UtilityScan®

Quick Start Guide

A Fast Check List For Field Operation

MN72-448 Rev H

Section 1: Startup System

1   Assemble cart as shown in your cart assembly instructions.

2   Attach the SIR® 3000 to the brackets on the cart, connect the antenna control cable, and insert a battery. Push the green power button to turn the system on.

3   After the system boots-up, push the Mark button (horizontal line with down arrow above it) to change units between English and Metric. The units displayed in bold are the ones currently selected. Then push the UtilityScan function key to enter the UtilityScan mode.

There are two basic modes in the UtilityScan software: Collect and Playback. Sections 2 and 3 deal with collecting data and viewing it in real time. Section 4 deals with playing back already saved data and doing some in field data processing on the system.

Section 2: Data Collection Setup

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.
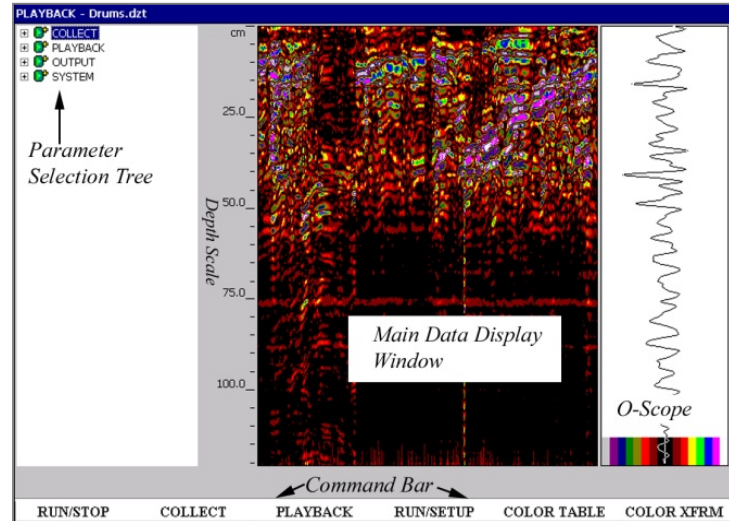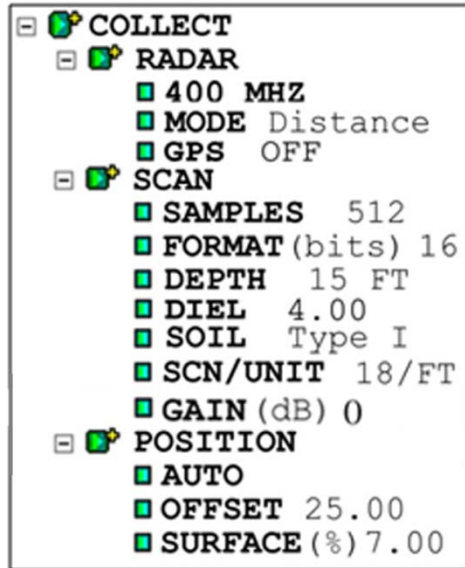
1 Press the Down arrow once to activate the menu tree and highlight the Collect menu,
then press Right to open that menu.

2 **Select Antenna:** Go to System>Setup>Recall and click the Enter button. Choose the appropriate antenna and cart
combination from the list and click the Right Arrow to enter and accept. This will cause the antenna to re-initialize.
You will see the blue bar at the lower left scroll twice and data will begin to move across the screen.

3 **Calibrate Survey Wheel:** Select **Mode** and click Enter. Toggle up to Time and click Enter. Toggle down to
Distance and click Enter again. This will bring up a survey wheel calibration box.

- Lay out a measured distance on the survey surface and position the cart at the beginning of that distance.

- Using the Up/Down arrows, enter in the distance that you have laid out on the ground and then click Enter.

- Move the UtilityScan to the end of that distance and then click Enter. The UtilityScan will then divide the total
number of measurement "ticks" by the distance and display that number in the New window. There is no right
answer to this; it depends on your equipment and survey surface. Repeat this a few times to make sure that it is
repeatable within 10-20 ticks per unit. Once satisfied, click the Right arrow.

  If you are using a GPS, see Chapter 7 of the SIR 3000 User Manual for additional setup instructions.

4 **Set Depth:** Under the Scan submenu, highlight Depth and press Enter. Choose your maximum depth of interest from
the list. Always choose a depth that is deeper than the targets you are trying to image.
Click Right to enter and accept.

5 **Set Soil Type:** This parameter is important for an accurate depth calculation. After making your choice, click Right to enter and accept.

Type 1	Type 2	Type 3	Type 4
• Sand (dry) • Gravel • Granite • Frozen Soil • Sandstone • Dry Grade	• Silt (moist) • Clay (dry) • Limestone • Loamy soil (average residential)	• Average forested land • Rich agricultural • Sand/clay (dry) • Saturated Grade • Shale	• Saturated Sand • Saturated Clay
Dielectric = 4	Dielectric = 8	Dielectric = 16	Dielectric = 32

6 **Set Scn/Unit:** This sets the resolution along your survey line. Possible choices are: 6, 12, 18, or 24 scans per foot. If you are working in Metric, then your choices are 10, 25, or 50 scans per meter. Unless you are looking for unusually large targets, such as 36" sewer pipe, set this to 18 scans/foot (50 scans/foot).

Helpful Hint: If you believe the gains are set too low and the contrast of the linescan is too low to see targets, press Run/Stop to pause the setup, then press it again. This will cause the system to re-initialize the gains and may help visibility. This will typically need to be done if the surface of your survey area changes. For example, if you are scanning a paved area and then move onto a grassy field, then the gains will likely need readjustment. You could also increase the display gain by increasing the "Gain" selection in the Scan menu.

Section 3: Collecting Data

1 **Start Collection:** Click Run/Setup to begin collecting a data file. The data file's name will appear in the top left corner of the screen. Data only gets collected when you move the cart forward.

2 **Locating Targets:** After you see a hyperbola 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.

- The center of the antenna is directly under the connector panel. After marking the location on the ground, push the cart straight forward. No data will be collected until you have passed the spot where you started to reverse.

3 **Calibrating Depth:** (Optional) Match the target location in the data to its location in your survey area. Dig down to that target and measure the depth. Click Run/Stop to bring up the crosshairs and set them over the target in the data. Click Depth to bring up the depth input window and enter in the measured depth. Click the Right arrow. The vertical scale will adjust and the dielectric will be updated. Please note that this is only an approximation of the true depth because dielectrics can change with depth and across the site.
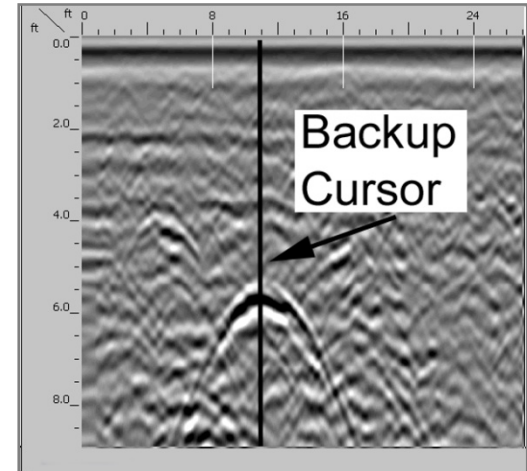
4   **Go to Next File:** When you have finished calibrating, click Next File to collect more data or Run/Setup to return to the Setup screen.

Helpful Hint: Make a sketch map of your survey area with immovable objects (trees, hydrants, etc.) as reference points. Sketch in your survey files, note the start and stop points, direction of travel, and file name on the map. This will make it much easier to relocate your targets after the survey.

Helpful Hint: The top of a target is generally the middle of the first positive peak for metal utilities (pipes, cable in PVC). If you are working in a grayscale color table, the positives are white. If the utility is air or gas filled (empty PVC, concrete sewers) the top of the target is the middle of the first negative peak (black).

Helpful Hint: If you do not see any data on the screen after you push Run/Setup and move the cart forward, pull the cart backward. If you see data scrolling on the screen now, it means that you have a wrong sign (positive/negative) for the survey wheel calibration. Either reload the appropriate setup for your cart model under System>Setup>Recall or perform a survey wheel calibration (recommended).

Section 4: Data Playback and Review

The Playback menu provides several tools to help you clean up and interpret your data. None of these functions are required to get interpretable data. They are simply meant to help you in 'cleaning up' difficult data. These functions do not permanently change your data, or affect your saved data in any way. More intensive processing can be done in RADAN.

Under the Scan submenu, you can change Soil type and Surface(%) if necessary. Changing the soil type will change the dielectric and change your depth calculation.

1 Recall Data: From the Collect Setup screen, click Playback Mode to bring up the list of saved files. Highlight the profile and click Enter to put a 'check' in the box next to it. Click Right to load the file.

2 Review Data: Click Run/Setup. The data will scroll until the file ends and then crosshairs will appear. These can be moved with the Arrow keys to get the coordinates of any target. Also check to see if you can easily interpret your data or if it needs any processing.

3 Background Removal: Apply this filter to check whether targets near the surface are being hidden by the direct coupling, or if you have strong horizontal banding (ringing) that you believe is making it difficult to see targets. The input here is in scans.
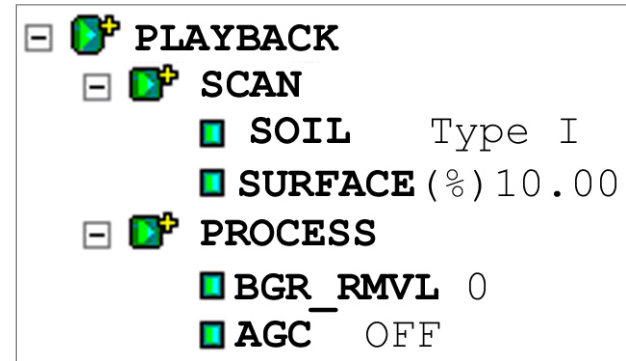
4 Find the length of the band that you want to remove in feet, then multiply that number by the SCAN/UNIT that you collected the data at. If you want to remove the surface reflection, then set this at 1024.

5 **Automatic Gain Control (AGC):** Set this to 5. This is the number of points along your vertical scan where the system is automatically adding gain to try to make targets more visible.

6 **Collect More Data:** To return to data collection mode, click the Collect Mode button.

Horizontal Banding
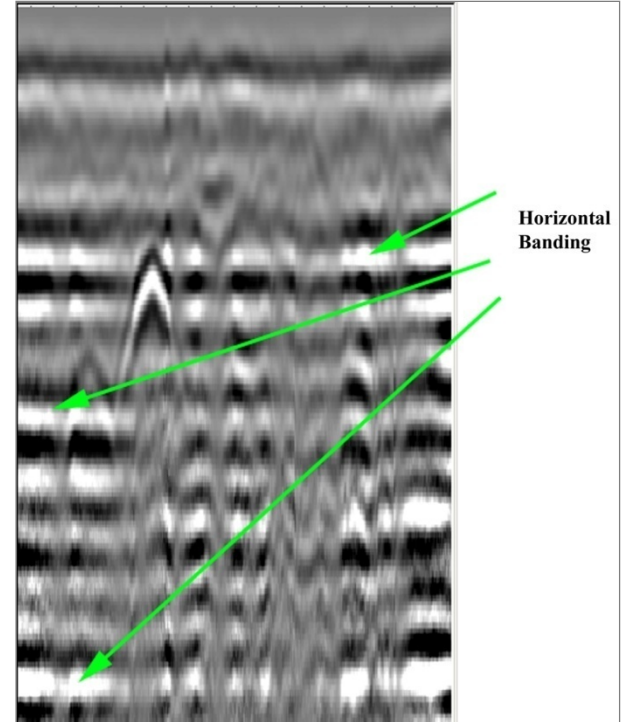
# Section 5: Saving an Image for the Client

Version GUI 2.0.1.0 and higher of the SIR 3000 operating system includes a feature called Save Image. Save Image allows you to save a screenshot of the data being viewed in Playback and save that image automatically to the SIR 3000 memory as a Windows Bitmap (.BMP) file. A bitmap file is a "picture" file that you can email to the client or print off. You do not need RADAN to see a bitmap file and any PC or Mac computer can view a bitmap. You should first check to see if you have the right software on your SIR 3000.

1   Reset the SIR 3000 so that the SIR 3000 screen comes up.

2   Click on the TerraSIRch mode.

3   Go to System>Version>Show and click Enter.

4   Check that the GUI is 2.0.1.0 (or higher). If not, visit http://support.geophysical.com and download the
        SIR 3000 update. You can also contact GSSI at 1-800-524-3011 or (603)893-1109 (International callers), Monday-
        Friday from 8 am to 5 pm for assistance. Be sure to have access to the internet and have your
        SIR 3000 and a USB cable ready.

To Use the Save Image Feature:

1   **Save the Data:** Save Image only works in Playback, so you must save the data file.

2   **Go to Playback Mode:** From the Setup screen (3 Windows) click on Playback Mode and select the data file that you
        want to see by highlighting it, clicking Enter, and then the Right arrow. The file will load and you will see it flashing
        on the screen. Click on Run/Setup to go to the Run screen (1 Window).

3 **Click Save Image:** In between Run/Stop and Playback Mode, you will see the Save Image button. The SIR 3000 will only save the image that is on the screen. This means that for longer data files, you must scroll left or right to get the portion that you want to see. Click on Save Image when ready. You will see a blue wait bar flash at the bottom left as the SIR 3000 save the image. It is now stored as the file name with a letter designator. For example, an image from FILE___036.DZT will be saved as FILE___036A.BMP.

4 **Transfer the File:** Transfer the data file (DZT) file to your computer following the steps in the next section. The BMP will transfer automatically. There is no way to transfer the image without transferring the data.
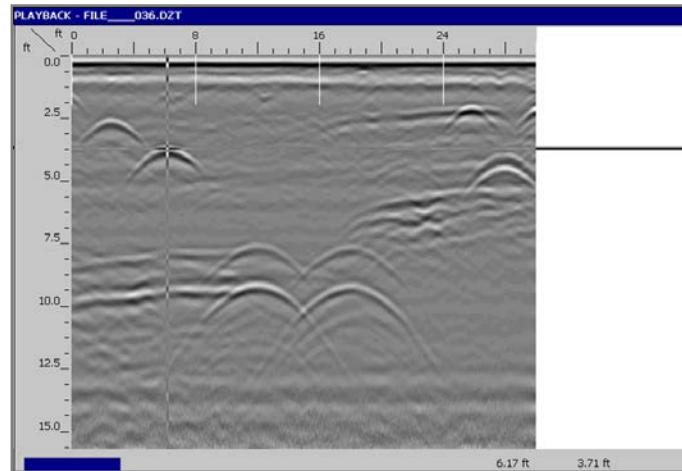

Save Image Output: FILE___036A.BMP

Section 6: Data Transfer to a PC

The data that you collect with UtilityScan can easily be transferred to a PC for either intensive processing in RADAN, or permanent storage on a CD. Follow the steps below.

Please Note: If you left the memory card inserted in the SIR 3000 and then turned on the system and collected data, the data were automatically stored to the removable card, so there is no need to transfer.

1 **Turn on the SIR 3000:** Connect a battery or AC power and push the green power button to turn on the system. Select UtilityScan. You do not need to have an antenna connected.

2 **Plug in Memory Card:** Remove the black plastic cover above the antenna connector and find the slot for the Compact Flash memory card. Insert the card into the slot and push gently until the square plastic button next to the slot pops up. There is only one right way for it to go in, so do not force it. You can also use a USB jump drive.

3 **Open Transfer submenu:** In the Output menu, highlight Transfer and click Right. Highlight Flash and click Enter. You will see a box that says "Select Files to Copy," and it will show the file name, size in KB, and date it was collected.

4 **Select Files and Transfer:** Highlight each file you want to transfer and press Enter to put a check in the box next to the file name. Press Right to transfer files. This moves each file from the internal memory to the memory card.
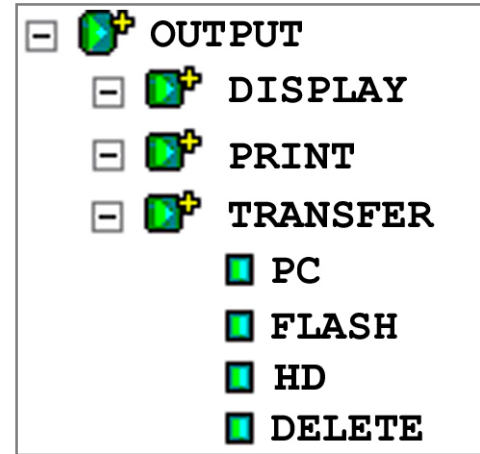
5 **Eject Memory Card and Plug into PC:** Gently push the black plastic button next to the card slot. The card will pop out slightly. Plug a USB card reader into your PC. These are available at very low cost from any computer store. Your PC will automatically find it. It will show up as "Removable Disk." Insert the card into the reader. Click the "My Computer" icon and then "Removable Disk."

6 **Copy Data to PC:** You will see a folder on the memory card called COMMON.PRJ. This is where your data is. Double click that folder to open it, and "drag and drop" your data to a folder on your PC.

Helpful Hint: After you have transferred your data, delete the data off of your memory card from your PC. This is much easier and faster than deleting data through the SIR 3000.

Helpful Hint: Create different folders on your computer to hold data from different jobs. This will help you keep things organized.

Helpful Hint: You can also use a USB memory "stick." These devices plug into the USB master port on the back of your SIR 3000 and can be used as a data taxi just like Flash cards. They are more durable than Flash cards, but you cannot collect data directly to them. You must first collect to the internal Flash card and then plug in one of those devices to transfer data to them. You will use the HD choice under the Transfer menu for these devices.
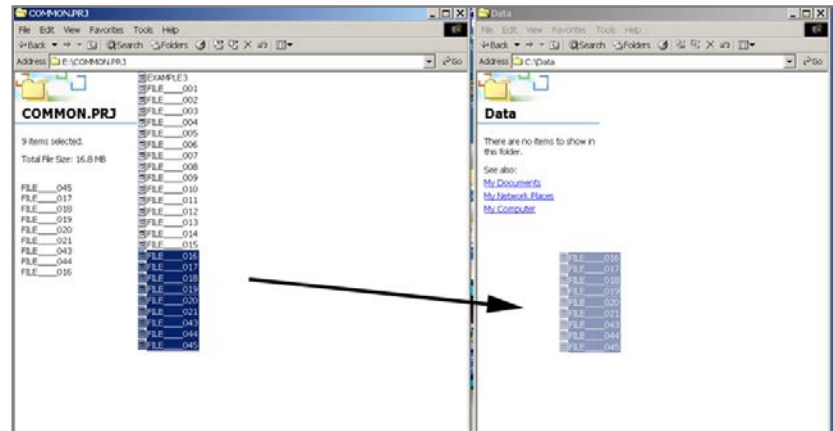
Appendix A: Survey Wheel Calibration

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   Under the Radar submenu of the Collect menu, highlight Mode and press Enter.

2   Highlight Time and press Right.
      Then highlight Mode again and press Enter.

3   Highlight Distance and press Right. A dialogue window will come up.

4   Measure a distance on the surface you will be surveying.
      Put that number in under Distance.

5   Push Enter and move the antenna along that distance.
      The start and finish line must be on the same spot on the antenna.
      When you get to the end, click Right.
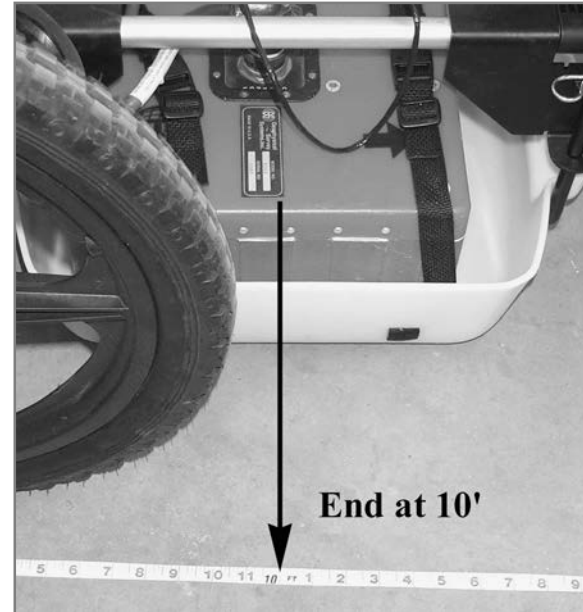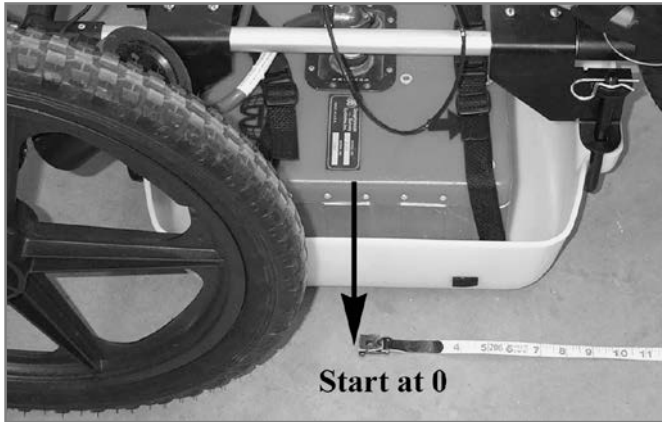
Correct Start/Finish positioning of antenna during survey wheel calibration.

Appendix B: Dielectrics of Common Materials

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 C: 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. All images are of raw data copied from the SIR 3000 using the Save Image feature.
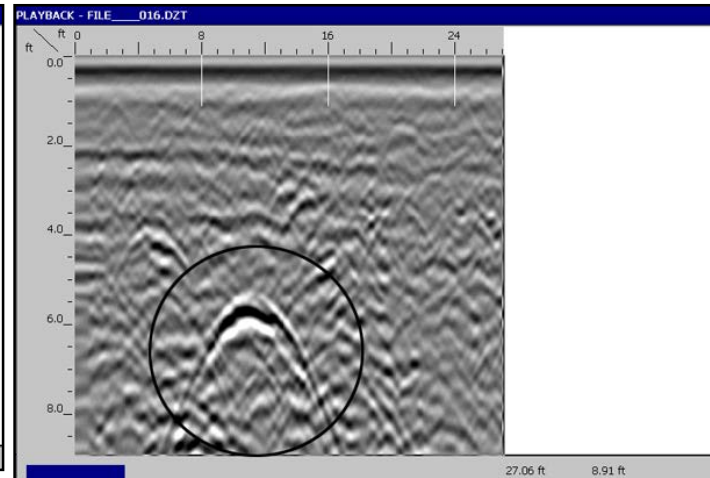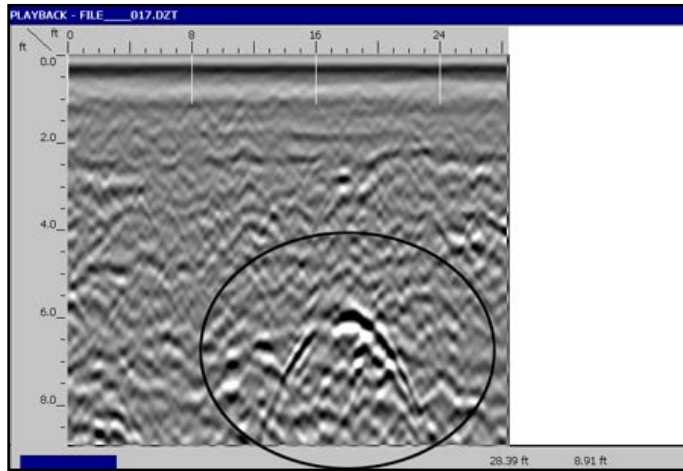
Example 1:

This piece of data shows a bank of conduits feeding a light industrial building. Note the dipping edge of a trench cut to the upper left of the conduits.
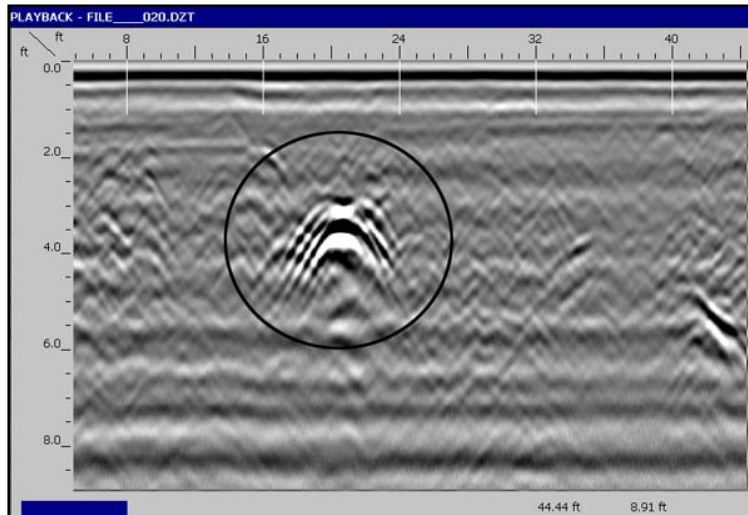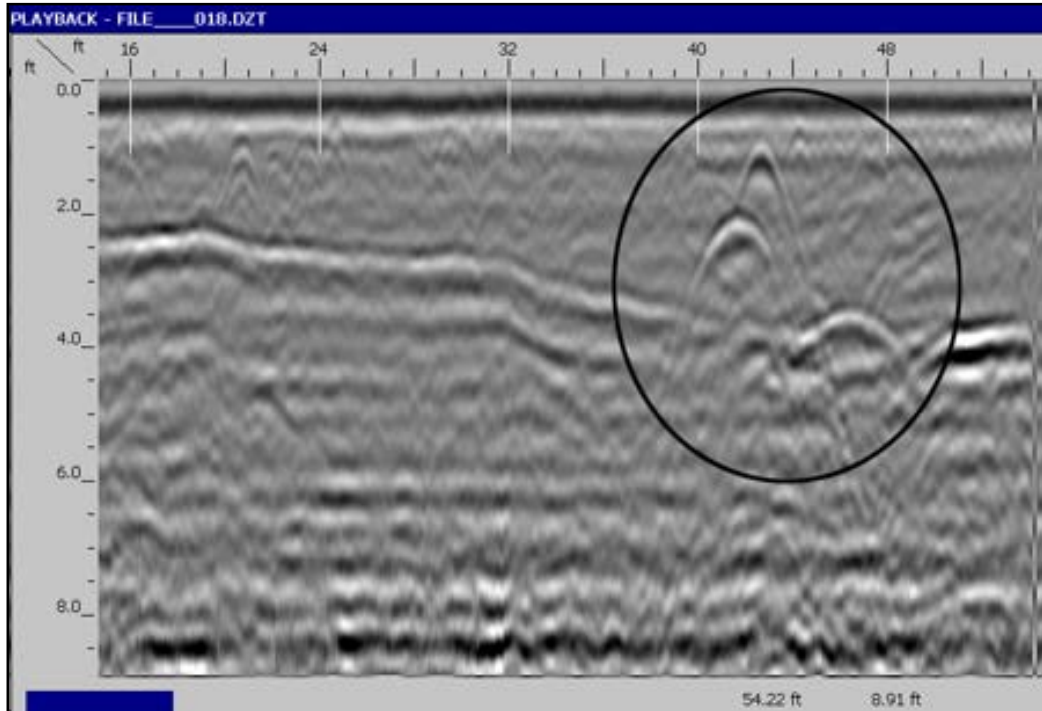
Example 2:

These files show a 24" concrete storm sewer pipe. They are of the same pipe, but were taken 10 feet apart. Note the broken up and inconsistent appearance of the hyperbolas. This is because although the concrete wall of the pipe is transparent to GPR, there is some wire reinforcing in the pipe.

Example 3:

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

Example 4:

This image shows data collected along a sidewalk. The sidewalk is made of concrete and has wire mesh (6")
reinforcement. Note the very small dots toward the top of the image. Those are from the steel mesh. When possible, try to
avoid scanning through this type of material. Since metal blocks GPR penetration, try to survey to one side of the
sidewalk to avoid scanning through the mesh.
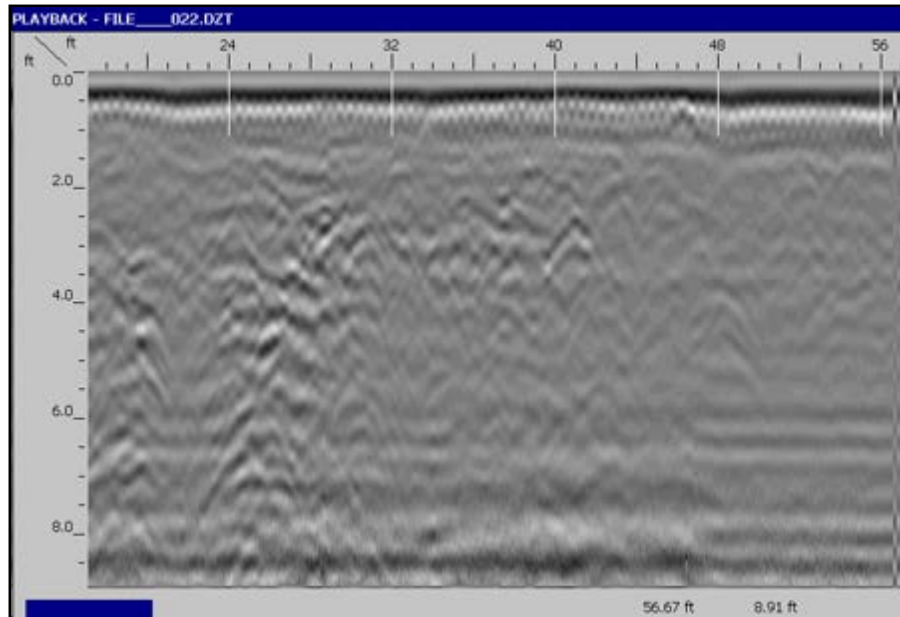
Appendix D: Using the Model 643 Rugged 4-Wheel Cart

Using UtilityScan with the 4-wheeled cart is very similar to using the standard 3-wheeled cart.

Consult your cart manual for assembly instructions and follow all of the previous steps for SIR 3000 software setup.

It is especially important to calibrate the survey wheel because the value will be different for the different carts. Also, be sure to note the correct spot on the antenna capsule when marking out targets.