

2550GR

Operator's Manual



Issue 2.0

053-2906

ORIGINAL INSTRUCTION

Overview

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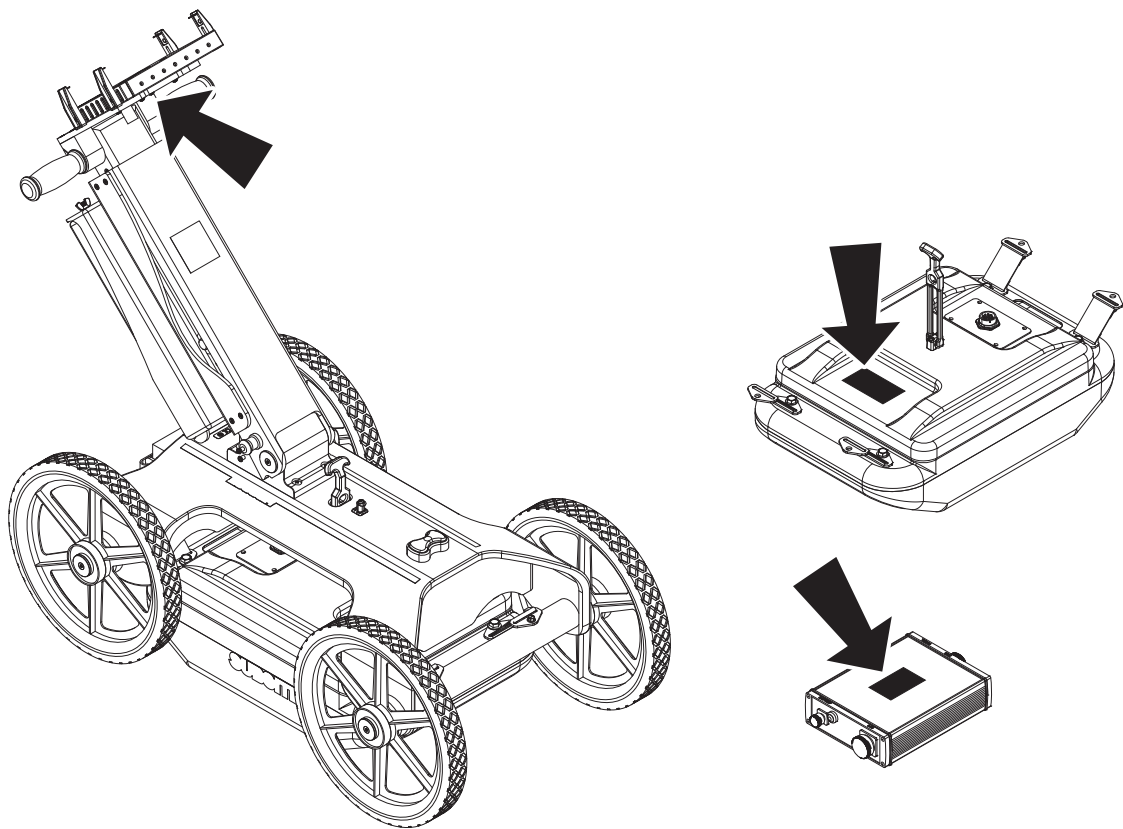
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Serial Number Location

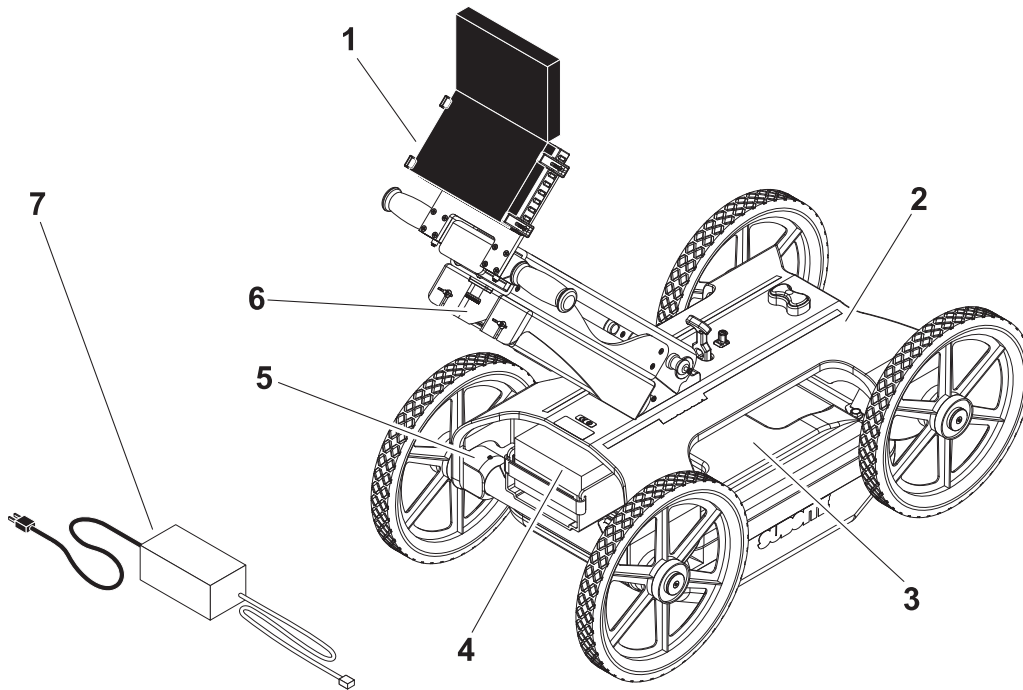
Record serial numbers and date of purchase in spaces provided. Serial numbers are located as shown.



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Date of manufacture	
Date of purchase	
2550GR serial number	
Antenna serial number	
Cart serial number	

Overview



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- | | |
|--------------|--------------------------|
| 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	Digital radar transmitter/receiver that uses two frequencies to detect buried pipes. High frequency (700 MHz) has shallow penetration. Best in conditions with good radar conductivity, such as ice, sand, concrete, or rock. Low frequency (250 MHz) has broad, deep penetration. Better in conditions with poor radar conductivity, such as clay, salt, or wet soil.	The 2550GR scans and records both frequencies simultaneously at all times.
4. Battery	Provides 12V DC to control unit.	Recharge when battery icon turns red. See "Battery status indicator" on page 27.
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 2550GR is a ground penetrating radar system that detects metallic and non-metallic pipes and cables buried underground. Following standard radar principles, the 2550GR uses a high performance electromagnetic sensor equipped with electromagnetic transmitters and receivers to help locate 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 2550GR 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 generates radio interference in residential, commercial and light industry environments. The user may be required to take appropriate countermeasures during operation.



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

In accordance with RSS 220 section 6:2: This Ground Penetrating Radar Device shall be operated only when in contact with or within 1 m of the ground. This Ground Penetrating Radar Device shall be operated only by law enforcement agencies, scientific research institutes, commercial mining companies, construction companies, and emergency rescue or fire fighting organizations.

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 2550GR 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 2550GR. 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 2550GR 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 2550GR requires additional coordination or within which the operation of a 2550GR 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 2550GR 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 2550GR 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 Ditch Witch® dealer. If you need assistance in locating a dealer, visit our website at **www.subsite.com**, email info@subsite.com, call 800-846-2713, or write to the following address:

Subsite Electronics
Attn: Product Support
1950 W. Fir
Perry, OK 73077
USA

The descriptions and specifications in this manual are subject to change without notice. Subsite Electronics 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 Ditch Witch dealer.

Thank you for buying and using Subsite Electronics equipment.

**2550GR
Operator's Manual**

Issue number 2.0/OM-05/17

Part number 053-2906

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Safety

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Guidelines

Follow these guidelines before operating any jobsite equipment:

- Complete proper training and read operator's manual before using equipment.
- Mark proposed path with white paint and have underground utilities located before working. In the US or Canada, call 811 (US) or 888-258-0808 (US and Canada). Also contact any local utilities that do not participate in the One-Call service. In countries that do not have a One-Call service, contact all utility companies to have underground utilities located.
- 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.
- 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 unit, 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 a hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

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

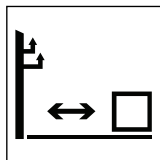
 **CAUTION** indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

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

NOTICE indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

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

Safety Alerts



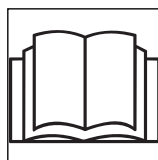
⚠ DANGER Electric shock will cause death or serious injury. Stay away.



⚠ WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment. 274-050; 274-724 (2P)



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



⚠ WARNING Read operator's manual. Know how to use all controls. Your safety is at stake. 273-475



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



⚠ WARNING Potential radio frequency (RF) hazard. Operating this device within 8" (200 mm) of your body may cause RF exposure levels to exceed FCC RF exposure limits and should be avoided.

Controls

Chapter Contents

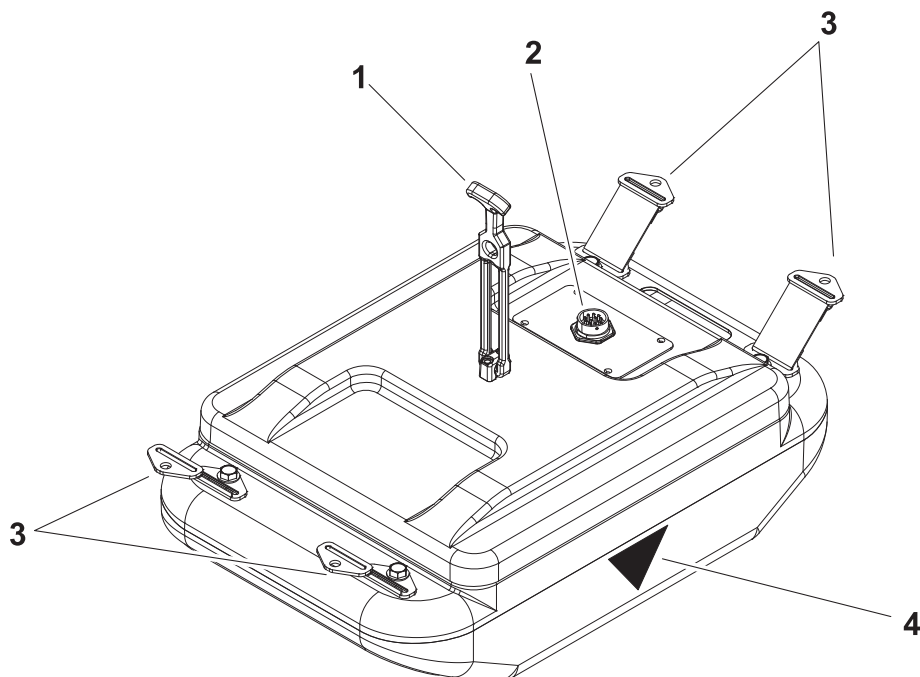
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Antenna

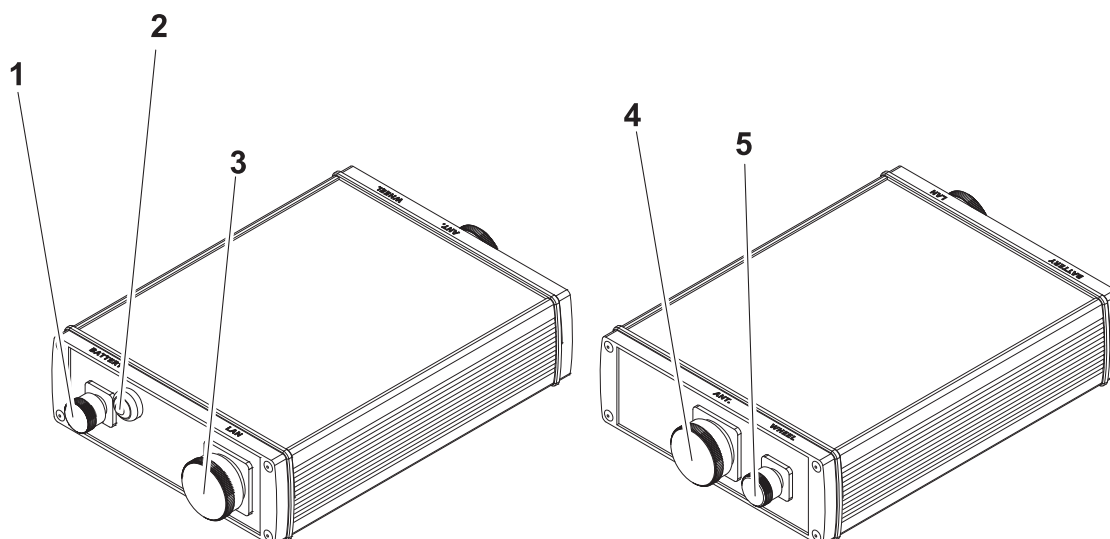


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- | | |
|-----------------------------|-------------------------------|
| 1. Antenna lift/lower strap | 3. Cart mounting straps |
| 2. Control unit port | 4. Antenna centerpoint marker |

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 to lower antenna.	
2. Control unit port	Connects to the control unit antenna port (ANT 1).	
3. Cart mounting straps	To attach antenna to cart, align cart with antenna mounts and secure with straps.	
4. Antenna centerpoint marker	Denotes centerpoint of the antenna.	

Control Unit



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- | | |
|--------------------------------|---------------------------------------|
| 1. Power supply port (BATTERY) | 4. Antenna port (ANT 1) |
| 2. Power button | 5. Wheel position sensor port (WHEEL) |
| 3. Network port (LAN) | |

Item	Description	Notes
1. Power supply port (BATTERY)	Connects the control unit to the battery.	Red indicator lights when system is powered by the battery.
2. Power button	To start system, press. To stop system, press again.	Red indicator lights when system is on. IMPORTANT: After 15 minutes of inactivity, the power indicator light will start flashing. After two additional minutes of inactivity, the unit will turn off.
3. Network port (LAN)	Connects the control unit to the tablet PC.	
4. Antenna port (ANT 1)	Connects the control unit to the antenna.	

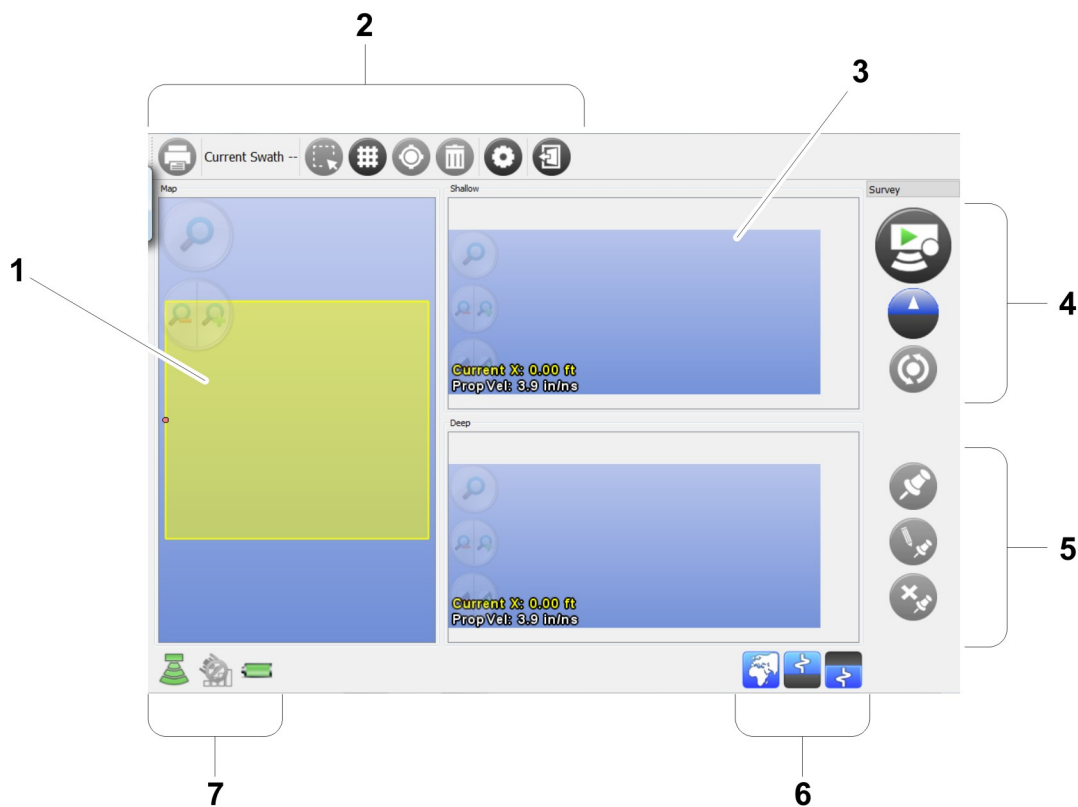
Item	Description	Notes
5. Position sensor port (WHEEL)	Connects the control unit to the cart wheel position sensor	

Software

Main Menu

Item	Description	Notes
1. New Project	Select New Project to begin a radar scan.	This feature allows the user to use optional GPS if data connection is available. See "Setup New Project with GPS" on page 59.
2. New Assisted Project	Select New Assisted Project to begin a radar scan.	This feature allows the user to draw a reference line and acquire radar scans following a grid.
3. Open Project	Select Open Project to review radar scans.	
4. Settings	Select Settings to modify surveys, hardware, or international settings.	
5. Menu bar	Select File in the Menu bar to access the following commands: • New Project • New Assisted Project • Open Project • Exit	
	Select Options in the Menu bar to access the Settings screen.	
	Select Help in the Menu bar to register 2550GR.	IMPORTANT: To register, see "Register 2550GR" on page 73
6. Exit	Select Exit to exit main screen.	

New Project



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- | | |
|-------------------------|----------------------------|
| 1. Map display | 5. Target commands |
| 2. Acquisition menu | 6. Radar scan/Map commands |
| 3. Radar scan display | 7. Status indicators |
| 4. Acquisition commands | |

Map Display

The map display can be used to view the area map and the current position of the 2550GR.

Item	Description	Notes
1. Area map	Displays the current area map.	IMPORTANT: The current position of the radar is represented by a red icon and a yellow box.
2. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
3. Zoom in/out 	To zoom in, select right. To zoom out, select left.	

Acquisition Menu

The acquisition menu can be used to manage various functions of the radar scan.

Item	Description	Notes
1. Create report 	To create report of acquisition, select.	Selecting this button opens the "Create Report" window. See "Create Report" on page 63.
2. Select scan line 	To select a scan line on the grid, select.	IMPORTANT: Scan line can only be selected before beginning a new assisted scan.
3. Show grid 	To toggle grid on and off, select.	Grid appears on radar scan display. See "Radar Scan Display" on page 24.
4. Starting point editor 	To open starting point editor window, select.	User can modify the starting position of the next scan based on the defined grid. IMPORTANT: This function is only available before beginning a new assisted scan.
5. Delete current swath 	To delete the current swath, select.	

Item	Description	Notes
6. Settings menu 	To access setting menu, select.	IMPORTANT: Settings menu during a scan is only for visualization. To change the settings, the user must access the settings menu from the main menu. See "Main Menu" on page 21.
7. Exit acquisition 	To exit the current acquisition and return to the main menu, select.	

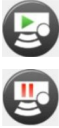
Radar Scan Display

The radar scan display can be used to view the current radar scans.

Item	Description	Notes
1. Shallow radar scan display	Displays real time ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
2. Deep radar scan display	Displays real time ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
3. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
4. Zoom in/out 	To zoom in, select right. To zoom out, select left.	
5. Adjust contrast 	To increase contrast, select right. To decrease contrast, select left.	

Acquisition Commands

The acquisition commands can be used to perform a scan.

Item	Description	Notes
1. Start/Stop acquisition 	To start acquisition, select. To stop acquisition, select again.	Icon will change from green to red once scan is started. IMPORTANT: User can press F1 key to start and stop scan.
2. Scan direction 	To choose forward scan direction, select top of button. To choose backward scan direction, select bottom of button.	
3. Recalibrate radar settings 	To recalibrate radar settings, select.	NOTICE: If soil conditions change suddenly, the user must recalibrate the radar settings.

Target Commands

The target commands can be used to add and delete markers to acquired scans.

Item	Description	Notes
1. Place marker 	To place marker, select, then select a point directly on the radar scan. This will open the "Place Target" window. See "Place Target Window" on page 62.	NOTICE: Place a marker on the radar scan display when a hyperbola is present. For more information about hyperbolas, see page 67.
2. Edit marker 	To edit marker, select, then select the marker to be edited.	
3. Delete marker 	To delete marker, select, then select the marker to be deleted.	

Radar Scan/Map Commands

The radar scan/map commands can be used to view or hide the area map and shallow and deep radar scans.

Item	Description	Notes
1. Area map 	To display area map, select. To hide area map, select again.	
2. Shallow radar scan 	To display shallow radar scan, select. To hide shallow radar scan, select again.	IMPORTANT: The manufacturer recommends viewing dual frequencies to best detect buried objects.
3. Deep radar scan 	To display deep radar scan, select. To hide deep radar scan, select again.	IMPORTANT: The manufacturer recommends viewing dual frequencies to best detect buried objects.

Status Indicators

Status indicators give the user information about the radar, the optional GPS, and the battery while in use.

Item	Description	Notes
1. Radar status indicator 	Indicates radar status.	Green icon indicates optimal GPS accuracy. Yellow icon indicates reduced GPS accuracy. Red icon indicates that the antenna is disconnected.
2. GPS signal indicator (optional) 	Indicates GPS signal if using optional GPS.	Green icon indicates GPS is functioning properly. Yellow icon indicates low GPS accuracy. Red icon indicates no GPS accuracy. IMPORTANT: If GPS symbol is disabled, the unit was unable to connect to the tablet PC.

Item	Description	Notes
3. Battery status indicator 	Indicates battery status.	Green icon indicates battery is fully charged. Yellow icon indicates battery is below 40%. Red icon indicates battery is below 10%.

New Project with GPS



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- | | |
|-------------------------|----------------------------|
| 1. Map display | 5. Target commands |
| 2. Acquisition menu | 6. Radar scan/Map commands |
| 3. Radar scan display | 7. Status indicators |
| 4. Acquisition commands | 8. Map list display |

Map Display

The map display can be used to view the area map and the current position of the 2550GR.

Item	Description	Notes
1. Area map	Displays the current area map.	IMPORTANT: The current position of the radar is represented by a red icon and a yellow box.
2. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
3. Zoom in/out 	To zoom in, select right. To zoom out, select left.	

Acquisition Menu

The acquisition menu can be used to manage various functions of the radar scan.

Item	Description	Notes
1. Create report 	To create report of acquisition, select.	Selecting this button opens the "Create Report" window. See "Create Report" on page 63.
2. Select scan line 	To select a scan line on the grid, select.	IMPORTANT: Scan line can only be selected before beginning a new assisted scan.
3. Show grid 	To toggle grid on and off, select.	Grid appears on radar scan display. See "Radar Scan Display" on page 30.
4. Starting point editor 	To open starting point editor window, select.	User can modify the starting position of the next scan based on the defined grid. IMPORTANT: This function is only available before beginning a new assisted scan.
5. Delete current swath 	To delete the current swath, select.	

Item	Description	Notes
6. Settings menu 	To access setting menu, select.	IMPORTANT: Settings menu during a scan is only for visualization. To change the settings, the user must access the settings menu from the main menu. See "Main Menu" on page 21.
7. Exit acquisition 	To exit the current acquisition and return to the main menu, select.	

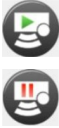
Radar Scan Display

The radar scan display can be used to view the current radar scans.

Item	Description	Notes
1. Shallow radar scan display	Displays real time ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
2. Deep radar scan display	Displays real time ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
3. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
4. Zoom in/out 	To zoom in, select right. To zoom out, select left.	
5. Adjust contrast 	To increase contrast, select right. To decrease contrast, select left.	

Acquisition Commands

The acquisition commands can be used to perform a scan.

Item	Description	Notes
1. Start/Stop acquisition 	To start acquisition, select. To stop acquisition, select again.	Icon will change from green to red once scan is started. IMPORTANT: User can press F1 key to start and stop scan.
2. Scan direction 	To choose forward scan direction, select top of button. To choose backward scan direction, select bottom of button.	
3. Recalibrate radar settings 	To recalibrate radar settings, select.	NOTICE: If soil conditions change suddenly, the user must recalibrate the radar settings. IMPORTANT: Recalibration is instant and user will not be notified once it is complete.

Target Commands

The target commands can be used to add and delete markers to acquired scans.

Item	Description	Notes
1. Place marker 	To place marker, select, then select a point directly on the radar scan. This will open the "Place Target" window. See "Place Target Window" on page 62.	NOTICE: Place a marker on the radar scan display when a hyperbola is present. For more information about hyperbolas, see page 67.
2. Edit marker 	To edit marker, select, then select the marker to be edited.	
3. Delete marker 	To delete marker, select, then select the marker to be deleted.	

Radar Scan/Map Commands

The radar scan/map commands can be used to view or hide the area map and shallow and deep radar scans.

Item	Description	Notes
1. Area map 	To display area map, select. To hide area map, select again.	
2. Shallow radar scan 	To display shallow radar scan, select. To hide shallow radar scan, select again.	IMPORTANT: The manufacturer recommends viewing dual frequencies to best detect buried objects.
3. Deep radar scan 	To display deep radar scan, select. To hide deep radar scan, select again.	IMPORTANT: The manufacturer recommends viewing dual frequencies to best detect buried objects.

Status Indicators

Status indicators give the user information about the radar, the optional GPS, and the battery while in use.

Item	Description	Notes
1. Radar status indicator 	Indicates radar status.	Green icon indicates the radar is functioning correctly. Yellow icon indicates that one or two antenna channels are not functioning correctly. Red icon indicates that the antenna is disconnected.
2. GPS signal indicator (optional) 	Indicates GPS signal if using optional GPS.	Green icon indicates GPS is functioning properly. Yellow icon indicates low GPS accuracy. Red icon indicates no GPS accuracy. IMPORTANT: If GPS symbol is disabled, the unit was unable to connect to the tablet PC.

Item	Description	Notes
3. Battery status indicator 	Indicates battery status.	Green icon indicates battery is fully charged. Yellow icon indicates battery is below 40%. Red icon indicates battery is below 10%.

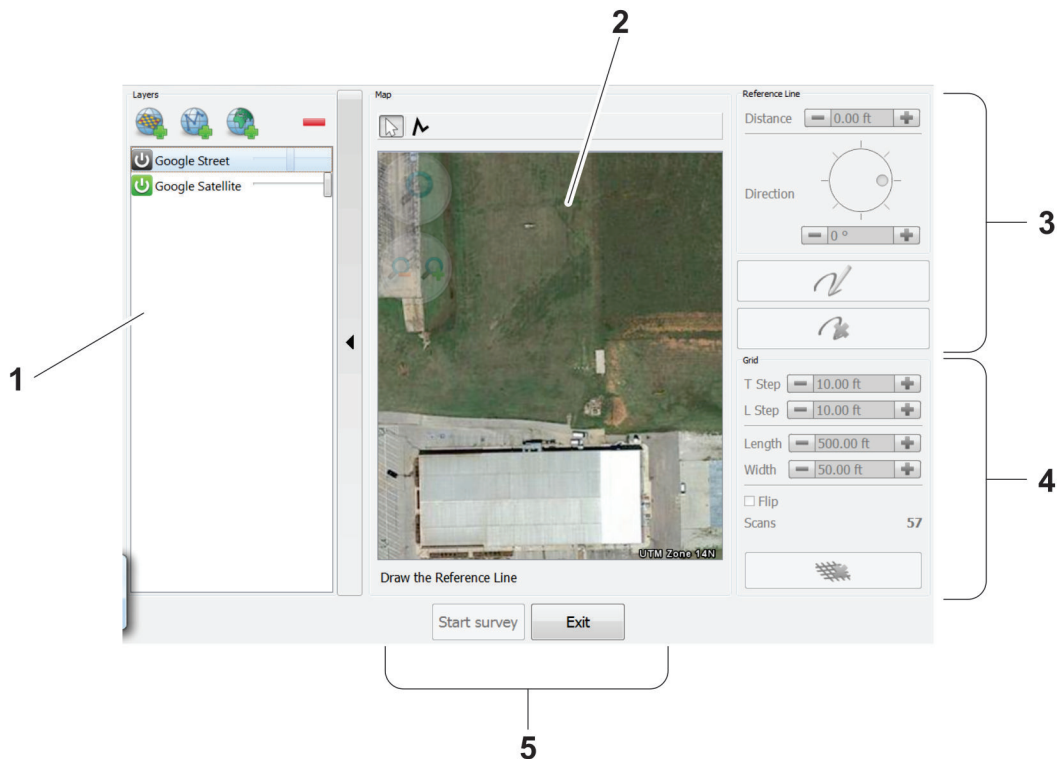
Map List Display

In the map list area, one or more maps from a saved file or maps from a GPS connection can be loaded to better visualize the scan. These maps are managed in the map list area and are viewed in the map area.

Item	Description	Notes
1. Add raster layer 	To add raster image, such as an aerial photograph, select button.	File formats that can be loaded are .tif and .tiff. IMPORTANT: Ensure the loaded map is of the area you are currently scanning.
2. Add vector layer 	To add vector image, such as a city planning map, select button.	File formats that can be loaded are .shp, .dxf, and .kml. IMPORTANT: Ensure the loaded map is of the area you are currently scanning.
3. Load online map 	To load an online map, ensure tablet PC has internet connection and select button.	Views that can be loaded are: - Google Satellite view - Google Street view - Google Terrain view - Google Hybrid view IMPORTANT: More than one of these views can be loaded at the same time and layered together.
4. Remove map layer 	To remove map layer, select and choose layer to remove.	

Item	Description	Notes
5. Turn off map layers 	To turn map layers off, select.	
6. Transparency slider	To adjust transparency of layers, drag transparency slider.	

New Assisted Project Setup



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IMPORTANT: When an assisted project is chosen, the **New Assisted Project Setup** window will open, which allows the user to set up the measurement grid.

- | | |
|----------------------------|--------------------|
| 1. Map list display | 4. Grid settings |
| 2. Map display | 5. Survey controls |
| 3. Reference line commands | |

Map List Display

In the map list area, one or more maps from a saved file or maps from a GPS connection can be loaded to better visualize the scan. These maps are managed in the map list area and are viewed in the map area.

Item	Description	Notes
1. Add raster layer 	To add raster image, such as an aerial photograph, select button.	File formats that can be loaded are .tif and .tiff. IMPORTANT: Ensure the loaded map is of the area you are currently scanning.
2. Add vector layer 	To add vector image, such as a city planning map, select button.	File formats that can be loaded are .shp, .dxf, and .kml. IMPORTANT: Ensure the loaded map is of the area you are currently scanning.
3. Load online map 	To load an online map, select button.	Views that can be loaded are: • Google Satellite view • Google Street view • Google Terrain view • Google Hybrid view IMPORTANT: More than one of these views can be loaded at the same time and layered together.
4. Remove map layer 	To remove map layer, select and choose layer to remove.	
5. Turn off map layers 	To turn map layers off, select.	
6. Transparency slider	To adjust transparency of layers, drag transparency slider.	

Map Display

The map display can be used to view the area map, the grid sketch, and the current position of the 2550GR.

Item	Description	Notes
1. Area map	Displays the map layers selected by the user with the grid sketch created by the user.	IMPORTANT: The current position of the radar is represented by a red icon and a yellow box.
2. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
3. Zoom in/out 	To zoom in, select right. To zoom out, select left.	
4. Pan map 	To pan the map, select and drag.	
5. Draw grid reference line 	To draw the grid reference line, select and select a place on the map to place two or more points.	

Reference Line Commands

The reference line commands can be used to draw a reference line in the map area. Once a second point of a line is selected, the user can make adjustments to the line.

Item	Description	Notes
1. Change distance	To change distance from previous point to previous segment of the line, increase or decrease value.	
2. Change angle	To change angle relative to previous segment of the line, increase or decrease value.	
3. Edit reference line 	To edit reference line, select.	

Grid Settings

The grid settings can be used to make adjustments to the grid in the map area.

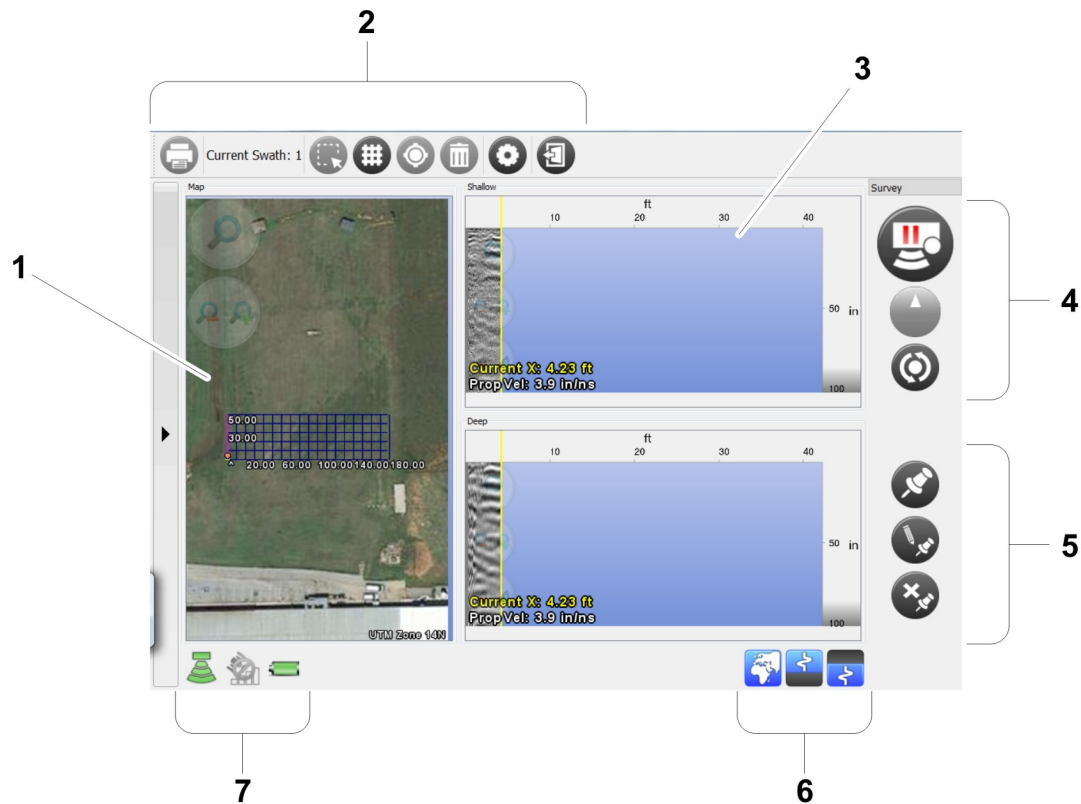
Item	Description	Notes
1. Change step of grid	To change the step of the grid, increase or decrease value.	
2. Change dimension of grid	To change length or width of the grid, increase or decrease values.	
3. Flip grid	To flip the grid 180 degrees, check box.	
4. Total scans	Displays the number of scans needed to complete the survey.	
5. Edit grid 	To edit grid, select.	

IMPORTANT: When measurement grid is complete, select **Start survey** to begin the acquisition. Select **Exit** to return to the main menu.

Survey Controls

Item	Description	Notes
1. Exit	To exit New Assisted Project Setup screen, select.	
2. Start Survey	To finish and start new assisted project, select.	

New Assisted Project



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- | | |
|-------------------------|----------------------------|
| 1. Map display | 5. Target commands |
| 2. Acquisition menu | 6. Radar scan/Map commands |
| 3. Radar scan display | 7. Status indicators |
| 4. Acquisition commands | |

Map Display

The map display can be used to view the area map and the current position of the 2550GR.

Item	Description	Notes
1. Area map	Displays the map layers selected and the reference line commands and grid settings selected by the user.	IMPORTANT: The current position of the radar is represented by a red icon and a yellow box.
2. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
3. Zoom in/out 	To zoom in, select right. To zoom out, select left.	

Acquisition Menu

The acquisition menu can be used to manage various functions of the radar scan.

Item	Description	Notes
1. Create report 	To create report of acquisition, select.	Selecting this button opens the "Create Report" window. See "Create Report" on page 63.
2. Select scan line 	To select a scan line on the grid, select.	IMPORTANT: Scan line can only be selected before beginning a new assisted scan.
3. Show grid 	To toggle grid on and off, select.	Grid appears on radar scan display. See "Radar Scan Display" on page 41.
4. Starting point editor 	To open starting point editor window, select.	User can modify the starting position of the next scan based on the defined grid. IMPORTANT: This function is only available before beginning a new assisted scan.
5. Erase current swath 	To delete the last swath, select.	

Item	Description	Notes
6. Settings menu 	To access setting menu, select.	IMPORTANT: Settings menu during a scan is only for visualization. To change the settings, the user must access the settings menu from the main menu. See "Main Menu" on page 21.
7. Exit acquisition 	To exit the current acquisition and return to the main menu, select.	

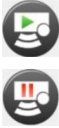
Radar Scan Display

The radar scan display can be used to view the current radar scans.

Item	Description	Notes
1. Shallow radar scan display	Displays real time ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
2. Deep radar scan display	Displays real time ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
3. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
4. Zoom in/out 	To zoom in, select right. To zoom out, select left.	
5. Adjust contrast 	To increase contrast, select right. To decrease contrast, select left.	

Acquisition Commands

The acquisition commands can be used to perform a scan.

Item	Description	Notes
1. Start/Stop acquisition 	To start acquisition, select. To stop acquisition, select again.	Icon will change from green to red once scan is started. IMPORTANT: User can press F1 key to start and stop scan.
2. Scan direction 	To choose forward scan direction, select top of button. To choose backward scan direction, select bottom of button.	
3. Recalibrate radar settings 	To recalibrate radar settings, select.	NOTICE: If soil conditions change suddenly, the user must recalibrate the radar settings. IMPORTANT: Recalibration is instant and user will not be notified once it is complete.

Target Commands

The target commands can be used to add and delete markers to acquired scans.

Item	Description	Notes
1. Place marker 	To place marker, select, then select a point directly on the radar scan. This will open the "Place Target" window. See "Place Target Window" on page 62.	NOTICE: Place a marker on the radar scan display when a hyperbola is present. For more information about hyperbolas, see page 67.
2. Edit marker 	To edit marker, select, then select the marker to be edited.	
3. Delete marker 	To delete marker, select, then select the marker to be deleted.	

Radar Scan/Map Commands

The radar scan/map commands can be used to view or hide the area map and shallow and deep radar scans.

Item	Description	Notes
1. Area map 	To display area map, select. To hide area map, select again.	
2. Shallow radar scan 	To display shallow radar scan, select. To hide shallow radar scan, select again.	IMPORTANT: The manufacturer recommends viewing dual frequencies to best detect buried objects.
3. Deep radar scan 	To display deep radar scan, select. To hide deep radar scan, select again.	IMPORTANT: The manufacturer recommends viewing dual frequencies to best detect buried objects.

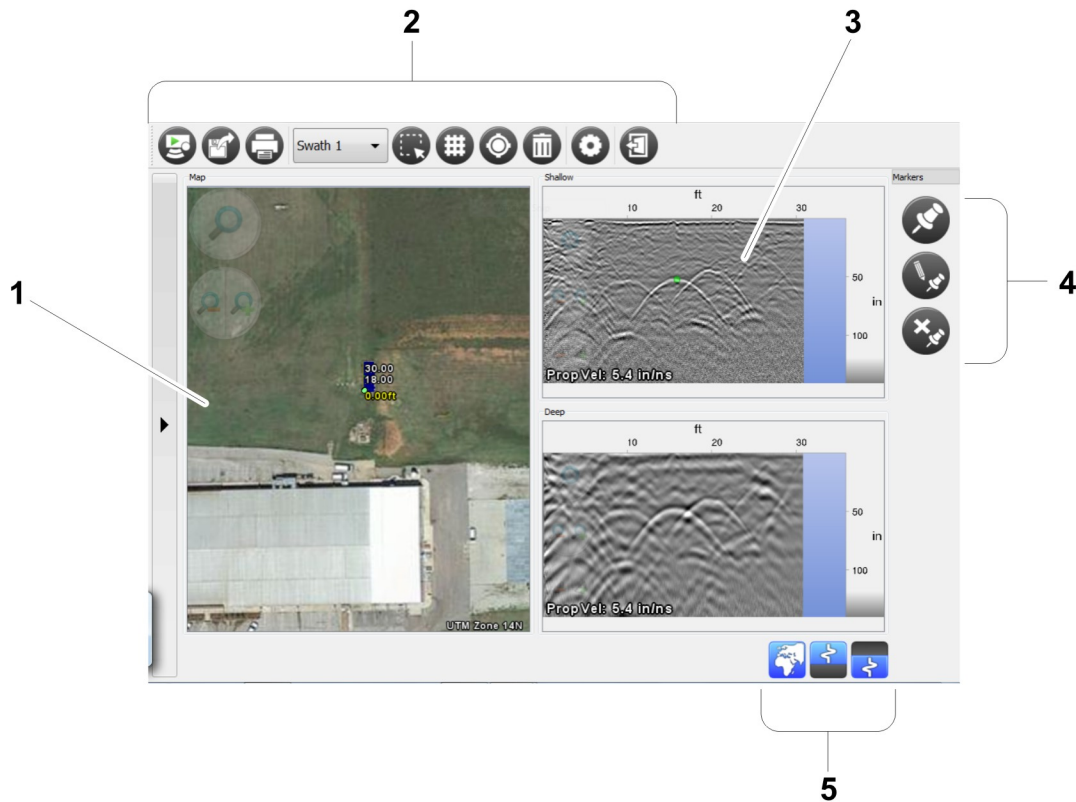
Status Indicators

Status indicators give the user information about the radar, the optional GPS, and the battery while in use.

Item	Description	Notes
1. Radar status indicator 	Indicates radar status.	Green icon indicates the radar is functioning correctly. Yellow icon indicates that one or two antenna channels are not functioning correctly. Red icon indicates that the antenna is disconnected.
2. GPS signal indicator (optional) 	Indicates GPS signal if using optional GPS.	Green icon indicates GPS is functioning properly. Yellow icon indicates low GPS accuracy. Red icon indicates no GPS accuracy. IMPORTANT: If GPS symbol is disabled, the unit was unable to connect to the tablet PC.

Item	Description	Notes
3. Battery status indicator 	Indicates battery status.	Green icon indicates battery is fully charged. Yellow icon indicates battery is below 40%. Red icon indicates battery is below 10%.

Open Project



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- | | |
|-----------------------|----------------------------|
| 1. Map display | 4. Target commands |
| 2. Acquisition menu | 5. Radar scan/Map commands |
| 3. Radar scan display | |

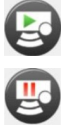
Map Display

The map display can be used to view the area map.

Item	Description	Notes
1. Area map	Displays the map layers selected by the user.	IMPORTANT: The current position of the radar is represented by a red icon and a yellow box.
2. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
3. Zoom in/out 	To zoom in, select right. To zoom out, select left.	

Acquisition Menu

The acquisition menu can be used to manage various functions of the radar scan.

Item	Description	Notes
1. Start/Stop acquisition 	To start acquisition, select. To stop acquisition, select again.	Icon will change from green to red once scan is started. IMPORTANT: User can press F1 key to start and stop scan.
2. Export targets 	To export files to default file location, select.	File can be saved as a .dat, .dxf, .shp, or .kml file.
3. Create report 	To create report of acquisition, select.	Selecting this button opens the "Create Report" window. See "Create Report" on page 63.
4. Current swath dropdown selection	To select a swath, select from the dropdown menu.	Selecting this button opens the "Create Report" window. See "Create Report" on page 63.
5. Select scan line 	To select a scan line on the grid, select.	IMPORTANT: Scan line can only be selected before beginning a new assisted scan.
6. Show grid 	To toggle grid on and off, select.	Grid appears on radar scan display. See "Radar Scan Display" on page 47.

Item	Description	Notes
7. Starting point editor 	To open starting point editor window, select.	User can modify the starting position of the next scan based on the defined grid. IMPORTANT: This function is only available before beginning a new assisted scan.
8. Erase current swath 	To delete the last swath, select.	
9. Settings menu 	To access setting menu, select.	IMPORTANT: Settings menu during a scan is only for reference. To change the settings, the user must access the settings menu from the main menu. See "Main Menu" on page 21.
10. Exit acquisition 	To exit the current acquisition and return to the main menu, select.	

Radar Scan Display

The radar scan display can be used to view the current radar scans.

Item	Description	Notes
1. Shallow radar scan display	Displays ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
2. Deep radar scan display	Displays ground penetrating radar image.	Horizontal scale represents distance traveled. Vertical scale represents depth.
3. Fit to screen 	To enlarge the map to the size of the entire screen, select.	
4. Zoom in/out 	To zoom in, select right. To zoom out, select left.	

Item	Description	Notes
5. Adjust contrast 	To increase contrast, select right. To decrease contrast, select left.	

Target Commands

The target commands can be used to add and delete markers to acquired scans.

Item	Description	Notes
1. Place marker 	To place marker, select, then select a point directly on the radar scan. This will open the "Place Target" window. See "Place Target Window" on page 62.	NOTICE: Place a marker on the radar scan display when an hyperbola is present. For more information about hyperbolas, see page 67.
2. Edit marker 	To edit marker, select, then select the marker to be edited.	
3. Delete marker 	To delete marker, select, then choose the marker to be deleted.	

Radar Scan/Map Commands

The radar scan/map commands can be used to view or hide the area map and shallow and deep radar scans.

Item	Description	Notes
1. Area map 	To display area map, select. To hide area map, select again.	
2. Shallow radar scan 	To display shallow radar scan, select. To hide shallow radar scan, select again.	
3. Deep radar scan 	To display deep radar scan, select. To hide deep radar scan, select again.	

Settings

The settings menu can be accessed using the **Settings** button in the main menu.

IMPORTANT: To reset factory default settings, select the  icon.

Item	Description	Notes
1. Survey Settings	Select to access survey settings menu.	Survey settings menu allows user to: • modify the project name and save the folder, • turn optional GPS on and off, • access Positioning Settings. See "Position Settings Menu" on page 50, and, • manage and configure Leica Zeno GNSS/GIS sensors.
2. Hardware Settings	Select to access hardware settings menu.	Hardware settings menu allows users to modify the radar depth range and the number of samples. User can also begin calibration from the hardware settings menu. See "Calibrate Radar Settings" on page 59. See "Calibrate Wheels" on page 74.
3. International Settings	Select to access international settings menu.	International settings menu allows users to choose the language, measurement system, and units.
4. Graphics Settings	Select to access graphics settings menu.	Graphics settings menu allows users to choose the color of the radar scan area.

Position Settings Menu

The position settings menu can be accessed using the survey settings menu.

Item	Description	Notes
1. COM port settings	Select to access COM port settings menu.	IMPORTANT: Refer to GPS user manual.
2. Positioning system	Select to access positioning system menu.	Positioning system menu indicates satellite connection, horizontal dilution of precision (or HDOP), and fix, which indicates the real time kinetic status.

Prepare

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- Assemble Handle 53
- Attach Computer 54
- Install Optional GPS Mount. 54

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- Tablet PC. 55

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.

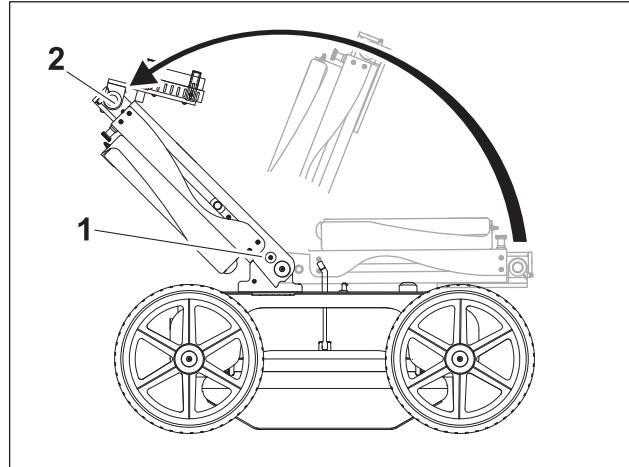
To request maps, contact the utility's cartographic or planning office. Specify street names and areas of interest. Request maps well in advance of the actual survey. Types of utilities to consider are:

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

Setup

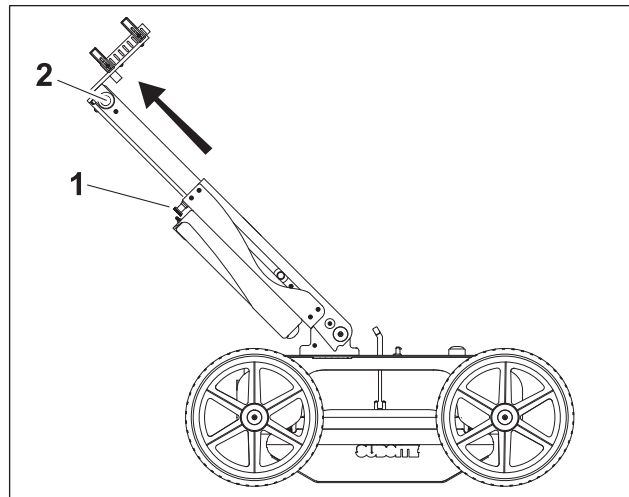
Assemble Handle

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



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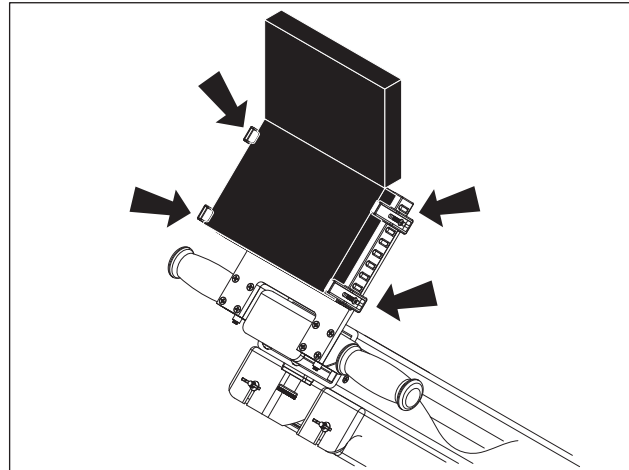
2. To adjust height, pull knob (1) and raise or lower the handle (2) to desired height. Release knob to engage pin.



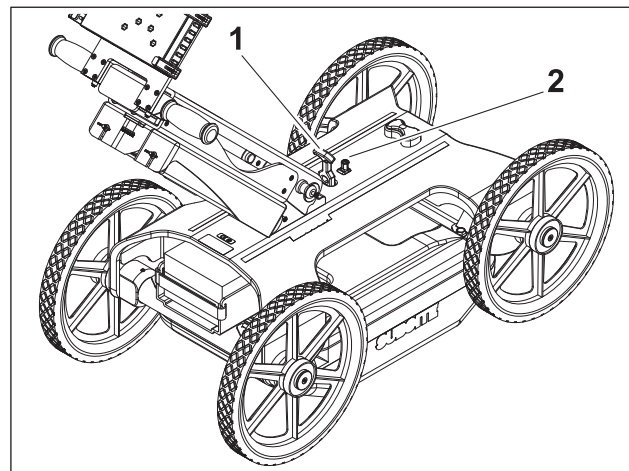
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Attach Computer

1. To attach computer to cart, slide tablet PC into mounting tray (shown).
2. Connect network cable from control unit to computer.
3. To lower antenna into scan position, pull rubber strap (1) until it is free from knob (2).



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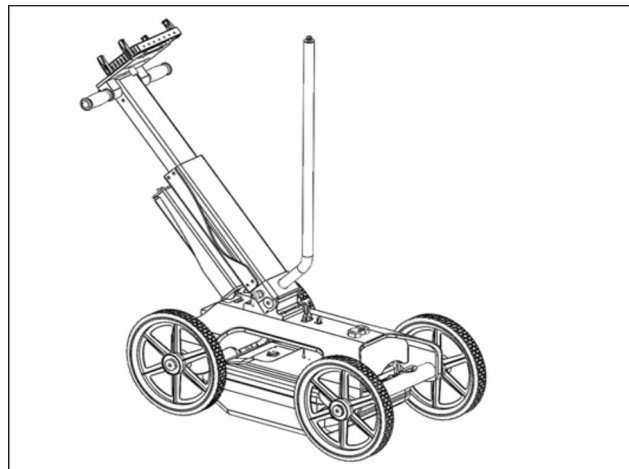


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Install Optional GPS Mount

1. Ensure handle is in upright position.
2. Line GPS mount (220-2588) up with holes on handle and secure with pin as shown.
3. Use a 5/8"-11 threaded adapter or a 1.25" (3.175 cm) diameter pole clamp adapter to attach the GPS device to the GPS mount.

IMPORTANT: The 5/8"-11 threaded adapter is recommended for optimal accuracy. Using a 1.25" diameter pole clamp adapter will give an offset GPS location.



ingpss001s.jpg

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 10 hours.

To check

1. Connect control unit to battery.
2. Press and hold power button on control unit.
 - If indicator on control unit lights, proceed with software.
 - If indicator on control unit does not light, check cable connections and/or recharge batter. See "Charge Battery" on page 72.

To recharge battery

If the battery runs down,

1. Shut down unit.
2. Connect another battery.
3. Restart the system.

Connect the discharged battery to the battery charger. It takes about three 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.

Operate

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- Calibrate Radar Settings. 59

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- Acquire Scan Data 60
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Troubleshoot Error Messages 64

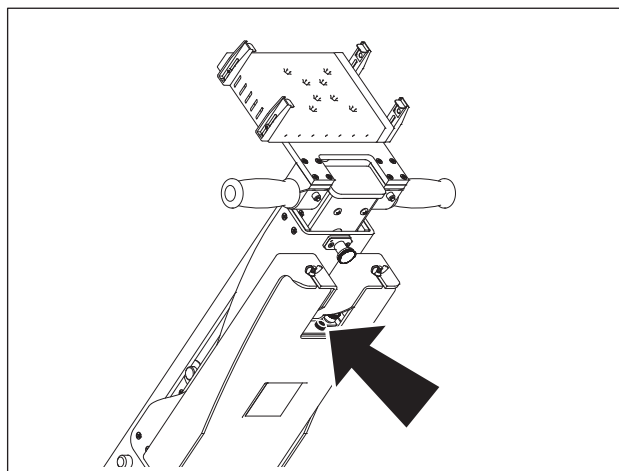
Setup

Position 2550GR at jobsite and lower antenna to ground.

Launch Acquisition Software

The 2550GR software allows scan data to be acquired, saved, and viewed directly in the field.

1. Turn on the tablet PC. (See manufacturer's instructions for more information.)
2. Set the control unit power switch (shown) to ON.
3. Select the 2550GR icon to launch the software.
4. Select the **New Project** or **Assisted Project** icon.
5. If a project does not successfully launch:
 - Check that control unit power switch is set to the ON position.
 - Verify that 2550GR battery is fully charged.
 - Verify that tablet PC battery is fully charged. (See manufacturer's instructions for more information.)
 - Check all cable connections.



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Setup New Project with GPS

The 2550GR allows the user to use GPS while scanning if desired. GPS can only be used in the New Project window and must be disabled before opening a New Assisted or Open Project.

1. Before selecting New Project, connect the tablet PC to the GPS device via Bluetooth.
2. Select **Settings** from the "Main Menu" screen. See "Main Menu" on page 21.
3. Navigate to the "Survey Settings" tab and select the  icon to turn positioning on.
4. Once positioning is on, select the  icon to navigate to the "Positioning Settings" tab.
5. Select the appropriate COM and ensure all other settings match the GPS device.

IMPORTANT: The appropriate COM varies. Cycle through the available COMs until a data stream is found.

6. Select **Ok** to close the "Positioning Settings" tab.
7. Select **Ok** to close "Survey Settings" tab.
8. Select **New Project** icon.

Calibrate Radar Settings

IMPORTANT: For an accurate survey, recalibrate any time ground conditions change, for example, when moving from grass to concrete, or from concrete to asphalt.

Unit will automatically calibrate upon beginning a new project or new assisted project. If recalibration is needed, see "Recalibrate radar settings" on page 25.

Scan

Acquire Scan Data

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

IMPORTANT: See “New Project” on page 22 for more information about controls in this section.

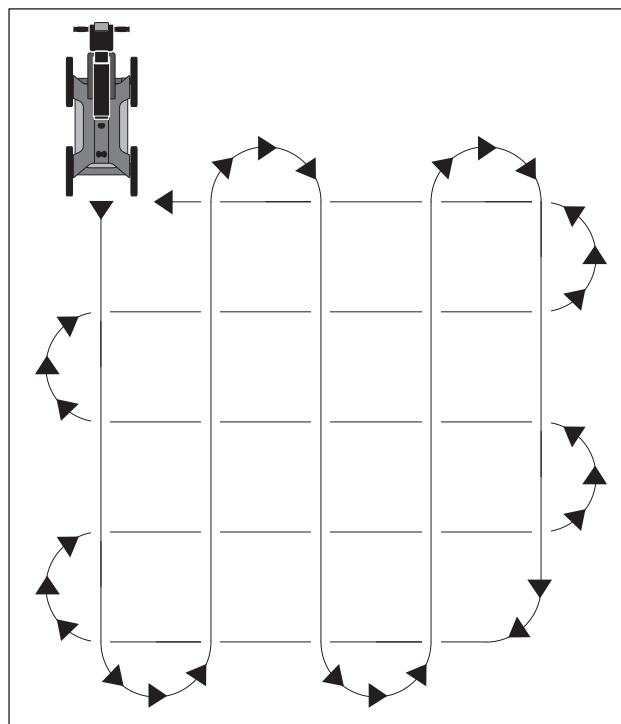
1. Ensure that the **New Project/New Assisted Project** window is open.
2. Select **Start Acquisition**.
3. Choose the scan direction and push or pull the cart to acquire survey data.

IMPORTANT: The 2550GR can be either pulled or pushed to acquire survey data. Follow a grid pattern to scan the survey area.

4. A radar scan will appear in the radar scan/map area. Select **Shallow** or **Deep** radar scan display preference.

IMPORTANT: It is recommended to view dual frequencies to best detect buried objects.

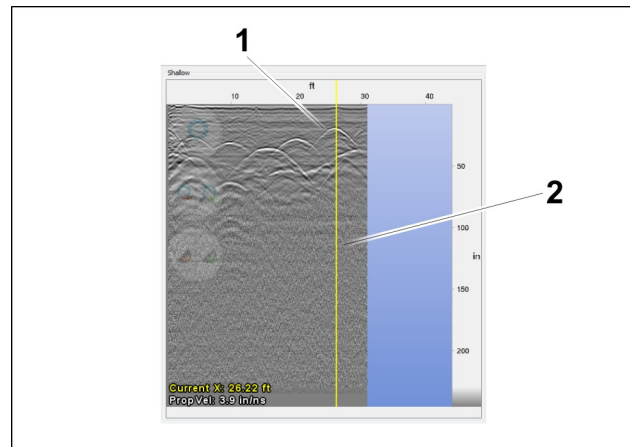
5. Watch radar scan for signs of buried objects, which appear as hyperbolas on the radar scan.



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Target Selection

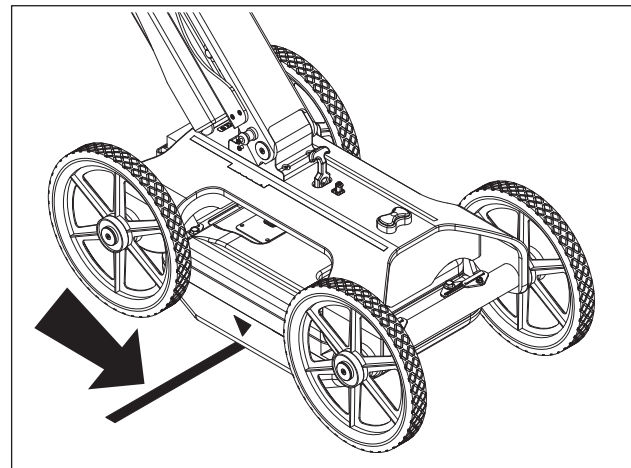
1. When a hyperbola (1) appears, move the cart in the opposite direction. A vertical yellow line (2) will display on the radar scan. Move the cart until the yellow line is in the center of the hyperbola.
2. Mark the ground:



e19om020h.jpg

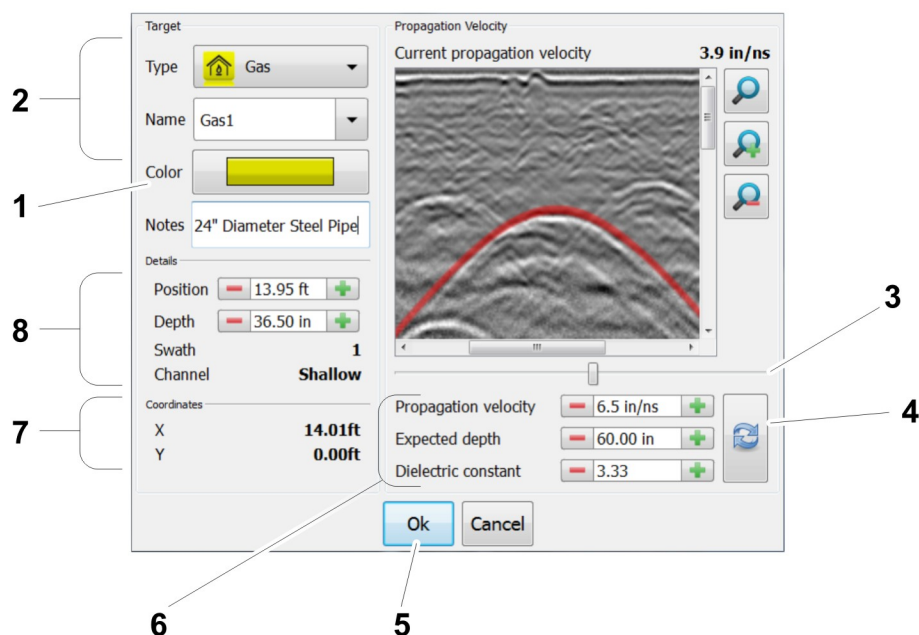
- Use spray paint to mark the location on the ground (shown). A red arrow on the side of the antenna corresponds to the yellow line on the radar scan.
3. Place marker on hyperbola on radar scan. See "Place marker" on page 25.

IMPORTANT: The "Place Target" window opens automatically after a marker is placed.



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Place Target Window



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NOTICE:

- 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.
- Exact depth of pipe or cable can be determined by consulting outside sources such as technical maps, opening manhole covers, or potholing.

Record target information during a survey, or at a later time.

1. Use the slider (3) to adjust the curve to match the hyperbola. The curve can also be adjusted by:
 - changing the propagation velocity, expected depth, and dielectric constant values (6),

Term	Definition
Propagation velocity	Speed of the electromagnetic wave traveling through a medium, dependent on the medium's dielectric constant
Dielectric constant	A medium's ability to concentrate electrical energy

- or changing the position and depth values (8).

IMPORTANT: Adjusting the **Position** value will adjust the curve left and right to match the hyperbola. Adjusting the **Depth** value will adjust the curve up and down to match the hyperbola.

IMPORTANT: Select the reset icon (4) to reset the propagation velocity to the last confirmed value.

2. Select the dropdown menu options (2) to choose type of utility, name of utility, and color to represent target.
3. Enter notes in the designated field (1) if desired.
4. When a target is placed, the relative coordinates will be recorded for reference (7).
5. When finished placing the target, select **Ok** (5).
6. To continue scanning, move 2550GR in original direction.

Create Report

To create a report:

1. Click on the create report button. See "Create report" on page 23.
2. Fill in the text boxes with applicable information (name, location, etc.).
3. Select paper size.
4. Select scale of scan images.
5. Select type of file to save report (PDF or HTML).

Troubleshoot Error Messages

Message	Description/Solution
Radar calibration error: Failure on channels 1, 2	Check that antenna cables are secure. Restart the software.
Radar error: DAD #1 antenna disconnected detected. The acquisition has been stopped.	Check that antenna cables are secure. Restart the software. IMPORTANT: All collected data will be saved when the acquisition is stopped.
Radar error: Failure on DAD #1. The acquisition has been stopped.	Check that LAN cables and battery cable are secure. Restart software. IMPORTANT: All collected data will be saved when the acquisition is stopped.
Radar programming: Connection error	Check LAN cable or radar power button. Restart the software.
Wheel sensor error: Software does not indicate movement while pushing unit during a scan.	Check that the wheel sensor cable is secure. Restart software.

Locating Concepts

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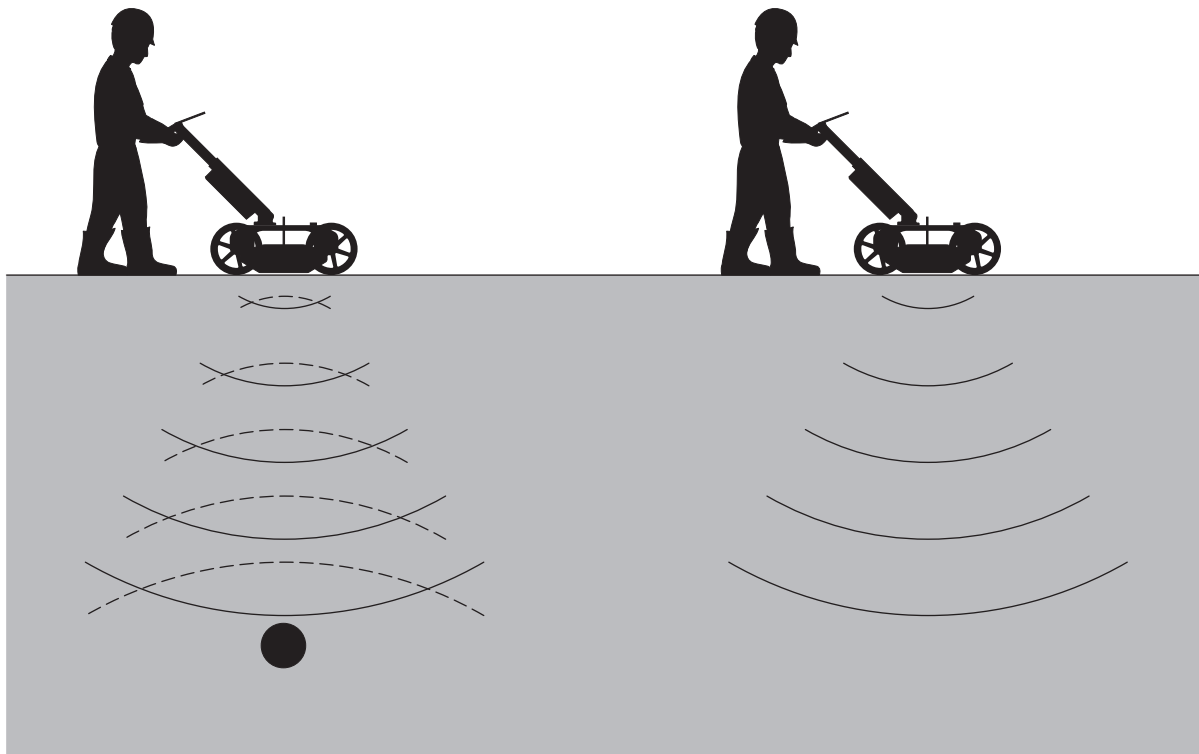
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- Analyzing Ground Conditions 68
- Selecting a Frequency 69

How the 2550GR Works

Radar (Radio Detection And Ranging) is generally used to detect aircraft, ships, vehicles, birds, rainstorms and other above-ground objects. The 2550GR focuses radar into the earth to detect objects buried below ground.



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The antenna of the GPR transmits a pulse of electromagnetic energy into the ground. When this energy reaches an object, it echoes and is captured by the antenna's receiver. Computer software uses the frequency of pulses transmitted and the amount of time delay between transmitting pulses and receiving echoes to formulate information about the target. Depth range and resolution are related to the radar frequency, transmitted power, electromagnetic properties of the ground material (soil), as well as to the shape and characteristics of the targets.

Using the 2550GR

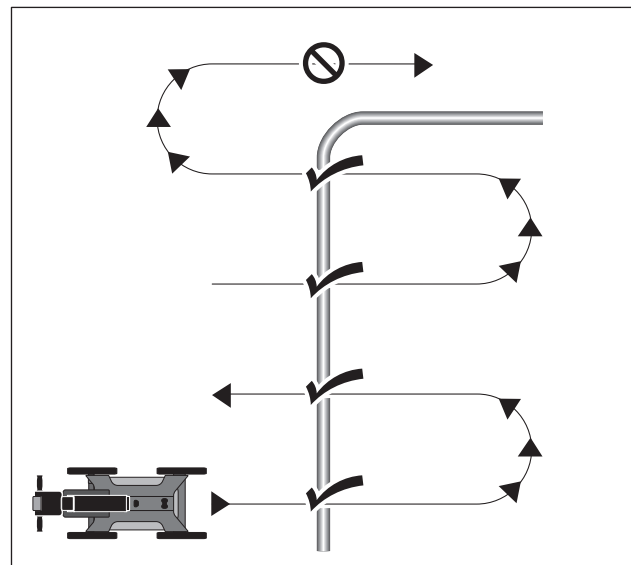
The main targets when surveying jobsites with the 2550GR are either extended structures (such as interface between layers, and pipes parallel to the investigation direction) or small structures such as pipes perpendicular to the investigation direction (cavities and rocks, etc.)

Interpreting radar scans becomes more efficient with experience. It is best to collect the largest possible amount of information for an area under investigation and use it to help choose the most appropriate equipment and investigation parameters.

Identifying Targets

Point Targets

Point targets are identified as the GPR path intersects with a structure (pipe). At the point of intersection, radar echoes received by the GPR reflect the shape of the object as the receiver passes over, generally a hyperbola. The hyperbola is created because the radar echoes from the sides of the pipe take a longer time to reach the receiver than the echoes from the top of the surface of the pipe.

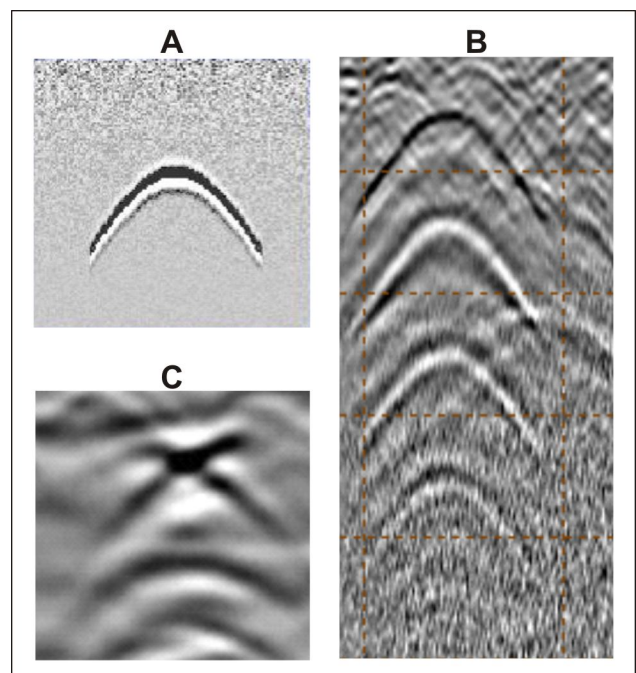


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If the antenna passes over a pipe or cable in an intersecting path, the reflected shape of buried pipe or cable is a hyperbola (A).

Pipes that contain water may show duplicate hyperbolae (B) as the radar echoes from the top of the pipe, the water in the pipe, and the bottom of the pipe.

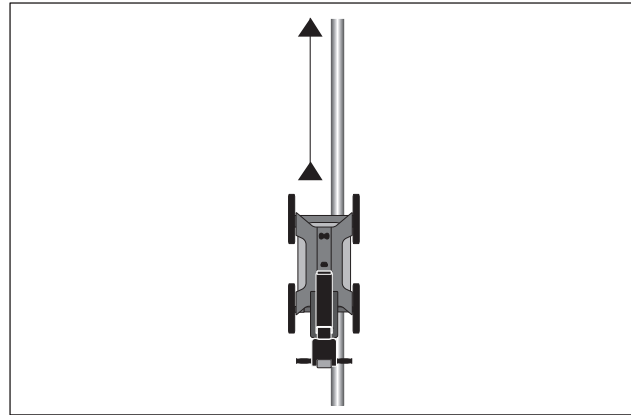
If pipe is buried in a trench with compacted walls, the radar echoes can reflect off the trench walls, forming an X above the hyperbola (C.)



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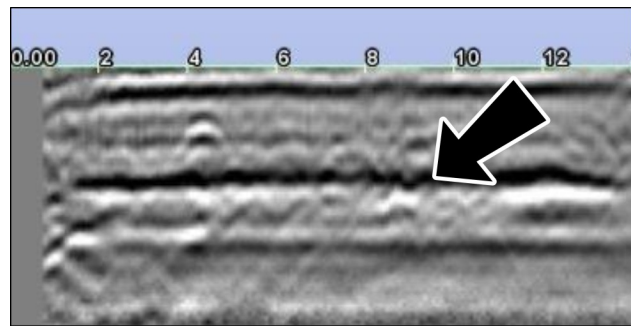
Linear Targets

Linear targets are identified as the GPR path runs parallel to the structure (pipe).



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The image reflected on the radar scan is a straight line.



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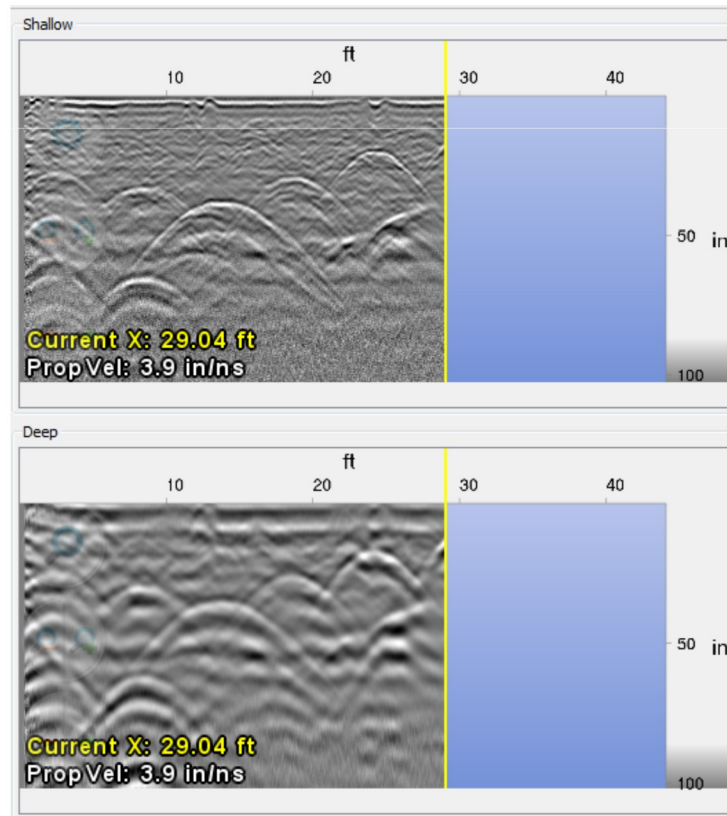
Analyzing Ground Conditions

The clarity of radar images depends upon the conductivity of the ground at the survey site. Soil, asphalt, concrete, rock, and ice conduct electromagnetic energy differently. If the ground conditions are very conductive, the radar signal can be dispersed before the receiver detects the echo, limiting the depth range of the scan. While you cannot change the ground conditions, you can adjust the frequency setting of the antenna to improve visibility. As the antenna's pulse frequency decreases, the sensitivity of the receiver increases.

Ground Condition	Conductivity	Radar Imaging	Best GPR Frequency
dry soils, granite, limestone, concrete, asphalt	low	excellent	high
freshwater, freshwater ice, snow, sand, silt, dry clay, basalt, seawater ice	medium	fair	high / low / dual
wet clay, wet shale, seawater	high	poor	low

Selecting a Frequency

The 2550GR scans at two frequencies simultaneously. You may choose to view high or low frequency depending on ground conditions. (See "Analyzing Ground Conditions" on page 68.)



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In general, high frequency (shallow) scans produce a radar scan with higher resolution and more detail while low frequency (deep) scans have a greater depth range and detect less ground clutter. Regardless of the view you choose, 2550GR scan data is recorded at both frequencies.

Service

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As Needed

Clean 2550GR

Use a damp cloth to clean the 2550GR.

IMPORTANT:

- Before cleaning any external parts of the 2550GR, make sure all cables have been disconnected, including the power supply cable.
- Make sure that cloth is not too wet to avoid damaging electrical components.
- 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.

To charge:



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

To help avoid injury:

- Use a single 12V maximum source for charging. Do not connect to rapid chargers or dual batteries.
- Use caution and wear personal protective equipment such as safety eyewear, when charging or cleaning battery.
- Keep sparks, flames, and any ignition source away from batteries at all times. Internal contents are extremely hazardous. Leaking fluid is corrosive. Battery may be explosive at higher temperatures.
- NEVER lean over battery when making connections..
- Do not attempt to charge a battery that is leaking, bulging, heavily corroded, frozen, or otherwise damaged.
- NEVER short-circuit battery terminals for any reason or strike battery posts or cable terminals.

Install Software

IMPORTANT: If installing software on PC not provided, see "Computer Requirements" on page 77 to ensure it meets minimum system requirements.

The tablet PC shipped with the 2550GR is already configured with acquisition software. If it is necessary to reinstall the software or if choosing a different PC, follow the steps below:

1. Right click on the **2550GR-x.x.x.exe** file.
2. This selection will start the 2550GR Setup Wizard. Once this screen appears, select **Next**.
3. When the License Agreement appears, select **I Agree**.
4. Select **Install** to set the installation location to the default location.
5. Select **Finish** once the software is installed.

Set IP Address

1. Navigate to the computer's network connection setting window.
2. 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
3. Follow the cues to save new settings and to exit the settings window.
4. Restart the computer.

Register 2550GR

1. Right click on software icon and select **Run as Administrator**.
2. In the Main Menu screen, select **Help** from the Menu bar and then select **About**.
3. If you have a license file, select the  icon to load the license.
4. Select **Open License File** and select the license file that matches the Product ID to register the computer, or:
5. Select **Register Now** if you do not have a license file that matches the Product ID number.
6. Fill out the information on the form.
7. An email to Subsite® Electronics Product Support will automatically pop up with the form as an attachment.
8. Send the email to obtain a license number that matches the Product ID and repeat steps 3-4.

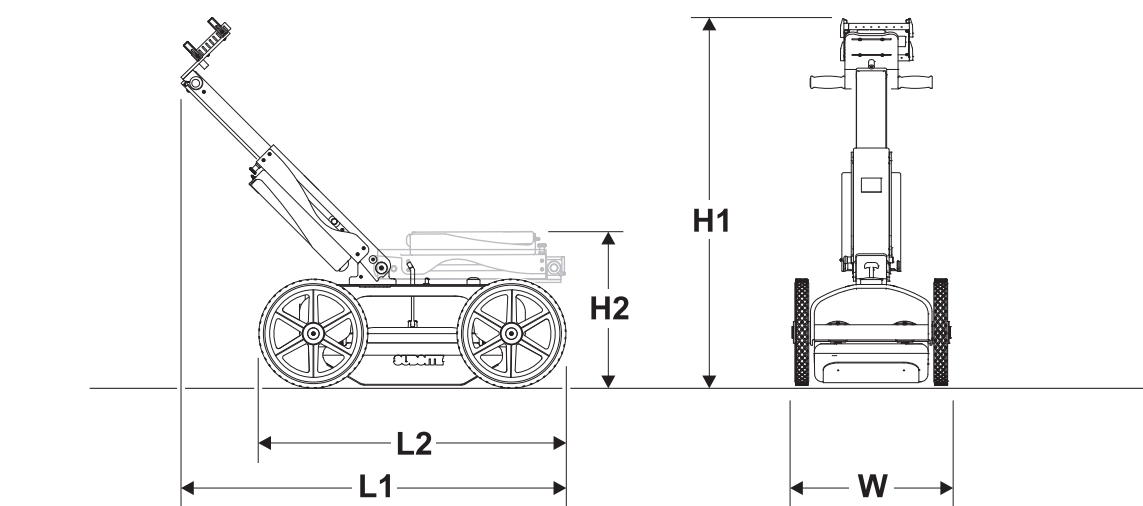
Calibrate Wheels

To calibrate, open the **Hardware Settings menu** located in the settings menu:

1. Select the  icon to access calibration process.
2. Select **Calibration** to start wheel calibration.
3. Select the  icon to begin calibration.
4. Push the cart a short distance, 10-15 ft (3-5 m) to calibrate.
5. After calibration is finished, select the  icon to stop calibration.
6. Enter the distance walked by selecting the  and  icons.
7. Select Ok to finish calibration.

Specifications

2550GR



e19om005h.eps

Dimensions		U.S.	Metric
Overall machine length		50.0 in	1270 mm
	L1, overall, handle extended fully, operating position	50.0 in	1270 mm
	handle collapsed, travel position	40.0 in	1016 mm
	L2, wheel base	40.0 in	1016 mm
Overall machine height			
	H1, from ground to fully extended handle	40.0 in	1016 mm
	H2, handle folded	20.5 in	521 mm
	above ground when optional GPS mount is installed (not shown)	52.0 in	1321 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

Antenna Performance	U.S.	Metric
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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	0.1-6.0 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	250 and 700 MHz
Typical collection speed (scans/second)	100	100
Typical collection speed at 2-in (5 cm) sampling interval	5.6 mph	9 km/h
Data storage	tablet PC w/hard drive	
Maximum profile length	virtually unlimited	

Software	
Display mode	grayscale/color
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 scan
Diagnostic	radar and power supply status, excessive speed, data loss

Software		
Languages	Chinese, Dutch, English, French, German, Italian, Japanese, Malay, Polish, Portuguese, Romanian, Russian, Spanish, Vietnamese	
Data collection type	Parallel profile lines, perpendicular to the expected orientation of utilities	
Reading of pipe position/depth	software cursor	
Computer Requirements		
Minimum System Requirements:		
	Processor: Core i3 1.7 GHz	
	RAM: 1 GB	
	Display resolution: 800 x 600	
	Graphic adapter: compatible with Open GL 2 or newer	
	Hard drive: shock proof or solid state	
	Hard disk space: 100 MB available	
	Ethernet connection: 100 Mbps	
	USB connection: USB 2.0	
	Operating system: Windows 7	
Minimum System Recommendations (tablet PC shipped with unit meets these specifications):		
	Processor: Core i5 1.7 GHz	
	RAM: 2 GB	
	Display: sunlight-viewable	
	Display resolution 1024 x 768	
	Graphic adapter: compatible with Open GL 2 or newer	
	Hard drive: shock proof or solid state	
	Hard disk space: 100+ MB available	
	Ethernet connection: 100 Mbps	
	USB connection: USB 2.0	
Operating system: Windows 7		

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

Support



Procedure

Notify your dealer immediately of any malfunction or failure of 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 Subsite Electronics repair facility. Repairs done elsewhere will void warranty.

Resources

Publications

Contact your Ditch Witch[®] 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 dealer.

Warranty

Electronics Limited Warranty Policy

Subject to the limitation and exclusions herein, free replacement parts and labor will be provided when a unit fails due to a defect in material or workmanship within one (1) year of first commercial use (See Exceptions below for specific products). Defects shall be determined through inspection by Manufacturer or authorized repair centers. An inspection must occur within thirty (30) days of the date of failure of the product or part by Manufacturer or its authorized repair facility. Manufacturer will provide the location of its inspection facilities or its nearest authorized dealer upon inquiry. Manufacturer reserves the right to supply remanufactured replacement parts under this warranty as it deems appropriate. Each warranty repair carries the remainder of the factory warranty or 90 days, whichever is longer, for all repaired components and labor.

Product Warranty Exceptions:

- All Directional Drilling Beacons, Locate Beacons and Accessories carry a six (6) month warranty.
- All Used (Cosmetic) Electronics products sold from Manufacturer carry a six (6) month warranty from date of sale to dealer.

EXCLUSIONS FROM PRODUCT WARRANTY

- All defects or damages caused by misuse, abuse, improper installation, alteration, neglect, modification, lack of maintenance, or uses other than those for which products were intended.
- All defects, damages, or injuries caused by improper training, operation, or servicing of products in a manner inconsistent with manufacturer's recommendations.
- All batteries, which are considered consumable and therefore not covered under this warranty.
- All damaged plastics are considered to be the result of misuse or neglect unless Manufacturer has determined otherwise.
- All repairs or attempted repairs by non-certified repair facilities or personnel will void the warranty.
- All incoming duties and freight charges.

(Exclusions from Product Warranty, continued)



- Manufacturer reserves the right to make changes in design and/or improvements to products from time to time, and user understands that Manufacturer shall have no obligation to upgrade any previously manufactured product to include any such changes.
- In no event shall Manufacturer or its agents, assigns or parent company be liable for any indirect, special, incidental, or consequential damages or for any cover, loss of information, profit, revenue or use based upon any claim by user for breach of warranty, breach of contract, negligence, strict liability or any other legal theory. In no event shall Manufacturer liability exceed the amount user has paid for the Manufacturer product.
- Manufacturer will not be responsible for loss of accessories or loss or erasure of data storage media.
- Should it be determined that applicable law prohibits enforcement of any provision of this Warranty Policy, then to the extent it is necessary to comply with the applicable law, this Warranty Policy shall be deemed amended.
- This Warranty Policy shall be the entire agreement between Manufacturer and the Purchaser. Any statements that purport to be different than or modify or expand the terms set forth in this written policy are not effective for any purpose. ANY IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR USE ARE EXPRESSLY DISCLAIMED. IN NO EVENT SHALL SUBSITE® ELECTRONICS, THE CHARLES MACHINE WORKS, INC., OR ANY AUTHORIZED SERVICING AUTHORITY BE RESPONSIBLE FOR ANY LOSSES, INCLUDING CONSEQUENTIAL AND INCIDENTAL DAMAGES, EXCEPT AS EXPRESSLY PROVIDED HEREIN.

SERVICE AND REPAIR

All units repaired at Manufacturer's location or an authorized service center will carry a 90 day warranty on all replaced components/parts and labor commencing on the date of repair.

EXTENDED WARRANTY

Consult your local Ditch Witch dealer for extended warranty options.

WARRANTY DETAILS

For information regarding this limited warranty, contact Subsite Electronics Product Support Department, 1950 W. Fir, Perry, OK 73077, or your local dealer.

March 2015

