StructureScan™ Standard

Quick Start Guide

A Fast Check List For Field Operation

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MN72-453 Rev H

Please Note:

Your StructureScan Standard System is equipped with a "deadman switch." The red grip on the minicart handle must be fully depressed at all times in order for your system to function properly.

Because of this feature it is legal to operate this system on all surfaces including walls.

Introduction

This Quick Start guide will help you with the field operation of the two main modes of the StructureScan™ Standard system: ConcreteScan and StructureScan main. This is meant as a supplement for the SIR® 3000 manual that was also included with your system. Be sure to read through both this document and the main manual before starting work.

ConcreteScan: Use with either the 2.6 GHz, 2.0 GHz Palm, 1.5/1.6 GHz, 1 GHz, or 900 MHz antennas.

- ConcreteScan is for a quick linescan into a concrete slab. You will use it to note the location of a rebar, conduit, PT cable, etc., in real time so that you can mark its location on the slab.
- ConcreteScan data is not intended for processing in RADAN™. The first part of this guide will focus on ConcreteScan.

Quick 3D: Use with only the 1.5/1.6 GHz antenna and either a GSSI pad or a user created grid.

- StructureScan will allow you to collect 3D data that can be quickly and easily processed and examined in RADAN.
- StructureScan is best for those times when you either have complicated layouts or dangerous materials in the slab and you need that added confidence of seeing the whole picture before you cut or core. The second part of this guide focuses on StructureScan field operation and the third part deals with processing and imaging.

Note: As per FCC regulations, your StructureScan system incorporates a “deadman” switch that will turn off the transmitter when you are not actively using the equipment. The deadman switch is the red grip on the survey minicart and must be depressed at all times while using the equipment and while starting up the equipment. At no time does the deadman switch need to be in the open position (not held down).

Section 1: Startup System and Hardware Assembly

1 Connect the antenna to the SIR 3000.

- If you are using the 900 MHz antenna, attach the survey wheel assembly to the antenna. Connect the antenna to the system with the control cable.
- If you are using the 2.6 GHz, 1.5/1.6 GHz or 1.0 GHz antenna, velcro the antenna into the minicart. Make sure that the lead from the minicart is connected to the antenna's electronics box. This lead is the short, black cable.
- If you are using the Palm antenna, plug the cable from the Palm directly into the SIR 3000.

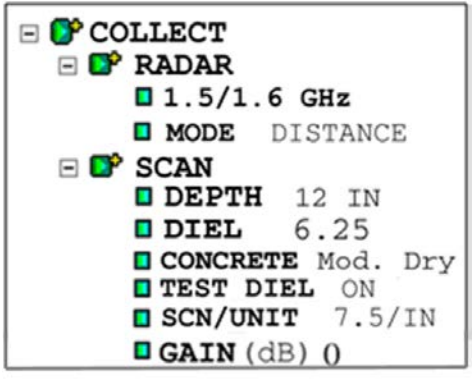
2 Plug the SIR 3000 into external power or insert a battery and push the green power button to turn the system on.

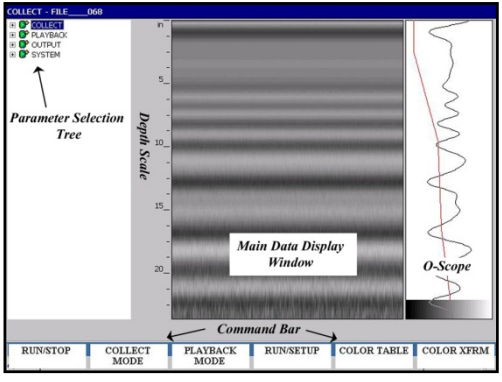
3 After the system boots-up, hold down the deadman switch and then push the ConcreteScan or the StructureScan function key.

Helpful Hint: Detailed hardware setup information can be found in Appendix B: How to Put Your System Together.

Section 2: ConcreteScan Data Collection

After the antenna initializes, the screen will be split into three windows. This is the Setup screen. 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 Enter. Select the proper antenna and cart combination from the pop-up menu and click the Right arrow. 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. *Make sure to hold down the deadman switch.*

3 **Check Collection Mode:** Go to Collect>RADAR and ensure Mode is set to Distance.

- If not, press Enter, select Distance, then press Right to enter and accept.
  This will bring up a survey wheel calibration box.
- **Check that the number is 102.4 for English, and 40.3 for Metric.**
  If not, click the Mark button to highlight the bottom window, then Up/Down to set the appropriate digit.
- If you need to calibrate your survey wheel because you are on unusually rough terrain, see Appendix A. Otherwise, it is fine to leave it on the factory default

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.

- If you are using the 1.5/1.6 GHz, it is usually best to choose 18 inches.
- If you do not think that you need the extra penetration, setting the depth to 6 or 12 inches will allow you to scan faster.
- Click the Right arrow to enter and accept.

5 **Set ConcreteType:** This sets the dielectric constant and is important for an accurate depth calculation. After making your choice, click the Right arrow to enter and accept. If you are unsure, set this to Mod.Dry. If you know your dielectric value from previous work on the concrete, change this to Custom and enter that value under the Diel option.

6 **Set SCN/UNIT:** This is the number of scans per inch (or cm) that you are collecting. Possible choices are 5/7.5/10 per inch and 2/3/4 per cm. It may be easier to resolve closely spaced targets with a higher number of scans per unit. The trade off is that if you set this higher, you will need to move the cart more slowly to prevent over-speeding the system.

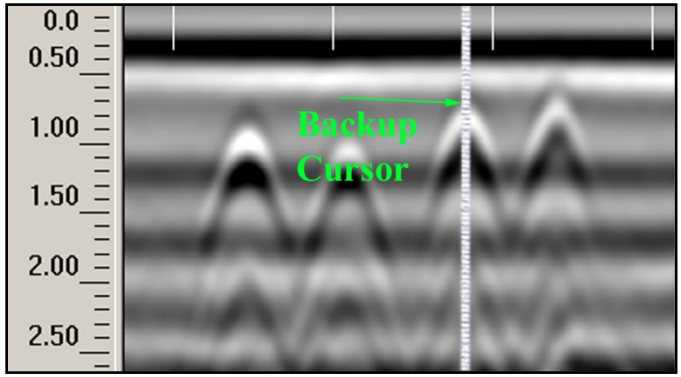
7 **Test Dielectric:** This will allow the user to set a dielectric value for the slab that is to be scanned. Please see Appendix B for steps to do a Test Dielectric.

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. The SIR 3000 will beep twice when it is ready to record the data. Data only gets collected when you move the cart forward.

2 **Locating Targets:** After you see a hyperbola on the screen, pull the antenna 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 in the center of the hyperbola, the center of the antenna is over that target.

- If you look on the side of the antenna (orange box) you will see an indented vertical line. That is the center of the antenna and when you have that backup cursor on top of your target, that is where you should mark.



- 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 **Figuring out the Depth:** To get the most accurate depth calibration, you need to find a target in your data and drill down to that target and measure how deep it is. When you have finished collecting that file, click Run/Stop to halt data collection and bring up the crosshairs. Now drill to get that depth measurement.

- Use the arrow keys to move the crosshairs to the middle of the first positive peak of the hyperbolas from your measured target.
- Click the Depth button to bring up the depth dialog, enter the number and click Right. The vertical scale is updated and the true depth of all of your targets is displayed.
- Click Run/Stop again to save the file. This depth calculation is good for any target in the whole area as long as it is the same material.

Helpful Hint: Make a sketch map of your survey area with immovable objects (columns, electrical boxes, 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.

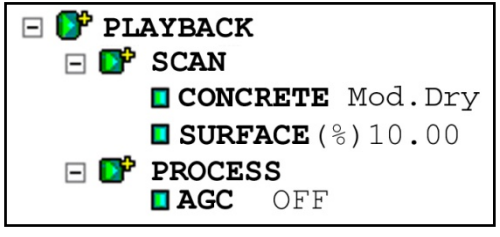
Helpful Hint: The top of a target is the middle of the first positive peak for metal targets (rebar, PT, cable in PVC).

- If you are working in a grayscale color table, the positives are white.
- If the PVC is air or gas filled (empty PVC) the top of the target is the middle of the first negative peak (black).
- The back of a wall or suspended slab will always show a negative (black) peak first.

Section 3: ConcreteScan Data Playback and Review

The Playback menu provides several tools to help you interpret your data on the systems. None of these functions are required to get interpretable data, they are simply meant to help you in visualizing difficult data. These functions do not permanently change your data, or affect your saved data in any way. All of these changes must be done in Playback Setup (3 windows). More intensive processing can be done in RADAN.

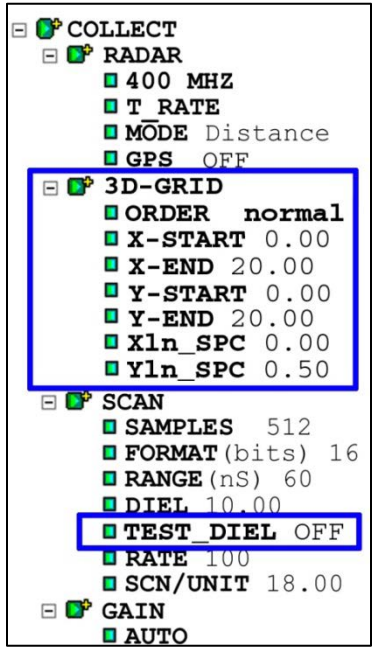
Under the Scan submenu, you can change Concrete type and Surface(%) if necessary. For a detailed discussion of the Surface %, see the SIR 3000 user manual. Changing the concrete type will change the dielectric and change your depth calculation.



1. **Recall Data:** From the Collect Setup (3 windows) 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. **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. If your data is weak-looking deeper down, this may help you to see those deeper targets.
4. **Collect More Data:** To return to data collection mode, click the Collect Mode button.

Helpful Hint: If you had collected data and turned the SIR 3000 off, it will remember the collection parameters you used and default to that setup the next time you turn the system on. You can also save multiple setups and recall them. See the SIR 3000 manual for more details.

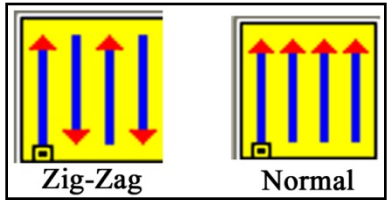
Section 4: Collecting 3D Data using Quick 3D Mode



Pictured at the right is the full Collect Menu tree from the Quick3D mode. The blue boxes enclose the menu choices which are new to the Quick3D.

3D-GRID: This menu controls the grid size, profile line spacing, and survey direction.

ORDER: Normal/Zig-Zag. This controls the survey line direction. Normal profiles are all surveyed in one direction. At the end of each line, you must move the antenna back to the starting baseline before moving to the next line and collect along that same direction. A zig-zag order allows you to collect data in both directions.



X/Y START: These two items tell the system the coordinate of your origin point. Typically these will both be 0. If you are working on a pre-existing site grid and you want your survey grid origin to have that coordinate, you can put it in here.

X/Y END: The SIR 3000 uses this coordinate to figure out the size of your grid. In the menu tree, the numbers for both the X and Y are 20. This means that the X axis and the Y axis both end at 20, and since the origin is at 0,0 the grid is 20×20.

Note: These numbers are coordinates, not line length. So if you have a 20×20 grid and X/Y START is 10×10, then X/Y END is 30×30.

Xln/Yln_SPC: This is the spacing between your survey lines. X lines are parallel to the X axis and Y lines are parallel to the Y axis. The X spacing can be different from the Y spacing, but the spacing must be regular. For example, you cannot start your grid at one interval and change halfway through to another. If you need to change the line spacing, you must start a new grid with the new parameters. If you only want to collect on the X or the Y, set the line spacing of the direction you are not collecting to 0.

TEST_DIEL: This function allows you to test the dielectric of the material you are scanning through by collecting a section of data and then performing a migration on that data. This is important because if your dielectric is correct, then you know what depth you are scanning to. This profile must go over known targets and must cut across those targets at a right angle.

Please see Appendix B for steps on Test Dielectric

Changing Units

Note: It is highly recommended that horizontal units are changed from feet to inches. To do this: System->Units and press enter on Horizontal. Change Feet to Inches and press ➔.

Collecting Data

Push the function key under RUN/SETUP to begin data collection. The system will beep twice to open the Collection Run window (2 display windows). You will see the Linescan window at the right (it will be blank at first), the Position window at the left, and the Prompt Area at the top. Position your antenna so that its center is in the middle of your start line and push the Mark button.

The ‘MARK TO START’ message will turn into a ‘COLLECT DATA’ message. Move the antenna along your survey line. You will see data scrolling across the screen. Once the SIR 3000 has collected enough data (based on your setup parameters), it will stop recoding automatically. Reposition your antenna at the beginning of the next line and continue by following the instructions shown in the Prompt Area.

Once you have completed the last line, press the Playback Mode button to display the grid on the screen.

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. 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.

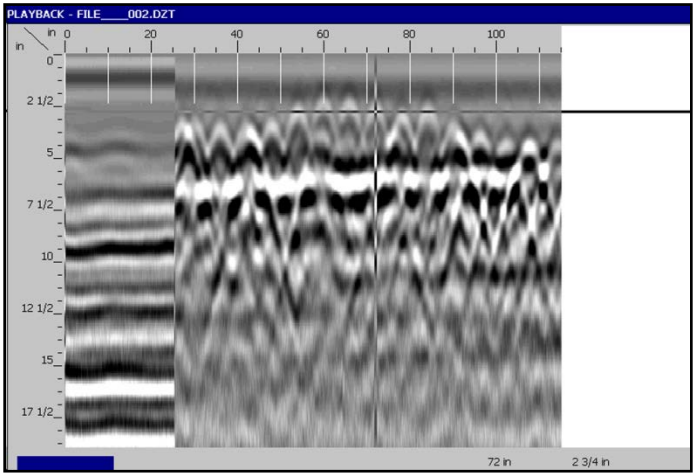
1. Reset the unit to the SIR 3000 screen.
2. Click on the TerraSIRch mode.
3. Go to System>Version>Show and click Enter.
4. Check that the GUI is 2.0.1.0 (or higher). If not, visit http://support.geophysical.com and download the SIR 3000 update. You can also contact GSSI at 1-800-524-3011 or (603)893-1109 (International callers), Monday-Friday from 8 am 5 pm for assistance. Be sure to have access to the internet and have your SIR 3000 and a USB cable ready.

To Use:

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).

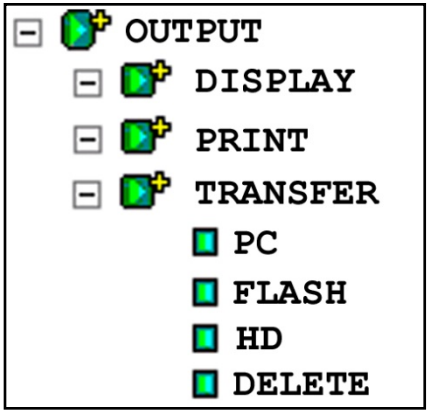
3 **Click Save Image:** In between Run/Stop and Playback Mode, you will see the Save Image button. The SIR 3000 will only save the image that is on the screen. This means that for longer data files, you must scroll left or right to get the portion that you want to see. Click on Save Image when ready. You will see a blue wait bar flash at the bottom left as the SIR 3000 saves the image. It is now stored as the file name with a letter designator. For example, an image from FILE___002.DZT will be saved as FILE___002A.BMP.

4 **Transfer the File:** Transfer the data file (DZT) 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 BMP file output, FILE___002A.BMP

Section 6: Data Transfer to a PC



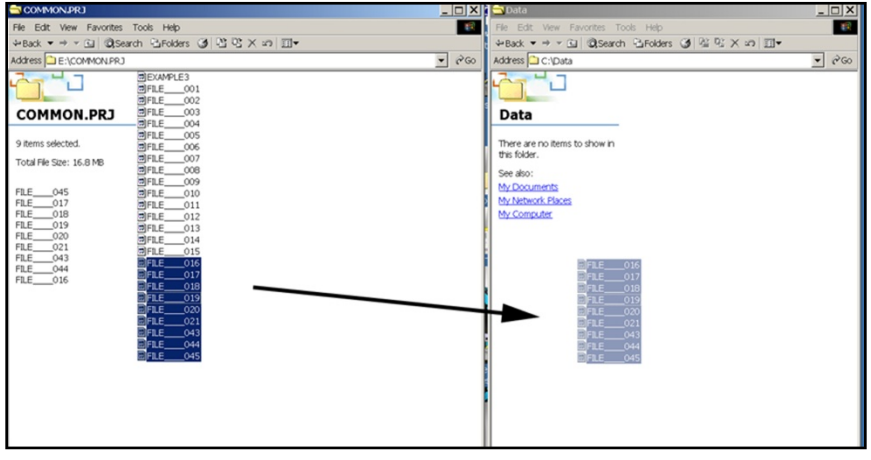
The data that you collect with StructureScan can easily be transferred to a PC for either intensive processing of pad data in RADAN, or permanent storage on a CD. Follow the steps below.

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 either ConcreteScan or StructureScan. 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.
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. If you want to transfer all of the files, highlight Select All Files and click Enter. Then click the Right arrow to transfer.

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 and insert the card into the reader. These readers are available at very low cost from any computer store. Your PC will automatically find it. It will show up as "Removable Disk." 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.

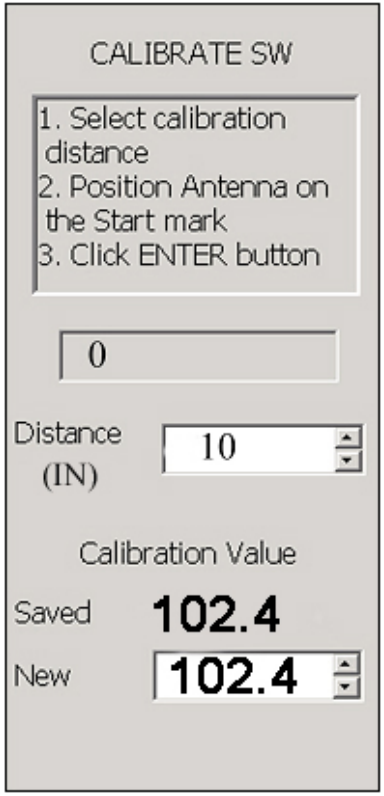
2 Highlight Time and press Enter. Then highlight Mode again and press Enter.

3 Highlight Distance and press Right. A dialogue window will open.

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

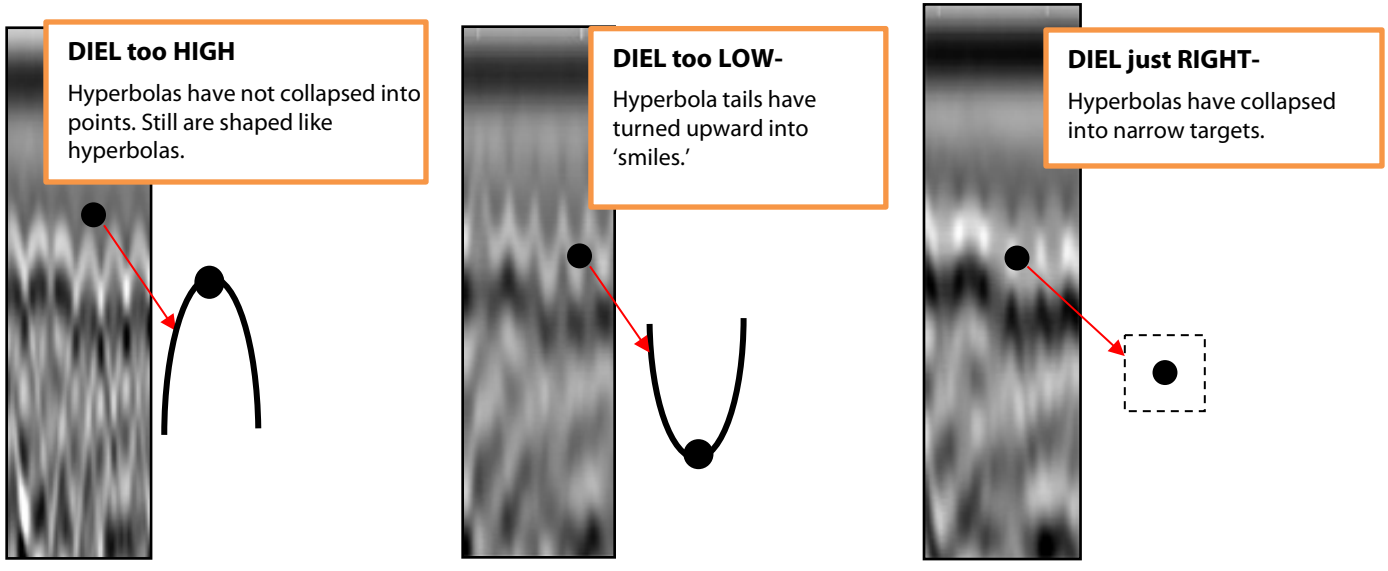
5 Push Enter and move the antenna along that distance. The start and finish line must be on the same spot on the antenna. When you get to the end, click Enter.

The factory calibration number for flat, smooth concrete is 102.4 ticks per inch and 40.3 ticks per centimeter.

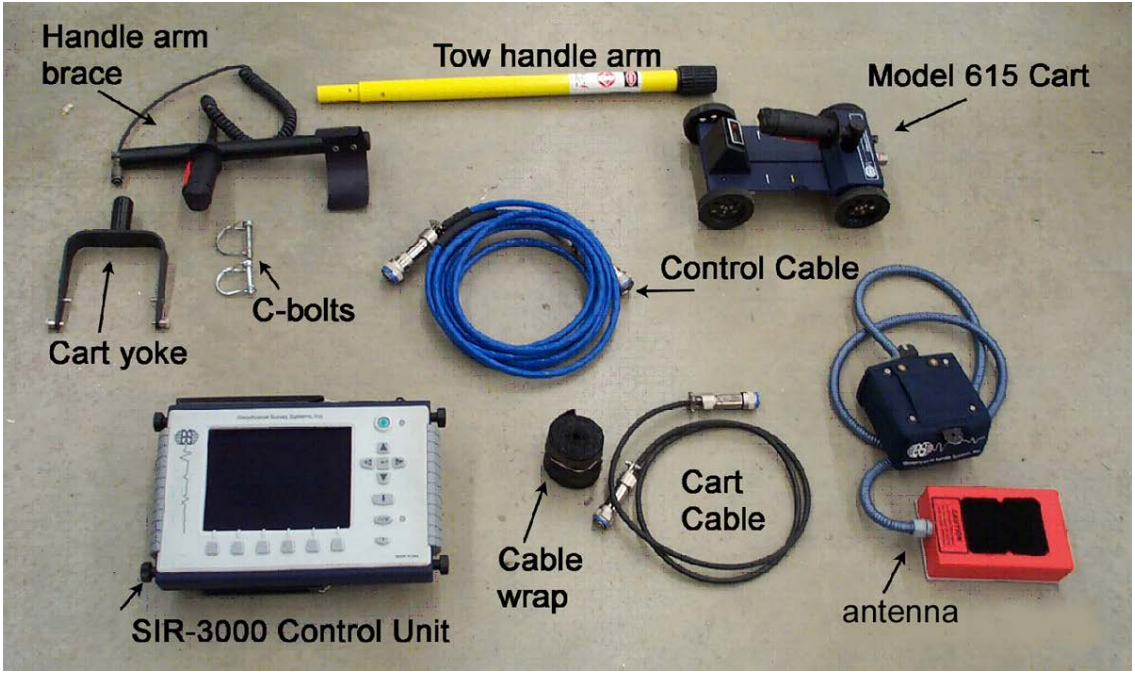


Appendix B: Steps for Test Dielectric

1. Highlight Test-Diel and press ↵ (the middle button)
2. Highlight On and press ➔
3. Collect a profile of at least a foot in length
4. Adjust the dielectric value up or down according to the image you have on your screen (see next page)
5. Once you have the desired result, press the ➔.


DIEL too HIGH
Hyperbolas have not collapsed into points. Still are shaped like hyperbolas.
DIEL too LOW-
Hyperbola tails have turned upward into 'smiles.'
DIEL just RIGHT-
Hyperbolas have collapsed into narrow targets.

Appendix C: How to Put Your System Together



Aside from the parts pictured here, you will also have 2 batteries, a charger and a packet of paper drill sheets.

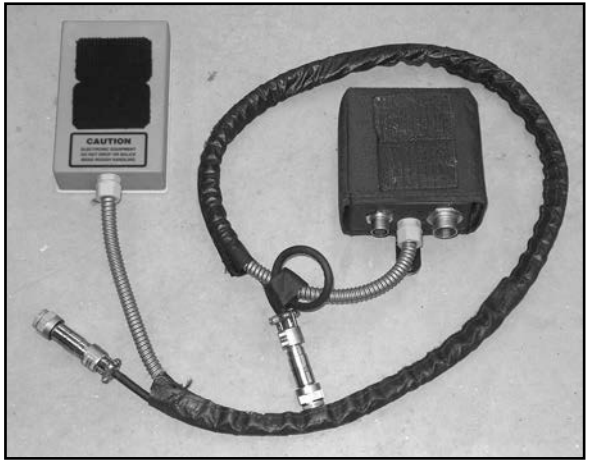
*Do not keep your black pad rolled up. Always keep it laid flat.

Do not attempt to detach the orange box of the 1.5/1.6 GHz antenna from the blue padded electronics box of the antenna. Doing so will void your warranty.

*GSSI recommends purchase of a black rubber 3D scan pad. The GSSI part number is FGDATAGRID. Contact your GSSI Sales Representative for details.

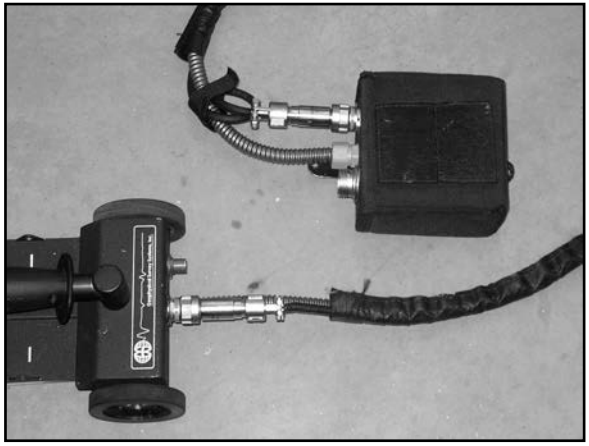
Step 1:

Unroll the Velcro cable wrap and use it to gather the cart cable and the blue cable on the 1.5/1.6 GHz antenna together.



Step 2:

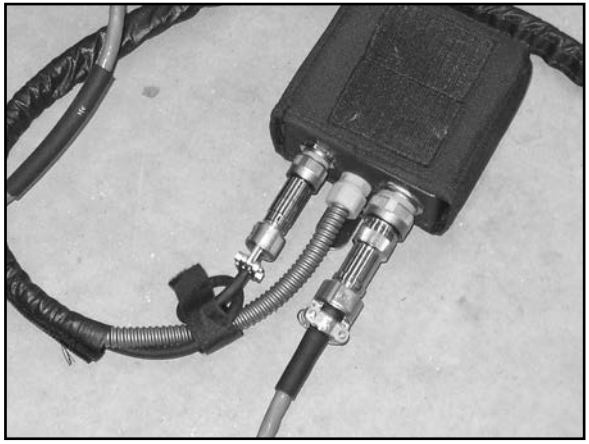
Velcro the orange box of the 1.5/1.6 GHz antenna into the bottom of the minicart. Make sure that the white plate on the orange antenna box is pointing down.



Next connect one end of the cart cable to the back of the minicart, and connect the other end to the blue padded antenna electronics box. Make sure all connections are snugged down.

Step 3:

Connect one end of the Control Cable to the blue padded antenna electronics box and connect the other end to the SIR 3000 control cable connector. Make sure that the red lines on the connectors are completely covered by the control cable collar. Connections should be hand tightened only. Once the antenna is connected, you can power-up the SIR 3000.



Step 4:

Slide the cart yoke into the tow handle arm and secure with a C-bolt. Then attach the handle arm brace to the tow handle arm and secure with a C-bolt. Connect the marker switch lead from the handle arm brace to the connector at the back of the minicart and connect the cart yoke to the minicart. The antenna electronics box connects to the back of the handle arm brace.

StructureScan™ Standard Data Processing

Basic Processing with RADAN™ 7 StructureScan Processing Software

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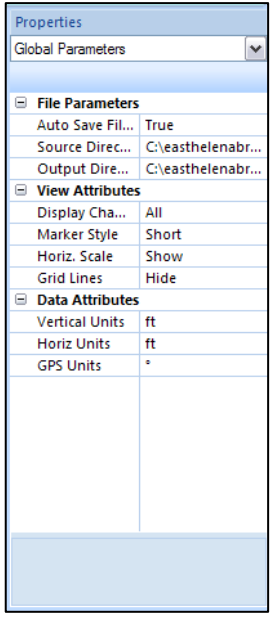
Section 7: Data Processing Setup



StructureScan Data Processing Buttons

1 Open RADAN. In the Properties Pane->Global Parameters

Auto Save File:

- True: Automatically save a processed file (GSSI naming convention) in a folder called "Proc" within the Source folder. See Appendix A in the GSSI's RADAN 7 Manual for the GSSI naming convention.
- False: User is prompted to save a processed file and you name the file.

Source Directory: Select the folder where the source (original data is located).

Output Directory: Select the folder where all processed data will be located. This is displayed ONLY if Auto Save File is set to False.

2 Open data file.

3 Because of StructureScan data collection settings, the display gain will initially be very weak.

To **increase** the display gain to better view data, right- click in data window and increase gain.

Section 8: StructureScan Grid Pad Files for C-Scan (or Depth Slices)

1 Open Grid pad file. The raw data file will appear on the screen. Increase screen gain (contrast).

2 Check data to make sure it has all (26) End Line Marks, and all (26) **Beginning and End** hyperbolas (circled in green in the image at right).

3 Click the StructureScan Tab in the Ribbon Pane.

4 Click the Structure Icon located on the left side of the Ribbon. This will load a GSSI created macro in the Process Bar Pane.

5 Click Apply and it will automatically test three processes:

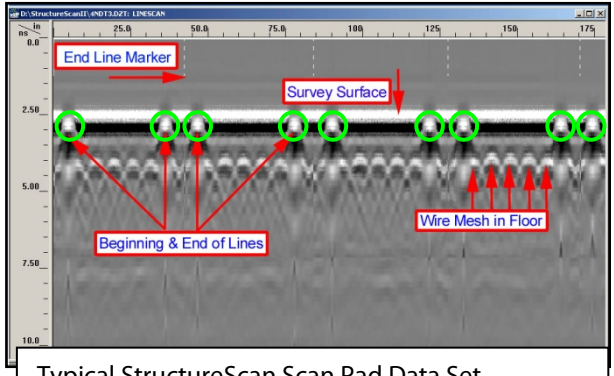
Time Zero Adjustment

Smart Background Removal

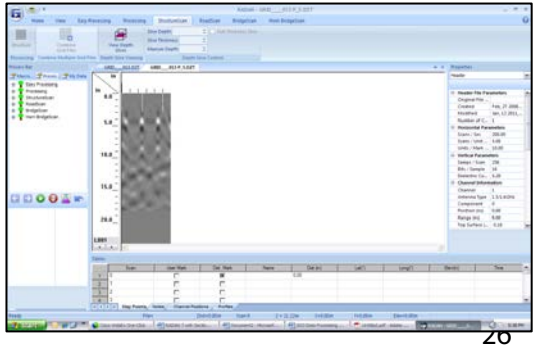
Auto Amplitude Correction (Migration)

6 If necessary, click Reset to make any adjustments to the three processes and click Apply again. Continue this until you have the desired results.

7 Click OK once you have the desired results. (Note the surface is at the top, noise has been removed, and migration was done.



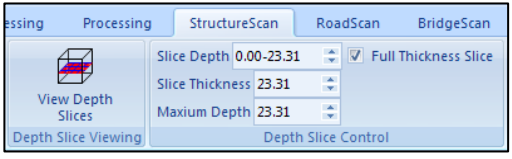
Typical StructureScan Scan Pad Data Set



Depth Slices

If you like, you make View Depth Slices. This view will allow you to view the data from the top and also give you the ability slice through the data.

1 Click the View Depth Slices Icon.



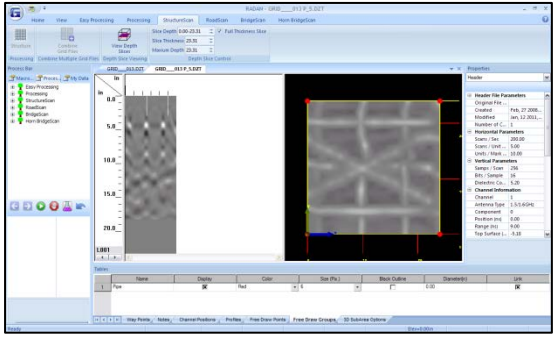
2 This will give you the top-down view of your data. You may make adjustments as follows:

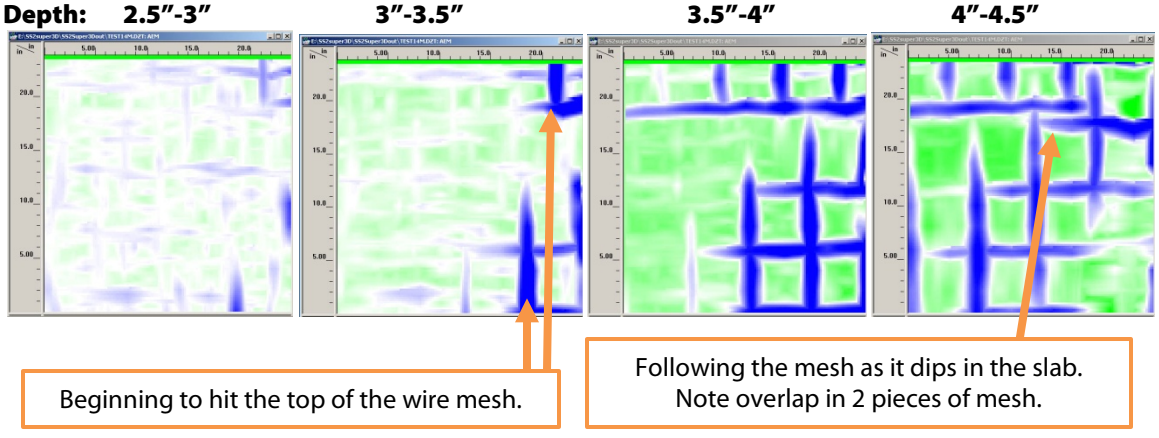
Slice Depth: Slice the Z slice up and down. You will need to uncheck Full Thickness Slice to do this.

Slice Thickness: Adjust the thickness of the slice

Maximum Depth: Adjust the Depth of the data

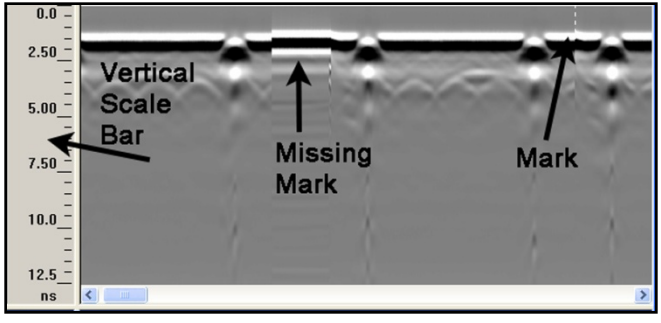
When viewing from the very top of the data, you may have a Full Thickness Slice, or turn it off.

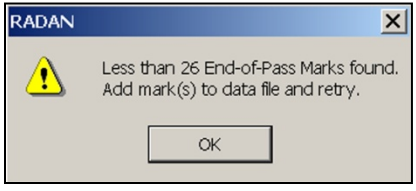



Depth: 2.5″-3″
3″-3.5″
3.5″-4″
4″-4.5″
Beginning to hit the top of the wire mesh.
Following the mesh as it dips in the slab.
Note overlap in 2 pieces of mesh.

Section 9: Editing Marks in StructureScan Grid Pad Files

If you have missed adding end of line marks, or have inserted too many marks, an error message will appear after trying to process data. RADAN will still try to process the data. When the data window has finished scrolling, click Cancel at the Save prompt. You need to edit the markers.



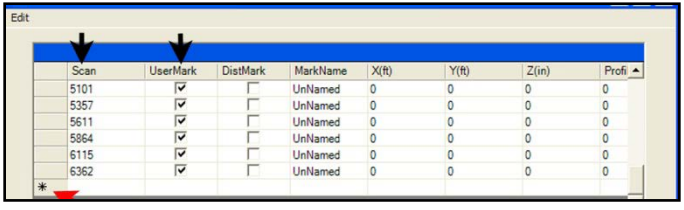


To Add a Mark:

1 Right click on the vertical scale bar and set the Horizontal Scale to Scans. You will need to find the scan number where you want the new mark to go. With that horizontal scale in scans, left click at the location of the missing mark. Anywhere between the two copper wire hyperbolas is fine. You will see the scan number displayed in the Status Bar at the bottom of the screen. Write that number down.

2 Open the edit markers window. To do that you can either go to the Table Pane located at the bottom of the screen. Click on the Way Points Tab.You will see a spreadsheet with many columns. Each row represents a marker. The only important columns are Scan and User mark.

3 Scroll down to the last row on the markers window. The last row will have a black asterisk next to it (red arrow in the image at right). Click on the empty box in the Scan column and type in the number you got in Step 1.



4 Click on the UserMark box until you see a dark black check in a pure white box. It will look like the other ones about it. If you see a gray check in the DistMark box, you can ignore it.

5 Click Apply until you see the mark appear in the data window. You may need to click several times. Once the mark appears, you can close the window.

To Delete a Mark:

1. Right click on the vertical scale bar and set the Horizontal Scale to Scans. You will need to find the scan number of the mark you want to delete. With that horizontal scale in scans, left click at the location of the extra mark. You will see the scan number displayed in the Status Bar at the bottom of the screen. Write that number down.
2. Open the edit markers window. To do that go to the Tables Pane located at the bottom of the screen, click on the Way Points Tab. You will see a spreadsheet with many columns. Each row represents a marker. The only important columns are Scan and User mark.
3. Scroll down until you find that marker that matches the scan number that you wrote down in Step 1. Once you find it, left-click on the empty gray box to the left of the scan number. The whole row will become highlighted. Click on the Scroll to Scan button and the data window will advance to show you the mark that you've highlighted.
4. Click on the Edit menu at the top-left of the edit markers window. The choice that will drop down will be Delete. Click on Delete. Click on Apply until the mark disappears. You may need to click several times.

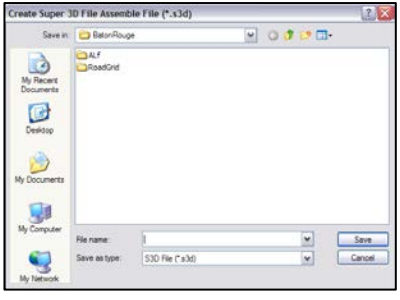
Section 10: StructureScan Super 3D

Multiple 2’ x 2’ grid pads can be combined into one large Depth Slice file.

- Grid pads must be collected with corner reference points connecting
- If corner reference points do not connect, they must be on the same spatial grid as other pad data sets.

Creating a Super 3D Grid (Combining Grids)

You may combine multiple processed 3D Grids to create one “super” 3D Grid. This will create a new file with the extension .s3d.



Note: Process each grid located in the super3d folder.

1. Click the GSSI Button, then click Assemble.
2. After you select Super 3D File, enter a filename for the newly created Super 3D file (.s3d).
3. Click Save to save and continue.
4. **Add File:** Click Add File to retrieve a grid.
5. **Filename:** Click Filename >> to browse and retrieve a grid
6. **Populate:** Populate the File Parameters window.
7. **Starting (X,Y) Coords:** Enter the X,Y position for this grid.

8 If this is the first grid you are adding, the Starting (X,Y) coordinate is more likely 0,0.

9 If this is NOT the first grid you are adding, the Starting (X,Y) coordinate is relative to the first grid you added.

10 If necessary, you can Rotate, Flip Horizontally, and/or Flip Vertically, depending on how the grid was collected relative to the coordinates of the first grid you added.

11 Click OK when you are done.

12 Repeat: If you have more grids to add, continue back to step 3.

13 Once you have completed adding all the grids, click OK and the system will combine all the grids and create a Super Grid file.