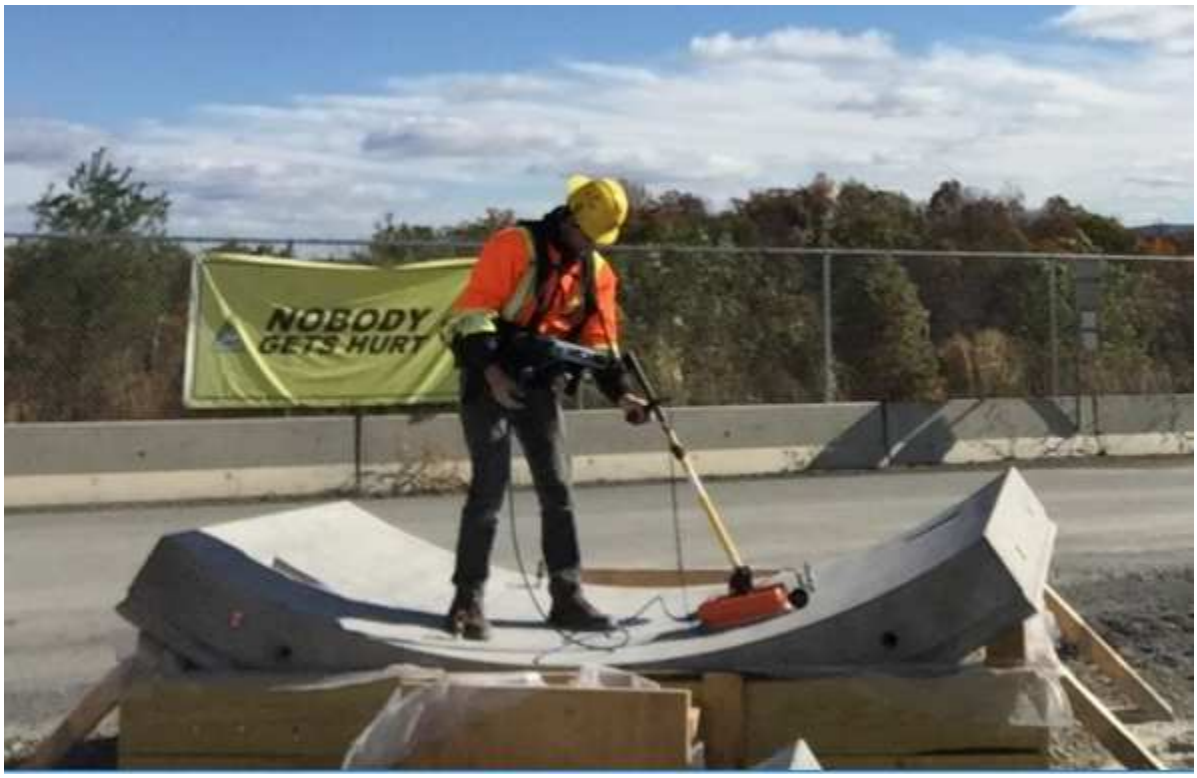
Kiewit-GPR User Guide



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Store/Charge equipment

A. Keep batteries out of the SIR 4000 unit
B. Store the SIR 4000 unit in the pelican case when not in use (keep dry)
C. Two batteries can be charged at a time in the GSSI battery charger base
    a. When batteries are fully charged, a solid green light will be displayed
D. Keep all cables disconnected from the antenna
E. Leave the metal caps attached to the outlets on the SIR 4000

B

C

D

Connect equipment

There are two blue cable lengths (3 m and 7 m). The 3 m cable should be used if using the SIR 4000 harness. The 7 m should be used when using the SIR 4000 stand.

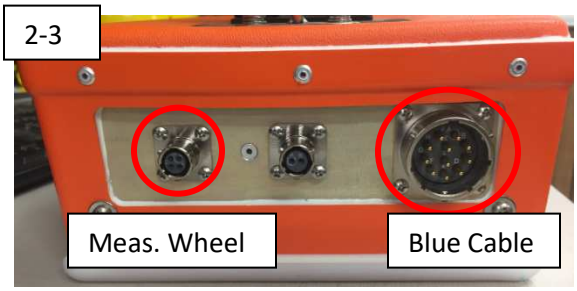
<u>Connect SIR 4000 to Antenna</u>

1. Plug the blue cable into the SIR 4000 unit
    a. The side of the blue cable with the metal cap will attach to the SIR 4000.
    b. The GSSI Logo on the cable should be facing up
    c. Push the plug gently into the SIR 4000 and twist the connection so that the red band is no longer showing (there will not be a click – DO NOT OVER TIGHTEN)

1a

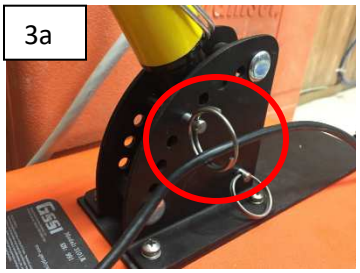
2. Plug the blue cable into the antenna
    a. The other side of the blue cable will go into the largest port on the antenna
    b. The GSSI logo on the cable should be facing up
    c. Push the plug into so that the prongs all align and twist the connection until you feel a click

2-3



3. Plug the measuring wheel into the antenna
    a. Run the cable through one of the metal loops at the top of the antenna to keep the wire on top of the antenna
    b. Measuring wheel has a 4-prong port that matches the 4-prong port on the antenna
    c. Align the pins and push the plug in then twist until you feel a click

3a

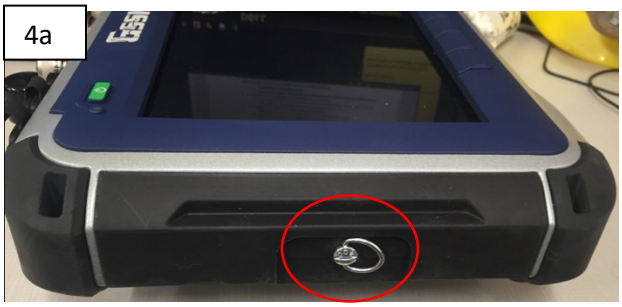


- The handle for the antenna does not need to be plugged in
    - The trigger on the handle has no useful function for our setup
    - If the cable is in the way, connect to the remaining central two-prong port on the antenna

3

4. Put battery into the SIR 4000 Unit (ALWAYS DO THIS LAST)
    a. Open the left side flap on the SIR 4000 unit by twisting the metal pin
    b. Take the yellow cap off the battery
    c. Lift the spring-loaded plastic flap with one finger and push the battery, with the - T D C + end facing up, into the battery slot until the plastic flap clicks down
    d. Close the left side flap

4a



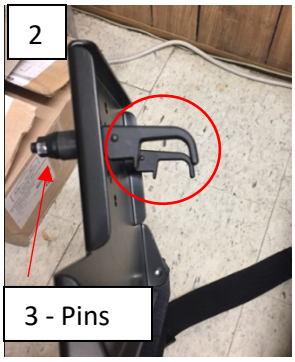
4a

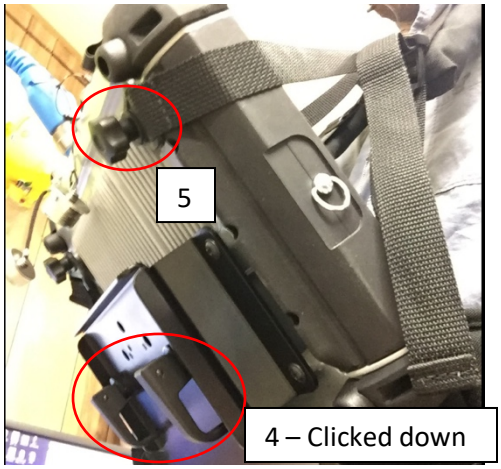
4c

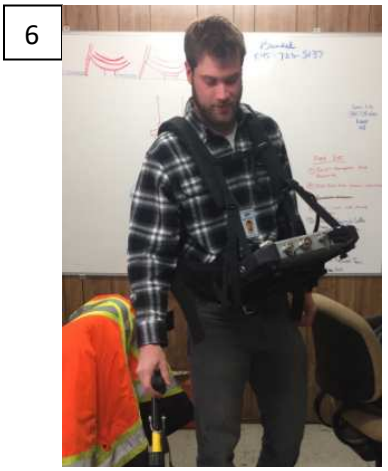
4c

SIR 4000 Harness

1. Place harness on body and buckle the side strap. Adjust all straps as necessary
2. Make sure the clips on the bottom of the harness plate are open
3. Place SIR 4000 on top of the harness's metal plate so that the two pins fit through the holes on the SIR 4000.
4. Then click down the clips on the bottom of the plate
5. Attach the two straps on the harness to the bottom of the SIR 4000 by threading hand-screws through the strap holes into the SIR 4000.
6. Tighten all straps so that the SIR 4000 rests at a comfortable position for reading

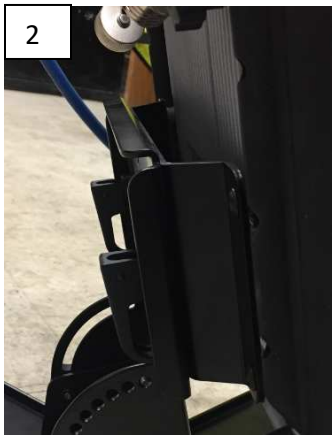






SIR 4000 Stand

1. Attach the back of the SIR 4000 unit to the metal plate on the stand such that the two large holes on the bottom plate of the SIR 4000 fit into the pins.
2. Click down the clips on the bottom of the plate.
3. Adjust the stand by using both the tightening screw and the pull-out pin which clips into a locking hole.

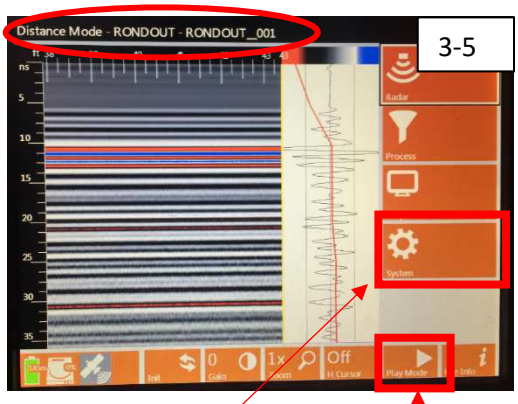


Perform a scan (with a previously saved setup file)

- Keep cell phones and 2-way radios off that are in the vicinity of the GPR while collecting data!
- To Get back to the home screen, hold down the stop button as many times as needed until you arrive back at the home screen

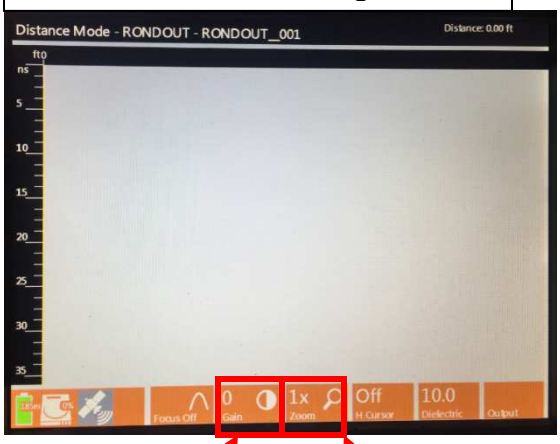
1. Turn SIR 400 unit on
2. When the home screen appears, under the top tab of “Expert Mode” select “Last used settings”
3. A RADAR screen will appear showing a live data feed. This is not actually saving any data, just showing you what the radar is capturing in that moment
4. Ensure at the top says “Distance Mode - RONDOUT –RONDOUT_###”
   a. If this is not the case, the wrong folder is in use. Click “Play Mode” at the bottom of the screen
   b. Next click “Choose Path” at the bottom of the screen
   c. Scroll down and select the RONDOUT.PRJ folder
   d. Select any file in that folder (a check mark should appear) and then hit the enter key
   e. Finally hit “Collect” on the bottom of the screen. You should now be in the correct directory where the top says “Distance Mode - RONDOUT –RONDOUT_###”

2 “Home Screen”



5. Setup File
    a. Select “System” on the right side
    b. Select “Recall Setup”
    c. Select “SETUP02”
    d. This will take you back to the collect screen
6. Make sure the Zoom at the bottom is 1x and Gain is 0
    a. These can be adjusted by clicking the icon button and using the scroll wheel
7. Tap the start button. A blank screen will appear
8. Move GPR antenna forward with the measuring wheel in front.
    a. Make sure the measuring wheel is spinning as you move the device
    b. Data should populate the screen as you move along the scan line. If it stays blank, then something is wrong. See trouble shooting!
    c. You can move backwards during a scan to look where a feature came up. The device will not collect data again until after you move passed the point you stopped
9. At the end of the scan, click stop.
10. Hit save file if you would like to keep that scan line file.
11. To record the next file, click start
    a. The number at the top of the screen should have changed to the next file number if you chose to save

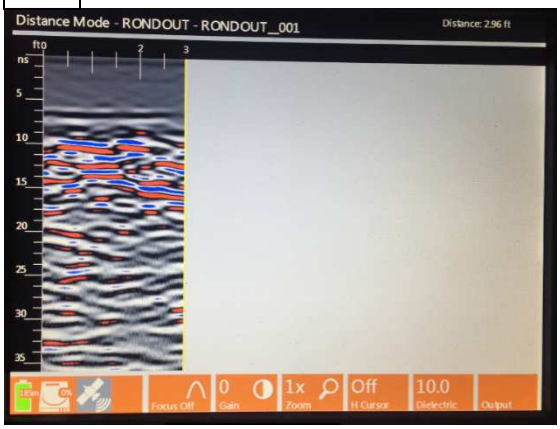
7 – Blank Screen after hitting start



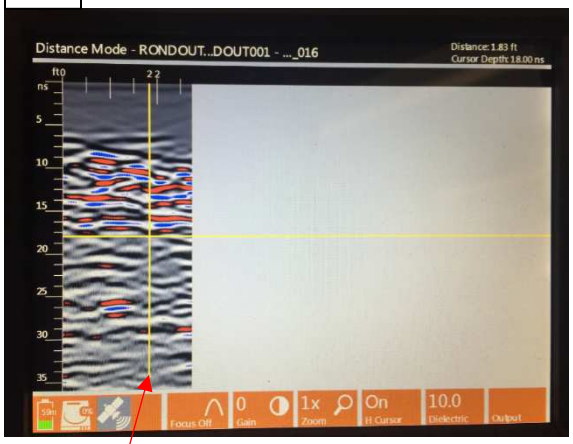
Gain = 0

Zoom = 1X

8b



8c

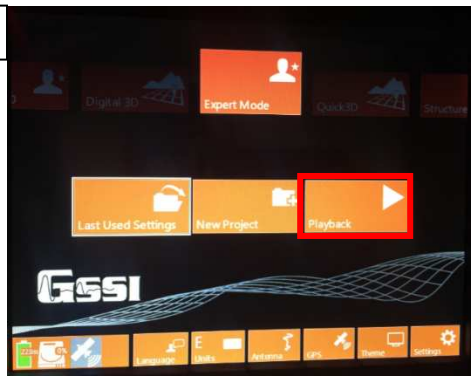


Yellow line shows where antenna is on scan line

8a

View Saved Scan Line

3



4

1. After completing a scan and saving, the data file should remain on the screen
2. If you would like to view a previously saved file, hold the stop button until you are brought to the home screen
3. Select Playback
4. Select the file you would like to view with the wheel and then hit enter
5. Click the start button. This will then freeze the scan line for you to analyze
6. Take a screen shot by holding the down arrow and tapping the up arrow
7. To go back to data collection, hold the stop button, then hit the collect button at the bottom of the screen

<u>Playback Filtering Options</u>

Always return the filter settings to how they were originally set to ensure the next scan has the original filter settings (Zoom = 1X and Gain = 0)

GAIN –Adjusts the total gain of the scan

ZOOM – Zooms in or out of the entire scan

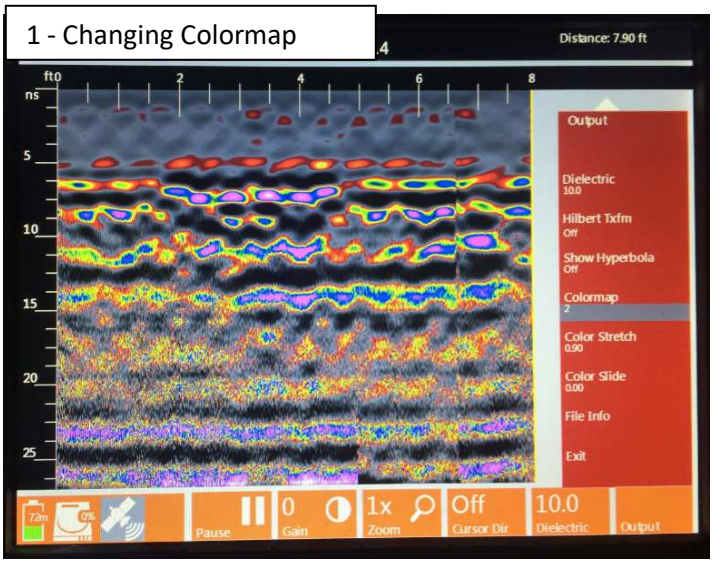
Cursor Dir – allows you to scroll through the scan line vertically or horizontally (the upper right corner provides exact distance and time where the cursor is)

- Click once for a vertical marker. This is useful to scroll through a long scan line or for determining the distance at which a void begins and ends
- Click a second time for horizontal marker. This is useful for determining the exact time at which a reflection occurred

Output – Two features to adjust (only adjust these two!):

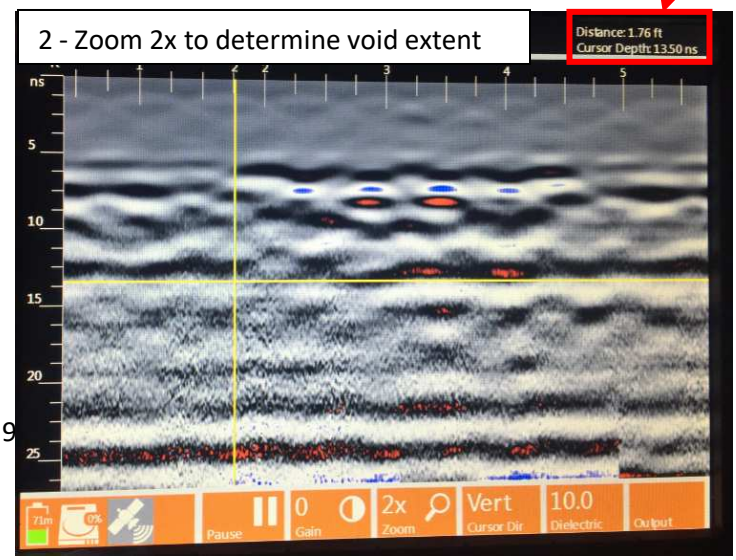
1. Colormap – change the color scheme of the scan to allow for different contrast
2. Color Stretch – Change the color scale to allow for different color thresholds (works best on Colormaps 9 & 10)

1 - Changing Colormap



Distance and time of marker

2 - Zoom 2x to determine void extent



Scan File Setup

- The Pre-setup file is saved as Setup03
  - Select “System”
  - Select “Recall Setup”
  - Select “SETUP03”
  - This will take you back to the collect screen

Below are the settings prescribed to Setup03:

Home Screen		
Antenna Type	900	MHz
Antenna Model	3101	
Transmit Rate	100	KHz
GPS Type	none	

Radar		
Transmit Rate	100	KHz
Scans/Second	177	
Samples/Scan	512	
Scans/ft	90	
Dielectric	10	
Time Range	40	ns

Process	
Gain Mode	Manual
Edit Fain Curve	8 Point
Gain Points	-20
	32
	50
	50
	50
	50
	51
	51
IIR Low Pass	1500
IIR High Pass	500

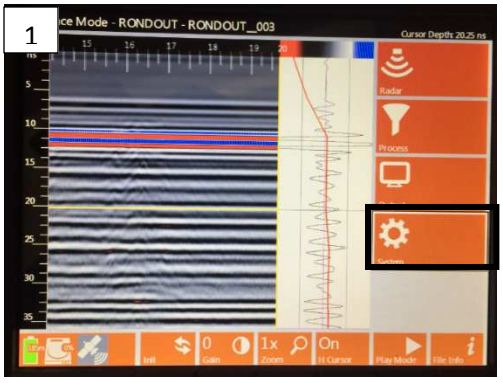
Output	
Vertical Scale	Time
Color Map	10
Color Stretch	0.9
Color Slide	0

<u>Wheel Calibration</u>

If horizontal distances are not accurate, re-calibrate the wheel according to these step:

1. At the scanning screen, select “System”
2. Select Calibrate SW
3. Survey wheel mode should be set to Quadrature. Measure out a known distance on a flat surface and enter that distance on the screen.
4. Hit the “Start” button and move the antenna and measuring wheel along the measured distance.
5. Hit the “Stop” button when done. A new calibration value should populate the box.
6. Select “Apply” to use the newly found calibration

1



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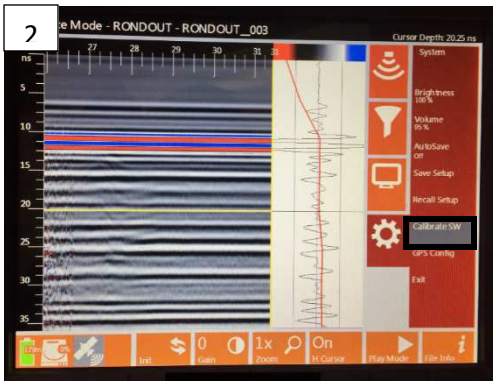
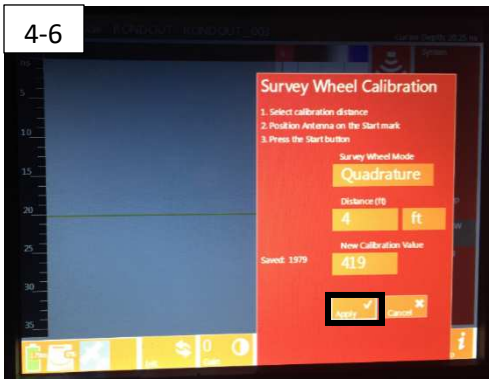


4-6



Transferring Data

DO NOT UNPLUG ANTENNA WHILE THE SIR 4000 UNIT IS ON.

- Data can be taken off the SIR 4000 with or without the antenna attached. Be sure to have the blue cable detached from the SIR 4000 before turning on.

Unplug antenna:

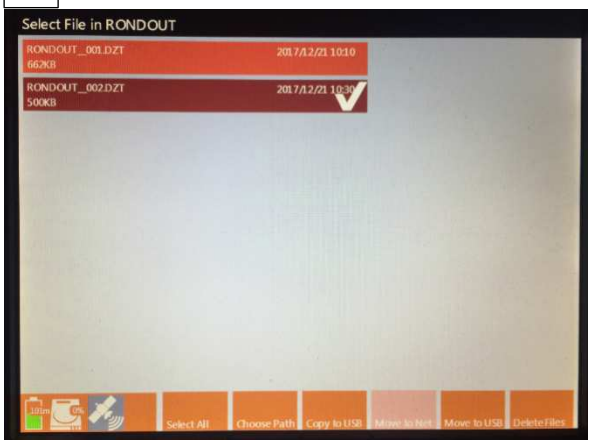
1. Turn off SIR 4000 by holding the green power button
2. Unplug antenna from the SIR 4000

Moving data from SIR 4000 to USB:

1. Turn on SIR 4000
2. Plug USB drive into the top of the unit
3. Select “Playback” from home screen
4. Use the scroll wheel to select whichever files you would like to copy. After selecting files, a check mark will appear on the right side of the file
    a. All files can be moved at once by clicking “Select All” from the bottom of the screen
5. Click Copy to USB
6. Hold “Stop” to go back to home screen
7. Hold power button to shut off SIR 4000 and then take out the USB

2

4

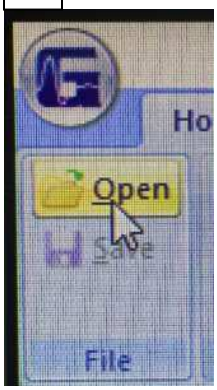


Opening Data in RADAN 7 on computer

1. Open RADAN 7 software installed on computer
2. Open the desired file by finding the file in the RONDOUT.PRJ folder on the USB or computer
    a. When opening the RONDOUT.PRJ folder where the files are saved, you need only select the .dzt file in the main directory. This will open two files into RADAN
3. Two files will appear in RADAN 7, one will be a raw (unfiltered) file, the other will have a P_1 next to the file name which has the same filters as were applied on the SIR 4000.
4. Under the View tab, from the vertical scale drop down menu select time (ns).
    a. Vertical units cannot be saved in ft (the displayed vertical depth is false!), must be in nS!
5. Save the file either by taking a screen shot or by exporting as a JPG from the G logo in the upper right corner

1

2



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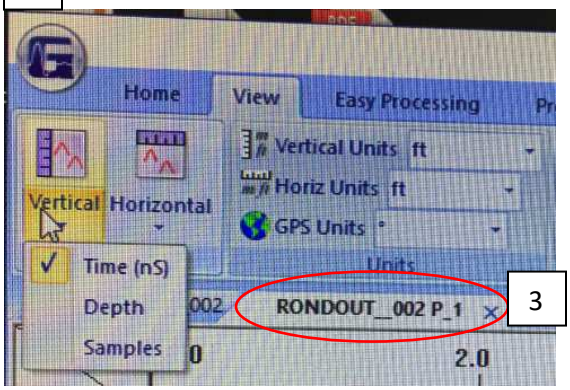

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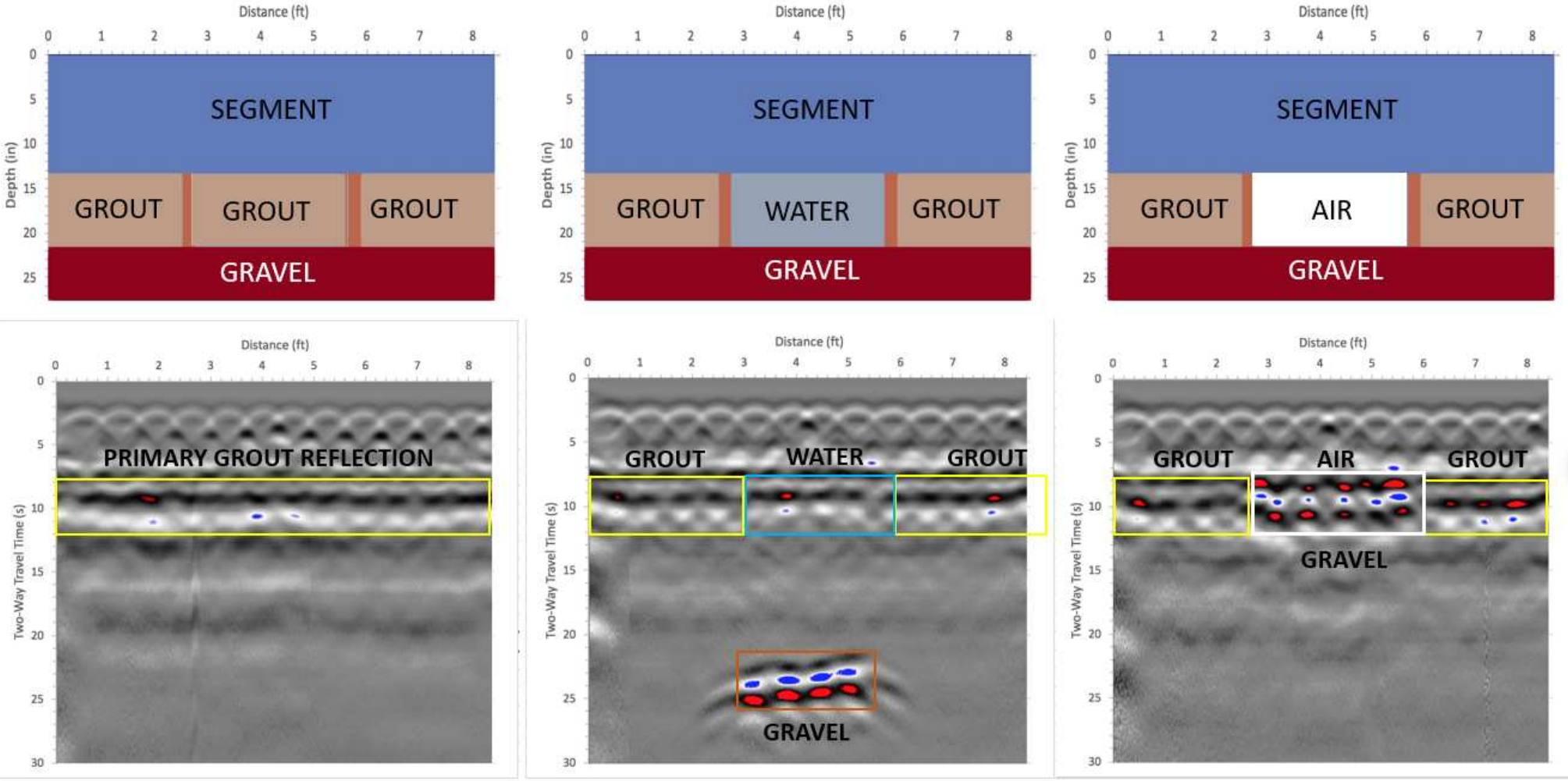
SEE WORK PLAN FOR DETAILS ON WHERE/HOW TO CONDUCT SCANS IN THE TUNNEL AND WHAT TO DO WITH THE DATA AFTER PERFORMING SCANS

Trouble Shooting

This list is not-exhaustive. For other issues and questions call Jonathan Brinkmann at GSSI (mobile: 781-254-8861; direct: 603-681-2082)

Issue	Possible Solutions
SIR 4000 won't turn on?	• Ensure batteries are fully charged and placed in the SIR 4000 correctly • Check for signs of water damage
SIR 4000 will not allow you to select "Last Used Settings"	This may indicate the Antenna is either not plugged in properly. Turn off the SIR 4000 unit and check all antenna connection
After clicking "Start" to begin a new scan, no data appears on the screen	• This is likely an issue with the measuring wheel. Check that the measuring wheel is plugged into the antenna properly (remember, 4 plug prong) • Ensure you are moving the unit so that the measuring wheel is in front of the antenna (if you are spinning the wheel backwards, it will not collect data) • Check all connection associated with the measuring wheel (if any parts are spinning that are not supposed to, then there is likely a faulty connection) • Check on the Home screen under Antenna that the 900 MHz antenna type is selected
When performing a scan, the data feels either squished or spread out	• Check that you are using the correct scan Setup (Setup02). Go to system->Recall Setup->SETUP02 • May be due to the Scan/ft (check against the scan file setup table) • Check the zoom on the bottom of the screen (should be set to 1x)
Vertical bands disrupting the scan line often	• This may be due to signal interference from nearby cell phones or radios • Ensure the antenna is being pushed as smoothly as possible and not too quick. Make sure not to jolt the antenna forward
Measured Distances do not match the actual distances moved	Follow steps in Scan File Setup to re-calibrate the measuring wheel
Other issues with the scan line data not appearing as expected	Check the setup file parameters against those listed in the Scan File Setup tables

VOID SIGNATURES



SCAN LINE DISTANCES OF SEGMENT EDGE