UtilityScan™ LT

Quick Start Guide

A Fast Check List For Field Operation

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MN72-485 Rev A

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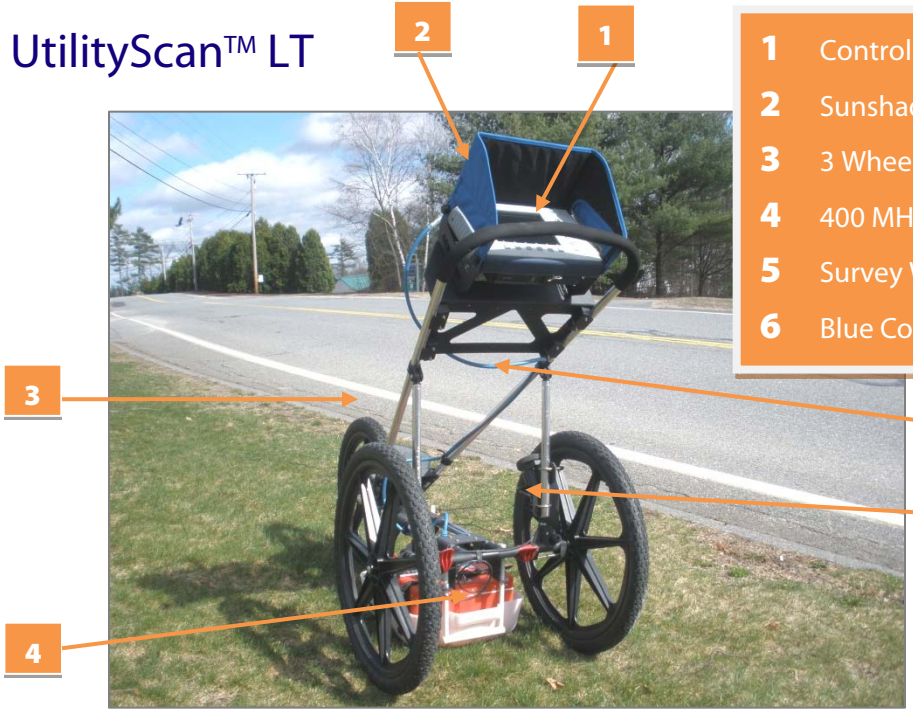
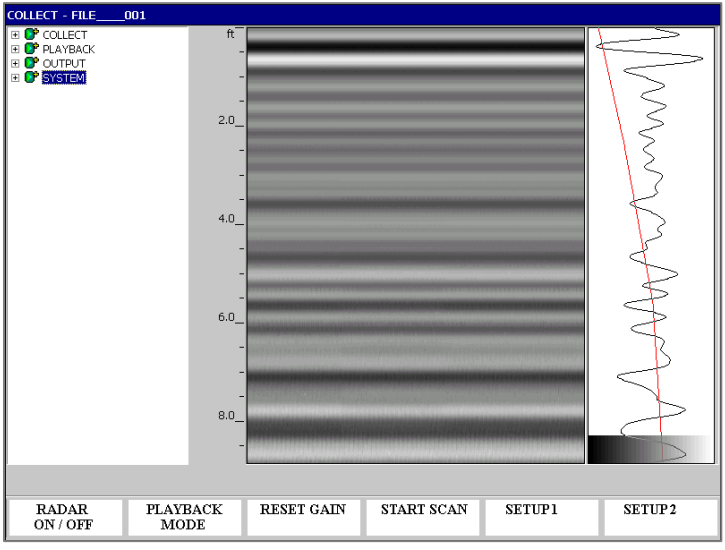
- FCC Notice for U.S. Customer
- Canadian Requirements for RSS-220
- Declaration of CE Conformance

UtilityScan™ LT



1. Control Unit
2. Sunshade
3. 3 Wheel Cart
4. 400 MHz Antenna
5. Survey Wheel
6. Blue Control Cable

Section 1: Getting Started



1 Assemble the cart as shown in Appendix A: Cart Assembly Instructions.

2 To power up the system:

- Insert the battery into the base of the Control Unit. Close the door to protect the system from dust.
- Press and hold the green power button for about 2-3 seconds. A red light will illuminate next to the power button. (**Note:** To power off, simply press and hold the power button for approximately 5-6 seconds. Then remove the battery.)

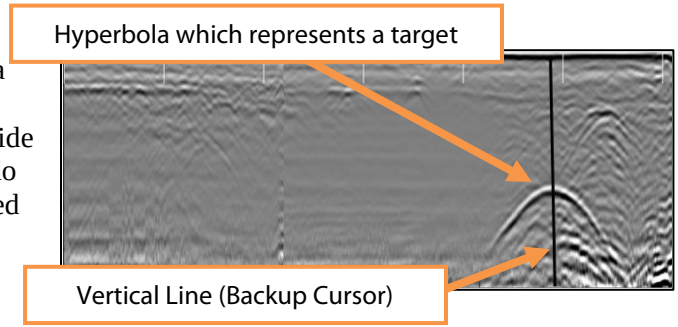
3 After a few seconds, the system will boot up and the UtilityScan LT Setup Screen is displayed.

4 After the antenna initializes, the screen will be split into three windows. You will see the menu tree at left, a linescan display in the center, and a single scan in the O-scope display on the right. The six function keys will be displayed in a bar at the bottom.

Section 2: Power Up and Go

The UtilityScan LT is designed to allow you to power-up and go. If you wish to use the factory settings (See Appendix B for these values) as the default settings, simply:

1. Power up the Control Unit.
2. When the Setup Screen is displayed, go to System>Setup>Recall and select Factory for the factory default settings.
3. Press the Start Scan button located at the bottom of the Control Unit.
4. If you plan to save the data you collect, note the file name located at the top left of the screen.
5. Begin collecting data by moving the cart forward. Data gets collected only when the cart is moving forward.
6. Once you start seeing hyperbolas on the screen, pull the system straight back along your survey line. You will see a vertical line (the backup cursor) scroll along your data. When that vertical line is right over the apex of the hyperbola, the center of the antenna is over that target.
7. The center of the antenna is located in the middle of the antenna directly under where the blue cable is connected to the antenna. Using this reference point as a guide, mark the ground at each side of your cart. Push the cart straight forward or move the cart to do another line scan. No data will be collected until you have passed the spot where you started to reverse.



Other Options During Collection

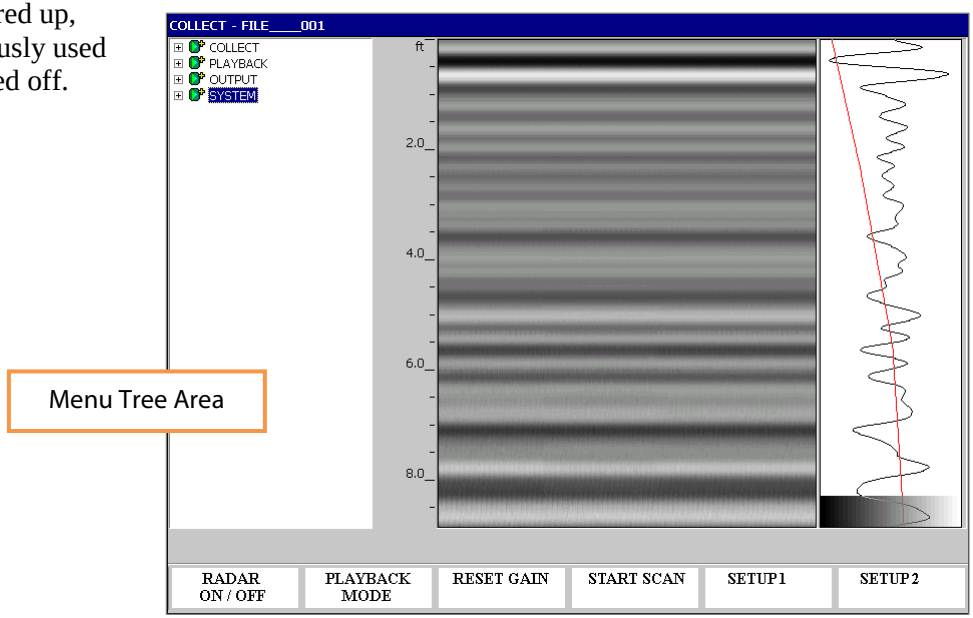
- **Next File** – Press this to clear the screen and to save (or not save the current file). Press (Yes) to save the file, press (No) to cancel the save. Regardless of saving or not saving the file, the screen will be cleared of data.
- **Stop Scan** – This will take you back to the Setup Screen. This will also ask you if you wish to save the current file.
- **Save Image** – This will save the image on the screen as a bitmap (.bmp) file with the same name as the data file.
- **User Mark** – While collecting data, you may press the Mark button (located at the right side of your Control Unit) to insert user marks in your data.

Section 3: Configuring the UtilityScan LT System

You may also configure the Control Unit for a particular job or job site. Some factors about the job site may require you to change some of the settings of the Control Unit.

You can change the settings using the Menu Tree area of the screen.

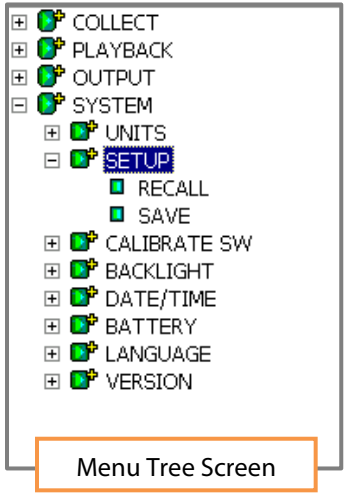
Note: Each time the system is powered up, the settings will default to the previously used settings when the system was powered off.



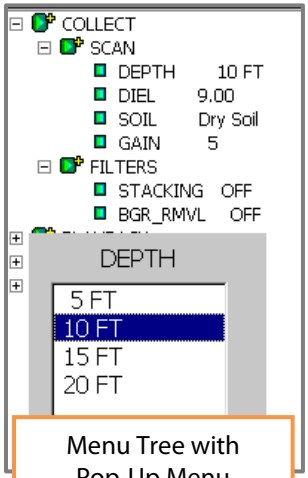
Navigating Through the Menu Tree

Note that some menu options have a green arrow next to them, and other menu options have a green square next to them.

- Press the ▲ and ▼ to navigate up and down the menu tree.
- If the menu option has a green arrow next to it, press the ➤ to open the menu option. Press the ⊗ to close the menu option.
- If the menu option has a green box next to it, press the ↵ (Enter button located in the middle) to select that menu option.
- If there is a pop-up menu, use the ▲ and ▼ arrows to highlight the appropriate option and press the ➤ to select or "accept" that option or press the ⊗ to cancel the selection.



Menu Tree Screen



Menu Tree with Pop-Up Menu

Menu Tree

By following the instructions in the previous page, navigate through the menu tree to configure your system.

For detailed information about the terms used below (Dielectric, Filters, and Gain), please refer to Appendix F: Glossary of Terms.

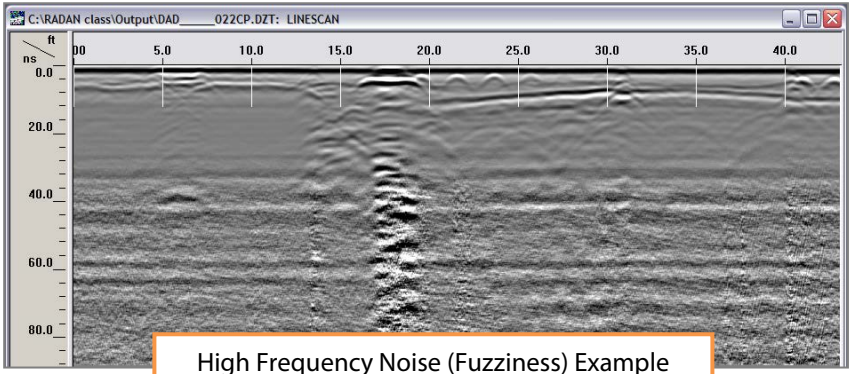
Collect

These settings are used during collection of data (Collect Mode).

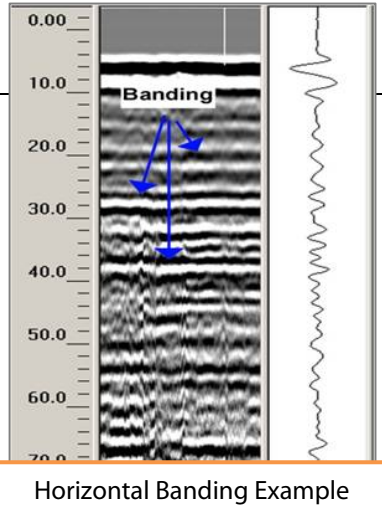
Scan	**Depth** – Increase or decrease the depth of your scan (5, 10, 15, or 20 feet). **Diel** - Change the Dielectric value according to soil conditions (See Appendix C for suggested dielectric values for soil conditions). This will range from 1 (air) to 81 (water). The better the dielectric estimate, the better the depth of the target accuracy. **Soil** - Match the soil description of the area you are scanning (this will change the Dielectric value). **Gain** - Change the contrast or brightness of your screen.

Filters – Filtering is a trial and error process. Choose different values and do a test run. Continue this until you get a setting to best see your data.

Filters	**Stacking** – For high frequency noise due to weakening RADAR signal (fuzziness in your data). Values are Off, 3, 5, 9, and 15. **Bgr_Rmvl** – Background Removal to filter out horizontal banding (typically found in clay soil). Any target that is greater than the number of scans you select in this option will be filtered out. **Off** – No Filter. **Low** – 1023 Scans (Filter out large targets). **Med** – 511 Scans. **Hi** – 127 Scans (Filter out small targets).



High Frequency Noise (Fuzziness) Example



Horizontal Banding Example

Playback

These settings are use during the playback (or viewing) saved data (Playback Mode).

Scan	**Diel** – Estimate the Dielectric value for soil conditions (See Appendix C for suggested dielectric values for soil conditions). This will range from 1 (air) to 81 (water). The better the dielectric estimate, the better the depth of the target accuracy.
Process	**Stacking** – For high frequency noise due to weakening RADAR signal (fuzziness in your data). Values are Off, 3, 5, 9, and 15. **Bgr_Rmvl** – Background Removal to filter out horizontal noise (typically found in clay soil). **AGC** – Adjust the Gain to change the contrast or brightness of your screen.

Output

Display	**C_Table** – Color Table, change the color of the data during collection or playback. **C_XForm** – Color Transform, change how the colors are distributed in your data during collection or playback.
Transfer	**PC** – Use this to transfer data from the Control Unit to a PC using a connecting cable. **HD** – Use this to transfer data from the Control Unit to a USB memory stick. **Delete** – Use this to delete data from the Control Unit.

System

Units	**Type** – English or Metric. (Note: Changing this will result in the system shutting down. You must press the green button to start the system back up again.) **VScale** – Depth or Time.
Setup	**Recall** – Load Factory Setting or Saved Settings (Setup01, Setup02, and Factory). **Save** – Save your own settings for quick loading (Setup01 and Setup02).
Calibrate SW	**Calibrate** – Steps to calibrate the survey wheel (see Appendix D for these steps).
Backlight	**Level** – Control the backlight brightness of your screen.
Date/Time	**Date** – Configure the date. **Time** – Configure the time. **Zone** – Configure your time zone.
Battery	**Status** – Check the battery status.
Language	**English** – Change the language of your system.
Version	**Show** – Show the version of the system.

Section 4: Function Keys Located at the Bottom of the Control Unit

This display will change according to what mode you are in. You are either in Collect Mode or in Playback Mode. The options for Playback Mode are in parenthesis.

Function Key	Collect Mode	Playback Mode
RADAR On/Off (Play/Stop)	Turn the RADAR on or off.	Play or Stop the scrolling of the data.
Playback Mode (Collect Mode)	Load a saved file to view it. Once the file is loaded, you should view the file by pressing Run File.	Press Collect Mode to return back to Collect mode.
Reset Gain (Select File)	Re-initialize the antenna to get better quality of your data.	Select another saved file to view.
Start Scan (Run File)	Press Start Scan to collect data.	Press Run File to view data.
Setup1 & Setup2 (Color Table & Color XForm)	Quickly load saved settings.	Change the display colors and how the colors are distributed with your data.

Appendix A: Cart Assembly Instructions

1 Unfold the cart frame. Press the button on the frame insert the black tips of the top assembly into the receivers on the front wheel fork. Snap the tabs in place to lock the assembly.

2 Press the button located on the rear axle and insert the wheel shaft into the axle. It will slide all the way in and lock securely. To remove wheels, press the button again and pull the wheel straight out.

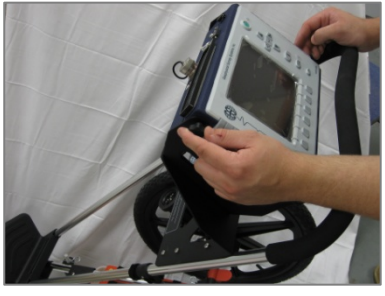
3 Slide the front wheel onto the front wheel fork and tighten clamp. When the clamp is slightly tight, turn the handle to the locked position. This will further tighten the clamp. Exercise care not to over-tighten the front wheel as this may result in damage to the front fork.

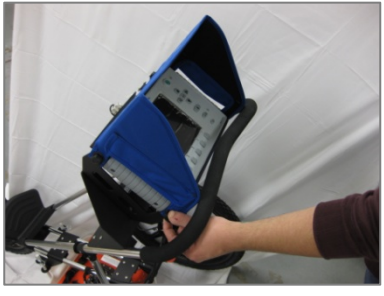
4 Remove the Velcro Plate from the plastic bucket. Using a Philips screw driver, remove the shark fin bracket from the antenna. Place the antenna into the white plastic bucket and secure with the attached straps.

5 With the arrows on the top of the antenna housing pointing toward the front of the cart, place the bucket under the cart so that the bucket handles face the front and the back of the cart.

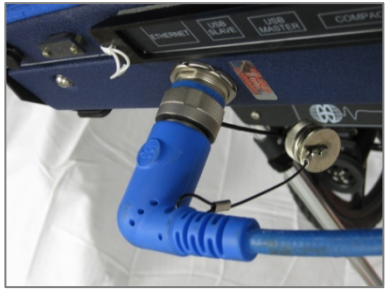
6 Attach the survey wheel cable to the antenna port mark “Survey.”

7 Attach the Control Unit to the mounting bracket using the thumb screws. Be sure to only hand-tighten the screws. Attach the optional sunshade, be sure that it is positioned on the outside of the bracket rather than being sandwiched between the mounting bracket and the Control Unit.





8 Attach the male end of the blue control cable to the antenna port on the back of the Control Unit. Be sure to only hand-tighten this connection as over tightening may cause system damage. Attach the female end to the antenna on the port marked “Control.”



9 Secure the blue cable by using the Velcro straps included on the bars of the 3 wheel cart.

Appendix B: Factory Settings

Menu Option	Value		Main Menu Option	Description
	English	Metric		
Depth	10 feet	3 meters	Scan	The RADAR will look up to 10 feet
Diel	9.00	9.00	Scan	The Dielectric value (soil condition) of the soil
Soil	Dry Soil	Dry Soil	Scan	The descriptive condition of the soil
Gain	5	5	Scan	The contrast of the screen
Stacking	Off	Off	Filter	No Stacking (condensing) of the data
Bgr_Rmvl	Off	Off	Filter	No Background Removal of the data
Units->Type	English	Metric	System	Units displayed in English system

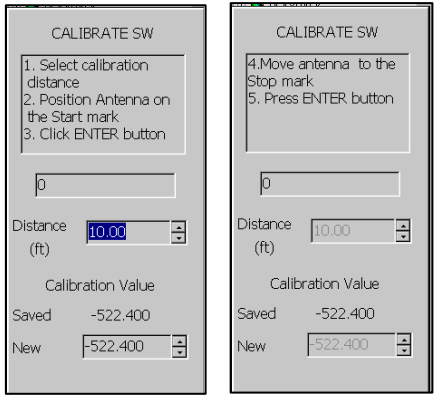
Note: The system is configured to collect data at 50 scans per meter or 18 scans per foot.
This cannot be re-configured by the user.

Appendix C: Dielectrics of Common Materials (Soil Conditions)

Material	Dielectric Constant	Material	Dielectric Constant
Air	1	Wet Granite	6.5
Snow Firn	1.5	Travertine	8
Dry Loamy/Clayey Soils	2.5	Wet Limestone	8
Dry Clay	4	Wet Basalt	8.5
Dry Sands	4	Tills	11
Ice	4	Wet Concrete	12.5
Coal	4.5	Volcanic Ash	13
Asphalt	5	Wet Sands	15
Dry Granite	5	Wet Sandy Soils	23.5
Frozen Sand & Gravel	5	Dry Bauxite	25
Dry Concrete	5.5	Saturated Sands	25
Dry Limestone	5.5	Wet Clay	27
Dry Sand & Gravel	5.5	Peats (saturated)	61.5
Potash Ore	5.5	Organic Soils (saturated)	64
Dry Mineral/Sandy Soils	6	Sea Water	81
Dry Salt	6	Water	81
Frozen Soil/Permafrost	6		
Syenite Porphyry	6		
Wet Sandstone	6		

Appendix D: Calibrating the Survey Wheel

Survey Wheel Calibration is run to calibrate the survey wheel to different survey surfaces. The Survey Wheel controls the data collection rate necessary for optimal data collection.



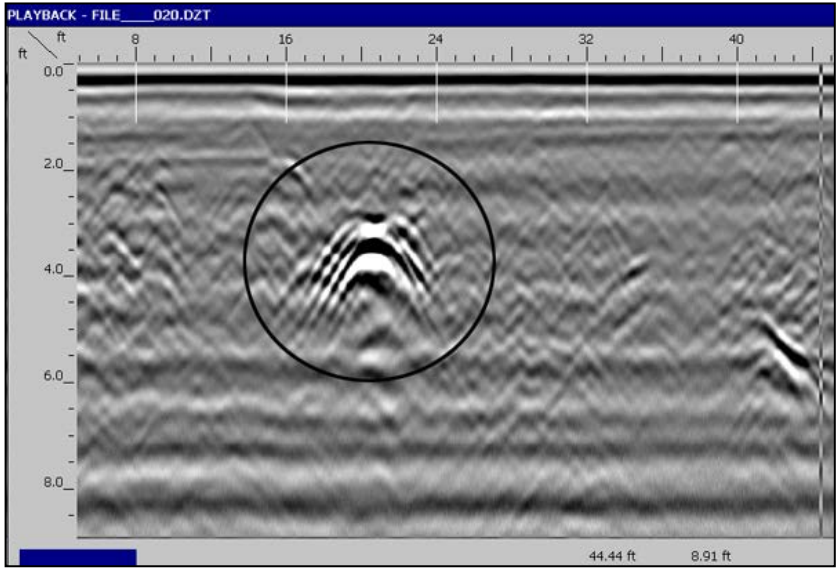
1. Highlight System and press ➤.
2. Highlight Calibrate SW and press ➤.
3. Highlight Calibrate and press ↵.
4. Following the steps EXACTLY on the screen.
5. Select Calibration Distance – Measure a distance on the surface you will be scanning. Enter that distance in Distance using ▲and ▼.
   (10 feet/3 meters is a good distance).
6. Using a reference point on the cart, position the cart at the start point using that reference point on the cart.
7. Press ↵.
8. Push the cart to the end mark, using the SAME reference point of the cart.
9. Press ↵.
10. Note the “New” number. If this was the first run repeat steps 6 - 9. If this was NOT the first run, go to step 11.
11. If the “New” number is within 2.0 of the original “New” number recorded in step 10, then press ➤.
    If not, re-do steps 4 – 10 as a “first run”.

Appendix E: Examples of Some Common Objects

These examples are presented for informational use only. The images that you see on your own site conditions may vary. Data were collected at 18 scans/ft.

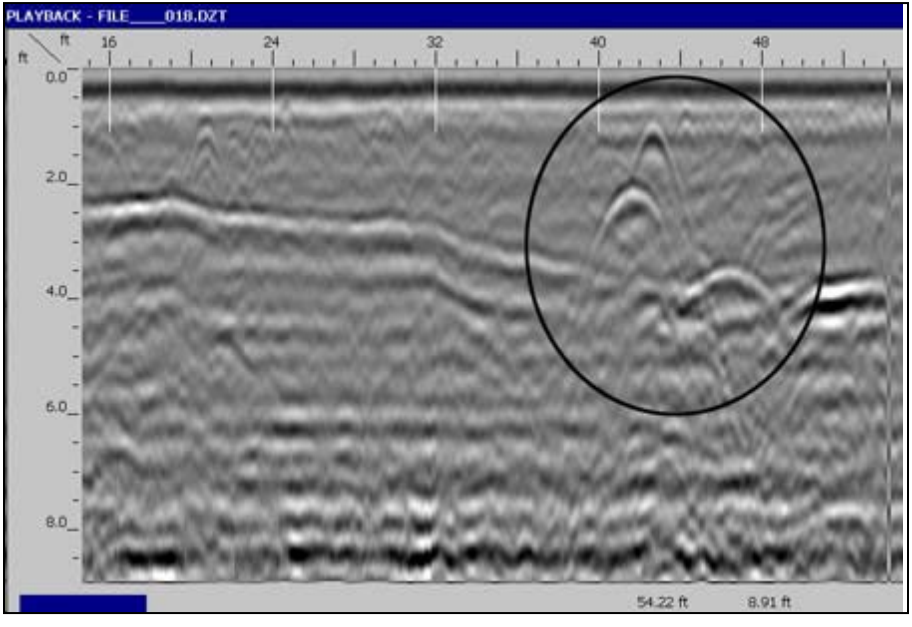
Example 1

This piece of data shows a bank of conduits feeding into an industrial building. Note the dipping edge of a trench cut to the upper left of the conduits.



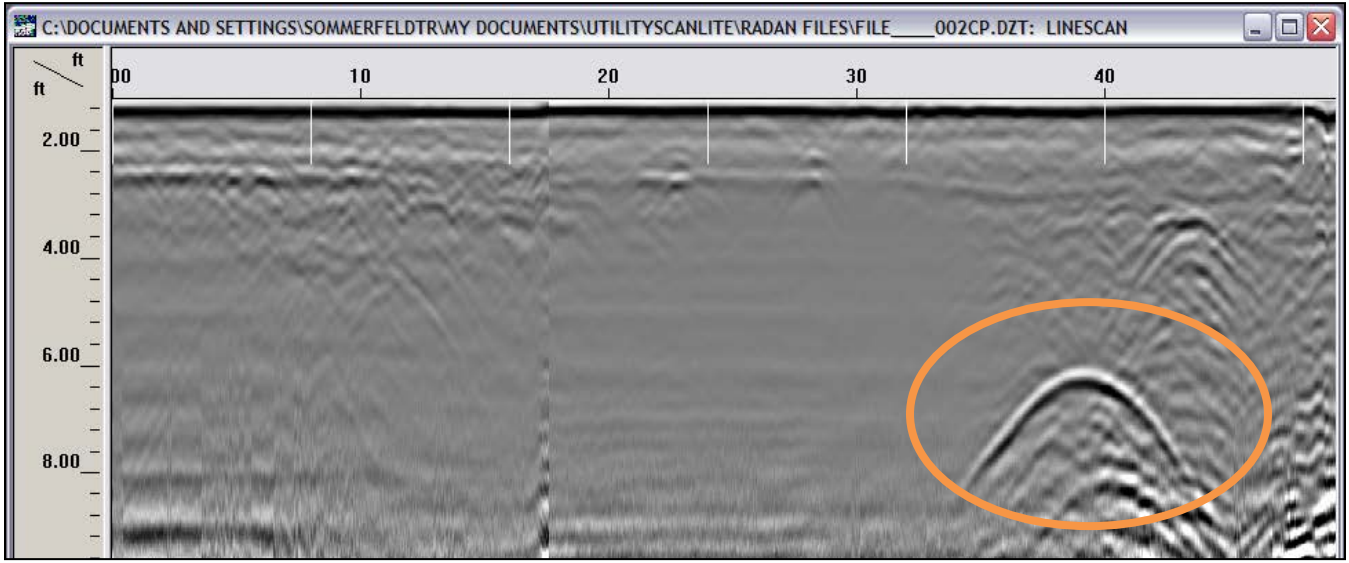
Example 2

This image shows three drain lines. The one in the middle (depth-wise) is an 8” PVC pipe (empty).



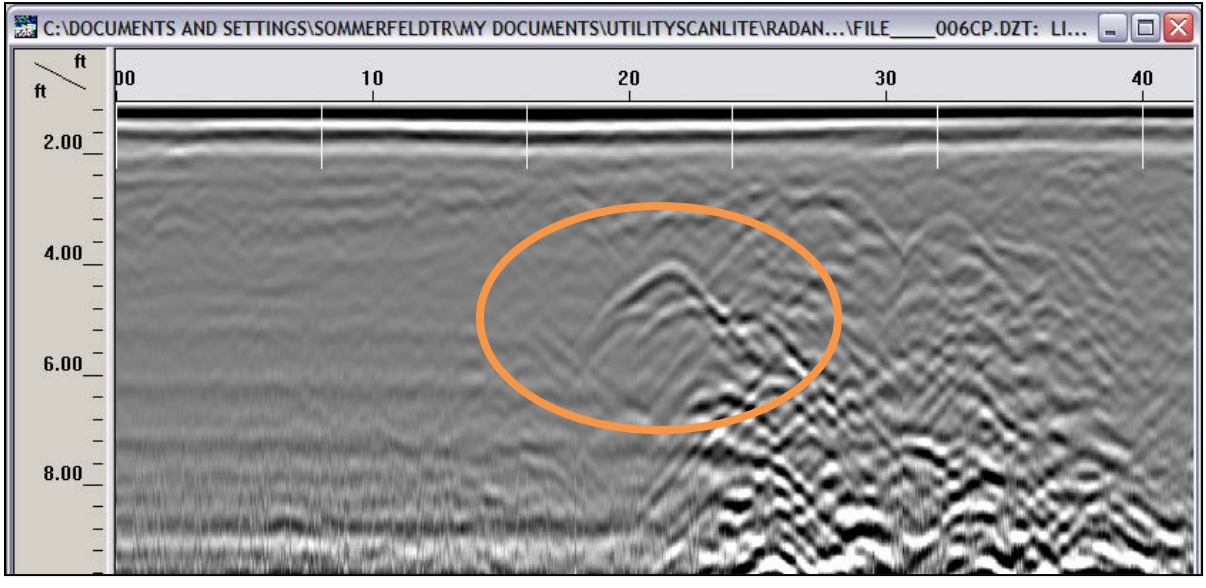
Example 3

This image shows data collected across a road, looking for a water main.



Example 4

This image shows data collected along a driveway next to a business. This shows a concrete culvert.

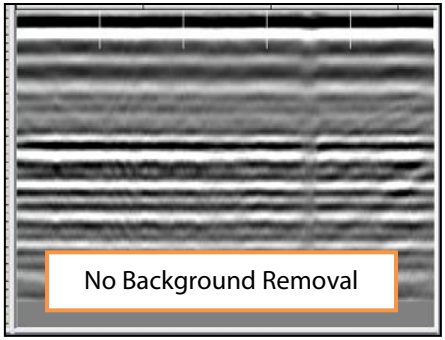


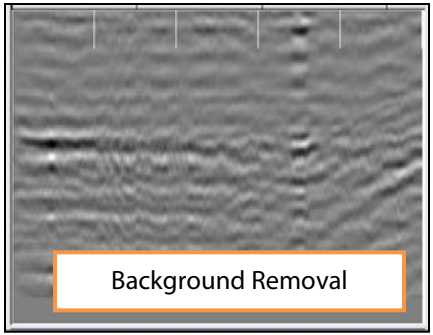
Appendix F: Glossary of Terms

Dielectric: A value assigned to materials and is used to calculate the velocity of RADAR in that material. RADAR will travel at different speeds depending upon the material and/or soil condition. RADAR travels fastest in air (dielectric = 1) and slowest in water (dielectric = 81). Everything else falls somewhere in between. It is important to know the dielectric value of a material so that the depth of a target can be calculated. Since determining dielectric is a best guess estimate, the depth of a target will never be an exact measurement. As a safety feature, you will always give about a 1 foot (or about 1/3 meter) margin of error when estimating the depth of a target.

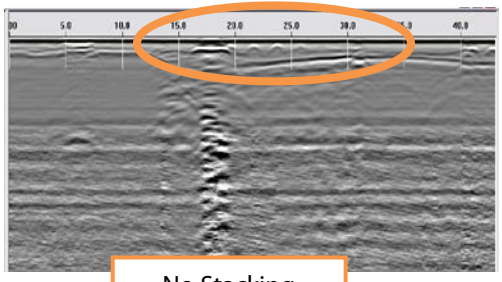
Filter: A process to remove unwanted noise in the data so that targets can be seen more clearly. Filtering is a trial and error process, therefore trial runs are necessary using different filtering values to determine the best configuration for a job site. There are two types of filtering:

Background Removal: This filter will remove unwanted noise that looks like horizontal banding across your data. Using this process, this will remove data that is consistent throughout your data.

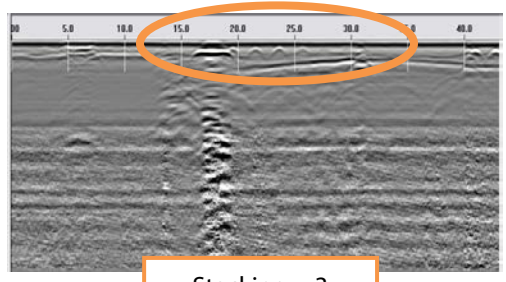




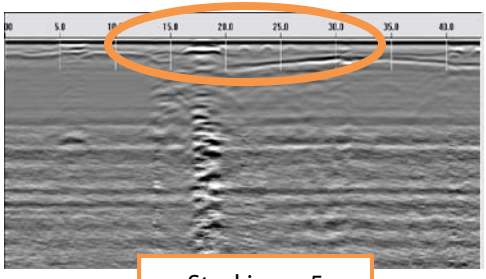
Stacking: This filter will remove unwanted noise that looks like fuzziness in your data. By selecting a value of 3, 5, 9, or 15, the process with take each scan and replace that scan with the average values of the surrounding scans. Be aware that too much stacking can filter out real targets. In this example, stacking of 3 is the best result. Targets at the top begin to disappear with higher scans to average.



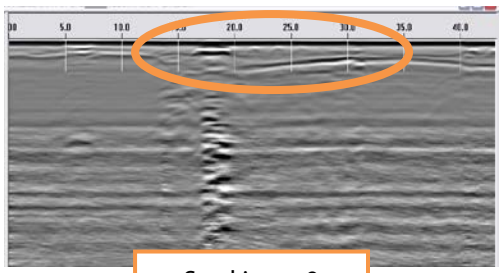
No Stacking



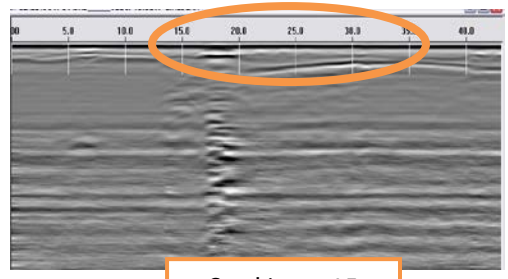
Stacking = 3



Stacking = 5

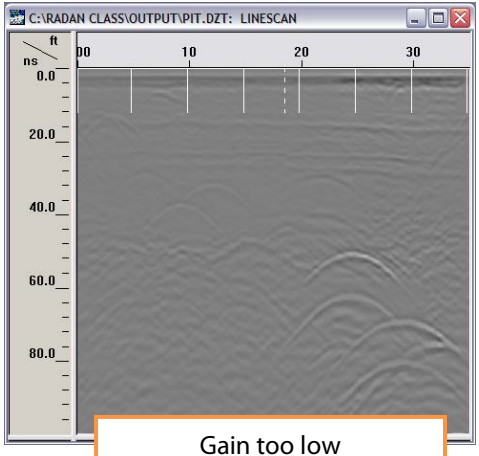


Stacking = 9

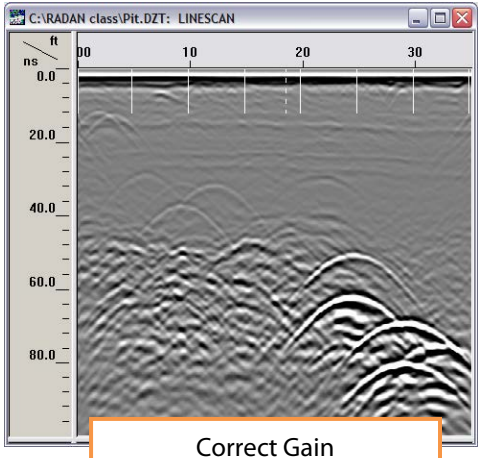


Stacking = 15

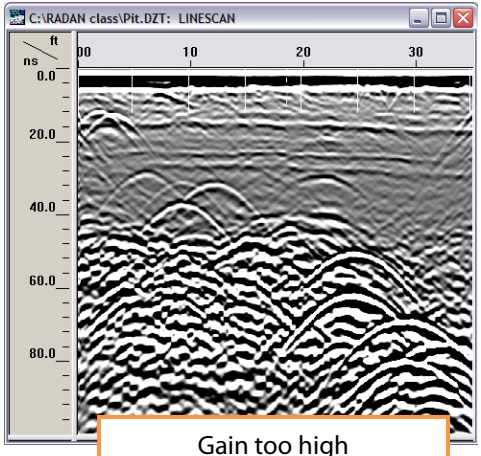
Gain: Adding or subtracting Gain from data will amplify or lower the image of the RADAR signals. It is advised that you use the lowest gain that will show targets.



Gain too low



Correct Gain



Gain too high