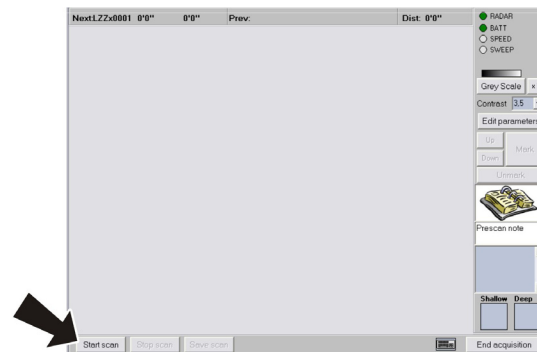
Scan

Acquire Scan Data

Ensure that the **New Acquisition Window** is open.

1. Press **START SCAN** and push or pull the cart to acquire survey data.

Note: The 2450GR can be either pulled or pushed to acquire survey data; however, the entire acquisition must be conducted in the same direction. Follow a grid pattern to scan the survey area.

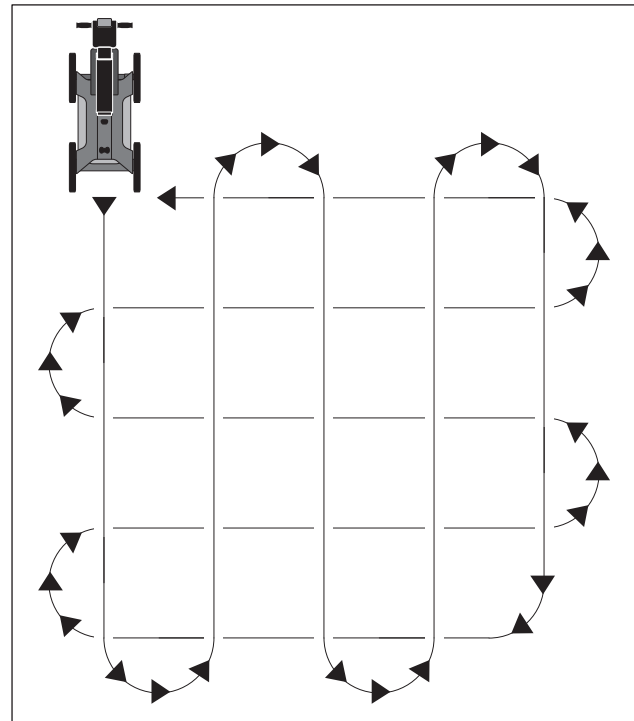


e15om018h.jpg

2. A radar map will appear on the computer display. Select **Shallow**, **Deep**, or **Dual** to set frequency viewing preference.

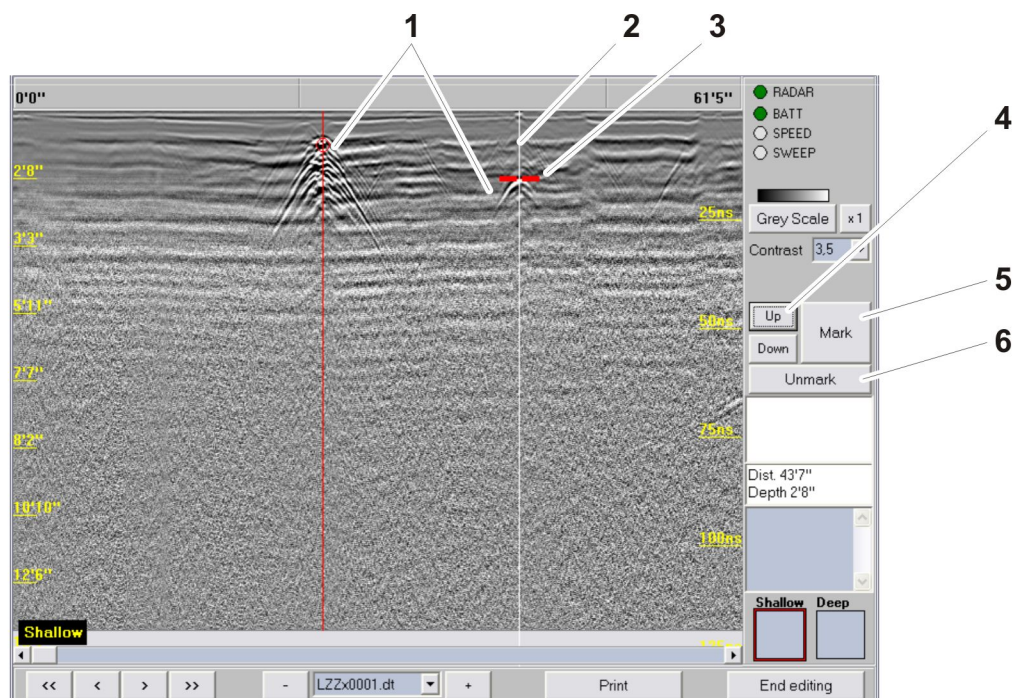
Note: The manufacturer recommends viewing dual frequencies to best detect buried objects.

3. Watch radar map for signs of buried objects, which appear as hyperbolas on the radar map.



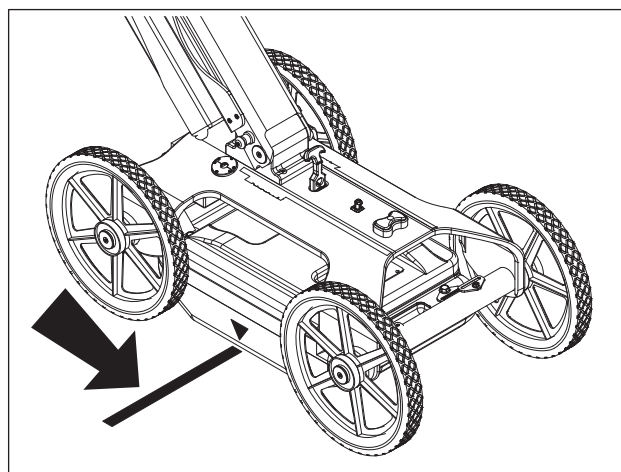
e15om009h.eps

Mark Objects



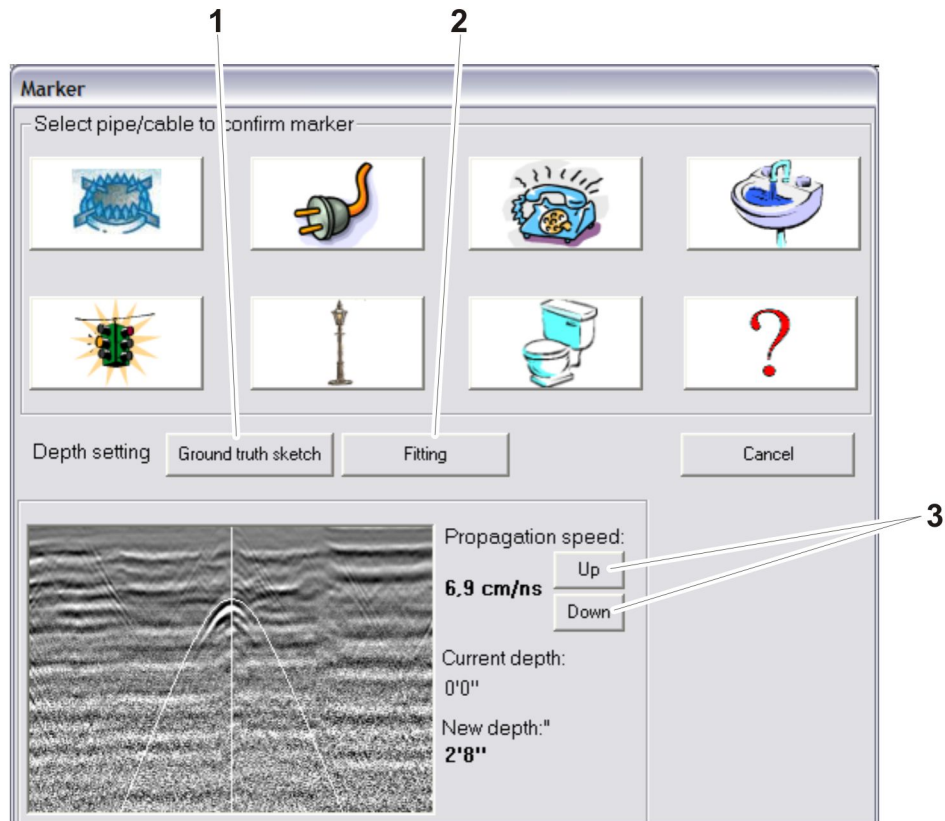
e15om019h.jpg

1. When a hyperbola (1) appears, move the cart in the opposite direction. A vertical white line (2) will display on the radar map. Move the cart until the white line is in the center of the hyperbola.
2. Mark the ground: Use spray paint to mark the location on the ground (shown). A red arrow on the side of the antenna corresponds to the white line on the radar map.
3. Mark the acquisition map:
 - Using the **Up/Down** buttons (4), position the red horizontal cursor (3) at the top of the hyperbola.
 - Press the **MARK** button (5) to open the **Mark Window**. (See next page.)



e15om008h.eps

Record Target Information



e15om020h.jpg

Record target information during a survey, or at a later time. See "Acquisition Editing Window" on page 25.

1. Press the **FITTING** button (2), then Use the **UP** and **DOWN** buttons (3) to adjust the curve to match the hyperbolas. This sets the correct propagation speed to accurately calculate object depth.
2. Select an icon to label the type of pipe you suspect.

IMPORTANT: The GPR system does not identify what type of pipe or cable is buried. This information can be determined from opening manholes or consulting technical maps.

3. Press **GROUND TRUTH SKETCH** (1) to note exact depth of cable or pipe, if known. This information is obtained from outside sources such as technical maps, by opening manhole covers, or by potholing.
4. To continue scanning, move 2450GR in original direction.

Troubleshoot Error Messages

Message	Description/Solution
Network error. Retry or check hardware!	Check that the network cable is connected properly to the PC and the control unit. Restart the program.
New depth must be >0. Please insert new value to continue. New depth must be >0. Unable to set the depth. New depth missing. Please insert value to continue.	Select a new value for the depth of the identified pipe.
Warning. Unable to print on the selected printer	Check that the printer is switched on and connected to the computer.
Unable to review: calibration file has been lost.	The calibration files for the selected survey have been deleted. To be able to see the data, the lgr.bkg and lgr.stc files have to be copied from the main program directory (C:\2150GR) into the survey directory.
Unable to review: mark file has been lost.	A system file has been deleted, making it impossible to review the selected acquisition.
Unable to mark: marker already present at this distance!	You have tried to mark an object in a point that already contains one. Select a new point.
Gain calibration has been skipped (or lost). Calibrate gain to proceed Unavailable: gain calibration has been skipped (or lost). Unavailable: gain calibration has changed.	Perform calibration to acquire data.
Unavailable: directory has been lost.	The last acquisition cannot be recovered. Select a new acquisition.

Service

Chapter Contents

As Needed 42

- Clean 2450GR 42
- Replace detector battery 42

Load Software 43

- System Requirements 43
- Install Software 43
- Set IP Address 43

As Needed

Clean 2450GR

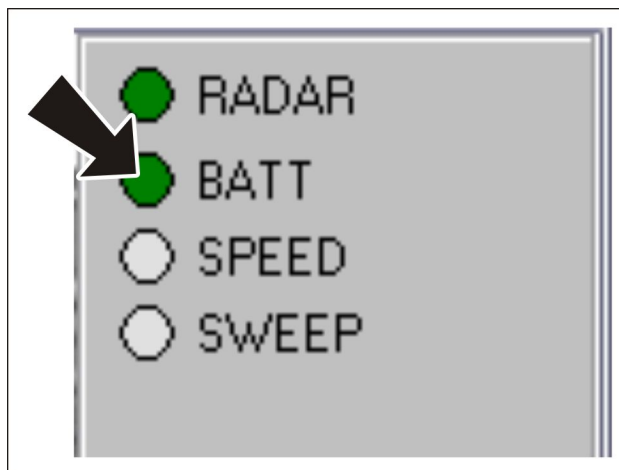
Use a damp cloth to clean the 2450GR.

IMPORTANT:

- Before cleaning any external parts of the 2150GR, make sure all cables have been disconnected, including the power supply cable.
- Make sure that cloth is not too wet to avoid any damage to the electrical components of the equipment.
- Do not use solvents or abrasive detergents.
- Do not apply liquid directly to the electrical contacts of the various connectors.

Charge Battery

Charge battery when software indicator shows that power is low.



e15om022h.eps

Load Software

System Requirements

Subsite Electronics recommends the Xplore tablet PC for optimum data processing with the 2450GR Ground Penetrating Radar unit. If you decide to use a different PC it must have the following:

- Pentium processor > 1/5 GHz or Centrino > 900 Hz
- Ethernet 100 Mbps card
- Monitor resolution (color) > 800 x 600
- Windows 2000 Professional (Service Pack 4) or XP Professional operating system
- HDD > 6 G, shock-proof mounted on a gel support or equivalent
- No firewall software protecting data exchanged on the Internet
- CD drive and/or floppy
- Weather resistant (>=IP54)

Install Software

The tablet PC shipped with the 2450GR is already configured with acquisition software. If it is necessary to reinstall the software, follow the steps below:

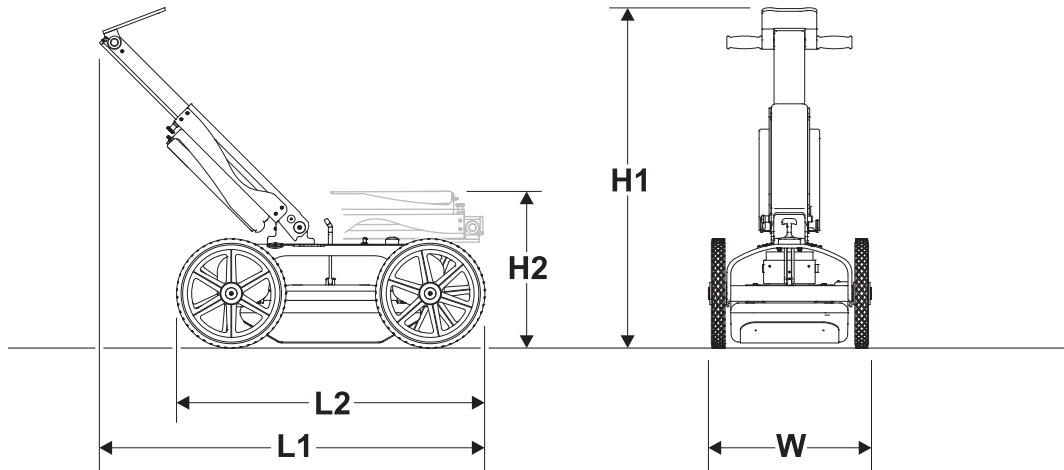
1. Insert USB flash drive into computer USB port.
2. Open USB port directory to view files stored on flash drive.
3. Locate and open the file **2450GRDuo.msi**.
4. Follow the on-screen cues and select a **TYPICAL** installation.
5. When installation is complete, follow the on-screen cues and click the FINISH button.

Set IP Address

1. Navigate to the computer's network connection setting window.
2. Disable any wireless connections already connected.
3. Navigate to the Ethernet connection properties window and enter the following information for the Internet Protocol (TCP/IP) setting:
IP address: 192.168.200.150
Subnet mask: 255.255.255.0
4. Follow the cues to save new settings and to exit the settings window.
5. Restart the computer.

Specifications

2450GR



e15om007h.eps

Dimensions	U.S.	Metric
L, overall length, handle extended fully	40.0 in	1016 mm
Length, handle collapsed, travel position	40.0 in	1016 mm
L2, wheel base		
H1, height from ground to handle extended fully	40.0	1016 mm
H2, height handle folded	20.5	521 mm
W, width	21 in	533 mm
Weight, without PC	68.6 lb	31.1 kg

Battery

Type: 12V sealed lead acid, 12AH
 Life: >10 hours

Specifications are general and subject to change without notice. If exact measurements are required, equipment should be weighed and measured.

Antenna Performance	U.S.	Metric
----------------------------	-------------	---------------

Antenna technology: ultra-wide band, ground coupled, shielded dipole.

250 MHz:

typical range	0.6-8.2 ft	0.2-2.5 m
maximum range	0.6-19.7 ft	0.2-6.0 m

700 MHz:

typical range	0.32-4.9 ft	0.1-1.5 m
maximum range	0.32-19.7 ft	0.1-8.2 m

Dual Frequency

typical range	0.32-8.2 ft	0.1-2.5 m
maximum range	0.32-19.7 ft	0.1-6.0 m

System	U.S.	Metric
---------------	-------------	---------------

Survey path width	19.7 in	500 mm
Recording channels	2	2
Transmitting frequency	200 kHz	200 kHz
Typical antenna frequency	250 and 700 MHz	
Typical collection speed (scans/second)	100	
Typical collection speed at 2-in (5 cm) sampling interval	5.6 mph	9km/h
Data storage	laptop w/ harddrive	
Maximum profile length	virtually unlimited	

Software	
Display mode	grayscale/color
Zoom	up to 4x
Stored data format	raw data (for further data analysis)
Setting of GPR propagation velocity (to get accurate evaluation of depth of detected targets)	ground truth or hyperbola fitting methods
Reading of pipe position/depth	software cursor
System output	printable annotated radar map
Diagnostic	radar and power supply status, excessive speed, data loss
Languages	English, French, German, Spanish, Italian, Portuguese, Chinese
Data collection type	Parallel profile lines, perpendicular to the expected orientation of utilities
Reading of pipe position/depth	software cursor

Support

Procedure

Notify your dealer immediately of any malfunction or failure of [Ditch Witch Subsite Electronics](#) equipment.

Always give model, serial number, and approximate date of your equipment purchase. This information should be recorded and placed on file by the owner at the time of purchase.

Return damaged unit to dealer for inspection and warranty consideration if in warranty time frame.

All repairs must be done by an authorized [Ditch Witch Subsite Electronics](#) repair facility. Repairs done elsewhere will void warranty consideration.

Resources

Publications

Contact your [Ditch Witch Subsite Electronics](#) dealer for publications and videos covering safety, operation, service, and repair of your equipment.

Training

For information about on-site, individualized training, contact your [Ditch Witch Subsite Electronics](#) dealer.

Warranty

Ditch Witch Electronics Subsite Electronics Limited Product Warranty Policy

Warranty Periods

New Product

A twelve-month period starts on the date of delivery to the end user:

All Trackers, Remote Displays, Transmitters, Receivers, Radars, and Fault Finders

A six-month period starts on the date of delivery to the end user:

All Directional Beacons and Locate Beacons

A three-month period starts on the date of delivery to the end user:

All Accessories: cables, clamps, canoes, bags, and adapters

Used Product (Cosmetics)

A three-month warranty starts on the date of delivery to the end user on used and refurbished products sold from Ditch Witch Electronics Subsite Electronics dealers. Used products are non-returnable.

Service and Repair

A one-month warranty on **labor** starts on the date the unit is repaired, and a three-month warranty on **parts** starts on the date the unit is repaired for all products.

Extended Warranty

The extended warranty may be purchased at the time the equipment is sold or anytime within the original warranty period. The extension is for an additional twelve or twenty-four months, depending on extended warranty purchased, for a total coverage of twenty-four to thirty-six months. Exclusions: All Beacons and accessories.

Details and Exclusions

- The warranty includes only [Ditch Witch Electronics Subsite Electronics](#) products and accessories that are manufactured and distributed by dealers of [Ditch Witch Electronics Subsite Electronics](#). The warranty compensates on defects in material or workmanship.
- Defects will be determined through inspection by a [Ditch Witch Electronics Subsite Electronics](#) authorized repair centers. Original purchaser must make the defective item available for inspection within 30 days of the date the part fails.
- The warranty is limited to replacement of the defective part. The replacement part may be new or remanufactured. Repair or installation of defective part will be at no charge when product or item is delivered to a [Ditch Witch Electronics Subsite Electronics](#) authorized repair center. The product or item will be returned at no charge for return freight.
- The warranty periods do not represent the useful life of [Ditch Witch Electronics Subsite Electronics](#) products and accessories.
- If [Ditch Witch Electronics Subsite Electronics](#) products are purchased for commercial purposes, as defined by the commercial code, no warranties extend beyond the specific terms set forth in this limited warranty. All other provisions of this limited warranty apply, including the duties imposed.
- [Ditch Witch Electronics Subsite Electronics](#) products have been tested to deliver acceptable performance in most conditions.
- This limited warranty applies to the original purchaser only. Some states or jurisdictions do not allow exclusion or limitation of incidental or consequential damages, so above limitations may not apply. This limited warranty gives original purchaser specific rights that vary from state to state or jurisdiction to jurisdiction.
- Each serial-numbered piece of equipment must be registered by the selling dealer to determine the warranty start date.
- When registration is not received, the shipping date from the manufacturer is used to establish the warranty period start date.
- Product inspection and estimates may require that the unit be disassembled and tested.
- Out-of-warranty inspection costs include labor accrued at the full labor rate plus return freight.
- Approved out-of-warranty repair costs include parts, labor accrued at full labor rate, plus return freight.

