



Surface Systems and Instruments, Inc.

Profiler V3 Operation Manual

CS-8500 Profilograph System

Version 3.2.4.11.

smoothroad.com



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Table of Contents

SAFETY	0
CARE AND MAINTENANCE OF THE PROFILOGRAPH	0
SET UP	1
<i>Preparing for Operation</i>	1
DATA COLLECTION	4
COLLECT	5
CALIBRATION	5
<i>Height Calibration</i>	8
SAMPLE INTERVAL	11
CALIBRATION SUMMARY	11
ODOMETER MODE	11
<i>Changing Settings and Parameters</i>	12
<i>Naming Files</i>	12
STARTING A COLLECTION	12
<i>Pause</i>	15
<i>Add Note</i>	16
<i>Start Station</i>	16
<i>End Station</i>	16
<i>Ending a Collection</i>	16
<i>Distance</i>	17
<i>Speed</i>	18
<i>Saving the Data</i>	18
1.0- FILE TAB	18
1.1. - NEW	18
1.2. - OPEN	19
1.3. - OPEN RECENT	19
1.4. - SAVE	20
1.6. - EXPORT	21
<i>1.6.1. Export Location</i>	21
<i>1.6.4. – Exporting to PRO Format</i>	26
<i>1.6.5. – Exporting to Survey Format</i>	28
<i>1.6.6. – Exporting to Excel Format</i>	29
<i>1.6.7. – Exporting to Google Earth</i>	31
<i>1.6.8. – Exporting to GPX Format</i>	31
<i>1.6.9 – Exporting to Sidewalk Format</i>	31
<i>1.6.10 – Exporting to Localized Roughness</i>	31
<i>1.6.11 – ProFAA</i>	33
<i>1.6.12. – RMS Export</i>	33
<i>1.6.13. – GIS Export</i>	34
<i>1.6.14. – Exporting Raw Data</i>	34
<i>1.7. – Exiting Program</i>	34
<i>1.8. – Shortcut Bar</i>	34
2.0. - EDIT	35
2.1 – EDIT DATA	35
EDIT SEGMENTS	36
<i>Crop Data</i>	39
<i>2.2.1. - Job Information</i>	39
<i>Paving</i>	40
<i>Additional</i>	40

2.2.2. - Report Memo	40
2.2.3. - User Defined.....	41
2.2. - SETTINGS	41
 2.2.1. – General Settings	41
Section 1 – Units.....	42
PRI.....	47
PRI Parameters.....	48
Scallop Definition	48
Blanking Band	48
Minimum Scallop Width.....	48
Scallop Resolution	48
HRI	49
RN	49
RMS Roughness	50
 2.2.3. – ANALYSIS PARAMETERS: FILTERS	50
Section 1 - IRI/HRI Filter---Same for IRI, HRI, RN.....	50
Section 2 - PRI Filter.....	50
 2.2.4. –LOCALIZED ROUGHNESS.....	51
Section 2 - Bump Parameters.....	52
Section 4 - Localized Roughness.....	53
Section 5 - Defect Data Type	53
Relative Height	53
Texas-1001-S Method	54
IRI.....	54
Section 6 – Advanced	54
Section 7 – Correction Type.....	54
 2.2.5. - REPORT OPTIONS.....	55
Ride Index Thresholds	55
MULTIPLE TRACK REPORTING.....	56
 2.2.6. –GPS OPTIONS.....	58
GPS Lock-On to Run	59
Report GPS Notes in Trace.....	59
Interpolate Lock-On	59
3. 0 – VIEW	59
 3.1. - REPORT	60
 3.2 – COLLECT.....	62
Refresh.....	63
Plot Options Settings.....	64
Rendering Mode.....	65
GPS Lock-On.....	65
Highlight IRI Thresholds	65
Localized Roughness in Trace View.....	65
Display Localized Roughness.....	65
Use Localized Roughness Settings in Trace View (Recommended)	66
4.0. – NAVIGATION	70
 4.1. – MICROSOFT MAPPOINT	70
 4.2 – GOOGLE MAPS	72
 4.3. – TRACE VIEW NAVIGATION	74
5.0 – ABOUT	76
MANUAL	76
CHECK FOR UPDATES.....	76
SEND FEEDBACK.....	76

TROUBLESHOOTING	77
LIST OF PARTS.....	79
ATTAINING PROFILOGRAPH SOFTWARE AND REPLACEMENT PARTS	82
PANASONIC TOUGHBOOK COMPUTER	82
PAPER SUPPLIES OR PRINTER SERVICING.....	82

Table of Figures

FIGURE 1: WINDOWS EXPLORER CAN BE USED TO OPEN THE SURFACE PROFILER PROGRAM INSTEAD OF A DESKTOP ICON.....	2
FIGURE 2: THE TOP AND SIDE VIEW SCHEMATIC FOR THE PROFILOGRAPH SYSTEM	2
FIGURE 3: THE TOP VIEW OF A CORRECTLY ASSEMBLED PROFILOGRAPH	3
FIGURE 4: THE SYSTEM STATUS AND GPS COORDINATES (CURRENT POSITION).....	4
FIGURE 5: THE GPS DETAILS WINDOW.....	4
FIGURE 6: THE MAIN COLLECTION WINDOW.....	5
FIGURE 7: THE MAIN CALIBRATION WINDOW	6
FIGURE 8: THE FIRST WINDOW OF THE DISTANCE CALIBRATION.....	6
FIGURE 9: THE INSTRUCTIONS FOR THE DISTANCE CALIBRATION.	7
FIGURE 10: THIS SCREENSHOT IS TAKEN NEAR THE HALFWAY MARK OF THE DISTANCE CALIBRATION	7
FIGURE 11: DISTANCE CALIBRATION ERROR.....	7
FIGURE 12: THE INITIAL STEP OF THE HEIGHT CALIBRATION.....	8
FIGURE 13: ENTER THE FIRST BLOCK THICKNESS FOR HEIGHT CALIBRATION	8
FIGURE 14: PLACE THE FIRST BLOCK UNDER THE MEASUREMENT WHEEL.	9
FIGURE 15: SET THE HEIGHT OF THE SECOND BLOCK AS <i>1 INCH</i>	9
FIGURE 16: PLACE THE MEASUREMENT WHEEL UPON THE SECOND BLOCK.	9
FIGURE 17: CALIBRATION BLOCK REMOVAL.....	10
FIGURE 18: REMOVAL OF THE FIRST CALIBRATION BLOCK	10
FIGURE 19: IF THE CONSISTENCY CHECK IS A SUCCESS, THE CALIBRATION SETTINGS WILL BE SAVED.	10
FIGURE 20: A FAILED CONSISTENCY TEST FOR THE HEIGHT CALIBRATION. PERFORM CORRECT PROCEDURE.....	11
FIGURE 21: CALIBRATION SUMMARY	11
FIGURE 22: THE ODOMETER MODE	12
FIGURE 23: THE DEFECT DETECTION PARAMETERS.....	13
FIGURE 24: THE COLLECTION INFORMATION WINDOW.....	13
FIGURE 25: THE COLLECTION WINDOW WITH A COLLECTION IN PROGRESS.....	13
FIGURE 26: BACKING UP DURING A COLLECTION	14
FIGURE 27: A PAUSED COLLECTION.....	15
FIGURE 28: THE PAUSE NOTE	15
FIGURE 29: THE ADD NOTES WINDOW	16
FIGURE 30: SAVING OPTIONS AFTER A COLLECTION	16
FIGURE 31: THE START AND END STATIONS, DISTANCE TRAVELED AND THE SPEED ARE DISPLAYED IN THE MAIN COLLECTION WINDOW....	17
FIGURE 32: THE RIDE VALUES OF PRI AFTER SEGMENT LENGTH	18
FIGURE 33: SAVING THE COLLECTION FILE.....	18
FIGURE 34: OPENING A DATA FILE IN THE PROFILER V3 PROGRAM.	19
FIGURE 35: THE OPEN RECENT FEATURE.....	19
FIGURE 36: THE CLEAR RECENT FEATURE	20
FIGURE 37: SAVING A FILE THROUGH <i>Save As</i> IN RSD FORMAT.	20
FIGURE 38: THE EXPORT WINDOW FOR EXPORTING THE DATA INTO EXCEL FORMAT.	21
FIGURE 39: SELECTING A LOCATION TO SAVE THE EXPORTED FILE.....	22
FIGURE 40: THE EXPORT FORMAT AND FOLDER LOCATION SELECTION	22
FIGURE 41: THE EXPORT TYPE DROP DOWN MENU	22
FIGURE 42: THE ERD FORMAT EXPORT WINDOW WITH MATCH TRACKS SELECTED.....	23
FIGURE 43: THE ERD EXPORT WINDOW SETTINGS	24
FIGURE 44: THE PPF EXPORT WINDOW	25
FIGURE 45: THE OPTIONAL SETTINGS WHEN EXPORTING IN PPF FORMAT.	26
FIGURE 46: THE EXPORT WINDOW WHEN PRO FORMAT IS SELECTED.....	27
FIGURE 47: THE DETAILS TAB CONTAINS INFORMATION ABOUT THE PROJECT.	28
FIGURE 48: THE WINDOW FOR EXPORTING IN SURVEY FORMAT.....	28
FIGURE 49: THE ADVANCED OPTIONS OF THE SURVEY FORMAT.....	29
FIGURE 50: EXPORTING THE DATA INTO MICROSOFT EXCEL FORMAT.....	29
FIGURE 51: THE TYPES OF EXCEL FORMATS ARE LISTED IN THE DROP DOWN MENU.	30

FIGURE 52: GOOGLE EARTH ON A LAPTOP	31
FIGURE 53: THE EXPORT WINDOW WHEN THE GPX FORMAT IS SELECTED.	31
FIGURE 54: THE CUSTOMIZE WINDOW	32
FIGURE 55: THE LOCALIZED ROUGHNESS EXPORT TEMPLATE	33
FIGURE 56: PROFAA MATCHING	33
FIGURE 57: EXITING THE PROGRAM- SAVING	34
FIGURE 58: THE SHORTCUT BAR WITH ALL OF THE FREQUENTLY USED WINDOWS	35
FIGURE 59: THE EDIT RUN OPTIONS.....	36
FIGURE 60: ADDING OR REMOVING PAUSES FROM THE COLLECTION	37
FIGURE 61: EDIT EVENTS TAB	38
FIGURE 62: THE CROP DATA TOOL	39
FIGURE 63: THE PROJECT PARAMETERS WINDOW.....	39
FIGURE 64: THE REPORT MEMO WINDOW.....	41
FIGURE 65: THE USER DEFINED SECTION	41
FIGURE 66: THE GENERAL SETTINGS WINDOW	42
FIGURE 67: THE CUSTOM FILE NAMING CONVENTION WINDOW.....	43
FIGURE 68: THE IRI ANALYSIS PARAMETERS WINDOW.....	47
FIGURE 69: THE ANALYSIS TYPE DROP DOWN MENU DISPLAYING ALL OF THE RIDE VALUES OPTIONS	48
FIGURE 70: AN EXAMPLE OF THE BLANKING BAND IN THE TRACE REPORT.....	48
FIGURE 71: THE HRI ANALYSIS WINDOW WITH THE AVAILABLE FILTER SETTINGS.	49
FIGURE 72: THE RN ANALYSIS WINDOW WITH THE FILTER OPTIONS SHOWN.	49
FIGURE 73: THE FILTERS WITHIN THE IRI ANALYSIS PARAMETER WINDOW	50
FIGURE 74: THE FILTERS FOR THE PRI ANALYSIS PARAMETER.....	51
FIGURE 75: THE LOCALIZED ROUGHNESS WINDOW WITH THE DEFECT SETTINGS.	51
FIGURE 76: WHEN ONLY BUMPS ARE SELECTED FROM THE DROP DOWN MENU, THE DIP PARAMETERS BECOME UNAVAILABLE.	52
FIGURE 77: WHEN ONLY DIPS ARE BEING TESTED FOR, THE BUMP PARAMETERS BECOME UNAVAILABLE.....	52
FIGURE 78: THE LOCALIZED ROUGHNESS SETTINGS FOR DISPLAYING DEFECTS	53
FIGURE 79: THE TYPES OF TESTING AVAILABLE TO FIND THE DEFECTS IN THE DATA.....	53
FIGURE 80: MERGE DEFECTS	54
FIGURE 81: CORRECTION TYPES.....	54
FIGURE 82: THE REPORT OPTIONS WINDOW.	55
FIGURE 83: HIGHLIGHTING IRI VALUES OVER A THRESHOLD.....	55
FIGURE 84: THE TRACK AND RUN SELECTION WINDOW	56
FIGURE 85: THE GPS OPTIONS TAB	59
FIGURE 86: THE SUMMARY HEADER OF A SINGLE TRACE REPORT.....	59
FIGURE 87: ENABLE AND DISABLE REPORTS WINDOW.....	60
FIGURE 88: THE TOOL BAR FOR THE REPORT WINDOW	60
FIGURE 89: PRINTING OPTIONS WINDOW	61
FIGURE 90: THE DROP DOWN MENU FOR THE REPORT OPTIONS	61
FIGURE 91: THE BUILT IN ZOOM RATIOS	62
FIGURE 92: THE SEGMENT OR DEFECT NAVIGATOR.....	62
FIGURE 93: GO TO LOCATION FEATURE	62
FIGURE 94: AN EXAMPLE OF THE PROFILE TRACE.....	62
FIGURE 95: THE PLOT OPTIONS WINDOW.....	63
FIGURE 96: PLOT OPTIONS WINDOW	63
FIGURE 97: THE CONTINUOUS IRI PLOT OPTIONS WINDOW.....	63
FIGURE 98: THE PLOT OF THE CONTINUOUS IRI TRACE	64
FIGURE 99: THE PLOT OF THE PROFILE TRACE	64
FIGURE 100: THE CONTINUOUS IRI TRACE WITH THE LOCALIZED ROUGHNESS DIAMONDS SHOWN.....	66
FIGURE 101: DYNAMIC TAGGING FEATURE	66
FIGURE 102: STATIC TAGGING FEATURE	67
FIGURE 103: GRINDING NAVIGATION WITH GREEN CURRENT LOCATION DISPLAYED	67
FIGURE 104: THE PRINT WINDOW THAT APPEARS AFTER THE PRINT ICON IS SELECTED.....	68
FIGURE 105: THE TOOL BAR FOR THE TRACE WINDOW	68

FIGURE 106: WINDOWS EXPLORER TO SAVE A PICTURE OF THE GRAPH.....	69
FIGURE 107: THE AVAILABLE PICTURE FORMATS TO SAVE THE TRACE GRAPH IN.....	69
FIGURE 108: MAIN MAP POINT WINDOW	71
FIGURE 109: MAP POINT NAVIGATION	71
FIGURE 110: A BUMP IS SELECTED IN MAPPING	72
FIGURE 111: INITIAL GOOGLE MAPS SCREEN	72
FIGURE 112: GOOGLE MAPS SHOWING THE LOCALIZED ROUGHNESS	73
FIGURE 113: A LOCATION SELECTED AND READY TO START NAVIGATION	74
FIGURE 114: THE TRACE NAVIGATION OPTIONS.....	74
FIGURE 115: TRACE NAVIGATION WITH CURRENT AND DESTINATION.....	75
FIGURE 116: THE ABOUT WINDOW	76

Safety

Turn on headlights when profiling to alert other drivers and co-workers of your presence. Road profilers are precision instruments, handle with care. Improper maintenance and use will reduce system life and collection accuracy.

Care and Maintenance of the Profilograph

Respect the Profiling Machines

Profilers are precision instruments, handle with care. Improper maintenance and procedures will reduce system life and collection accuracy.

Literature

ASTM E1274 and CalTrans 526 Test Method are some of the state regulated Profilograph specifications.

Do Not Expose Electronics to Excessive Moisture

The encoders, cables, and suitcase housing should not be exposed to moisture while in storage or profiling. Excessive moisture will cause component malfunctions and the inability to collect accurate profiles.

Grease Bogey Wheel Pivot Points

Keep the pivot points on the bogey wheels well lubricated. The grease fittings are attached to the outer face of the bogey wheel assembly.

Keep Computer Updated

In order to keep the computer running efficiently, install updates periodically. Always install windows updates prior to installing new SSI profiler versions. To install updates, navigate to the start menu and select Control Panel from the right or type ‘Control Panel’ into windows explorer. Select the System and Security option, then select “Windows Update” from the list. Select “Check for Updates” and install the recommended software. Whenever an update is performed through Microsoft or the SSI support site, recalibrate the Profilograph before use.

Keep this Manual on Hand

Read and review this manual prior to operating the Profilograph. Always have a copy of this manual for repair schematics and troubleshooting, found at the end of the manual.

Proper Tire Pressure

Maintain proper tire pressure throughout the profiling process. The proper tire pressure for the measurement wheel is between 20 and 30 psi. Tire pressure will change throughout the day. If the temperature gradient is high for the duration of profiling, multiple distance calibrations may be necessary to collect accurate data. Always check tire pressure prior to performing the distance calibration.

Measurement Wheel Maintenance

If the measurement wheel is damaged or worn, contact SSI for a replacement. Do NOT install a replacement from a local store. SSI custom builds their measurement wheels for smoothness testing. Using a measurement wheel that is not rounded will introduce artificial roughness into the profile data.

Avoid Self Repair of Key Components

Do not attempt to repair or replace the center section encoders of measurement wheel. These components should only be serviced or replaced by SSI. If the factory installation of the encoders or measurement wheel is disturbed, the operating capabilities of the Profilograph may be adversely affected.

Position of Measurement Wheel

The measurement wheel should only touch the ground during collection. Lock the measurement wheel in the upright position when turning or moving the Profilograph into position between collections. Failure to lock the wheel in the upright position can cause the wheel to drag transversely on the pavement and lose its rounded shape. Accurate, smooth profiles depend on a smooth measurement wheel.

Avoid Excessive Speed

Optimal Profilograph collection speeds are at walking speeds of 2-3 m.p.h. Exceeding this threshold will introduce roughness into the profile data. The faster the speed the more likely for the measurement wheel to bounce, which adds roughness to the collected data.

Set Up

Preparing for Operation

Before proceeding further, verify that the system has been assembled correctly, no component parts are left unattached, and all cables are plugged in. Check that the generator has fuel and oil and has the 110AC cable plugged in. Following the generator manufacturer's instructions, start the generator and allow at least one minute for the generator to warm up and stabilize. Following the instruction in the computer manual, turn Toughbook computer on; enter the password (if applicable) when prompted. Double click Profiler icon to bring up Profilograph software (known as "SSI Profiler"). This will bring up the main menu of the Profilograph software.

Pinch Points

Avoid pinch points while assembling and disassembling the Profilograph system. Wear gloves to avoid finger injury.

Profilograph Frame

The California Profilograph frame is 25 feet long. Make sure that the frame clamps are tight by adjusting the nut and bolt within the clamp head. If the clamp is too tight against opposing frame, vibrations from operation can disengage the clamp. The Profilograph sections are oriented so that the guide pins on each corner of the Profilograph frame attach to their corresponding mate. The center section has female connection pins on one side and males on the other. Profilograph frame sections can only be assembled incorrectly if the pins do not match.

Bogey Wheels

The bogey wheels are assembled easiest when not connected to the Profilograph frame. Connect the two pairs of arms that consist of the wheel chassis and secure the clamps. After the Profilograph frame is assembled, carefully lift one end of the frame and guide it over the bogey wheel positioning pins. Repeat for the other side and set the brake on the Profilograph frame if necessary.

Steering Wheel Install

To assemble the steering column, place the rectangular aluminum rod partially into the frame rings on the Profilograph frame. Then attach the end of the steering shaft to the angle gear at the bottom of the frame near the bogey wheels. Recent model Profilographs have two way steering, so the angle gear used will be the one at the forward-end of the Profilograph. In this position the operator will be able to push the machine with the generator behind him. The steering wheel should be on the same side of the Profilograph so that it is possible to see inside the open Pelican suitcase while steering.

Connect the steering rod from the angle gear to the bogey wheels using the capped bolt. Always remember to loosen the lock on the bogey wheel adjustment knob. Failure to allow the bogey wheels to move freely when steering can cause the pins in the angle gears to shear. If the pins of the angle gear shear, steering will not operate in that direction until the pins are replaced. While profiling, the alignment of the rear bogey wheels may need to be adjusted. Always be able to steer freely with the bogey wheels connected to the steering column, but have the rear bogey wheels locked in place.

Opening the Profiler Software

Open the Profiler software by selecting the Profiler icon on the desktop, or through the destination of

MyComputer>C:>Program Files>SSI Profiler and selecting the ‘SSI.Surface.Roads.Profiler.App.exe’ file.

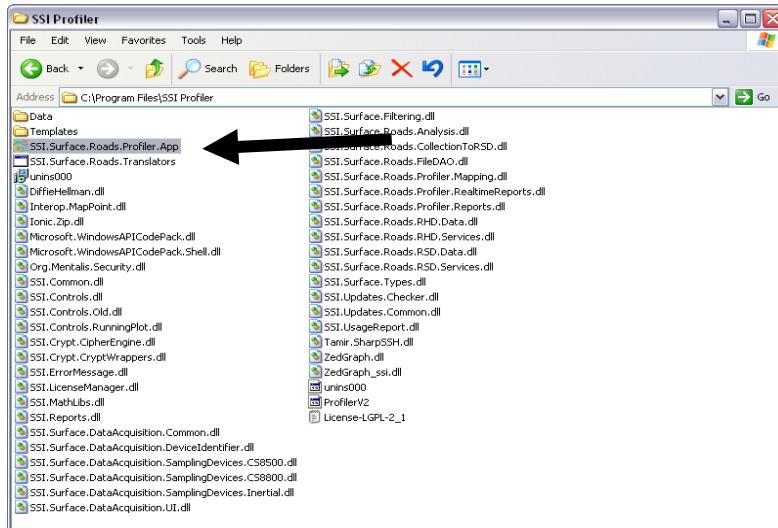


Figure 1: Windows Explorer can be used to open the Surface Profiler program instead of a desktop icon

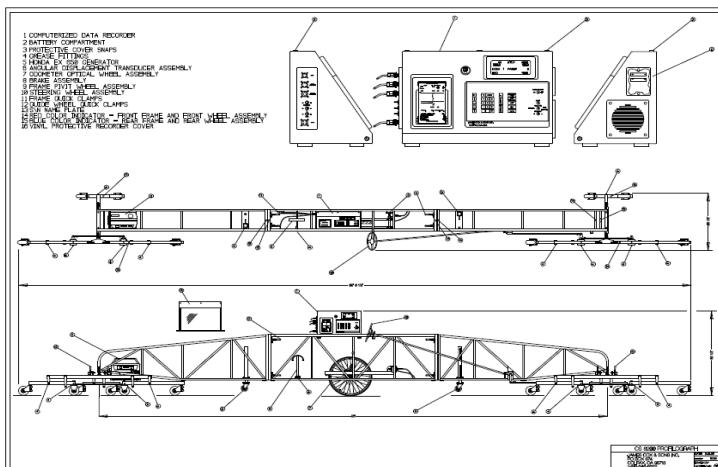


Figure 2: The top and side view schematic for the Profilograph system

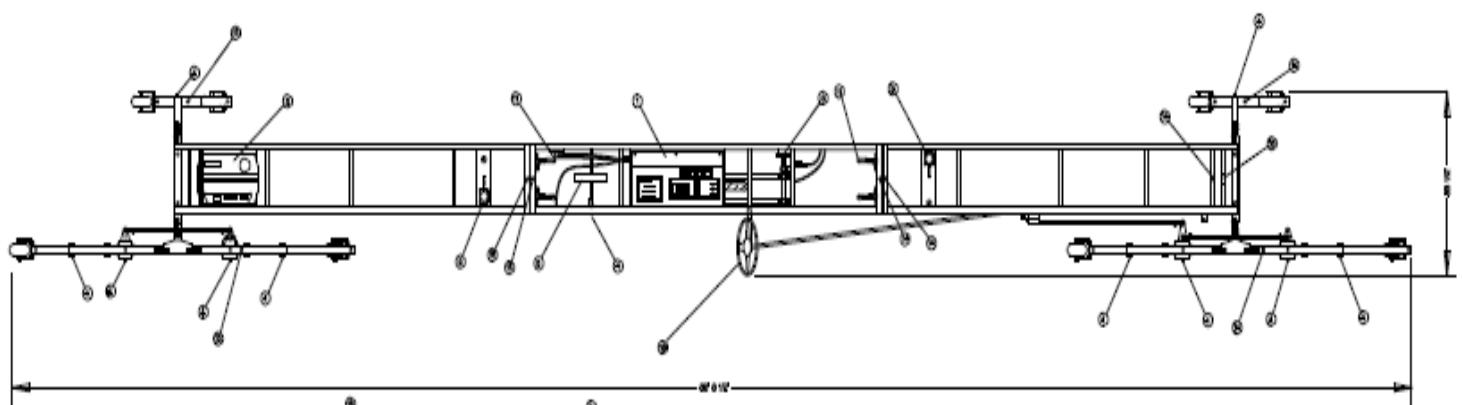


Figure 3: The top view of a correctly assembled Profilograph

Generator

Check the oil and fuel levels of the generator before each use. It is important that the generator is allowed to warm up before connecting it to the Profilograph system. Do not start the generator while it is connected to the suitcase electronics. Reference the generators manual for more information on operation.

Suitcase

Place the suitcase housing on top of the Profilograph frame within the guide rails on the center section. The guiderails will contain the feet of the Pelican suitcase. Use the Jeep hooks to secure the case to the frame. The suitcase should open towards the side of the steering wheel and the measurement wheel lock pin. If the suitcase is placed correctly on the Profilograph frame, the Amphenol connections will easily reach the ports on the side of the suitcase.

Amphenol Connections

The Amphenol connections are the military grade connectors used to transfer the signal of the encoders to the computer housing electronics. Do not twist the cable to attach or remove the cables from the housing. If the cable is twisted, the soldered lead wires will break and the Profilograph will not be able to collect data. If this has occurred, reference the wiring schematic in the appendix of this manual.

Toughbook Computer

If you encounter problems with the Profiler software, always try completely exiting the Profiler program and restarting it. If the problem persists, or if you encounter problems with the windows operating system on the Profilograph computer, try turning the computer OFF and then ON again. If the computer freezes during operation, press the CTRL-ALT-DEL keys several times to reboot the computer, or once to open the task manager. If this does not allow the computer to restart, slide the ON-OFF switch continuously for 10 seconds (until the computer beeps) and the computer will shut itself off. Consult the computer manual or Windows operating system manuals for further assistance for problems that do not relate to the Profiler software. Contact SSI if problems persist with the profiler software program. If identical reoccurring messages appear (e.g. access violations, invalid floating point operations, etc) ALWAYS close down and restart the Profiler software, and reboot the computer if necessary. Contact SSI for technical support if the issue persists.

Printrex Printer

Connect the Printrex printer to the operating computer through the USB port on the side of the Toughbook. If problems occur with printing, review the printer settings found in Control Panel, Devices and Printers. Right click upon the Printrex 422 icon and select preferences. The majority of problems come from the USB port not being set up correctly. If the printer is connected but the print queue is not being processed, open the properties of the Printrex printer and change the port that the printer is connected through. For more information contact SSI technical support.

Profilograph Alignment

During the distance calibration and other movements of the Profilograph prior to collection, view and adjust the alignment of the bogey wheels so that the Profilograph moves in a straight path within the lane. Adjust the steering alignment on the rear bogey wheels by changing the position of the lock bolt. If at any time the Profilograph is difficult to push on level surfaces, stop and check the cause of the problem. Excessive force while pushing a Profilograph can cause damage to the angle gear, steering wheel, bogey wheels or brake assembly.

GPS

The GPS system of the Profilograph will acquire the satellites and its position automatically as soon as the system receives power. If the GPS does not acquire its position, open the GPS Details window and check the status of the GPGGA coordinates and the number of satellites. If problems persist, contact SSI technical support.

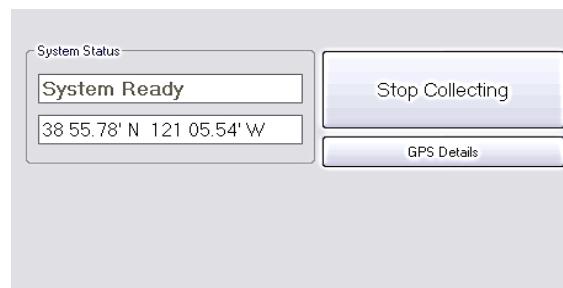


Figure 4: The System Status and GPS Coordinates (current position).

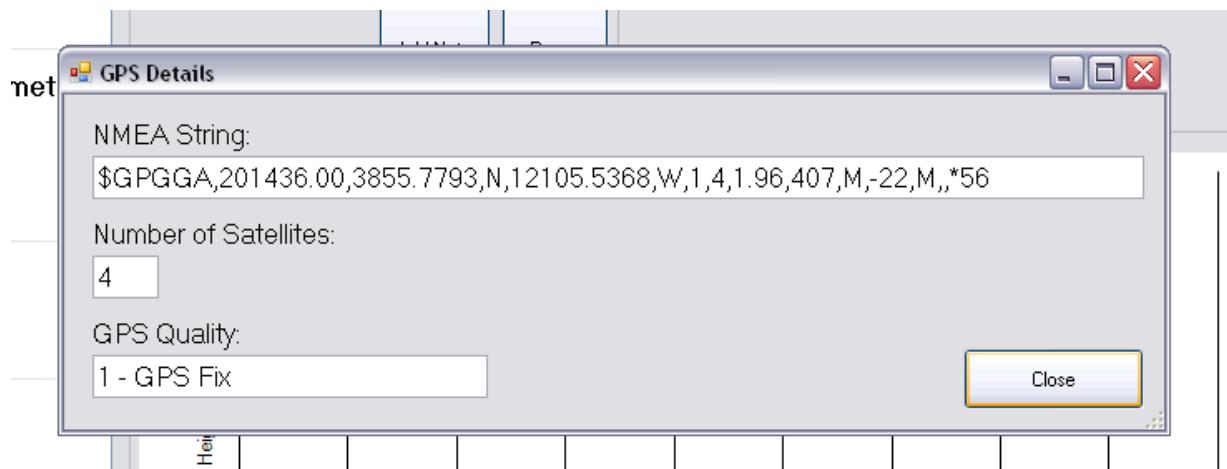


Figure 5: The GPS Details window

Data Collection

Collect

Under the collect window shown below, the operator can collect data or perform height and distance calibrations.

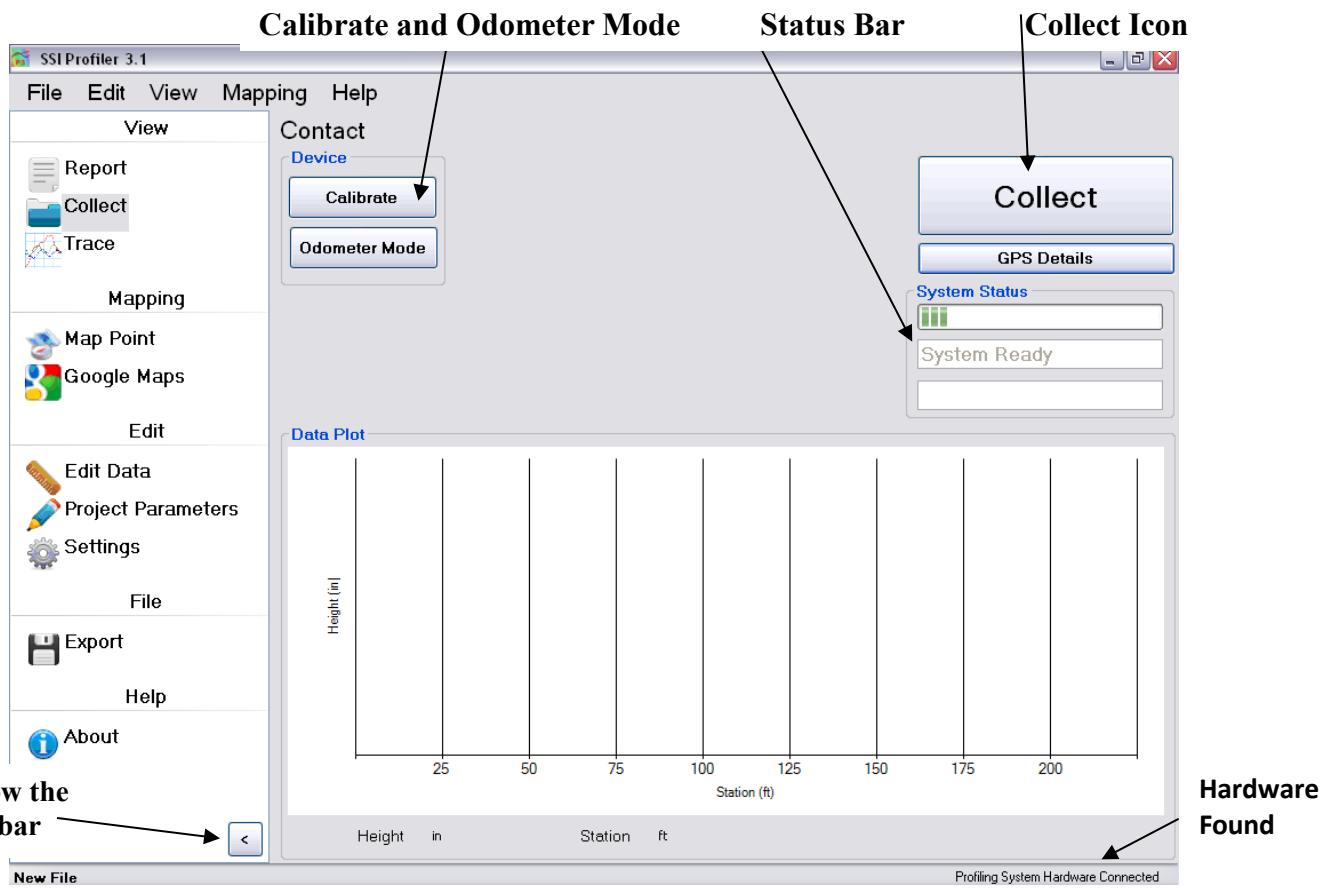


Figure 6: The Main Collection Window

Hardware Found

Once hardware is properly connected and set up, the Profiler program will recognize the hardware and ‘Hardware Found’ will appear at the bottom right corner of the screen. If the hardware is not found, “Searching for Hardware...” will be displayed instead. If this is the case, check all of the connections and power sources. If the problem persists, contact SSI Support.

Calibration

The Calibration Window can be viewed only when profiling hardware is connected to the operating computer. Once hardware is found, navigate to the collect window by selecting View>Calibration from the menu bar or by selecting Calibration from the shortcut bar.

Select "Calibrate to open the Calibration Menu

Select the Calibration icon to open the Calibration Menu Window and choose the type of calibration to be performed. The options will be a height calibration, distance calibration or done to exit the menu.

Distance Calibration

A distance calibration should be completed at least once per day. The distance calibration is started by measuring 528 feet or 160 meters; a tenth of a mile, over a straight and flat surface. ***You must calibrate the profilograph in the same units of measurement as the project you are about to profile.*** For example, if the specification calls for metric testing, you must calibrate the profilograph in metric. Select the calibration icon from the Collect Window, then Distance Calibration.

When Distance Calibration is selected from the Calibration Options menu, the Track length window will appear. Set the track length as 528 feet or 160 meters, and select 'Accept'. Follow the directions under the calibration instructions and proceed with the test. **The estimated distance read out does not have to match the distance actually traveled during the calibration.** The estimated distance rarely matches the actual distance during a calibration if the Profilograph has been relocated, in storage or the software has been updated. After finishing a successful distance calibration, select "Next" to save the data. Recalibration may be necessary if the temperature changes by twenty degrees. The changing pressure in the tire will alter the circumference and the distance readout.

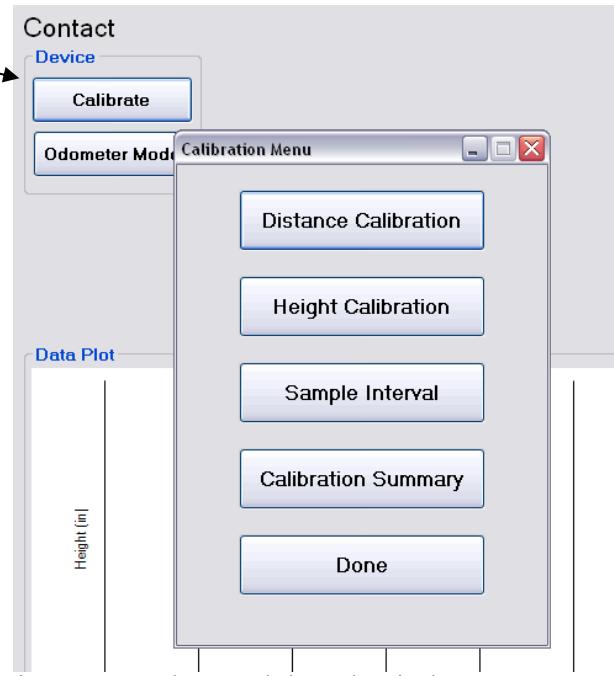
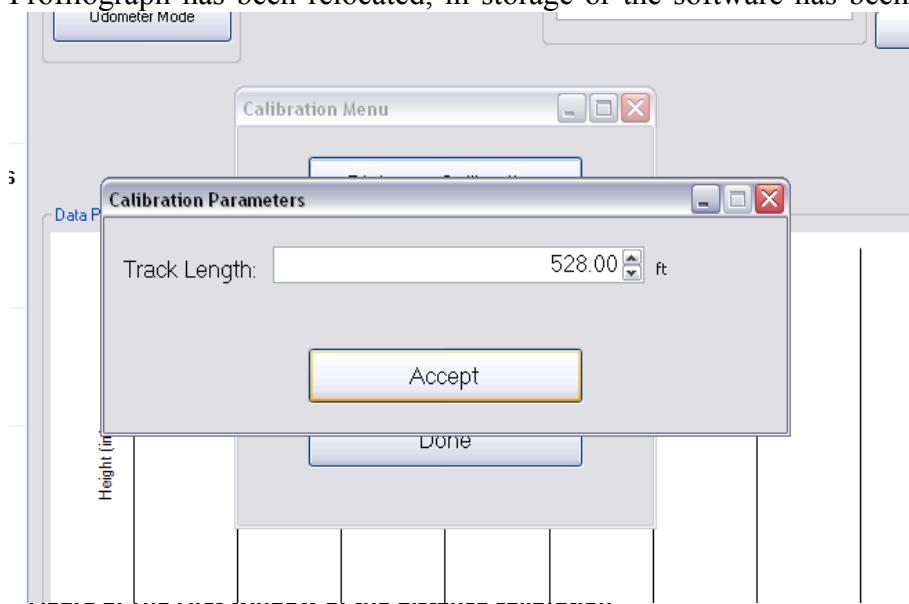


Figure 7: The Main Calibration Window

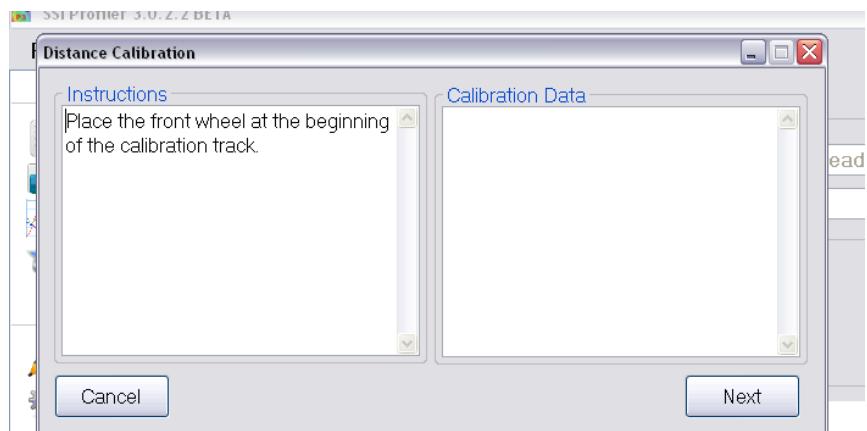


Figure 9: The instructions for the distance calibration.

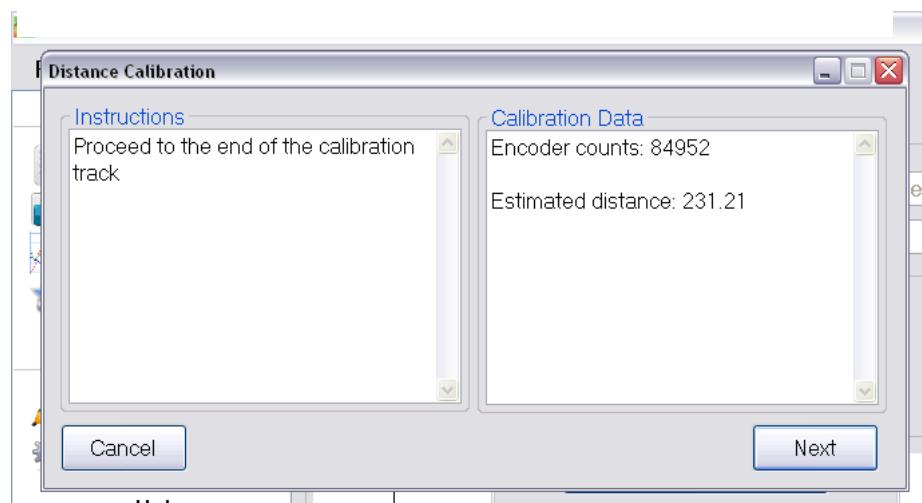


Figure 10: This screenshot is taken near the halfway mark of the distance calibration

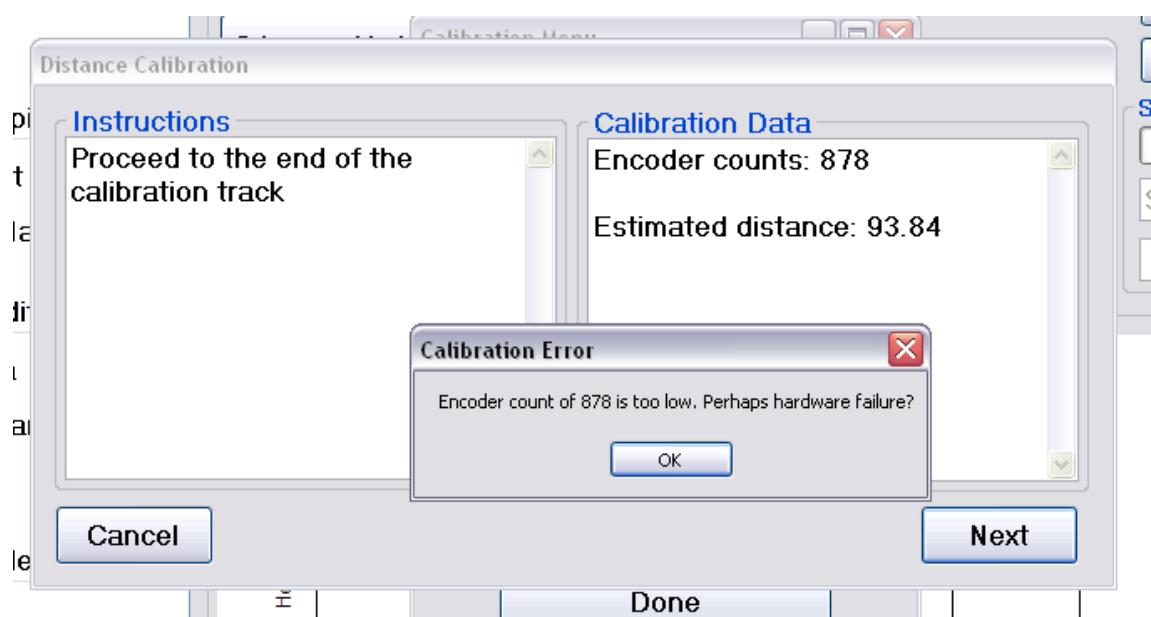


Figure 11: Distance Calibration Error

Height Calibration

The height calibration is found by opening the Collect Window and selecting the Calibration Icon. Select “Height Calibration” from the Calibration Menu. Follow the directions within the instructions text box for placing the blocks. Only use the machined step block and base plate supplied by SSI. If replacement calibration blocks are needed, contact SSI technical support. The initial step is to enter the height of Block 1 as one inch, then select “Accept.” Place the measurement wheel upon the first block, and select next. The program will call for the height of the second block which is **one inch**. Once accepted, the Profiler program will ask for the second block to be placed under the measurement wheel. At this time the blocks will be removed one by one as per the instructions. If the calibration passes the consistency test, the calibration settings will be saved.

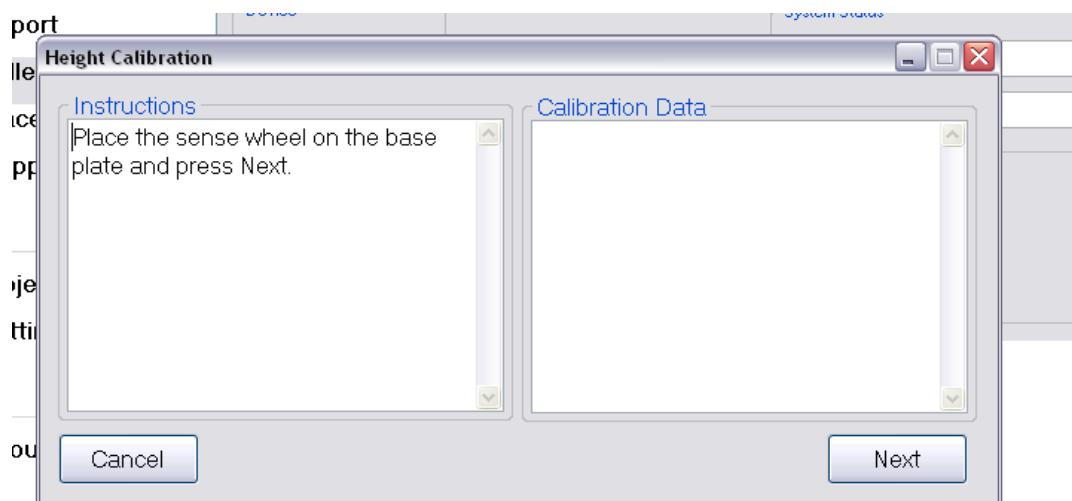


Figure 12: The initial step of the height calibration

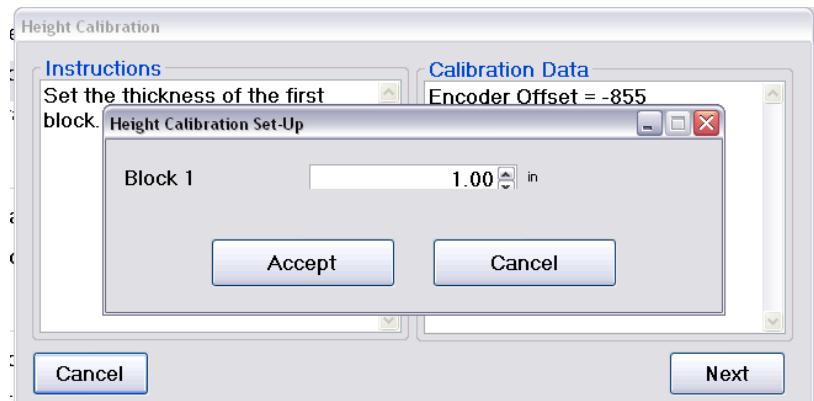


Figure 13: Enter the first block thickness for height calibration

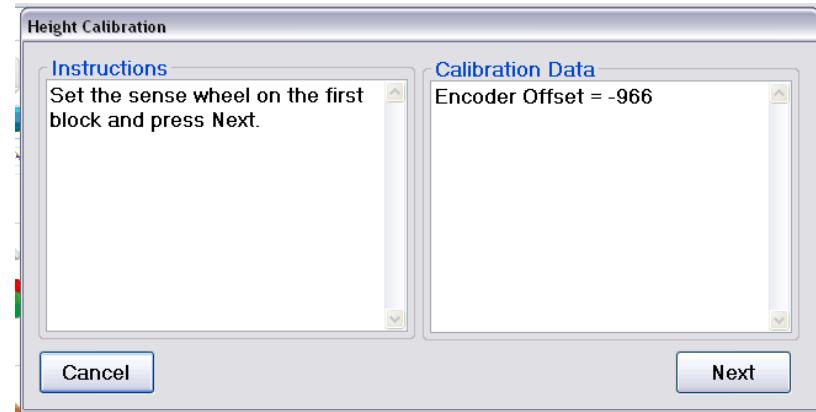


Figure 14: Place the first block under the measurement wheel.

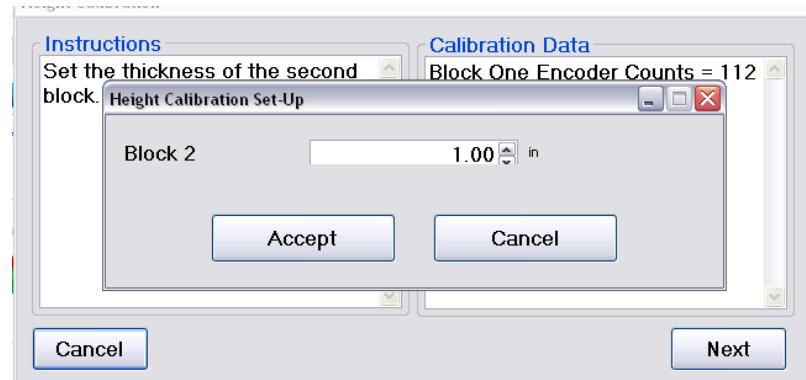


Figure 15: Set the height of the second block as 1 inch

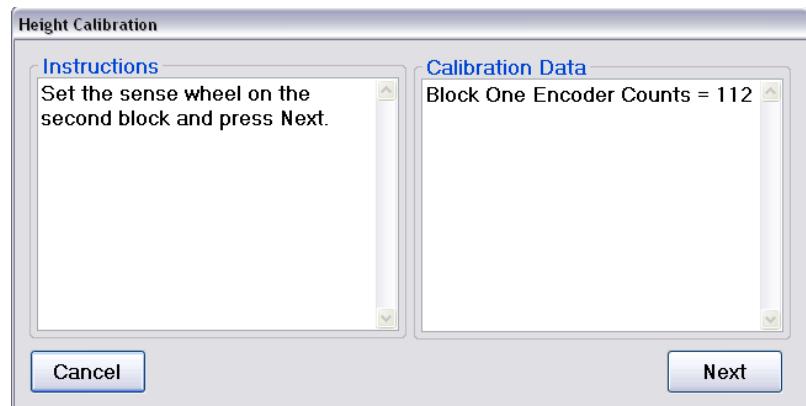


Figure 16: Place the measurement wheel upon the second block.

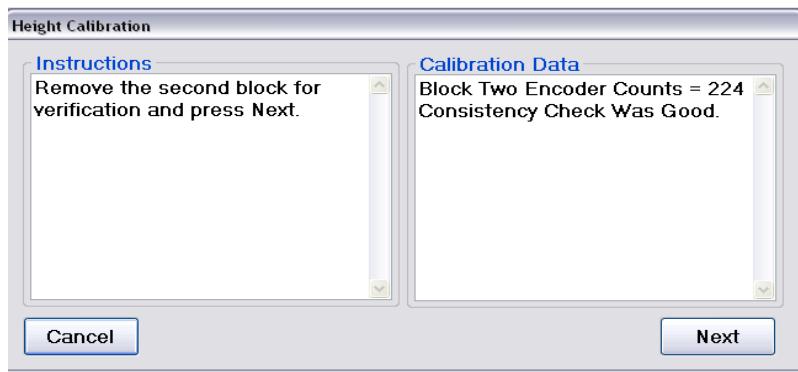


Figure 17: Calibration block removal

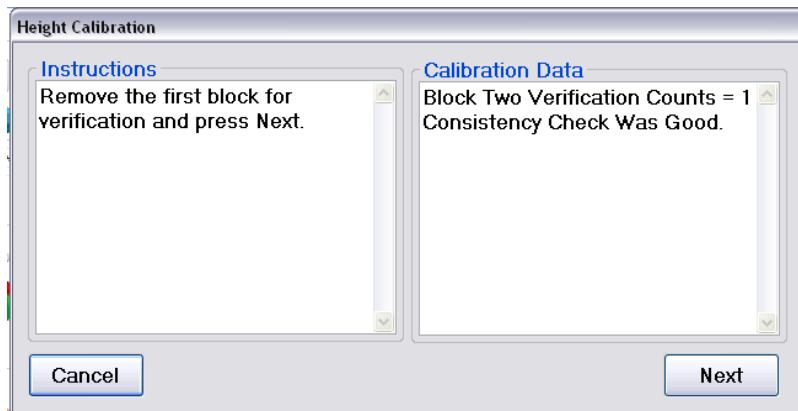


Figure 18: Removal of the first calibration block

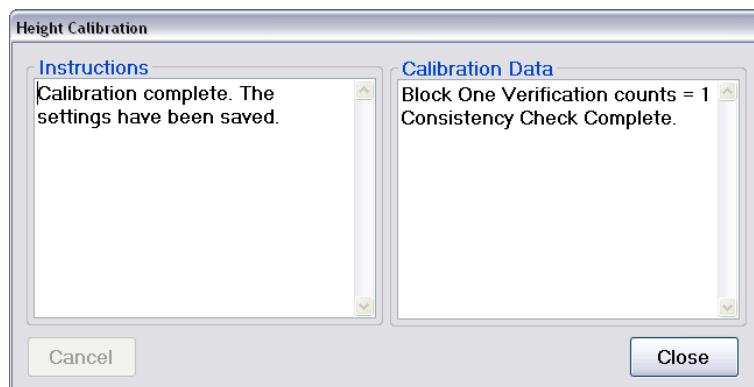


Figure 19: If the consistency check is a success, the calibration settings will be saved.

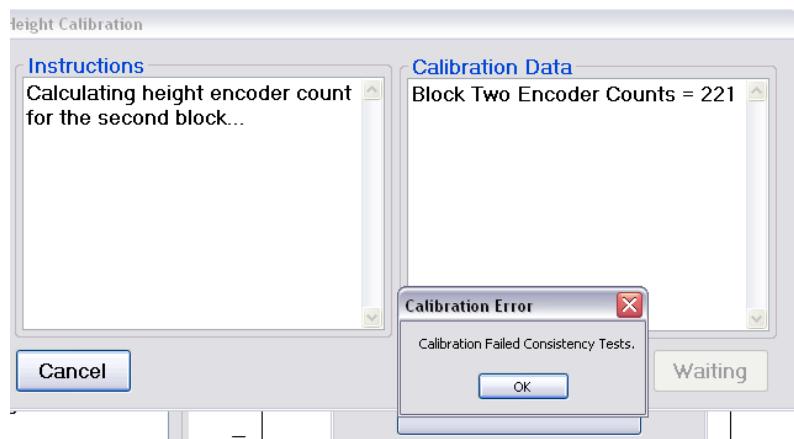


Figure 20: A failed consistency test for the height calibration. Perform correct procedure.

Sample Interval

The sample interval is the distance between two points of length measurement. The default value for Profiler V3 is 1 inch.

Calibration Summary

To view the current saved calibrations, open the Calibration Menu and select Calibration Summary. The height and distance calibrations will be displayed within this window.

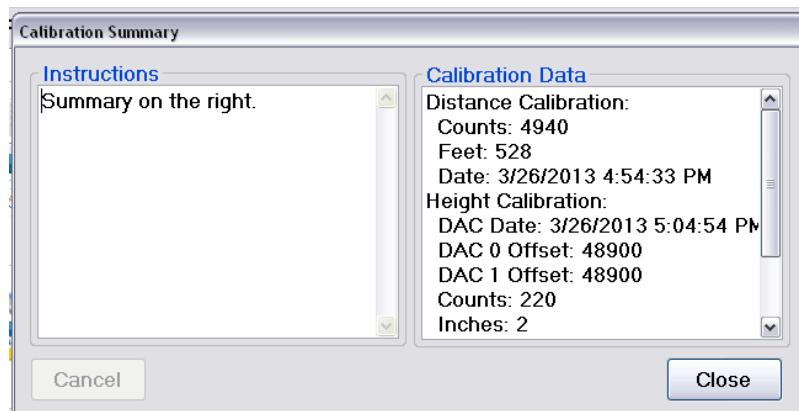


Figure 21: Calibration Summary

Odometer Mode

A correctly calibrated Profilograph can also be used as a distance measuring tool. This feature is useful to find accurate localized roughness when a measuring wheel is not an option. The odometer can be used when the Profilograph is not collecting. Input the starting station and whether the system will be traveling up or down station. Distance will be measured when the measurement wheel begins to rotate. To reset the inputted values, select the reset icon on the Odometer Mode Window.

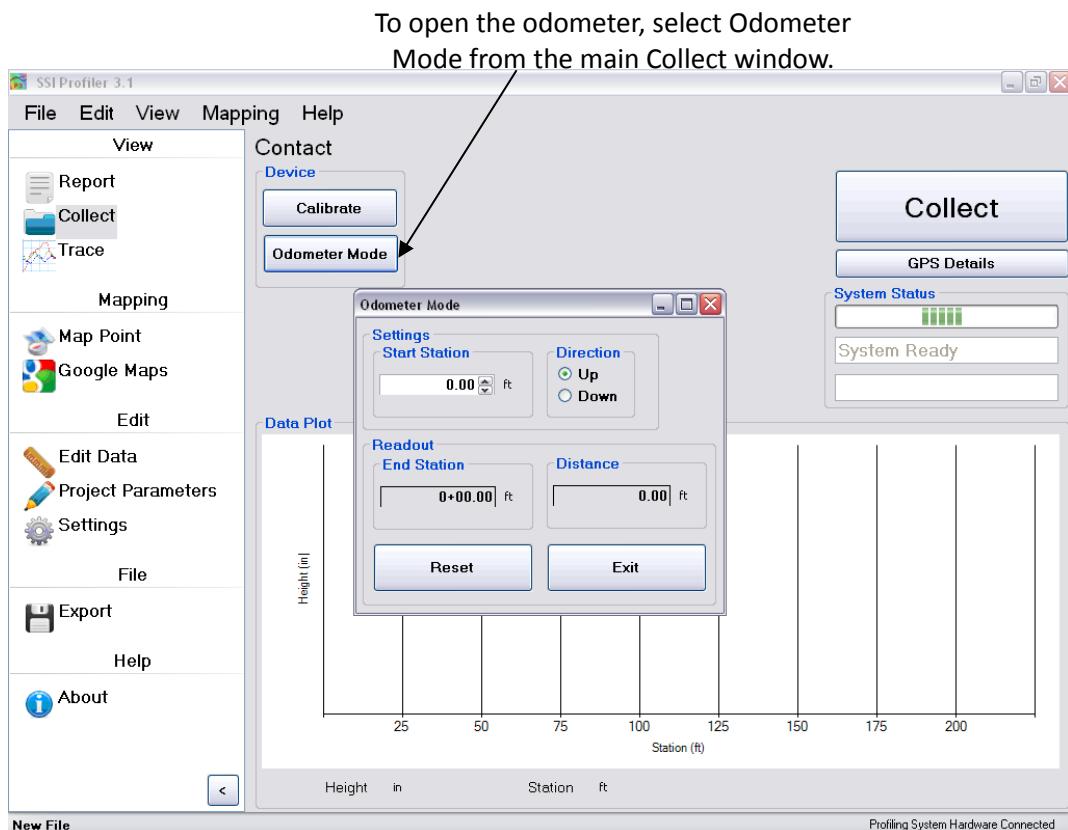


Figure 22: The odometer mode

Create a New Job Folder on the Hard Drive for Organization

Prior to starting a profile job, it is recommended to organize the files into a folder where all of the files can be easily accessed. Each job should have its own folder. To create a new folder, right click within windows explorer and select New>Folder.

Changing Settings and Parameters

All parameters within Profiler can be changed after initial setup *except for the Lane Number, and Track Number*. It is possible to change the other settings under General Settings, Localized Roughness, Edit Data and Analysis Parameters at any time after collection.

Naming Files

The naming convention of V3 is set by the user in the Settings. Select "Configure File Naming" to populate the name of the file with certain collection parameters. The default file name chosen will be used after a collection has been completed and if an unsaved collection is saved through File>Save As. The naming feature will be used after a collection has been completed and the user chooses either "Save As New" or "Save File". See the Default File Naming Section for more information.

Starting a Collection

Once the Profilograph has been properly assembled and calibrated, collections may begin with safety precautions being taken. Begin with the Profilograph on the starting line for the collection. Select the 'Collect' icon to initiate the collection procedure. When Collect is selected, enter the

preliminary information for the analysis parameters and the localized roughness. These values may be changed later, however ***Direction and track number cannot be adjusted after the collection has started.*** When “Begin” is selected, the collection may start.

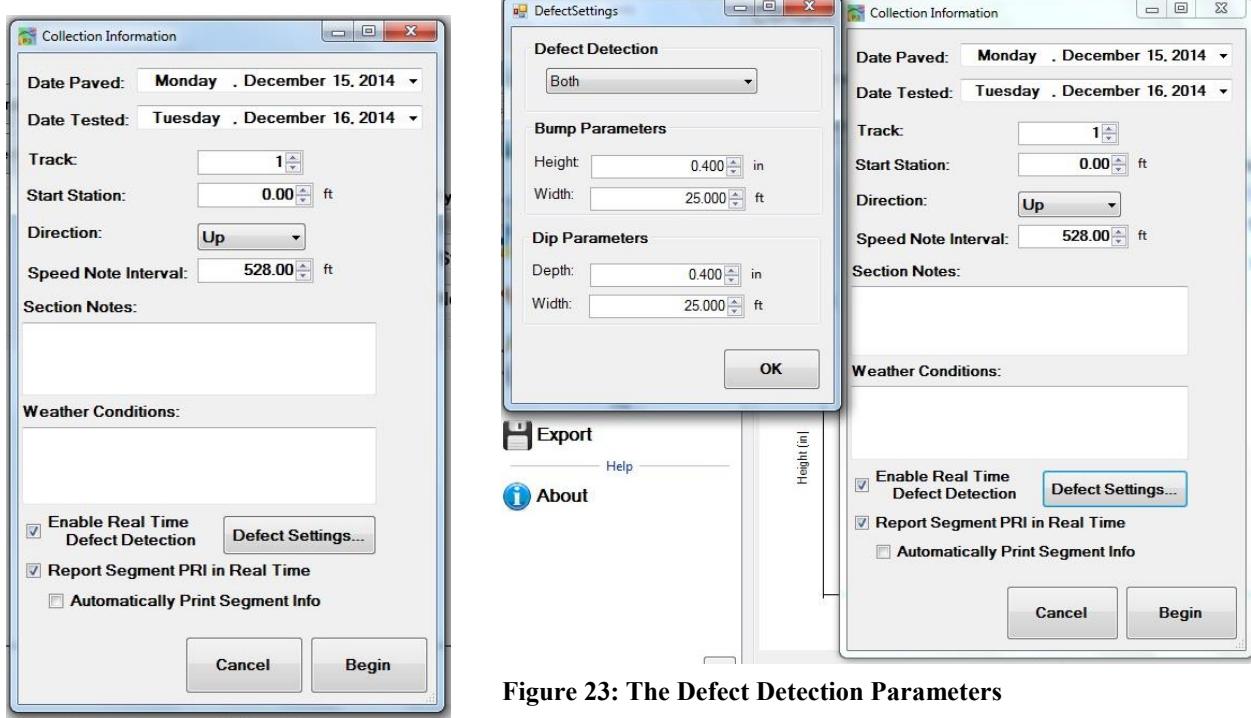


Figure 24: The Collection Information window

Figure 23: The Defect Detection Parameters



Figure 25: The collection window with a collection in progress

Defect Detection in Real Time

The operator will have the option to choose the "Enable Real Time Defect Detection" checkbox from the Collection Parameters Window prior to a collection. Use the drop down menu to choose the type of defect and adjust the bump template values according to the specification of the project. When a defect is found while profiling, the system computer will beep and add the defect's information to the defect list.

Backing Up

The operator may erase data that was just collected by moving the Profilograph in reverse with respect to the direction of collection. When the measurement wheel begins to rotate in reverse, the status bar turns red and the queue says "Backing Up." While backing up, the operator will see the collected trace disappear at the same rate that the Profilograph is moving in reverse.



Figure 26: Backing up during a collection

Pause

Pauses are enacted when the stationing needs to continue, but height data needs to be excluded. This happens when the Profilograph approaches bridge decks, manholes or drainage areas that were paved by hand. Review the overseeing agency's specifications on paused data before using this feature. The pause function will continue to record longitudinal distance but will exclude the height measurements. The ride values or localized roughness on paused segments will not be calculated.

When the collection is paused, the status bar will be red and will display "Paused." The user can still insert notes into the data while the collection is paused.

The collection cannot be ended when the pause is enacted. To terminate the collection, "Resume" the pause and select "End Collection."

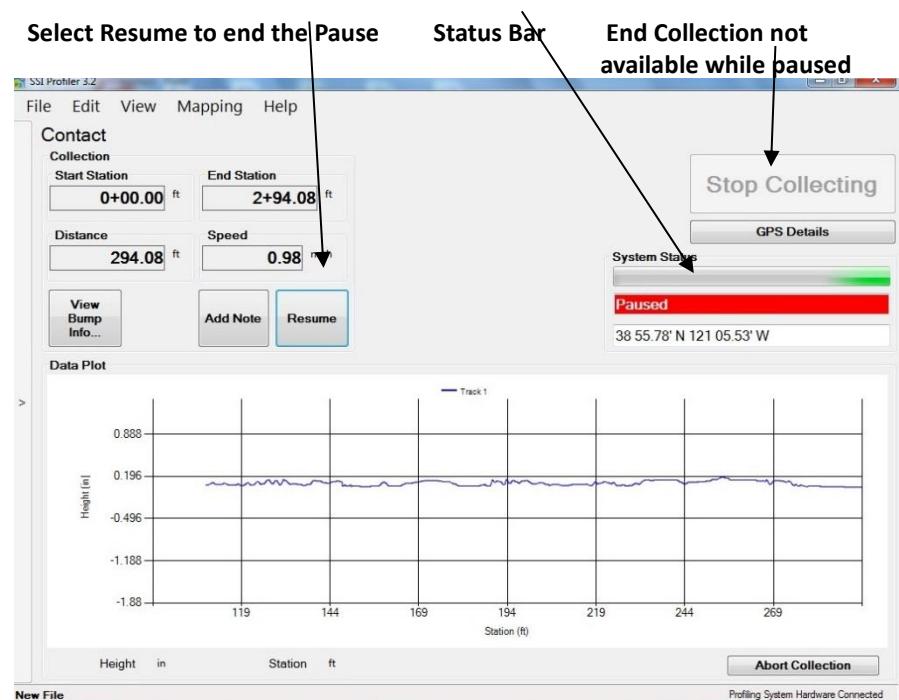


Figure 27: A paused collection

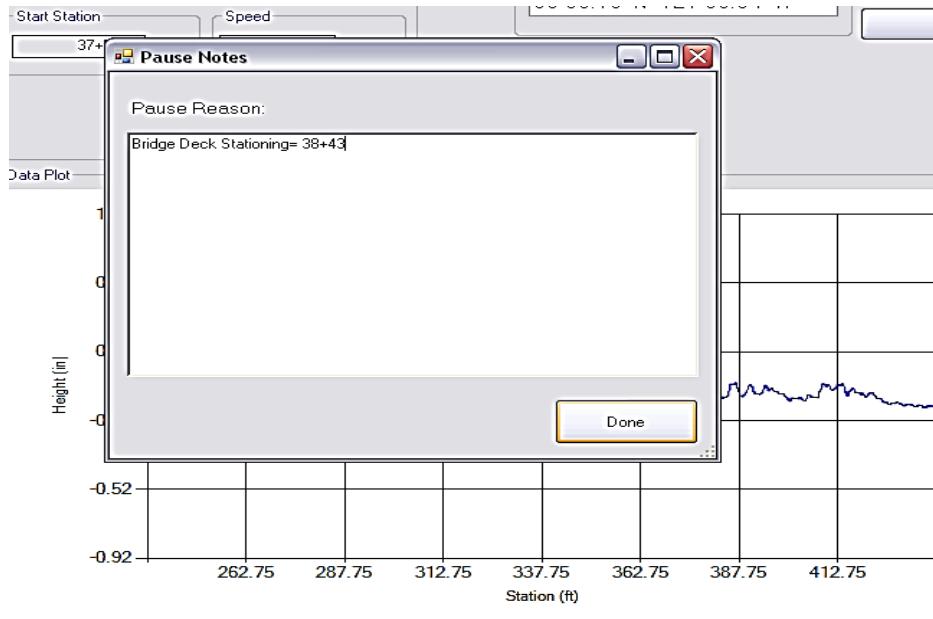


Figure 28: The pause note

Add Note

Notes can be used to explain defects, to leave notes for improvements or for adding any information about the current collection. The note locations will appear on the data traces in the report section. A window will appear that allows the operator to enter the information on the reason for the note.

The Note icon will flash red and blue when it is selected to assure the operator a note was added.

Start Station

The start station is entered with the preliminary data prior to collection. This value cannot be changed after collection begins.

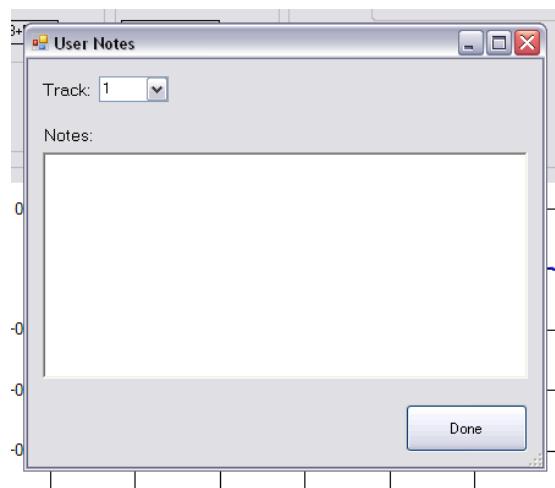


Figure 29: The add notes window

End Station

The end station is the current stationing location of the Profilograph after a collection has been started. The end stationing is based off of the starting station values entered prior to collection. The stationing cannot be adjusted after collection.

Ending a Collection

To finish a collection, select the “Stop Collection” icon. The program will open another window giving the user the options to save the file, save file and open a new file, and do not save file.

If the Do Not Save is selected, there will be no record of the data collection.

If Save Only is selected, the current file will remain open for the operator to collect more data on the file or to look at the collection in Reports.

If Save and Start New File is selected, the program will save the current file and open a new file to collect data.

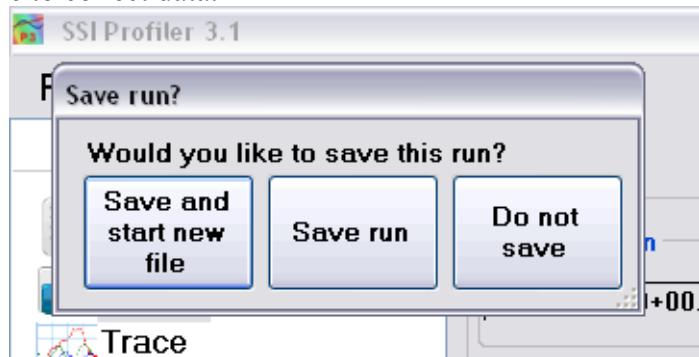


Figure 30: Saving Options After a Collection

Note: If multiple tracks are to be associated with one file, choose the Save Only option, then collect the next track.

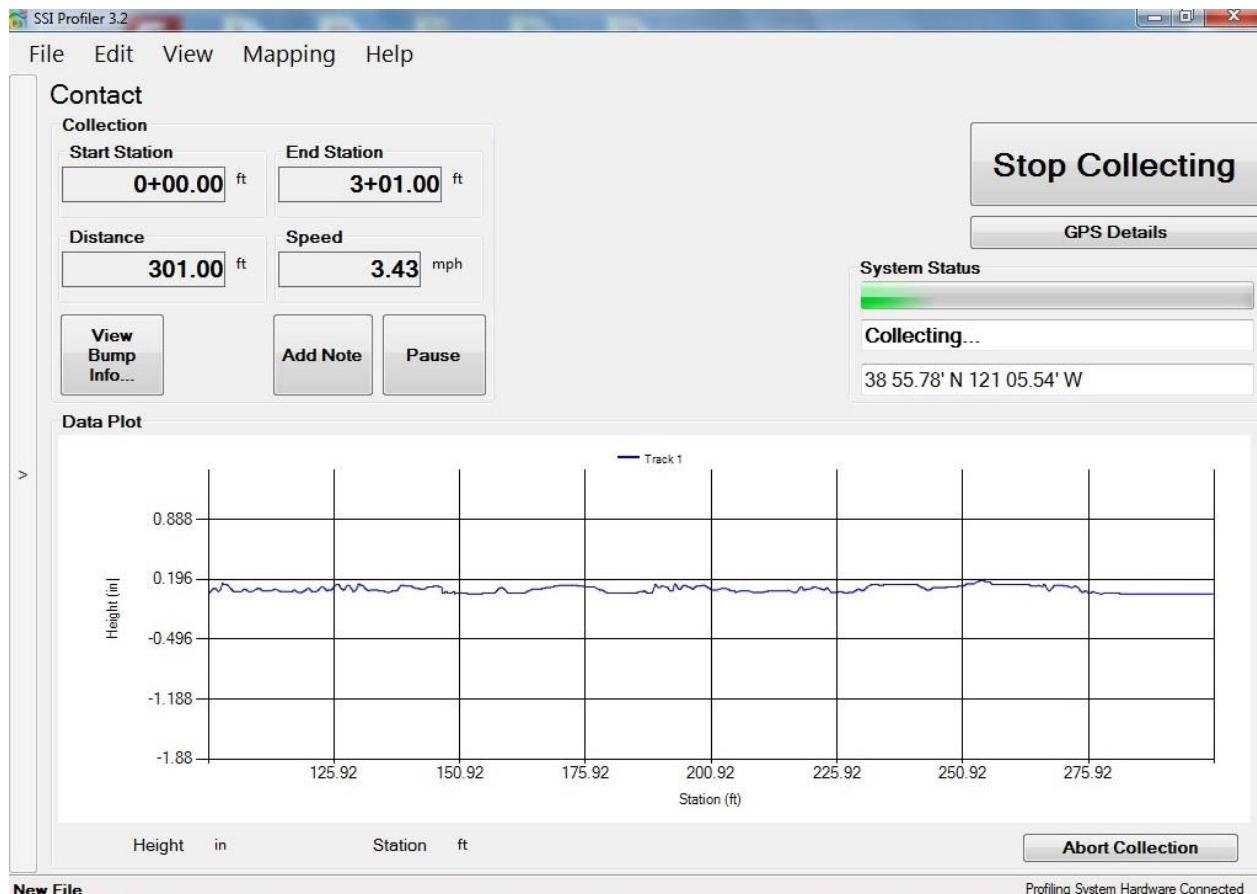


Figure 31: The start and end stations, distance traveled and the speed are displayed in the main collection window.

Distance

Distance is the distance traveled from the starting station to the current position. If the operator believes the distance is incorrect, review the calibration settings. If necessary perform a distance calibration.

Real Time Ride Values

If the operator selects the option to display the ride values in real time, the ride number for each segment will appear on the plot during collection. This feature is selected in the Collection Information window that appears when "Collect" is originally selected from the main Collect window. The real time ride values are displayed less than 25 feet from the end of the segment.

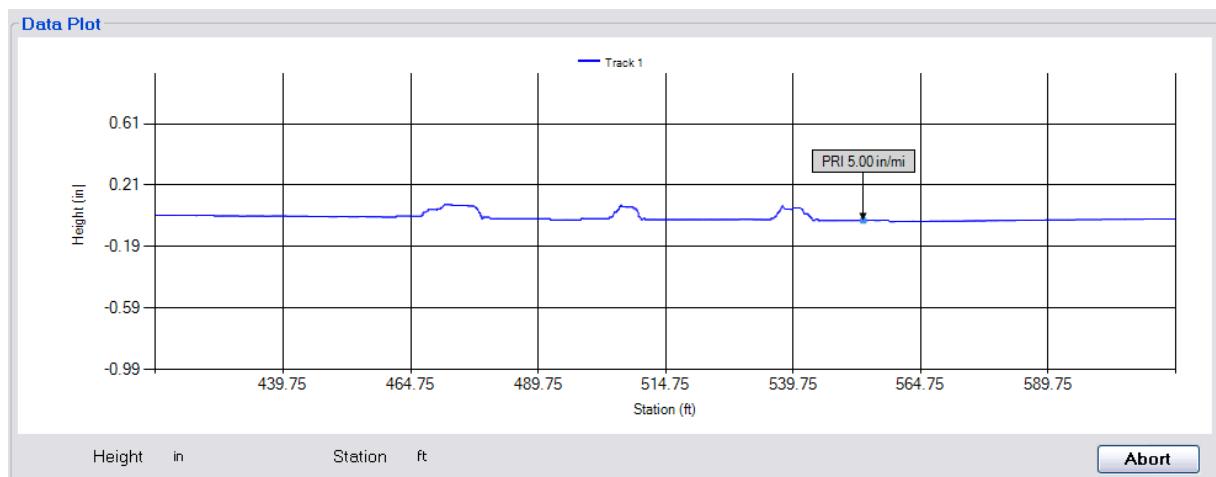


Figure 32: The Ride Values of PRI after segment length

Speed

The speed is the speed of the Profilograph based on the rotation of the wheel and the current distance calibration. Never exceed 7mph when profiling. Excessive speed will introduce artificial roughness into the collected data.

If the Profilograph is moving during a collection, but the speed and distance are not changing, inspect the hardware of the system, especially the coupling between the distance encoder axle and the measuring wheel axle. Also verify that all cables and wires within the Amphenol connections are secure.

Saving the Data

Select File>Save or ctrl+s to save changes and collected data. A windows explorer window will open and allow the operator to choose a destination to save the file. The format that Profiler can save collected data in is RSD. Once saved as an RSD file, the operator can export or convert the file into compatible formats.

1.0- File Tab

1.1. - New

Selecting New creates a new project file to be saved on the operator's computer or external device. The file will open automatically and the bottom left corner of the program will display "New File." If data has been collected with this file, the name will be displayed with an asterisk as "New File*."

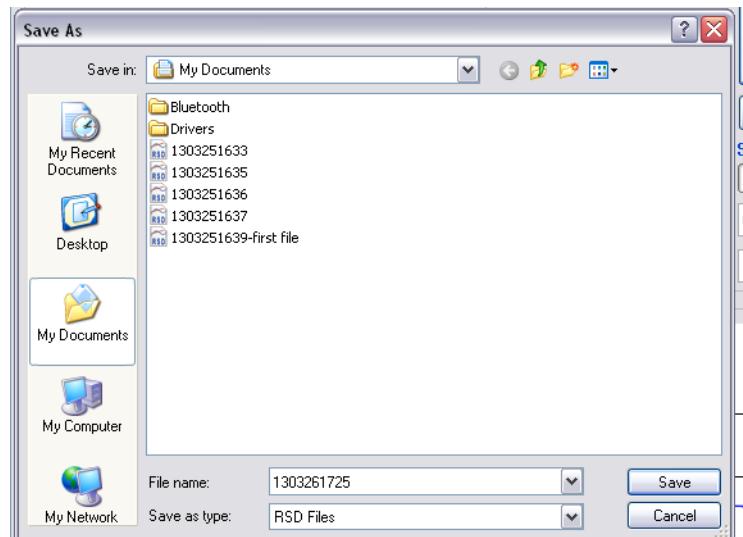


Figure 33: Saving the collection file

1.2. – Open

Opens a project file previously saved on the operating computer or connected external device. Profiler V3 creates RSD type files. The RHD file type from the previous version of Profiler can also be opened Profiler V3. If your file is in another format, use the appropriate translators are available for download on SSI's customer support website at this link:

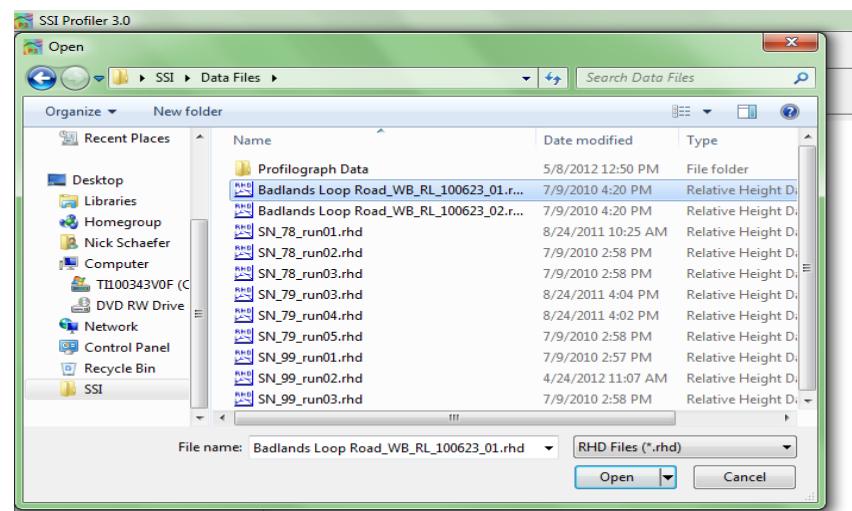


Figure 34: Opening a data file in the Profiler V3 program.

(<http://www.smoothroad.com/support/download.asp>). Or contact SSI Customer Support. The only two file formats used in the Profiler V3 program are RHD and RSD.

1.3. - Open Recent

Opens recently viewed or created project files. Files will only be available if they are saved on the operating computer or connected external device. The Open Recent feature is a shortcut to find current profiling data. It is also possible to use the File>Open tool to open saved data. The only two file formats used in the Profiler V3 program are RHD and RSD. Files can only be saved in RSD.

The default file to be searched for in Window's Explorer can be changed under General Settings and the "Default File Type."

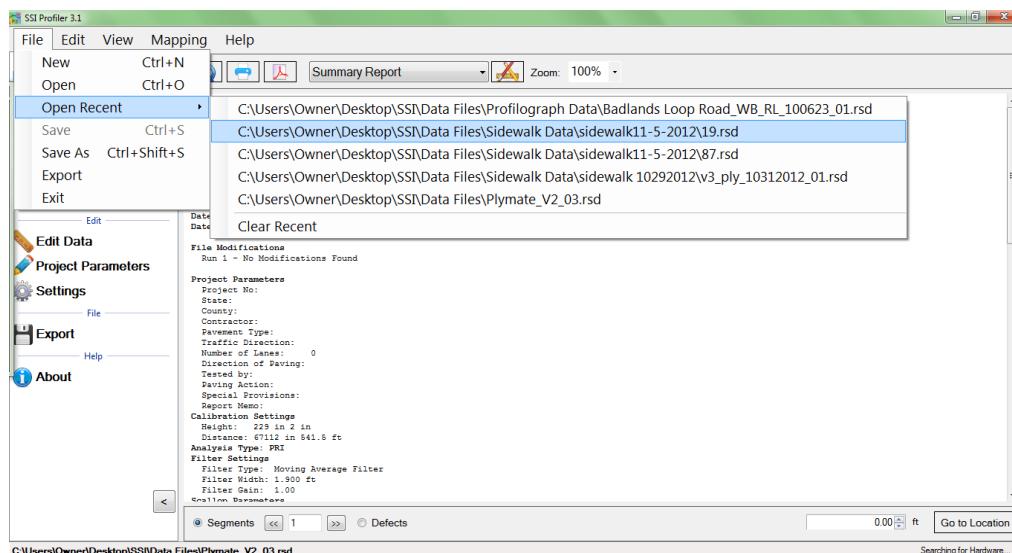


Figure 35: The Open Recent feature

Clear Recent

Clear Recent deletes the history of previously viewed RHD and RSD files. Once the history is cleared it cannot be reversed. The operator must navigate to File>Open to view saved files.

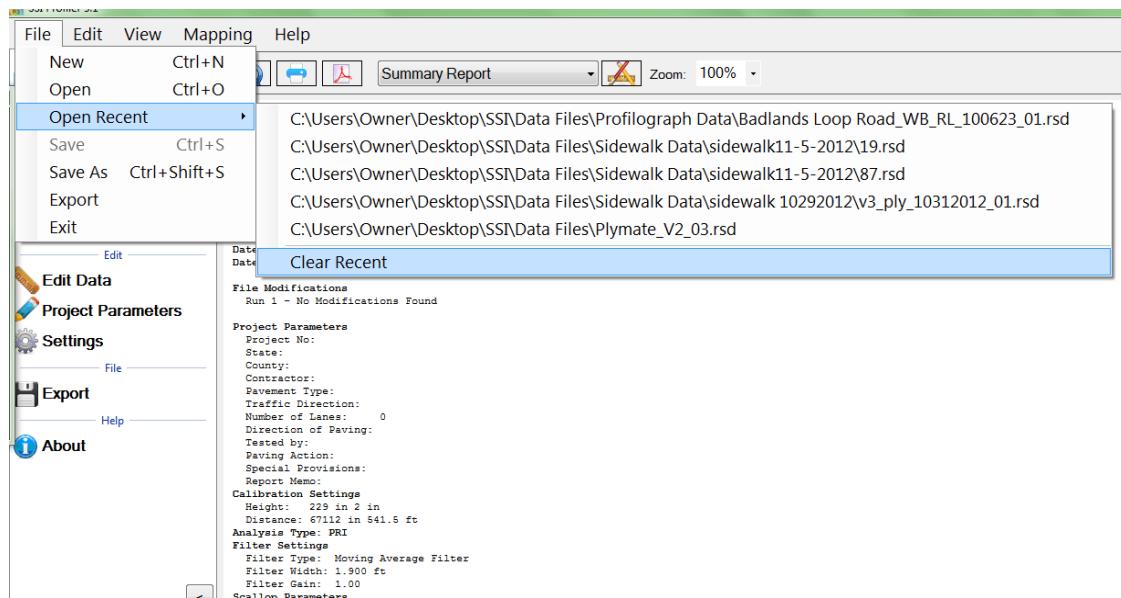


Figure 36: The clear recent feature

1.4. – Save

Save allows the operator to save the current file in RSD format on the operating computer or connected external device. If ‘Save’ is selected while an unsaved file is open, the operator will be prompted to choose a file name and folder destination to save the current file. The file will be saved in SSI’s patented RSD format. If another format is required, visit the SSI support website (<http://www.smoothroad.com/support/download.asp>) to download the latest translators or contact SSI Customer Support.

1.5. - Save As

When Save As is selected, the operator will be prompted to choose a file name and folder destination in which to save the current file. The file will be saved in SSI’s patented RSD format. If another format is required, visit the SSI support website

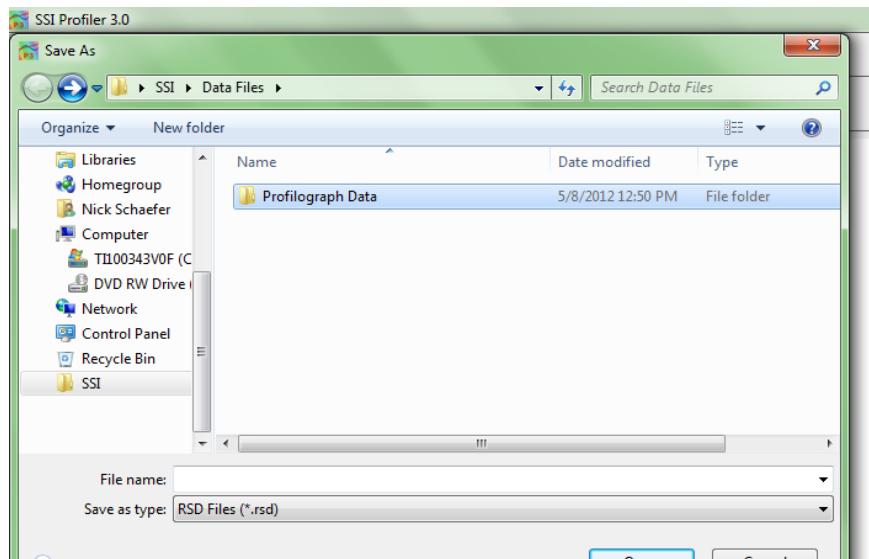


Figure 37: Saving a file through Save As in RSD format.

(<http://www.smoothroad.com/support/download.asp>) to download the latest translators or contact SSI Customer Support.

Note: Save and Save As are only available after data has been collected or if changes are made to preexisting file.

1.6. - Export

Exporting allows the operator to create files in **ERD, PPF, PRO, Survey, GPS Matching, GIS, Localized Roughness, RMS, GPX, ProFAA, and Excel** formats. The settings for each export feature are described below. For each of the exporting formats, a folder destination is required. The Export feature can be found in the shortcut bar on the left hand side of the Profiler V3 window and in File>Export.

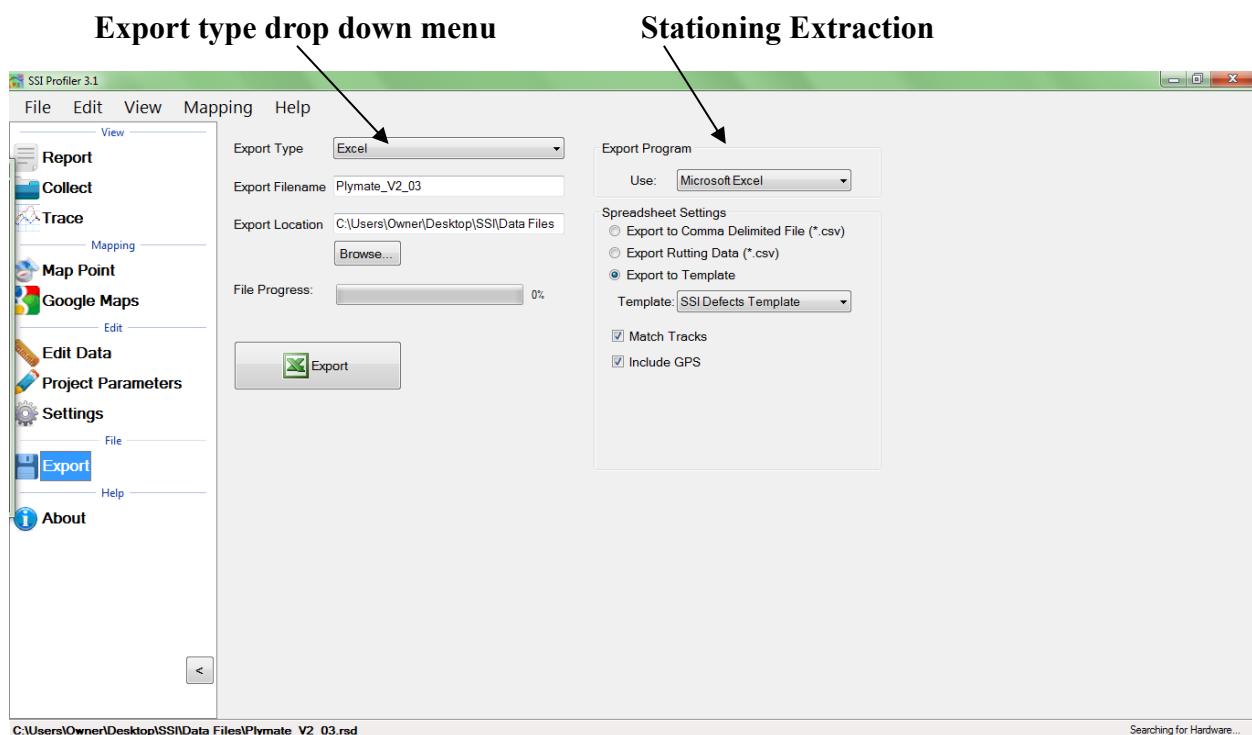


Figure 38: The export window for exporting the data into Excel format.

1.6.1. Export Location

To choose the folder destination, select ‘Browse’ and navigate through Windows Explorer to the desired folder. Once the folder destination is reached and selected, left click on ‘OK’ at the bottom of the window to save the folder location.

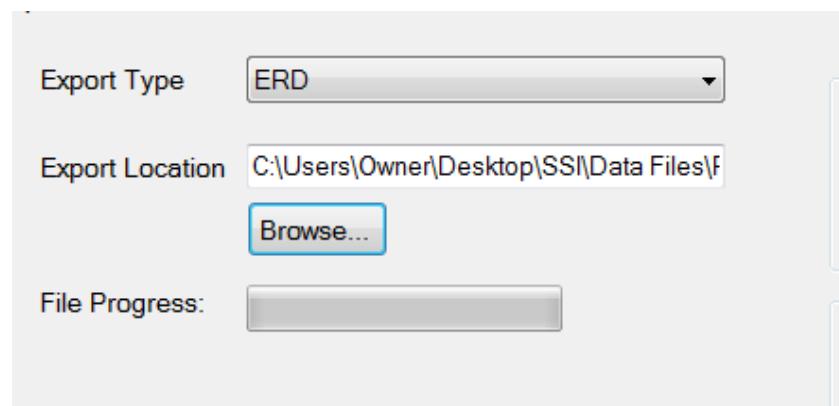


Figure 39: Selecting a location to save the exported file.

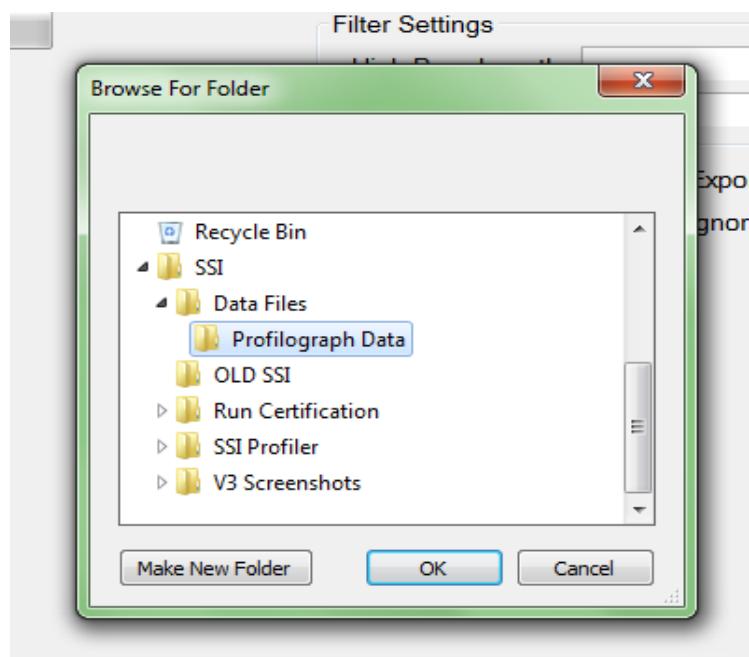


Figure 40: The export format and folder location selection

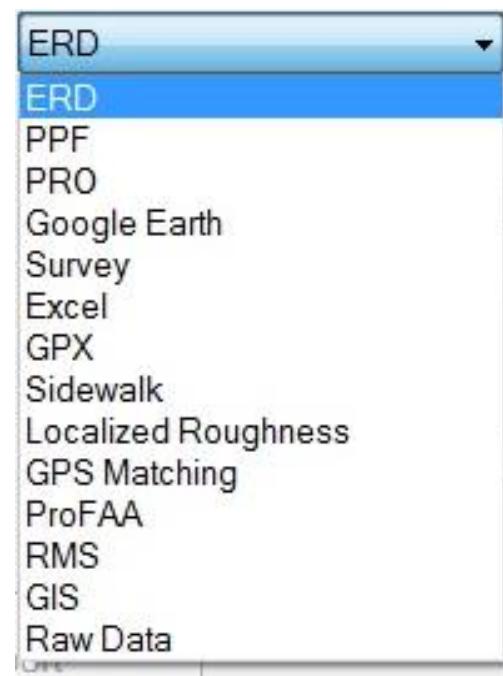


Figure 41: The export type drop down

1.6.2. – Exporting to ERD Format

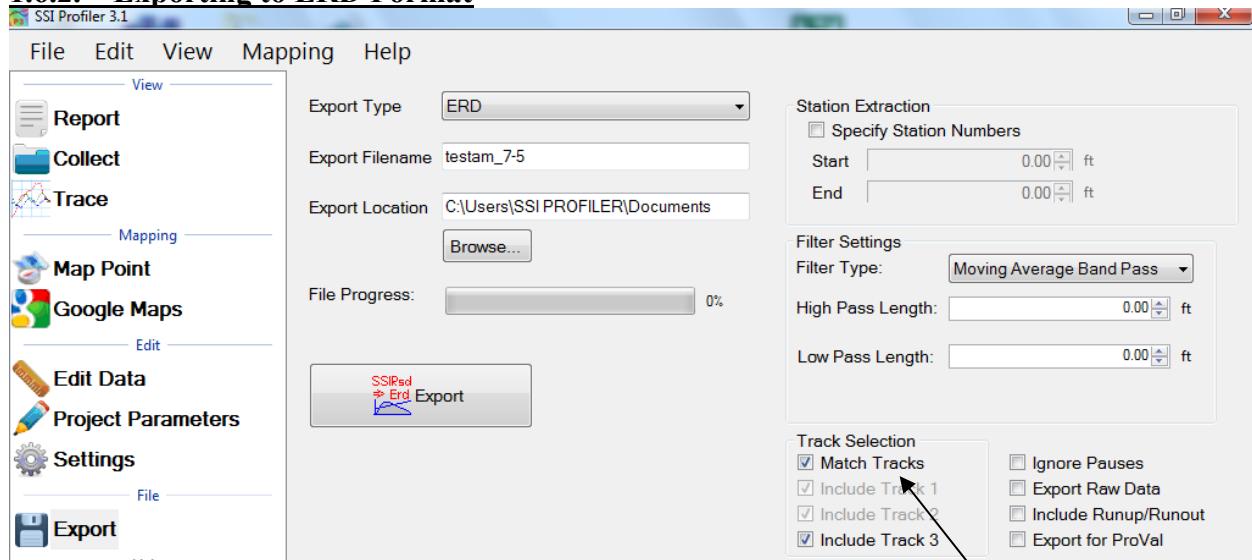


Figure 42: The ERD format export window with match tracks selected.

Match Tracks is selected

Station Extraction

The operator has the option to export only certain sections of the profile data, based on the stationing set within the Profiler V3 software. To use this feature, select the check box near “Specify Station Numbers.” When the box is selected, the operator will be able to adjust the stationing numbers. The ‘Start’ stationing is the initial stationing where the exported file will begin, while the ‘End’ stationing is the point where the exported file will finish. These values can be adjusted by typing values into the box or by using the arrow keys to the right of the box.

Filter Settings—High & low pass length

The exported data file can have additional filters applied while being processed into the chosen format. To not filter the data, leave the filter lengths at the default value of 0.00 feet.

Available Filters:

Moving Average High Pass Filter

Moving Average Band Pass Filter

Butterworth High Pass Filter

Butterworth Band Pass Filter

Include Run Up – Run Up Data

Some High Speed Profiling data files have Run Up and/or Run out data associated with them, depending on the practice used to collect the data. If this data exists, it will be included in the exported file if this box is selected. Run Up and Run out is used to allow the electronics to settle on the accurate profile.

Run Up data exists in HSP data files if the operator selected a Run Up and/or Run out distance in the initial stages of setting up a collection. In the HSP collection software, the Run Up and Run out settings are found on the last window before performing a collection.

Export Raw Data

Selecting the Export Raw Data check box assures the operator that only unfiltered data collected from the profile will be exported into the chosen file.

Match Tracks and Choosing Tracks

Match Tracks

Selecting ‘Match Tracks’ exports all of the tracks associated with the lane file. For the three laser systems, this includes Track 1, 2 and the center trace (Track 3). For Profilograph files, the tracks are matched based on the settings entered prior to profiling. The label of the track number and stationing cannot be changed after collection.

Choosing Tracks

The exported tracks are checked under “Track Selection.” If Match Tracks is selected the user cannot deselect track 1 or 2.

Ignore Pauses

Pauses are useful when an obstruction comes into the profiling path or when a section of pavement is not to be profiled. When Pause is activated, the stationing remains constant and under the same file. Pauses can either be omitted or included in reports and exported files of the Profiler V3 software. To omit pauses from the exported file, select the check box, “Ignore Pauses.”

Include Run Up/ Run out

When this option is selected, the Run Up and Run out data collected during the collection will be included in the export data.

Export for ProVal

When the user exports an ERD file for use in ProVal, it adds a negative sign in front of all stationing. This is done because ProVal does not use stationing, it only uses forward distance. If you collect data down station, you must check the Export for ProVal box to keep accurate stationing through the collection.

Always choose “Export for ProVal” when creating files to import into ProVal.

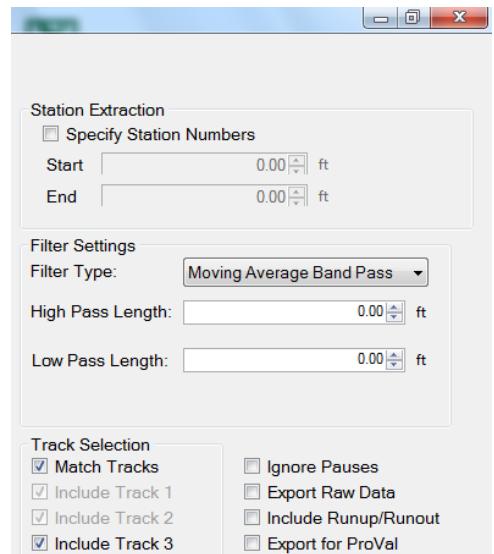


Figure 43: The EKD export window settings

1.6.3. – Exporting to PPF Format

Station Extraction

The operator has the option to export only certain sections of the data, based on the stationing set within the profiling data. To use this feature, select the check box near “Specify Station Numbers.” When the box is selected, the operator will be able to adjust the stationing numbers. The ‘Start’ stationing is the initial stationing where the exported file will begin, while the ‘End’ stationing is the point where the exported file will finish. The start and end stationing can be

adjusted by typing values into the box or by using the arrow keys to the right of the box.

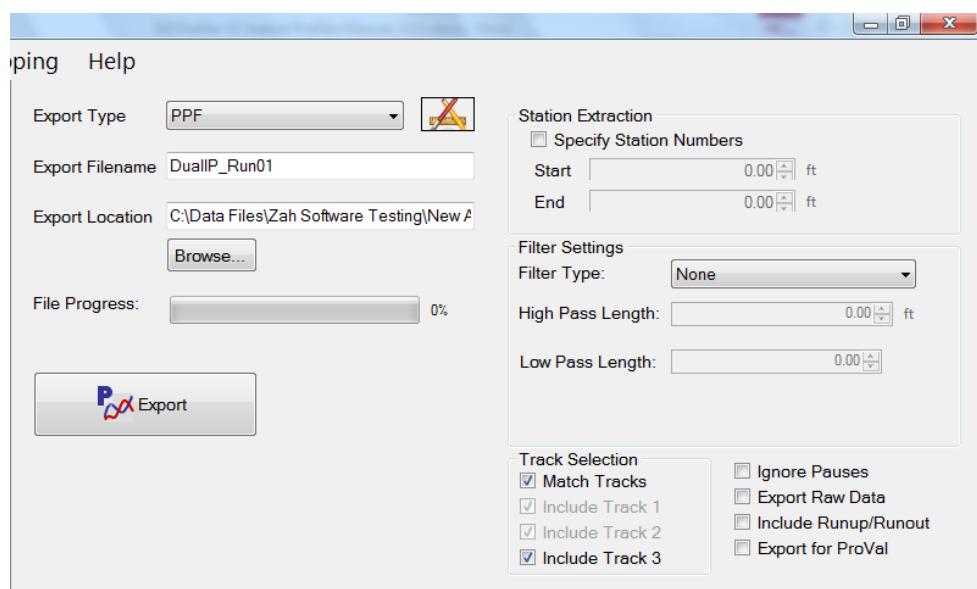


Figure 44: The PPF export window

Filter Settings—High & Low Pass Length

The exported data file can have an additional filter applied while being processed into the chosen format. To not filter the data, leave the filter lengths at the default value of 0.00 feet.

Available Filters:

Moving Average High Pass Filter

Moving Average Band Pass Filter

Butterworth High Pass Filter

Butterworth Band Pass Filter

Include Run Up and/or Run out Data

Some High Speed Profiling data files have Run Up and/or Run out data associated with them, depending on the practice used to collect the data. If this data exists in the data file, it will be included in the exported file if this box is selected.

Run Up data only exists in HSP (High Speed Profiler) data files if the operator selected a Run Up and/or Run out distance in the initial stages of setting up a collection. In the HSP collection software, the Run Up and Run out settings are found on the last window before performing a collection.

Export Raw Data

Selecting the Export Raw Data check box assures the operator that only unfiltered data collected from the profile will be exported into the chosen file. The file is adjusted so that the elevations begin at zero.

Match Tracks

Selecting ‘Match Tracks’ exports all of the tracks associated with the lane file. For the three laser systems, this includes Track 1, 2 and the center trace (track 3). For the Profilograph files, the tracks are matched based on settings entered prior to profiling. The stationing and number label assigned to the track are settings that cannot be changed after collection.

Ignore Pauses

Pauses are used when an obstruction comes into the profiling path or when a section of pavement is not to be included in the calculation of ride values and localized roughness. While Pause is activated, the program will continue to collect stationing data, but will not collect height data. Pauses can either be omitted or included in reports and exported files. To omit pauses from the exported file, select the check box, “Ignore Pauses.”

For importing into ProVal, the best method is to include pauses. The pauses of the rsd file will turn into a leave-out section within ProVal. If pauses are not included during export, it will result in two PPF files for the same track. There will be one more PPF file than the number of pauses.

Export for ProVal

When the user exports an ERD file for use in ProVal, it adds a negative sign in front of all stationing. This is done because ProVal does not use stationing, it only uses forward distance. If you collect data down station, you must check the Export for ProVal box to keep accurate stationing through the collection. *Always choose “Export for ProVal” when importing into ProVal.*

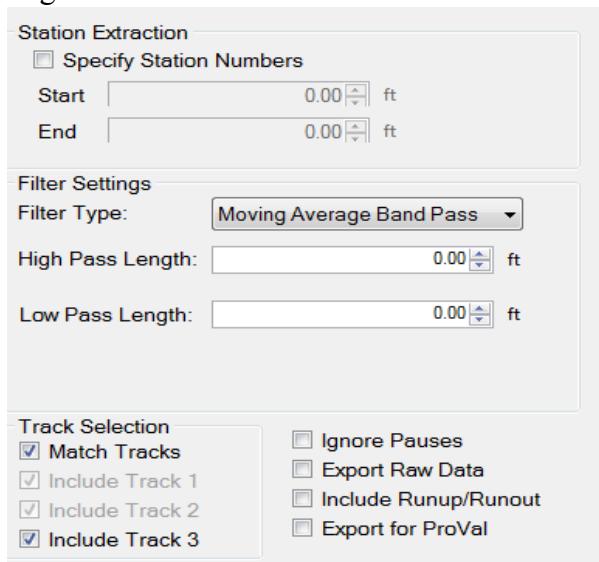


Figure 45: The optional settings when exporting in PPF format.

1.6.4. – Exporting to PRO Format

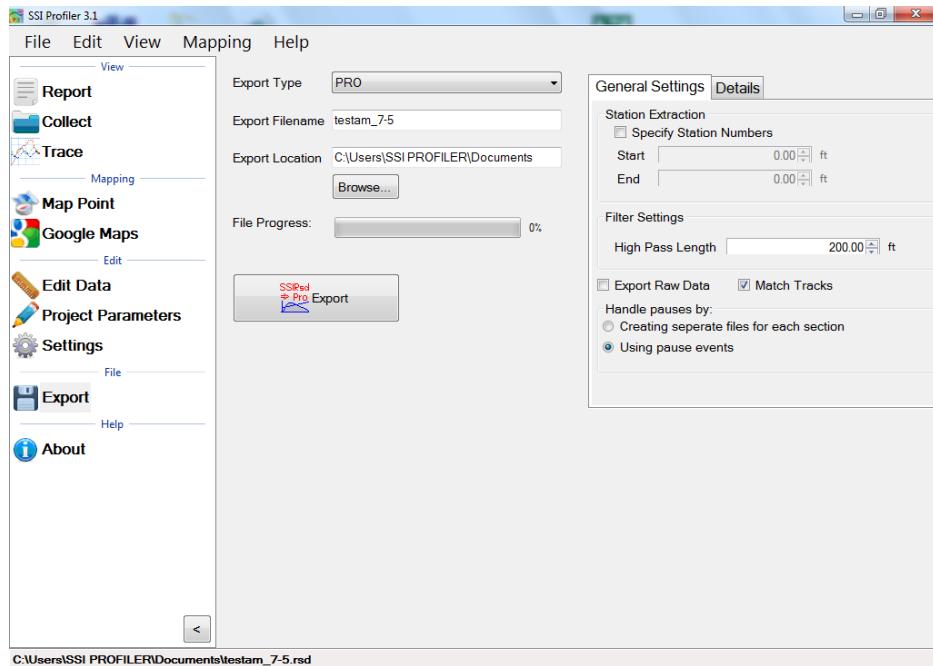


Figure 46: The export window when PRO format is selected.

General Settings

Station Extraction

The operator has the option to export only certain sections of the data, based on the stationing set within the profiling file. To use this feature, select the check box near “Specify Station Numbers.” When the box is selected, the operator will be able to adjust the stationing numbers. The ‘Start’ stationing is the initial stationing where the exported file will begin, while the ‘End’ stationing is the point where the exported file will finish. These values can be adjusted by typing values into the box or by using the arrow keys to the right of the box.

Filter Settings-High Pass Length

The High pass filter length can be changed when exporting files to PRO format. A High Pass Filter removes all of the data trends below the filter length. The default length of the High Pass Filter is 200 feet. In order to export the data without filtering, the ‘Export Raw Data’ check box must be selected. See ‘Export Raw Data’ below.

Export Raw Data

Selecting the Export Raw Data check box assures the operator that only unfiltered data collected from the profile will be exported into the chosen file.

Match Tracks

Selecting ‘Match Tracks’ exports all of the tracks associated with the lane file. For the three laser systems, this includes Track 1, 2 and the center trace (Track 3). For the Profilograph files, the tracks are matched based on settings entered prior to profiling. The label of the track cannot be changed after collection.

Handle Pauses By:

The paused sections within the collected data can be exported in two ways. Separate files can be created for each segment or the profile data can be exported with the paused sections included in one file. The difference in these two options is that creating separate files for each segment exports multiple files into the folder location, while the “Using pause events” option exports one file including all of the data. If the pauses were used to omit data because of pavement anomalies, use the option of ignoring the pauses.

Details

The details section of PRO exporting is the job specific information saved with the file, such as District Number, County Number, Reference Marker, Reference Offset, Highway Descriptor, Lane Descriptor, Certification Number, Certification Date, and Comments. This information is then saved with the PRO file to be displayed when the file is opened or printed using another program.

General Settings		Details	
District Number	1	Reference Marker	0
County Number	1	Reference Offset	0.000
Highway Descriptor		HH0000H	
Lane Descriptor		L0	
Certification Number			
Certification Date		Monday . June 27.20	
Comment 1	Comment		
Comment 2	Comment		

Figure 47: The Details tab contains information about the project.

1.6.5. – Exporting to Survey Format

Station Extraction

The operator has the option to export only certain sections of the trace, based on the stationing set within the profiling data. To use this feature, select the check box near “Specify Station Numbers.” When the box is selected, the operator will be able to adjust the stationing numbers. The ‘Start’ stationing is the initial stationing where the exported file will begin, while the ‘End’ stationing is the point where the exported file will finish. These values can be adjusted by typing values into the box or by using the arrow keys to the right of the box.

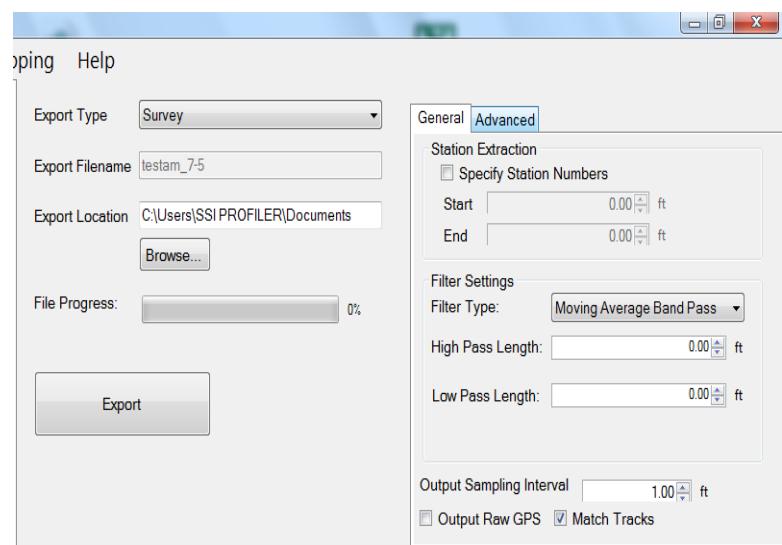


Figure 48: The window for exporting in Survey format

Filter Settings

High and Low Pass filters are optional when exporting to survey format. The exported data file can have an additional filter applied while being processed into the chosen format. To not filter the data, leave the filter lengths at the default value of 0.00 feet.

Available Filters:

Moving Average High Pass Filter

Moving Average Band Pass Filter

Butterworth High Pass Filter

Butterworth Band Pass Filter

Output Sampling Interval

The sampling interval is the distance between readings of the SSI survey system. The default length of this interval is 1 foot. This feature allows other intervals to be implemented, depending on the accuracy specifications required in the surveying program.

The raw GPS will be exported in a separate text file in a NMEA (GPGGA) GPS string format. To match tracks 1 and 2 within the same file select the match tracks option.

Advanced Tab

The user has the option to report the IRI ride value every interval. The figure below is set to ten feet; meaning the IRI will be displayed every ten feet of the profile.

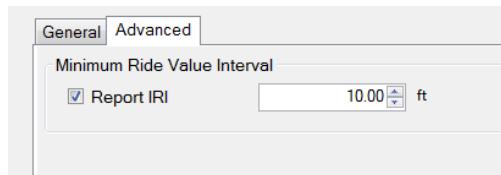


Figure 49: The Advanced Options of the Survey format

1.6.6. – Exporting to Excel Format

Exporting the profile data to excel gives the operator versatility and efficiency when an adjustable numerical printout is needed.

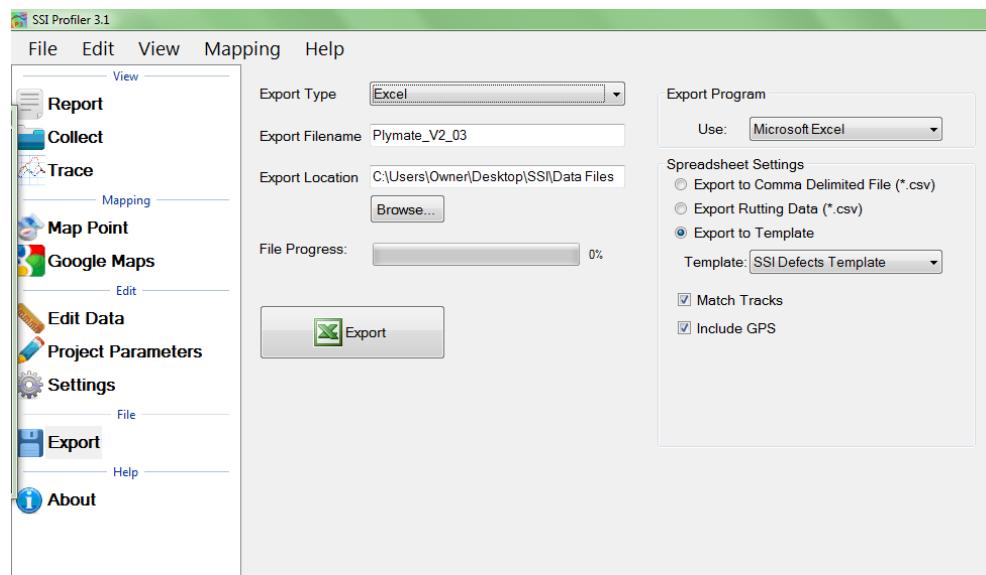


Figure 50: Exporting the data into Microsoft Excel format

Export to Comma Delimited File

The Comma Delimited file shows the track number, segment number, start and end stationing and the ride number selected in the Analysis Parameters.

Export to Template

To choose a SSI Excel Template, select “Export to Template.”

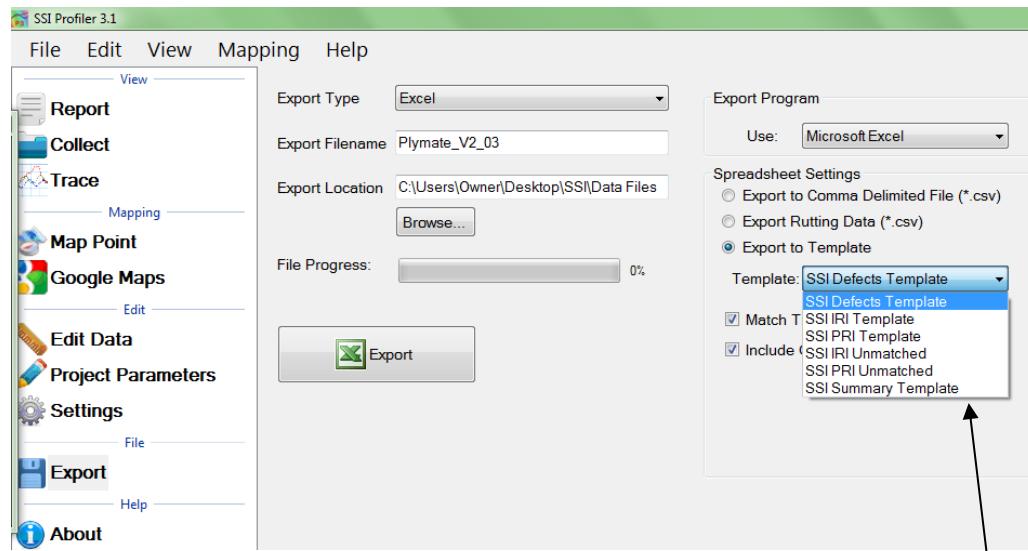


Figure 51: The types of excel formats are listed in the drop down menu.

Types of excel formats to export the collected data into.

Defects Template

The Defects Template shows the locations and heights of the defects and information about the file in spreadsheet form.

IRI Template

The IRI Template shows IRI statistics along with the defect locations and heights.

PRI Template

The PRI Template lists the PRI for each track along with the bump heights, locations and settings.

IRI Unmatched

The IRI Unmatched Template shows the calculated IRI for each track along with the defect heights, defect locations and settings.

PRI Unmatched

The PRI Unmatched Template shows the calculated PRI for each track along with the bump heights, locations and settings in spreadsheet form.

1.6.7. – Exporting to Google Earth

The export to Google Earth feature allows operators with Google Earth installed on their computers to view the test data in the real environment. The view of the Google Earth feature shows the project area with the traces superimposed onto the window. The user may view the traces and project from any view or angle. For this feature to be used, the operating computer must have Google Earth installed.

The user may then use Google Earth to view the profile trace in their computer, tablet or smart phone as long as the device has Google Earth installed. The .kmz file can be emailed to the device or sent via Bluetooth if your Toughbook is equipped.

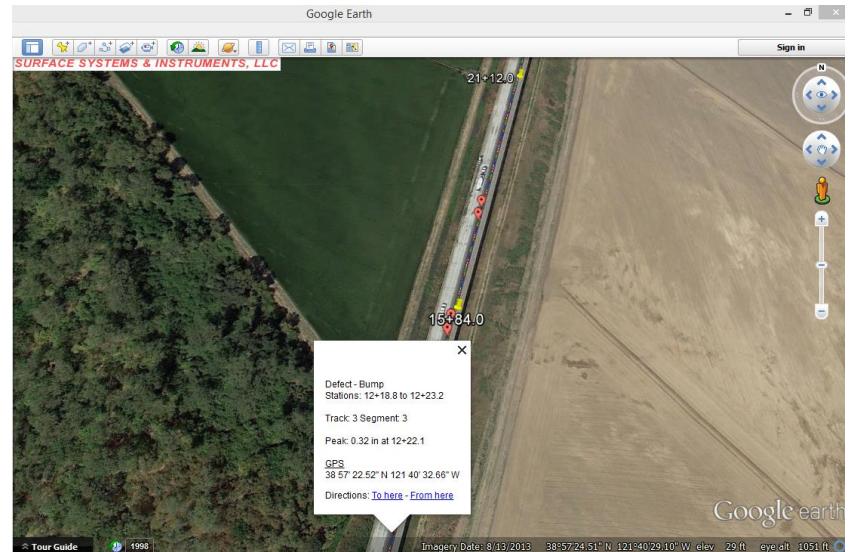


Figure 52: Google Earth on a laptop

1.6.8. – Exporting to GPX Format

The GPS coordinates can be exported into a format for submittals. The GPS coordinates of the defect can be viewed through the defect start station, defect end station or the defect peak station. Specific runs can be chosen to retrieve the GPS coordinates by adjusting the drop down menu under the title, "Select Run to Export."

Under the title "Data to Export" there are multiple check boxes. In order to export the defect's GPS coordinates, the "All Raw GPS Locations" check box must be unchecked. Once the "All Raw GPS Locations" box is deselected, the options to export the defect stationing GPS coordinates become available.

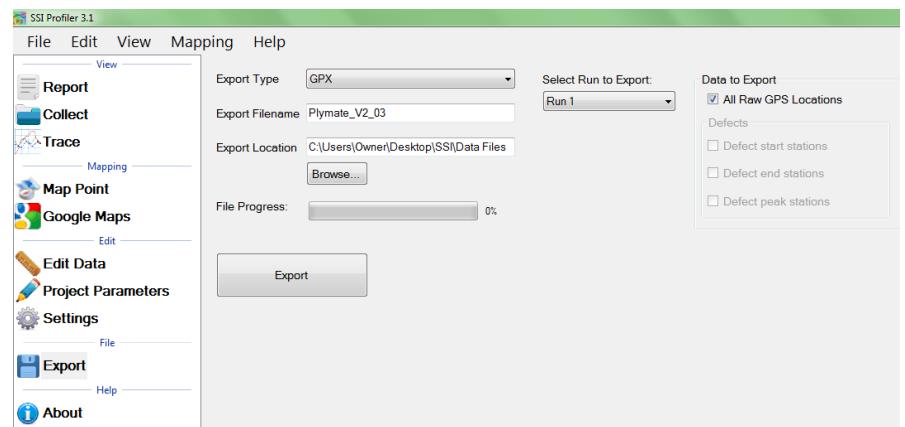


Figure 53: The export window when the GPX format is selected.

1.6.9 – Exporting to Sidewalk Format

This option is only to be used with files collected with the SSI Sidewalk Profiler (CS-8850). The sidewalk format has all of the information of the collection exported into GIS compatible file types. These file types and the corresponding information (See Glossary for explanation) within them are: ngd, pxyzd, pxyzdg and pxyzdinc, rmpslp, rmpslpg, rmpslpg_ls, ubag.

1.6.10 – Exporting to Localized Roughness

The localized roughness export feature allows the user to create an excel spreadsheet of the localized roughness, or defects, for the collected data.

Specify Station Numbers

If the user desires to only export a section of the collection, select this check box and enter the start and end stationing of the soon to be exported section. If the specify station numbers is not selected, the entire collection will be exported.

GPS Reporting

To choose the type of GPS format used in the export, select Northing/Easting, Decimal Degrees, or NMEA Format from the drop down list.

Lane Settings

The user may change the lane number that is currently in the collection file by selecting this check box and entering the correct lane number. To change the lane number, deselect the check box and change the lane number in the input location.

Customization

The user may add, move and remove columns from the Excel spreadsheet format. To do this, open the “Customize Contents” window and use the arrow keys. Move up and move down to change the order of the included columns. The columns types are at the top of the “Columns in File” side the left-most columns in the exported Excel file.

Merging

The ‘Merge Multiple Runs’ check box allows the user to include multiple collection runs in the spreadsheet. Runs that are saved in a separate file can be opened and exported alongside the current file by selecting “Use Existing File” and browsing to enter the location of the file.

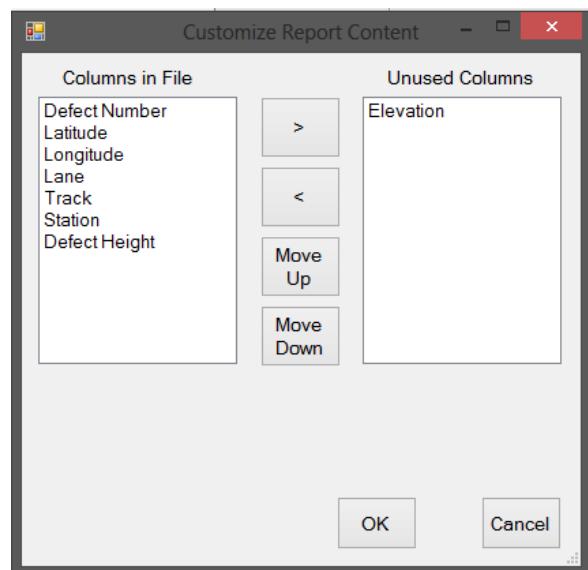


Figure 54: The Customize Window

Export Defect Locations

Use the check boxes to select whether the program will export the start, peak and end of the defect in the spreadsheet.

The user will have the option to match tracks 1 and 2, include the paused sections, and include the header information. When paused sections are included the defects within the paused sections will be listed.

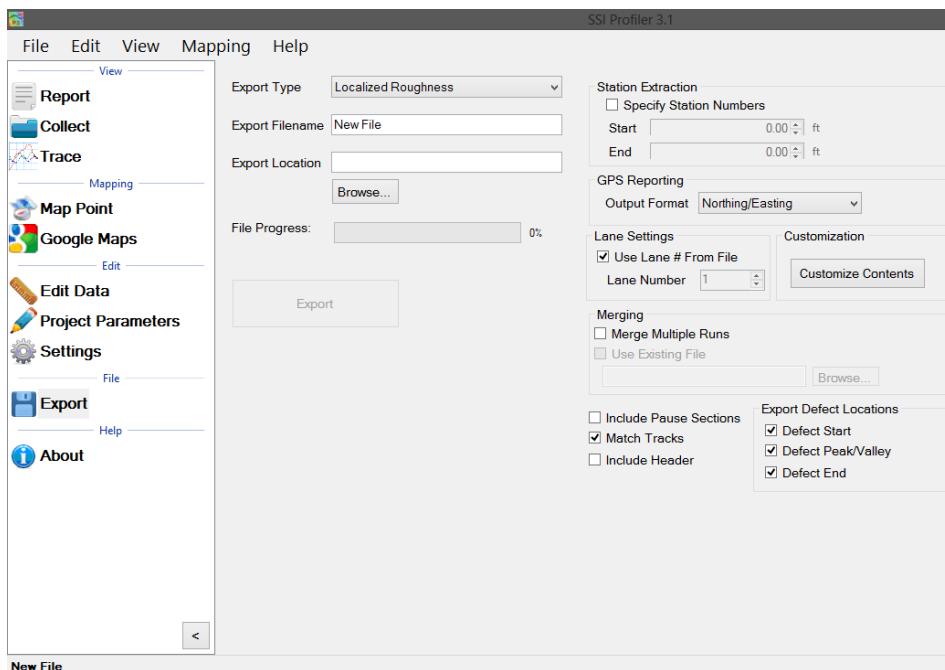


Figure 55: The Localized Roughness Export Template

1.6.11 – ProFAA

ProFAA is the format used for the Federal Aviation Administration (FAA) profiling program. This is the program that uses the Boeing Bump test method.

The user can enable high and low pass filters, change the start and end stationing, including the pauses and exclude specific tracks from the exported data.

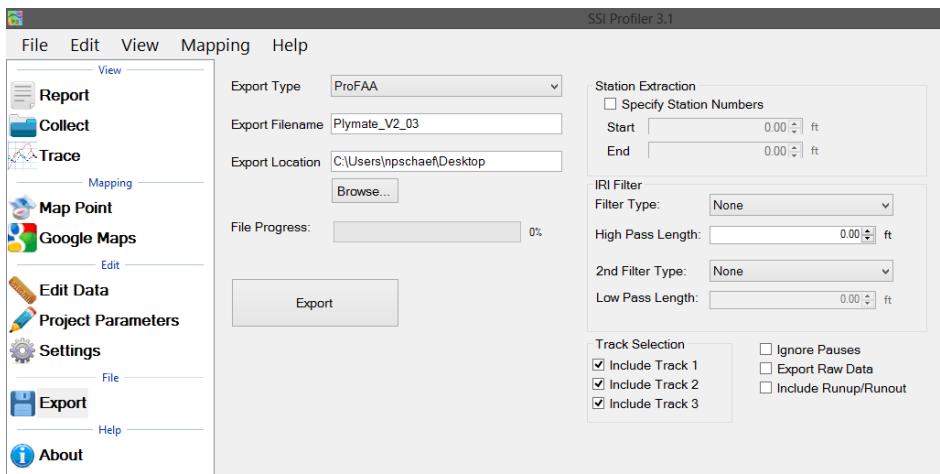


Figure 56: ProFAA Matching

Exporting raw data will force the data through a linear regression filter and have the data begin and end at zero elevation. The Run Up and Run out data can be included by selecting the check box.

1.6.12. – RMS Export

The RMS export is a normalization of the profile data. RMS removes the influences of long wavelengths and grades while focusing on the amplitudes of the wavelengths in the profile. The RMS output does not show the frequency of these amplitudes in the profile, only that they exist.

Set the RMS base length for continuous RMS and the sampling/segment interval.

The raw GPS is a text file of all GPS points within the collection. The RMS text file will display the closest GPS point at the start of the segment length in DMS form. The raw GPS will also be in DMS form.

1.6.13. – GIS Export

The GIS export will create shape files for the segments, localized roughness, events, and track path for the profile. These files will be organized into their own folder entitled GIS Files under the destination folder.

1.6.14. – Exporting Raw Data

The user can export raw elevation data, GPS data and GPS height data. The settings can be changed to export certain GPS string formats. It is recommended to use the Linear Regression Removal Filter to set the raw elevations along the null line. Otherwise there can be drift in the trace and give inaccurate elevation data.

1.7. – Exiting Program

To exit the Profiler V3 program, save current project and click the red “X” at the top right corner or navigate to the File tab and select Exit. If the current project is not saved when the program is terminated, Profiler V3 will ask if the operator would like to save the current project. To save and exit the program, select “Yes.” If you do not wish to exit to program, select cancel and the program will remain open.

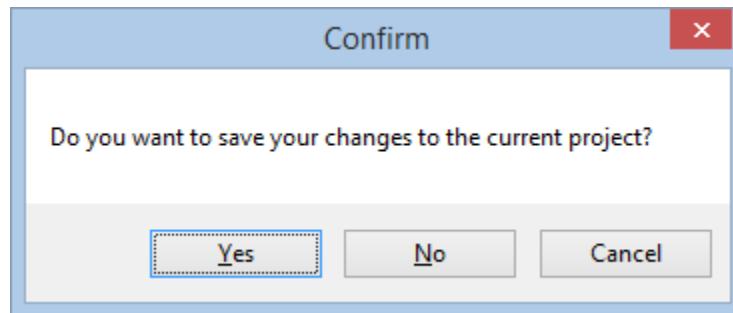
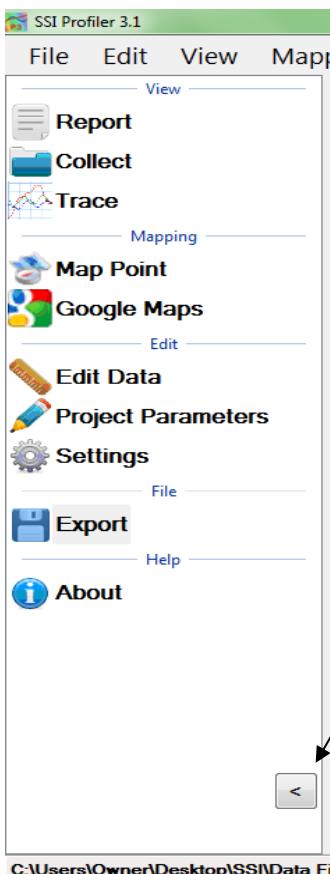


Figure 57: Exiting the program- Saving

1.8. – Shortcut Bar

The Shortcut Bar is located at the left side of the main window. The shortcut bar is used to navigate around the profiler program without using the menu bar.



The shortcut bar can be hidden by selecting the arrow at the bottom of the window. The direction that the arrow is pointing is the direction that the shortcut bar will move. It will either become hidden, or reappear.

Figure 58: The shortcut bar with all of the frequently used windows

Hide the shortcut bar by selecting the Hide Icon

2.0. - Edit

2.1 – Edit Data

Note: Any edit to the data will be described in the report header under File Modifications.

The edit data feature allows the user to adjust the starting station, insert pauses, or add events. All of this can be done in post processing, after a collection has been completed. To edit the collection:

- 1) Open the tab that has the information that needs adjustment. (Edit, Runs, Segments, Events)
- 2) Select the run that needs to be adjusted from the drop-down menu.
- 3) Change the parameter of starting position, run direction, and amount of Run Up or Run out data
- 4) Select apply.

Edit Runs

Under Edit Runs the user can adjust the starting position and change the Run Up or Run out lengths. If the data was collected in the wrong station direction, this can also be reversed by changing the bullet selection to “Up” or “Down.”

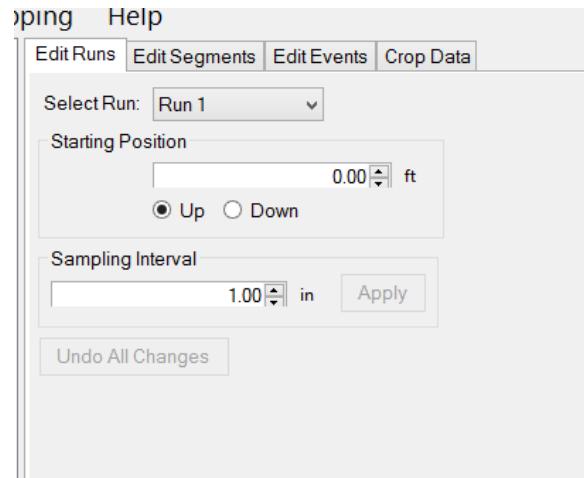


Figure 59: The Edit Run Options

Sampling Interval

The sampling interval is the distance between readings of the electronics of the profiling system (DMI, lasers, etc.). This is usually set to 1 inch.

Edit Segments

The Edit Segment feature allows the user to add pauses to the collection or to ignore a certain distance of collected data at the beginning or end of the run. The data will not be included in calculation of the PRI.

Adding & Editing Pauses

To add a pause

- 1) New Pause will be added above the highlighted blue bar “(add new pause).”
- 2) Select the run number to add the pause to from the drop down menu.
- 3) Select the pause type (Exclusion, Bridge, Intersection)
- 4) Enter the start station for the pause
- 5) Enter the end station for the pause
(The pause length will be updated automatically)
- 6) Select Add. The pause stations will appear in the Pause List.
- 7) The user will now be able to add Pause Notes.
 - a. Select Apply to save the pause note.

Note: A pause will not be added unless the Start Station is different than the End Station.

The pause can be edited at any time. Any pause or edit made after collection will be displayed in the report header under file modifications.

To Edit a pause

- 1) Select the paused section to be edited in the Paused list. It is selected when the blue bar is highlighting the pause title (Ex. “Run 1 - 0+00.0 to 0+010.0”)
- 2) Change the stationing.
- 3) Select Save to set the changes.
- 4) Select Apply for the changes to take effect

Note: The run(s) that the pause is applied to cannot be changed through Edit Run. Please create a new Pause to change the pauses of a run. See directions above to create a pause.

If the pause is going to be deleted, select the Delete icon to remove it from the list.

Pause Definition

When the collection system is paused, height data is omitted but the distance is still collected. When the paused sections are excluded the height values are not included in the calculation of localized roughness or ride values.

Pause Notes

To explain the reason for the pause or the location, enter the information in the pause notes. This information will appear in the track notes of the trace reports.

Pause List

The Pause List shows all of the paused sections of the selected runs. The runs are selected from the drop down menu of “Add Pause to Run.”

Start Station

The Start Station is the stationing where the pause is to begin.

End Station

The End Station is the stationing where the pause will stop, and collection will resume.

Save Pause Icon

When the operator selects a created pause in the Pause List by left clicking on it and highlighting it blue, the two options of Save and Delete appear in the middle of the window. To save the selected pause in the Pause List, left click Save.

Ignore Length at Start/End

This feature ignores a distance at the *start and end of a collection* by adding a pause at these locations. If the “Use Same Length” box is not selected, the ignored distance at start and end will be the same.

Pause Buffers

The Pause Buffer icon opens a new window to add length around pauses in the Pause List. Choose the Pause in the Pause Buffer window and add the buffer length. Select OK when finished.

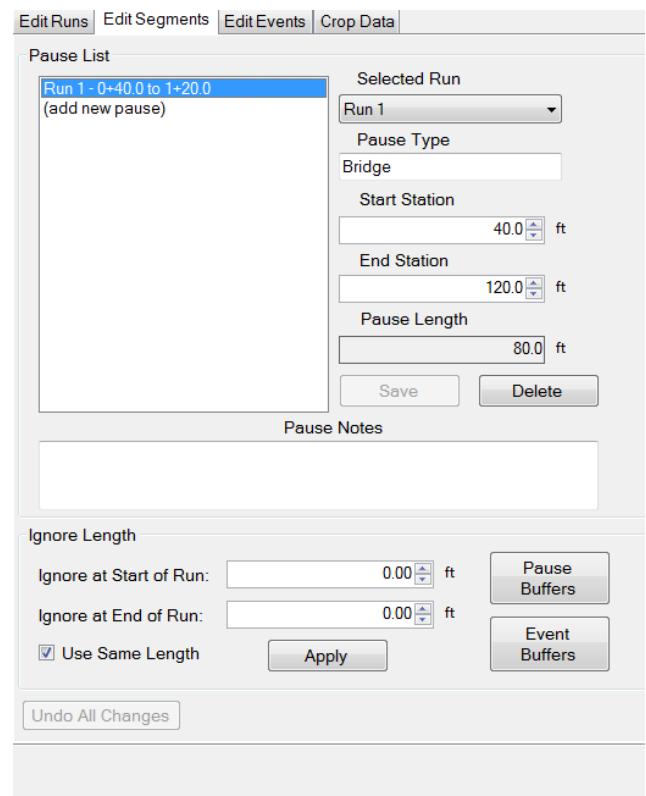


Figure 60: Adding or removing pauses from the collection

Pause Buffers

The Event Buffer icon opens a new window to add length around events around events in the Events Tab. Choose the event in the Event Buffer window and add the buffer length. Select OK when finished.

Use Same Length

When the Use Same Length check box is selected, the runs will be trimmed to the same length.

Edit Events

Edit Events allows the user to input events that were not added during collection, or to delete saved events. The events can have information associated with them that is inputted into the text box. The types of events for walking profilers (Sidewalk) are Height and Width obstruction. High speed and Profilograph systems should use the “Default” Event Type.

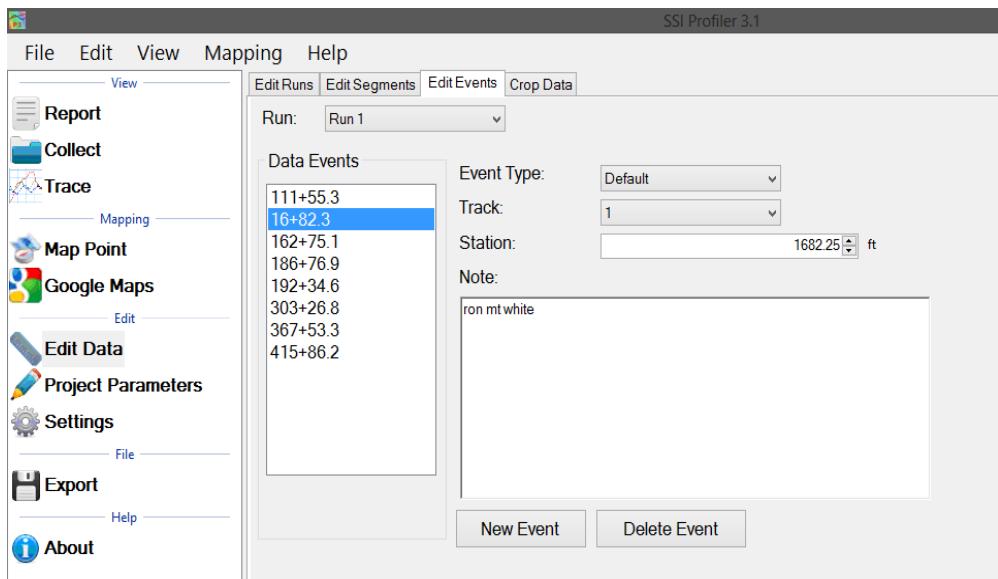


Figure 61: Edit Events Tab

To add an Event:

- 1) Select the run to add the event to,
- 2) Select New Event,
- 3) Change the Stationing to the correct point location
- 4) Adjust the Event type to explain the event.
- 5) Under notes, add information about the event. (Start Structure, manhole, drainage, etc.)
- 6) Select Apply

Editing an Event:

- 1) Select the event in the Data Events list to highlight it blue.
- 2) While highlighted, the event stationing, type or notes can be changed
- 3) Select Apply

Deleting Events:

- 1) Select the event in the Data Events list
- 2) Select Delete to remove the event.
- 3) Select Apply to save the changes

Crop Data

The Crop Data tool allows the user to trim the collections before analysis and reporting. If any changes are made to the file, the information that was changed will be described in the report header under File Modifications.

To crop the collection, change the distances for the run up and/or run out distances. When the lengths are at the desired distances, select Apply.

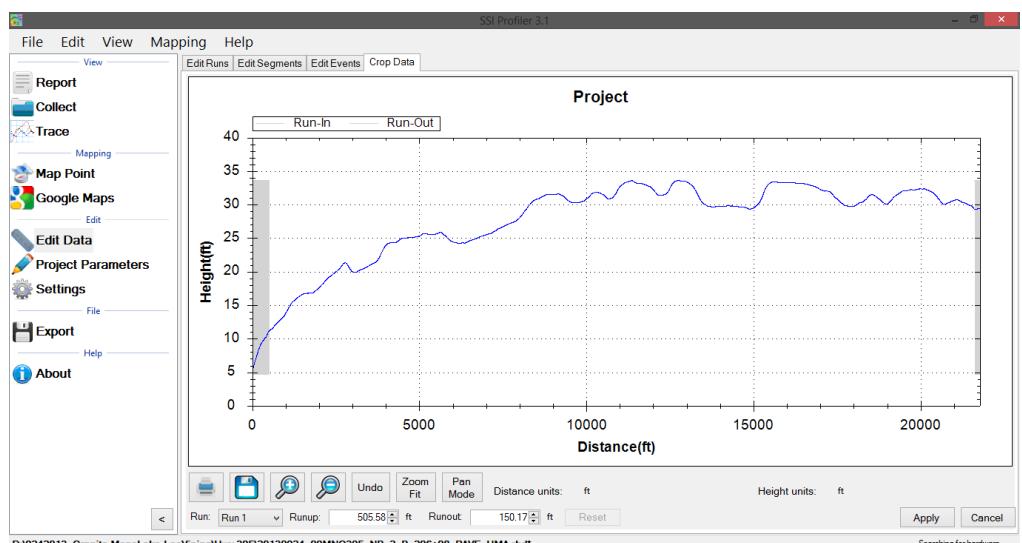


Figure 62: The Crop Data Tool

To reset the run up and run out to the original lengths select the rest icon next to run out. This icon will become available once a change has been made and Apply has been selected.

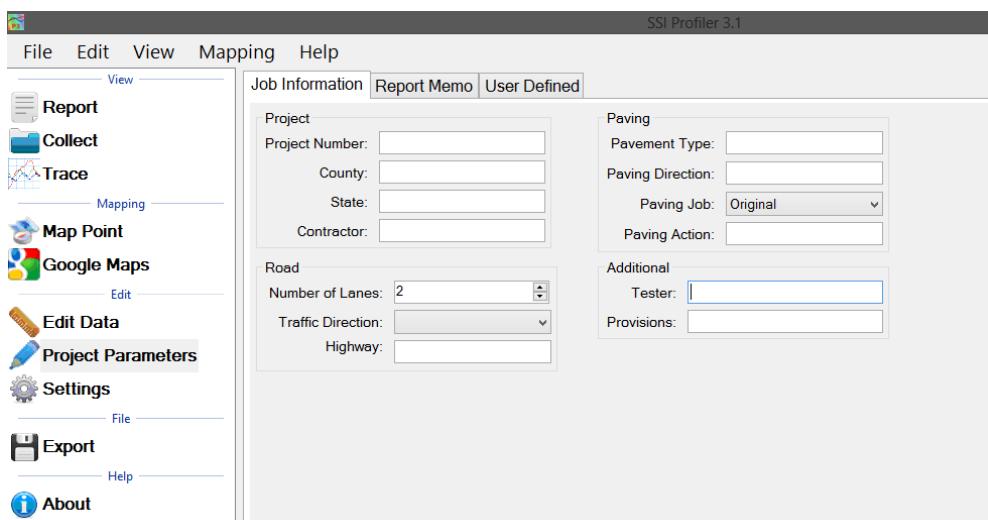


Figure 63: The Project Parameters window

2.2 - Project Parameters

The Project Parameters section is the location where the job information is inputted. This information appears on the header of the reports and the exported excel templates. Before leaving the Project Parameters window, always select ‘Apply’ if changes were made.

2.2.1. - Job Information

The job specific criteria listed below are descriptive information about the project. Review the contract to enter the required information into the sections listed below. These sections can be edited at any time within Profiler V3.

Project Project Number

The Project Number is unique to each project. This is to be determined by the State, Federal DOT or by the contractor. This information will be listed in the project contract.

County

This location is reserved to list the county where the profiling is taking place.

State

The state in which the profiling is taking place and the job is located.

Contractor

This section is for the name of the paving company or for the company operating the profiler.

Road

Traffic Direction

The traffic direction of the lane to be profiled.

Number of Lanes

The number of lanes of the project. This section can be changed by inputting values directly or by using the arrow keys. Traditionally, the number of lanes is the number of lanes travelling in the same direction for main line freeways. Use a classification system that can be understood during post-collection analysis.

Paving

Pavement Type

Input the type of pavement here. Enter pavement types such as Cold-in-Place Asphalt, HMA, JPCP, CRCP, Open Grade etc.

Paving Direction

Enter the direction of the paver when placing the pavement.

Paving Job

Specify the type of paving job, either corrected or original.

Paving Action

Under paving action list any further information about the paving process.

Additional

Tester

The individual operating the profiling equipment over the pavement surface.

Provisions/Weather

The weather at the time of profiling the pavement. Such as: Cold, Hot, Overcast, Morning, Afternoon, Evening, etc.

2.2.2. - Report Memo

Report Memo is a section available for inputting large amounts of text to be saved along with the data file. Anything from reminders to stationing can be inputted into the Report Memo and not influence the data.

2.2.3. - User Defined

Additional parameters can be stored in the data file as desired by the operator. Consult the contract for any additional user defined parameters that may be required for the profile data files.

Add new parameters by selecting ‘Add’ at the bottom of the window. The parameters are entered by double-left clicking on the ‘Key’ column and typing in the required information.

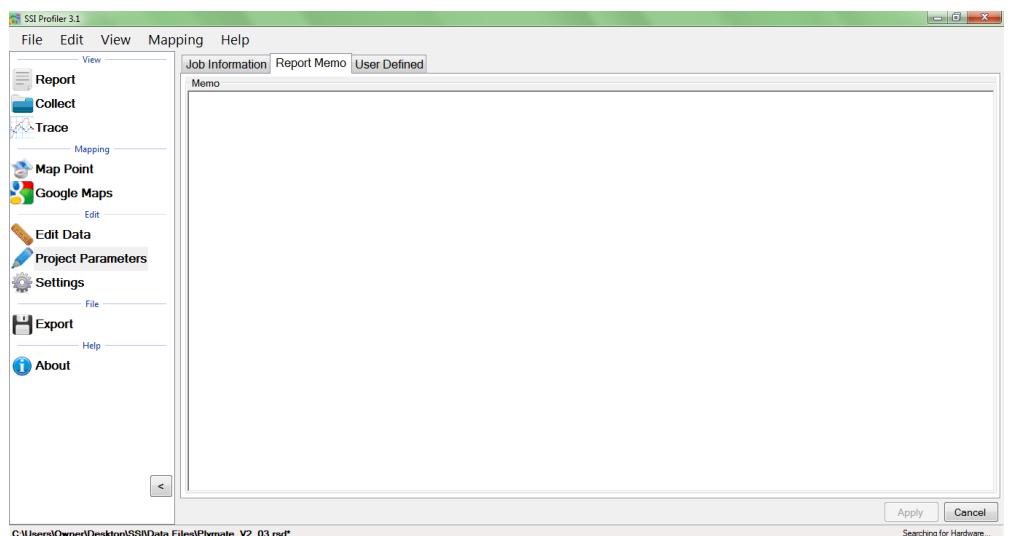


Figure 64: The Report Memo window

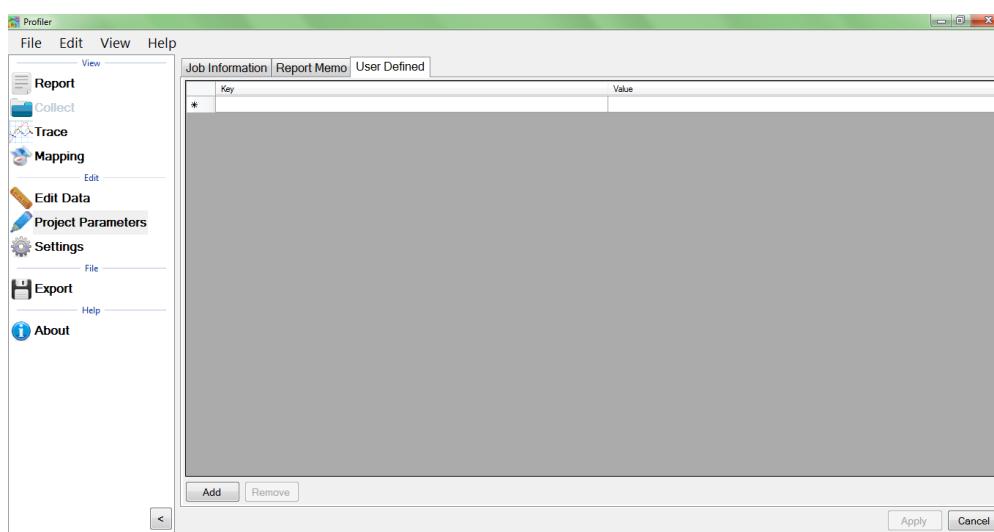


Figure 65: The User Defined section

2.2. - Settings

User defined parameters can be used in conjunction with the Default File Naming tool.

2.2.1. – General Settings

The default file preferences and settings for report generation can be changed under the “Settings”. Whenever a change is made, always select the Apply icon in the lower right corner.

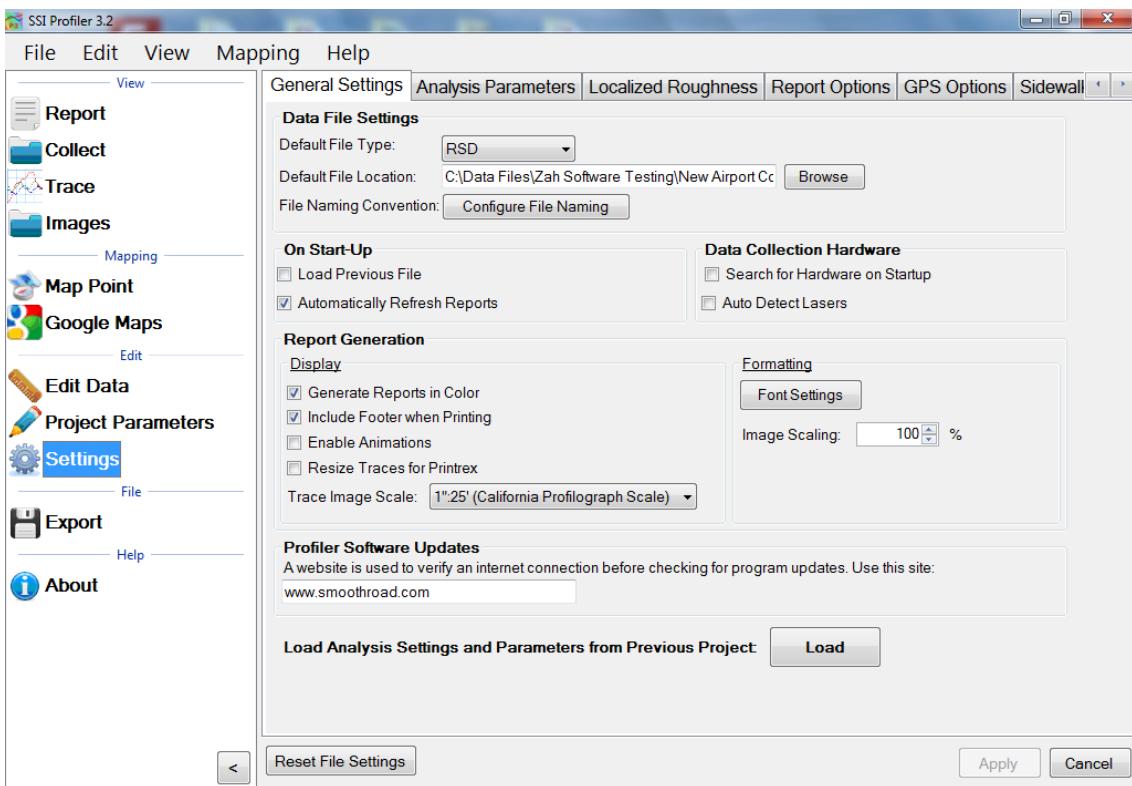


Figure 66: The General Settings window

Section 1 – Units

Default File Type (RSD, RHD)

The drop down menu can be used to select the type of file opened in Profiler V3. Both RHD and RSD files can be imported into the program at any time. The default file type is the file format that will be used automatically when files are opened. **Profiler V3 only saves in the RSD format.**

Default File Location

The default file location is the folder on the computer or external device that Profiler will search for the default file type. This folder can be changed through the Browse icon. If a location is used to open a file, the program will use this location to open files for future attempts. This feature saves time when opening files when the program opens directly to the file location. Select **Apply** after a folder is chosen.

Default File Name

The file name can be chosen to have a name based on parameters of the program or by using a pre-loaded template. The parameters can be chosen from the list of (multiple can be chosen): Contractor, Country, Tester, etc. When a template is selected there will be a preview at the bottom of the window. Select OK and Apply to set this configuration as the default file name.

Creating a New Template

Create a New Template by selecting the “New Template” icon on the right side of the window. Select the template’s name to rename it and append parameters to it. ***The template will be used as long as it is selected when OK is selected at the bottom right corner when exiting the Default File Name tool.***

User Defined Parameter

To create parameters that are specific to the job, type a new parameter name into the User Defined Parameter text box and select “Add User Defined Parameter.” The bracketed variable will appear in the filename preview. To add information to the user defined parameter, open Project Parameters and the User Defined Tab. The name of the parameter will be under the Key column. Under the Value column, enter the information that is needed in the filename.

Changing the Template Name

The template’s name can be changed by changing the characters under Template Name. Once a change is made, the Rename icon will be available. Select OK or Apply to save the changes.

Adding Parameters to the Template

When adding parameters to the template they will only be added to the right end of the template, as seen in the naming preview.

Select *Apply* after changes are made to the template.

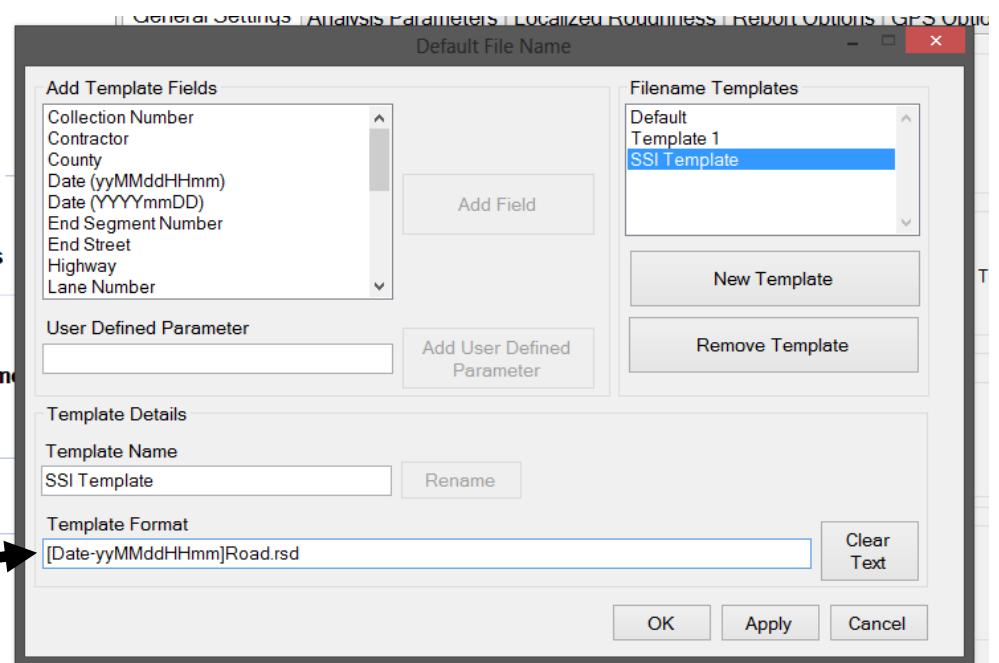


Figure 67: The custom file naming convention window

On Startup

Load Previous File on Startup

If this box is selected, the file that was open when profiler closed last will be reopened when the program is started. A report of this file will be generated when the program is opened.

Load Previous File's Settings

The user may choose a previous file to save time if entering the same analysis parameters or project parameters under “Settings.” To load a previous file’s setting’s, choose the file under General Settings or start a new file and choose one of the three options.

Use Last File's Parameters

This option will use the last file’s settings under the localized roughness and project parameters.

Choose from a Previous File (Browse)

When this option is chosen a window explorer window will appear and the user may select a file that is saved on the computer to import the saved file’s parameters under analysis and project parameters.

Set File Parameters after Collection

By choosing this option the user will not import a previously collected file, but will instead manually set the parameters after the collection has finished.

Automatically Refresh Reports

The reports will automatically refresh when the operator navigates to the report window from another tab. When the user makes a change of report type within the report window, the refresh button will have to be selected manually.

Data Collection Hardware**Search for Hardware on Startup**

If this option is selected, the program will search for hardware, and if available, will connect to it upon opening the program.

Disconnect Hardware When Changing Tabs

If this feature is checked the program will disconnect from the hardware when the operator leaves the collect tab.

Auto Detect Lasers

This feature will use the health string to determine the type of laser that is connected to the system. This is not an end-all solution. Please check the laser type in the System Settings under the collection window prior to any data collection or perform a height verification.

Report Generation**Generate Reports in Color**

If the reports are generated in color, the defect types will be more visible. On the trace reports dips will appear be highlighted blue and bumps will be highlighted red.

Include the Footer

If the footer is included, the file name and the page number will be printed at the bottom of each page for the report. Select the check box to apply this feature.

Do not include the footer while printing with a Printrex 422.

Enable Animations

When enable animations is selected, the windows within Profiler V3 will slide across the screen whenever the operator moves from one section to another (Reports to Collect). This feature does not affect the functionality of the program, but adds an aesthetic behavior when changing windows.

Resize for Printrex

Check this box if printing with a Printrex 422 and uncheck include the footer. This option allows the operator to correctly scale the trace for use with a sliding scale if necessary.

Report Scale

Depending on the specification and system type, the operator may choose between a 1":25' or a 1":15' scale. The bridge profilograph is usually a 1":15' scale while the California profilograph and all road profiling is 1":25' scale.

Formatting

Font Settings

The font of the reports can be changed by selecting the Font Settings icon under formatting. This allows the user to make the size of the font smaller or in a readable font. The image scaling allows the user to print off less pages if the scaling factor is increased. The window that appears can also change the font to a strike-through or an underline.

Image Scaling

The default for this value is 100%. When image scaling is set to a percentage greater than 100%, it acts the same way as the zoom function. The size of the traces within the reports will increase in size.

Profiler Software Update

Profiler V3 will check the internet connection by attempting to connect to the website listed under this location. If the internet connection is found, the updates will be available for download from the SSI server.

2.2.2. – Analysis Parameters (Ride Values)

Changing the units alters the specifications for defects and the ride numbers.

Section 1 – Units

Profiling Units

English

Selecting English units sets the segment length at 528 feet. English units use inches for the height of the defects and counts for roughness settings, while using feet for scallop width and filter lengths. After every adjustment of units, select apply in the lower right corner to save changes.

Metric Meters

In the Metric Meters setting, the blanking band, scallop height and scallop resolution are all in centimeters. The rest of the measurements for scallop width and filter lengths are in meters. The Metric Meters and Metric Centimeters settings have the same units of centimeters for height and meters for length for all sections of defects and roughness. After every adjustment of units, select apply in the lower right corner to save changes.

Metric Centimeters

In the Metric Centimeters setting, the blanking band, scallop height and scallop resolution are all in centimeters. The rest of the measurements for scallop width and filter lengths are in meters. The Metric Meters and Metric Centimeters settings have the same units of centimeters for height and meters for length for all sections of defects and roughness. After every adjustment of units, select apply in the lower right corner to save changes.

Metric Millimeters

In the Metric Millimeters setting, the blanking band, scallop height and scallop resolution are all in millimeters. The rest of the measurements for scallop width and filter lengths are in meters. After every adjustment of units, select apply in the lower right corner to save changes.

CA Bridge

The CA Bridge setting is based off of the specification of the California Bridge Profilograph, which is twelve feet long instead of the California Profilograph 25 foot length. The CA Bridge setting is in English units and has a segment length of 100 feet. After every adjustment of units, select apply in the lower right corner to save changes.

CA Bridge Metric

This setting is for simulation of the 12 foot frame of the Bridge Profilograph. The Bridge Metric setting is the metric version of the CA Bridge Profilograph. Its segment length is 90 meters and the defects and counts for roughness are in millimeters and meters. After every adjustment of units, select apply in the lower right corner to save changes.

Section 2 - Segment Settings

Segment Length

Segment length is the interval of profiling that is used to calculate ride values. Traditionally the distance used for segment length is one-tenth of a mile, or 528 feet (160 meters).

This section is adjusted by using the arrow keys or double-left clicking in the box to type the segment length.

Merge Last Segment if it is less than

If the last segment is a short length, the last segment can be merged into the second-to-last segment. This will prevent large ride values from short distances. Only use if your specification does not require a specific segment length for pay incentives. The last segment length will be changed if this feature is used.

Paused Sections Drop Down Menu

Exclude Paused Sections

When Exclude Pause Sections is selected, the paused sections created during collection or through the Segment Adjustment window will not be included in the report or the calculation of the ride values.

Include Paused Sections

When Include Paused Sections is selected, the paused sections are included with the actual collection when calculating the ride values. The report will show the paused sections in the segment summary and the trace view.

Paused Sections Only

When Include Paused Sections only is selected from the drop down menu, only the paused sections created during collection or through the Segment Adjustment Window will be displayed in reports and used to calculate ride values and counts for roughness.

Section 3 - Analysis Type

IRI

The International Roughness Index is a universal ride index calculation which is universal or roads around the world from concrete and asphalt surfaces. The profile is analyzed using a quarter-car

simulation that is weighted towards the frequencies of body and vehicle bounce; the most uncomfortable riding conditions.

To calculate IRI in Profiler V3, select IRI from the drop down menu, then adjust the filter settings if necessary according to the contract specifications. View the report under the Report Tab to observe IRI.

$$IRI = \frac{\text{Standardized Vehicle's Accumulated Suspension Motion}}{\text{Distance Traveled}}$$

PRI

The Profile Ride Index is a simple calculation to classify the smoothness of a road profile against other roads. The formula for this calculation is:

English Units:

$$5280 \text{ ft} \times (\text{Total Roughness in inches in Segment}) / (\text{Segment Length [ft]})$$

Metric Units:

$$1000 \text{ m} \times (\text{Total Roughness in m, cm, or mm in segment}) / (\text{Segment Length [m]})$$

To calculate the PRI in Profiler V3, select PRI from the Analysis Type drop down menu and set the defect settings. Once the defect settings are correct, select Apply and then view a report to observe the PRI ride values.

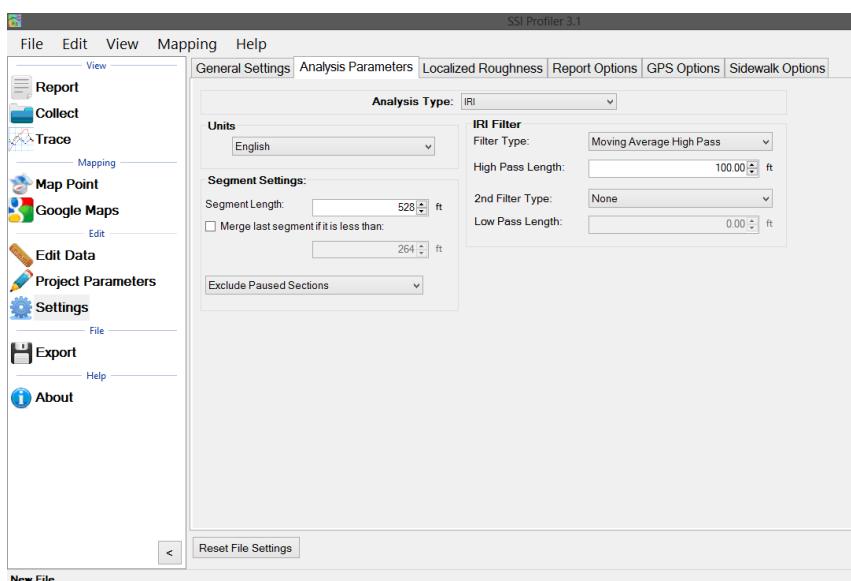


Figure 68: The IRI Analysis Parameters window

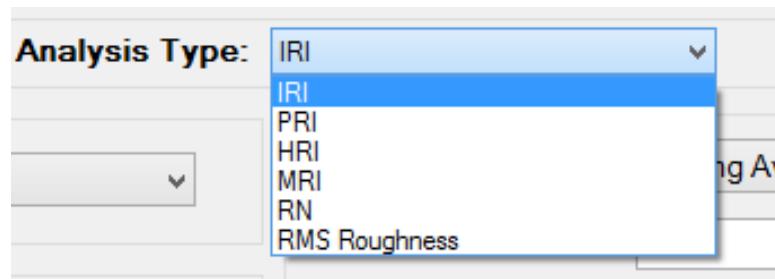


Figure 69: The Analysis type drop down menu displaying all of the Ride Values options

PRI Parameters

Note that the PRI Parameters are only for the calculation of the Profile Ride Index (PRI). Blanking Band, and Scallops have no connection to the manner in which defects are found. For defect settings, see *Localized Roughness*.

Scallop Definition

Scallops are the deviations of the profile trace from the limit of the localized roughness line. If the trace exceeds the defect height but the minimum width of the scallop is not reached, the deviation is not included as a defect. Although the defect is not included in the Ride Values, the deviation is still exceeding the defect height parameter which adds counts for roughness.

Blanking Band

The blanking band is a null area that classifies the height of all sections of the trace within its borders as zero. Therefore, a trace that remains within the borders of the blanking band would have zero counts for roughness and a PRI of zero.

Minimum Scallop Height

The minimum scallop height is the minimum height that is seen to be a deviation from the null line. Frequently, the value for minimum scallop height is 0.035 or 0.9mm, which is the default value for the Profiler V3 program.

Minimum Scallop Width

The minimum scallop width is traditionally 2 feet (0.61 meters). Review the Department of Transportation smoothness specification that pertains to the project. The minimum scallop distance is the minimum longitudinal length (the direction of traffic) that is used to find the deviations of the profile off of the null line or blanking band. The setting of 2 feet or 0.61 meters is the default setting for Profiler V3.

Scallop Resolution

The scallop resolution is the accuracy of the height measurement of the profiler. Current equipment is accurate to 0.01 inches, the default value for Profiler V3 software. A resolution of one-hundredth of an inch means that the scallop heights will always be rounded to the hundredth decimal. Consult

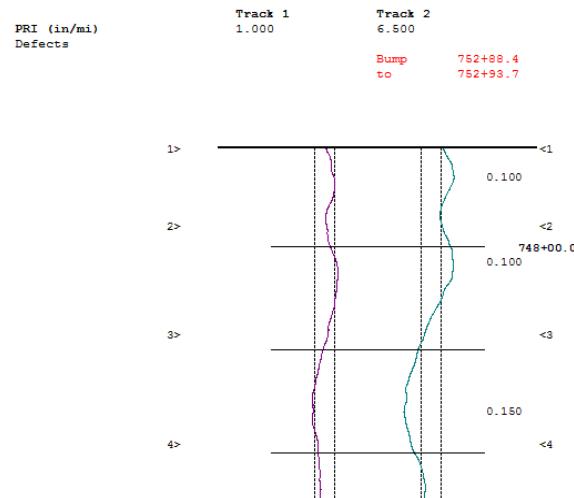


Figure 70: An example of the blanking band in the trace report.

the recent smoothness specification released by the overseeing agency to confirm the scallop resolution value.

Reset File Settings

Selecting this icon brings all values in Settings to their default program values.

Minimum Scallop Height Inclusive

When this box is selected, the minimum scallop height will be included as a scallop. Meaning, if the minimum scallop height is 0.035, 0.035 will be the minimum instead of 0.0351.

HRI

The Half Car Ride Index (HRI) is found by applying IRI to an average of two profiles. HRI uses a half car simulation, unlike IRI which uses a quarter car simulation. To calculate the HRI in Profiler V3, select HRI from the Analysis Type drop down menu and verify the settings of filter length based on the project specifications. Once the filters are correct, select **Apply** to save the settings. To view the calculated HRI, view one of the reports under View>Report.

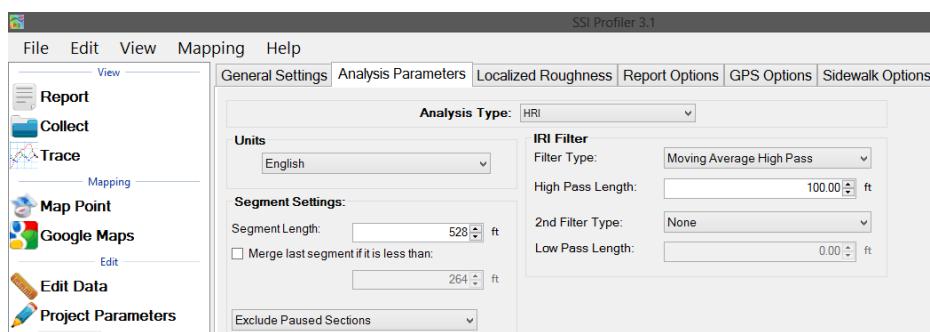


Figure 71: The HRI analysis window with the available filter settings.

RN

The Ride Number (RN) can be calculated in Profiler V3 by selecting RN from the Analysis Type drop down menu and verifying the settings of filter length based on the project specifications. Once the filters are correct, select Apply to save the settings. To view the calculated RN values, view one of the reports under View>Report.

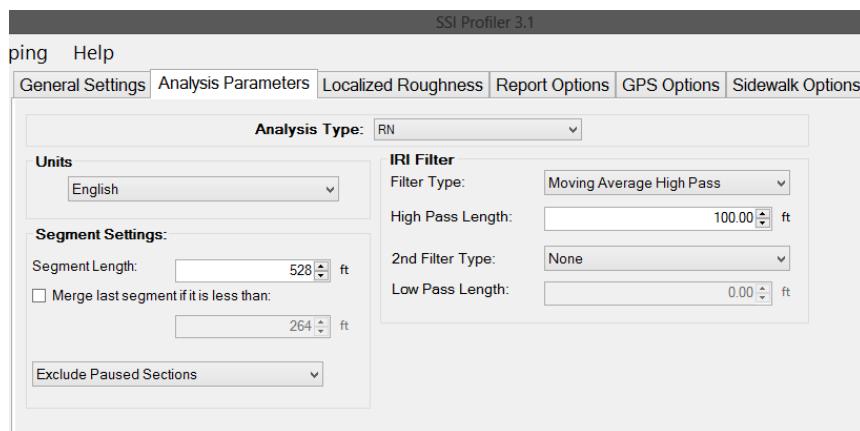


Figure 72: The RN analysis window with the filter options shown.

RMS Roughness

The RMS roughness is another ride value method that is calculated by the profile height over a base length of 25 feet. This is how RMS roughness gets the units of inches. The report of RMS gives a depiction of the amplitude and wavelength of said amplitude, but does not necessarily give the frequency that this amplitude and wavelength occurs. The output is similar to a PSD plot.

2.2.3. – Analysis Parameters: Filters

Section 1 - IRI/HRI Filter---Same for IRI, HRI, RN

High Pass Filter – The High Pass Filter will remove any trend in the data that is less than the chosen length. The length can be selected by typing the value in the box or by using the arrows to adjust the input.

Low Pass Filter – The Low Pass Filter will remove any trend in the data that is greater than the chosen length. The length can be selected by typing the value in the box or by using the arrows to adjust the input.

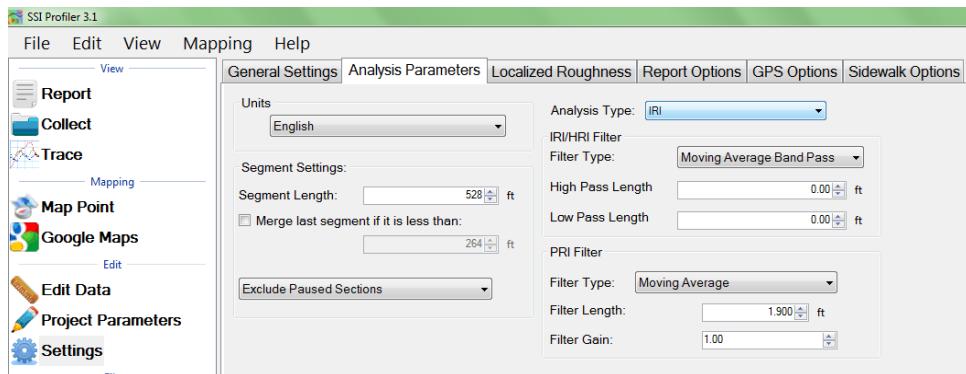


Figure 73: The filters within the IRI analysis parameter window

Section 2 - PRI Filter

Filter Type

Moving Average

A Moving Average Filter of length 2.0 feet can be chosen by the operator, depending on the contract specification. The use of the moving average filter was initially used by the Kansas Department of Transportation.

Kansas Department of Transportation (see Report No. K-TRAN: KSU-9302 “An Automated System for Determination of Pavement Profile Index and Location of Bumps for Grinding from the Profilograph Traces.)

Butterworth

The third order Butterworth filter has a default length of 2.0 feet. The Butterworth filter is not required for updated profiling specifications. The Butterworth filter was used for the original automated Profilograph systems.

Available Filters:

Moving Average High Pass Filter

Moving Average Band Pass Filter
Butterworth High Pass Filter
Butterworth Band Pass Filter

Filter Gain—1.00

The filter gain is to only be used when adjustments are necessary while comparing different profiling systems. The filter gain does not need to be used in normal profiling environments. When comparing high speed profiling systems to other Profilograph systems, the filter gain may be used to change the output of the data files so they are more accurate. A filter gain setting of 1.00 does not affect the collected data. For typical profiling use the default setting of 1.

2.2.4. –Localized Roughness

Localized roughness refers to the bumps and dips that occur over a distance (longitudinal distance is the width of the bump).

Section 1 - Defect Detection

The operator may choose the type of defect detection to implement in Profiler V3. The options to choose from are Bumps, Dips, Both, and None. To select the type, use the drop down menu labeled Defect Detection. **No filters are associated with localized roughness.** “Both” is selected by default.

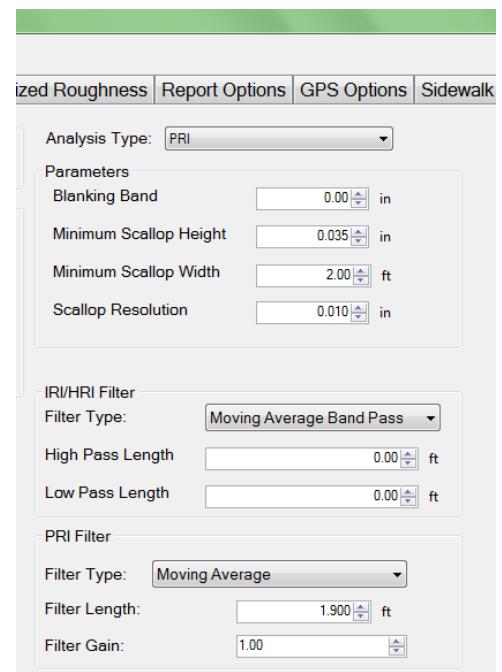


Figure 74: The filters for the PRI analysis

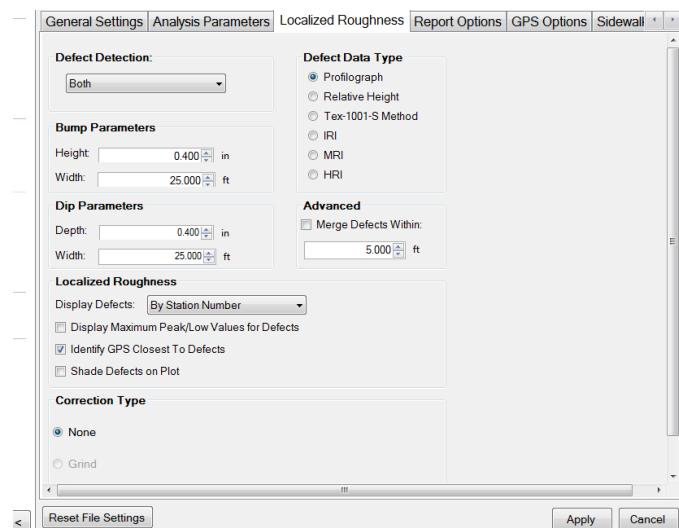


Figure 75: The Localized Roughness window with the defect settings.

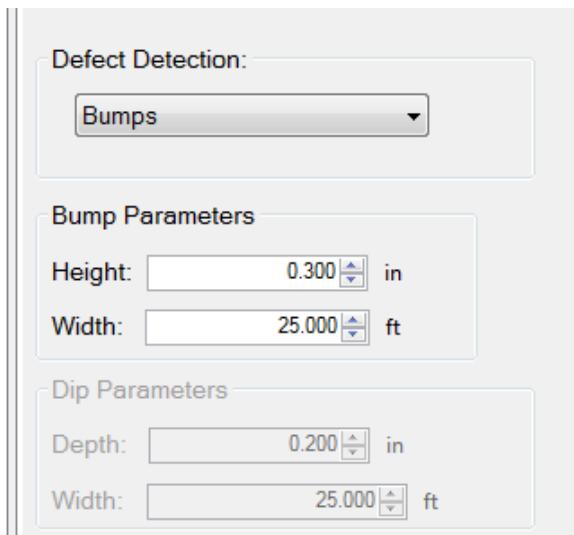


Figure 76: When only bumps are selected from the drop down menu, the dip parameters become unavailable.

Section 2 - Bump Parameters

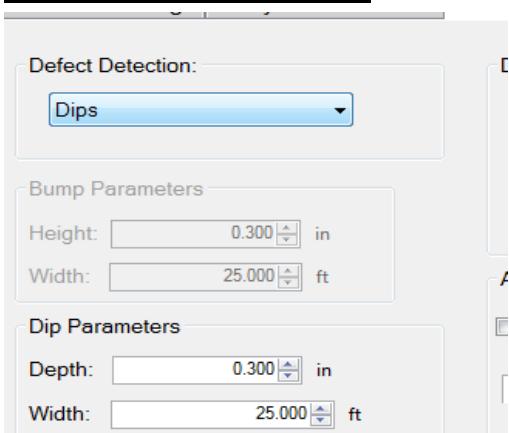
Height

Bump height is the maximum distance that a profile may deviate within the width of the bump. The width of the bump is the length of a Profilograph, or 25 feet (7.62 meters). A typical value for bump height is 0.3 inches. When the settings are changed for the bump parameters, always select **Apply** to save changes.

Width

The width of a bump is based on the length of a Profilograph; 25 feet or 7.62 meters. This is the default value for the Profiler software.

Section 3 - Dip Parameters



Depth

The depth of a dip is the maximum distance a profile trace may deviate within the width of the dip (25 ft or 7.62 m). The default value for dip height is 0.4 inches or 10.2 millimeters. When the settings are changed for the dip parameters, always select **Apply** to save changes.

Width

The width of a dip is based on the length of a Profilograph; 25 feet or 7.62 meters. This is the default value for the Profiler V3 software.

Figure 77: When only dips are being tested for, the bump parameters become unavailable.

Section 4 - Localized Roughness

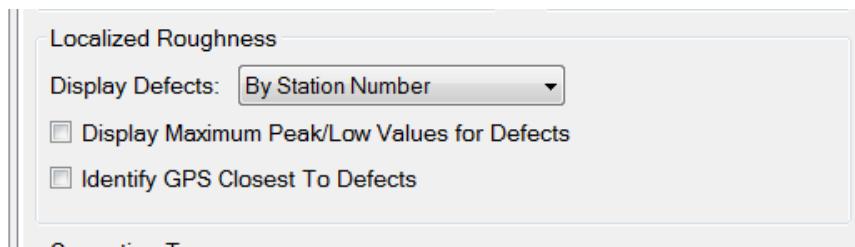


Figure 78: The localized roughness settings for displaying defects

Display Defects By:

The operator has the option to display defects by the station number or by the track in the report. To modify this setting, choose the desired display setting then select apply to save the changes. When displaying the defects by track, the defects are split up into their respective tracks. When the defects are organized by stationing they are listed in the same classification.

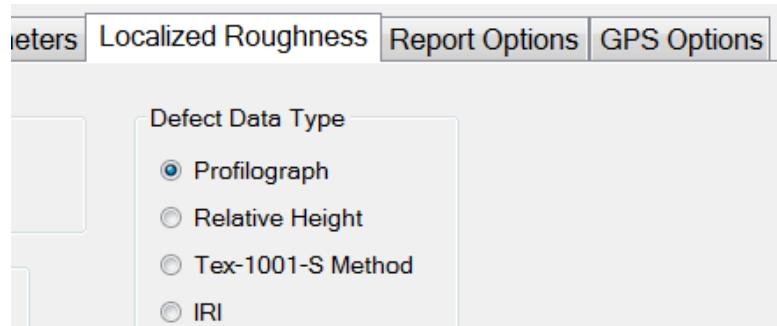
Display Maximum Peak/Low Values for Defects

Selecting this check box shows the peak values for the defects when viewing the summary report. When altering the settings, select Apply to save the changes.

Identify GPS Closest to Defects

To show the closest GPS reading to each defect, select this check box. When viewing the summary, the GPS coordinates will be in the table with Defect Type, Track, Segment, and Stationing of the defect.

Section 5 - Defect Data Type



Profilograph

The Profilograph defect data type is the most common method used to find defects. The settings are the same as described above in Analysis Parameters, defect detection, bump parameters and dip parameters.

Figure 79: The types of testing available to find the defects in the data.

Relative Height

Relative Height defect data type finds the defects of the profiled surface through the local differences in the trace. The settings required to be inputted within the Localized Roughness tab of the Settings Window are the bump and/or dip parameters.

Texas-1001-S Method

The Texas 1001-S Method is used mainly by the Texas DOT for profiling with inertial profilers. The procedures and information for this test method can be found on the Texas DOT website; a direct link is below.

ftp://ftp.dot.state.tx.us/pub/txdot-info/cst/TMS/1000-S_series/pdfs/spe1001.pdf

The Texas-1001-S method detects localized roughness (defects) of the profiled surface by applying the base length and the threshold values saved in the Settings Window.

IRI

When IRI Defect Data type is selected, the IRI calculation will be used to find the road's defects (localized roughness) of the profiled surface. If this setting is selected the IRI ride value will not be shown in the summary. To list the IRI ride values on the reports, select the analysis type to be IRI in the Analysis Parameters tab. The ride interval is set (usually to 25 feet, in English units) and is used as a sliding guide across the profile. When the summation of the profile's IRI exceeds the threshold, the entire continuous length which exceeds the threshold will be an area of localized roughness.

Section 6 – Advanced

Merge Defects within:

The operator is able to merge multiple defects into one defect to eliminate high frequency grinding patterns. The action of merging defects does not affect the ride values or the defect heights. Merging adjusts the start and end stationing of two defects into one length. The default value of the merge defects tool is 5 feet. To use this feature, select the check box next to "Merge Defects Within."

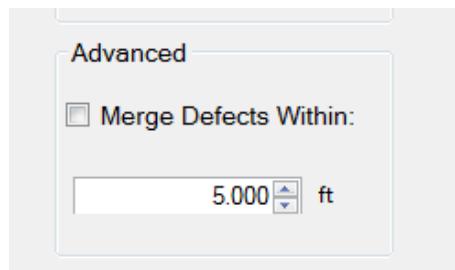


Figure 80: Merge Defects

Ignore Defects less than:

The operator may also ignore defects less than a certain length when using this feature.

Section 7 – Correction Type

When PRI is selected as the Analysis Type, the correction type may be chosen. The three options for Correction Type are None, Grind, and Overlay. When IRI, HRI, or RN are selected as the Analysis Type, the only Correction Type option is to select None.

When modifications are made to the settings, select 'Apply' to save the changes.



Figure 81: Correction Types

2.2.5. - Report Options

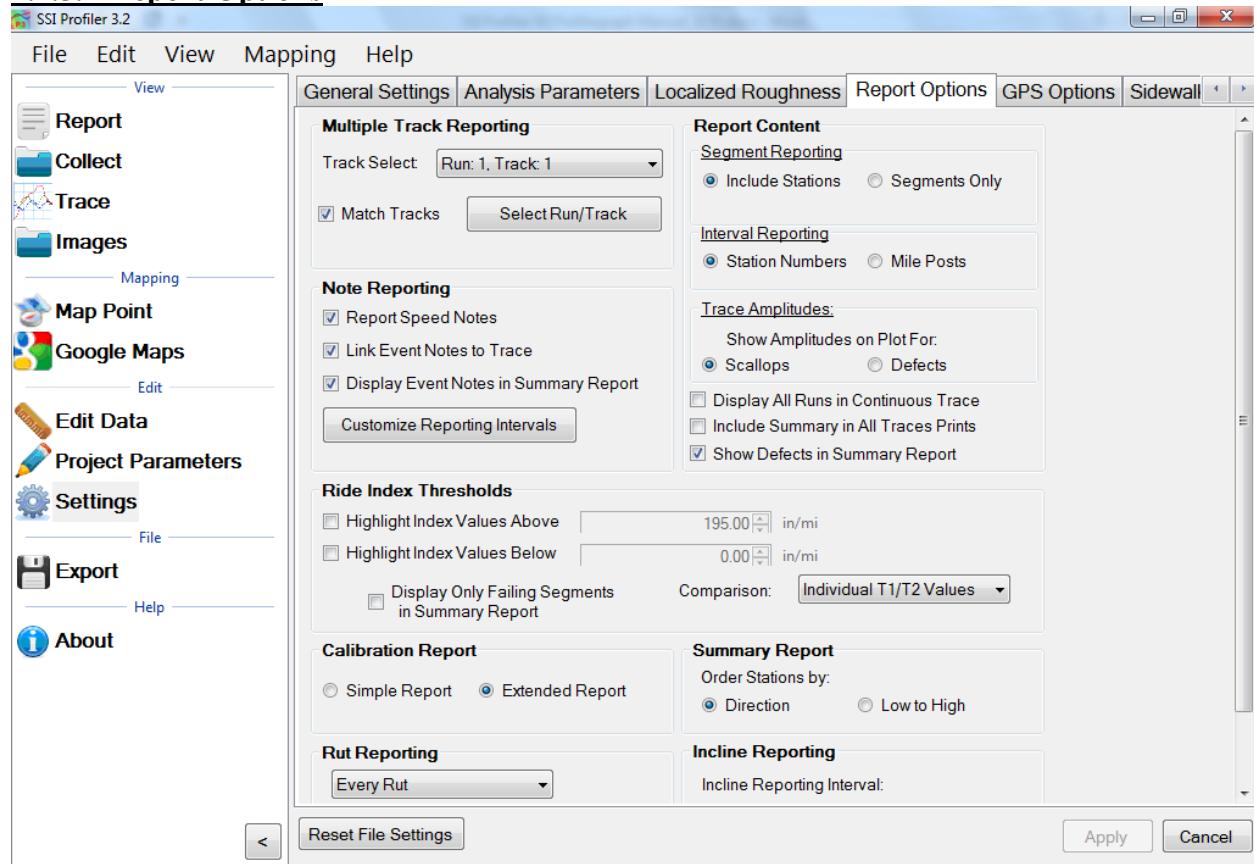


Figure 82: The report options window.

Ride Index Thresholds

Highlight Index Values Above

The operator may choose the threshold in which to highlight a certain interval of ride index values above a number. The highlight color is red and can be seen in the summary table of the reports. Only the segment ride values are highlighted, not the total ride values. This is convenient for comparing segment ride indexes to determine where grinding should be done.

Highlight Index Values Below

The operator may choose the threshold to highlight a certain interval of ride index values below a chosen number. The highlight color will be green and it is seen in the summary table of the reports. Only the segment ride values are highlighted, not the total ride values. This is convenient for comparing segment ride indexes to determine where grinding should be done.

This is a zoomed-in view of the 'Ride Index Thresholds' section from Figure 82. It shows two checkboxes: 'Highlight Index Values Above' with a value of 40.00 in/mi and 'Highlight Index Values Below' with a value of 0.00 in/mi.

Figure 83: Highlighting IRI values over a threshold

Displaying Ride Value Results

The operator has the option to display only the failing segments. To further customize the report, the type of comparison can be selected from the drop down menu. If individual T1/T2 values are chosen, the ride values for certain track will be highlighted if they exceed the threshold. Otherwise, the average of all tracks will be used in the comparison.

Multiple Track Reporting

Track Select

Track Select is the tool that is used to select the track which will be shown in the reports. From the drop down menu, select a single track based on the label of [Run: Number, Track: Number].

When Match Tracks is not selected, the reports will only show one trace. The selected run in the drop down menu will be the only run shown in the Reports of Single Trace, Continuous Trace, and All Traces.

To plot multiple or all tracks that are saved within the file, select Match Tracks. See below for information on Match Tracks. When Match Tracks is selected, the run shown on the collapsed Track Select drop down menu will be on the left side of the trace in the report. The figure above will have Run 1, Track 1 on the left side trace report.

To report specific runs and tracks, select the “Select Runs” icon under Multiple Track Reporting. Here the user can select certain tracks or runs that will be included in the reports, localized roughness and ride value calculations.

Match Tracks

When the Match Tracks check box is selected, all of the tracks associated with the file will be displayed in the reports of Single Trace, Continuous Trace, and All Traces.

With Profilograph profiles for the Profilograph, there are only two wheel paths, while with some High Speed Profiling Systems there have three traces. When dealing with multiple traces, the Track Select can change the order in which the tracks are displayed in the reports. The track that is selected in the drop down menu within “Track Select” will be the trace that is on the left side of the report of the single trace, continuous trace and all traces plots.

In order to save changes made to the Multiple Trace Reporting Section, always select Apply.

Rut Reporting

The operator has the option to change the rut reporting per segment to Report Every Rut, Report Average Rut or Report Maximum Rut per segment. When Report Every Rut is selected it is possible to report more than one rut. While average or maximum rut reporting is selected, the program will only report one rut value per segment. The segment length is set below in the interval of reporting.

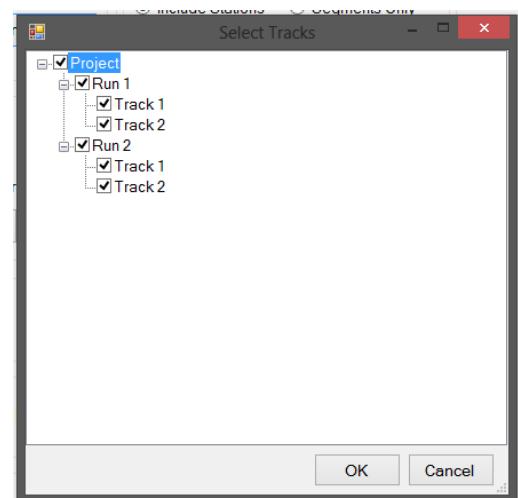


Figure 84: The Track and Run Selection Window

Rut Interval of Reporting

The interval of reporting is set to quantify the segment length for the calculation of maximum and average rut. The interval of reporting has no effect on reporting every rut.

Trace Amplitudes

This section relates to the amplitudes of the collected data relative to the trace.

Show Amplitudes on trace for Scallops or Defects

The operator has the option of showing the amplitudes for either the scallops or the defects on the plot. When comparing the reports to the SSI spreadsheet defects templates, the operators should choose to show only the defect heights. Scallops are the deviations of the trace outside of the centerline or blanking band. The defect heights will also be shown when scallops are selected, however there will be more labels on the deviations. Therefore, it is acceptable to leave the amplitudes on scallops.

Display All Runs in Continuous Trace Report

When this box is selected, all runs within the file will be displayed within the continuous trace. The organization of the runs and tracks is always the same when this option is selected. If Run 1 will come first, then Run 2. Track 1 will always be the left-most trace on the report.

Include Summary in All Traces Prints

The summary header will be included in the All Traces report when this feature is selected.

Incline Reporting

To adjust the frequency that Profiler V3 displays the incline data from the inclinometer, change this setting. If there are changes made, select Apply.

Note Reporting

Report Speed Notes

To have the speed notes included in the printed report, the check box to the left of “Report Speed Notes” should be selected. To change the interval which the notes are reported, select the “Customize Reporting Intervals” icon. If changes are made, select Apply.

Report GPS Notes

To have the GPS notes included in the report, select this box. If this box is not selected, the GPS notes will not be shown at the bottom of the report.

Customize Reporting Intervals

The reporting intervals are the distances traveled while collecting data to between a GPS, Speed or Incline note on the report. A new note will be shown each time the distance of the interval is traveled. The types of intervals that can be adjusted are:

Maximum GPS Note Reporting Interval

Minimum Speed Note Reporting Interval

Minimum Incline Reporting Interval

In the case that the report becomes cluttered with the report notes, the operator may increase the reporting intervals to simplify the printout.

Segment Reporting

The operator can choose to Include Stations and Segments Only. To include station and segment numbers in the continuous trace report select “Include Stations.” To only display the segment numbers select “Segments Only.”

Report Type

This section changes parameters that appear on the reports.

Station Numbers – The Default Setting

When Station Numbers is selected, the segment stationing will be given in the form of station numbers. Such as: ‘Track 1 Segment 1 Station: 0+00.0 to 5+28.0.’ In order to save changes made to the Report Type, always select Apply after making any changes.

Mile Posts

When Mile Posts are selected, the segment position will be given in terms of miles. This number will be in decimal form. Such as: ‘Track 1 Segment 1 Station: 0.0 to 0.10.’ In order to save changes made to the Report Type, always select Apply after making any changes.

Summary Report – Order Stations By:

Direction

The summary report will be organized by the direction of the profiling motion. The stationing direction will not be relevant.

Low to High

The stationing in the reports will be displayed from low to high numbers when the low to high feature is selected.

Calibration Report

Simple Report

The simple report contains information about the software version and the calibration summary. The included calibrations are the accelerometer calibration constants, distance calibration counts, and inclinometer calibration settings.

Extended Report

The extended report has the calibration and the verification data from the last verification procedures. The verifications for the inclinometer, height sensor, and the bounce test are all included along with the calibrations for the accelerometer, inclinometer, and distance encoder. To review the calibration report, select the Report tab and select the Calibration Report from the drop down menu.

2.2.6. – GPS Options

The operator has the option to choose the type of GPS to use for collection. If a survey system is being used, use the GPS supplied with the collection device.

GPS String Format

The string format is the type of string that will be displayed in the reports. This GPS type will not be displayed in the exports or the Collect window. To change the GPS in the Collect window, open system settings within the Collect window.

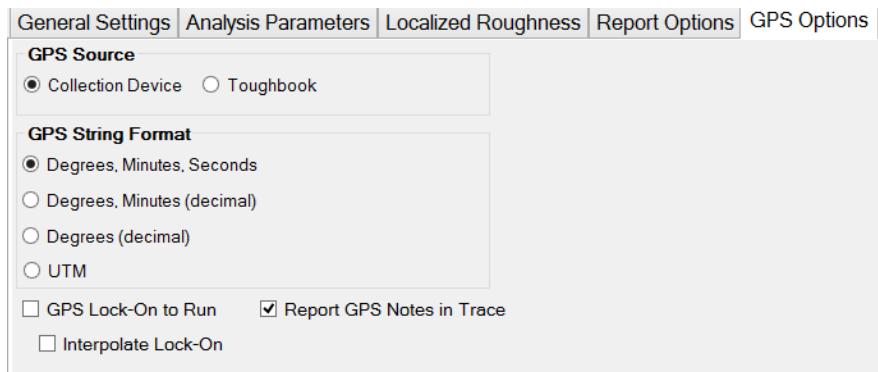


Figure 85: The GPS options tab

GPS Lock-On to Run

The GPS signal will reference the GPS coordinates of the collection while the system is in motion.

Report GPS Notes in Trace

To report GPS notes in the trace select this box. The GPS notes will be at the bottom of the trace with carrots and numbers signifying where the note is located.

Interpolate Lock-On

When between GPS points, the interpolation give the user a more accurate current location. The interpolation uses the two nearest GPS points and the position given by the profiler distance to give a location between the GPS points.

3.0 – View

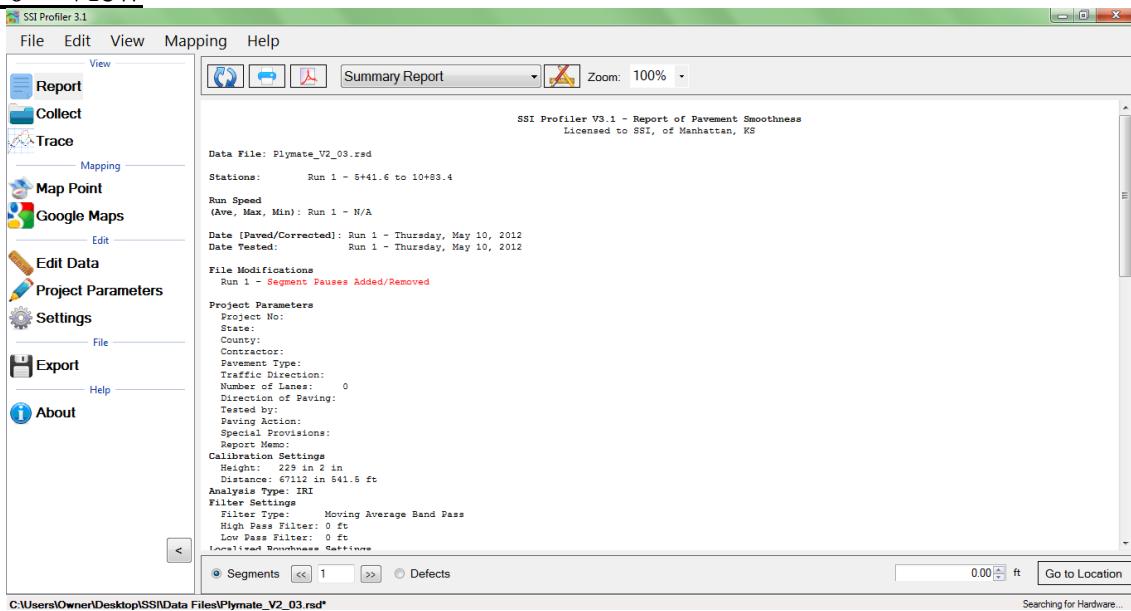


Figure 86: The summary header of a single trace report.

3.1. - Report Refresh

It is required to refresh the Report window whenever a change is made to the Project Parameters, Settings, or Report Options. The refresh icon is located at the top left of the Report window. Select the refresh button and verify that the information is accurate before printing.

Enable or Disable Reports

This feature allows the user to select the type of reports that appear in the drop down menu. To have a report not be displayed in the drop down menu, deselect the check box.

At the bottom of the Enable or Disable Window the user may choose which report type is opened by default with a new file. In the connecting figure, the summary report is the file that will be shown when a file is opened.

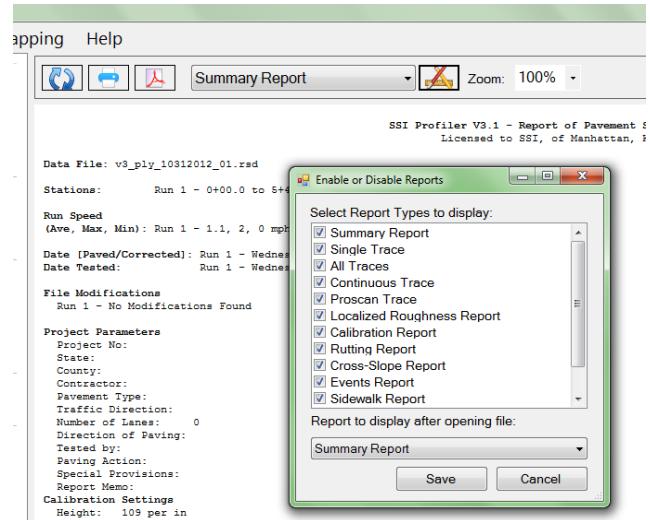


Figure 87: Enable and Disable Reports Window

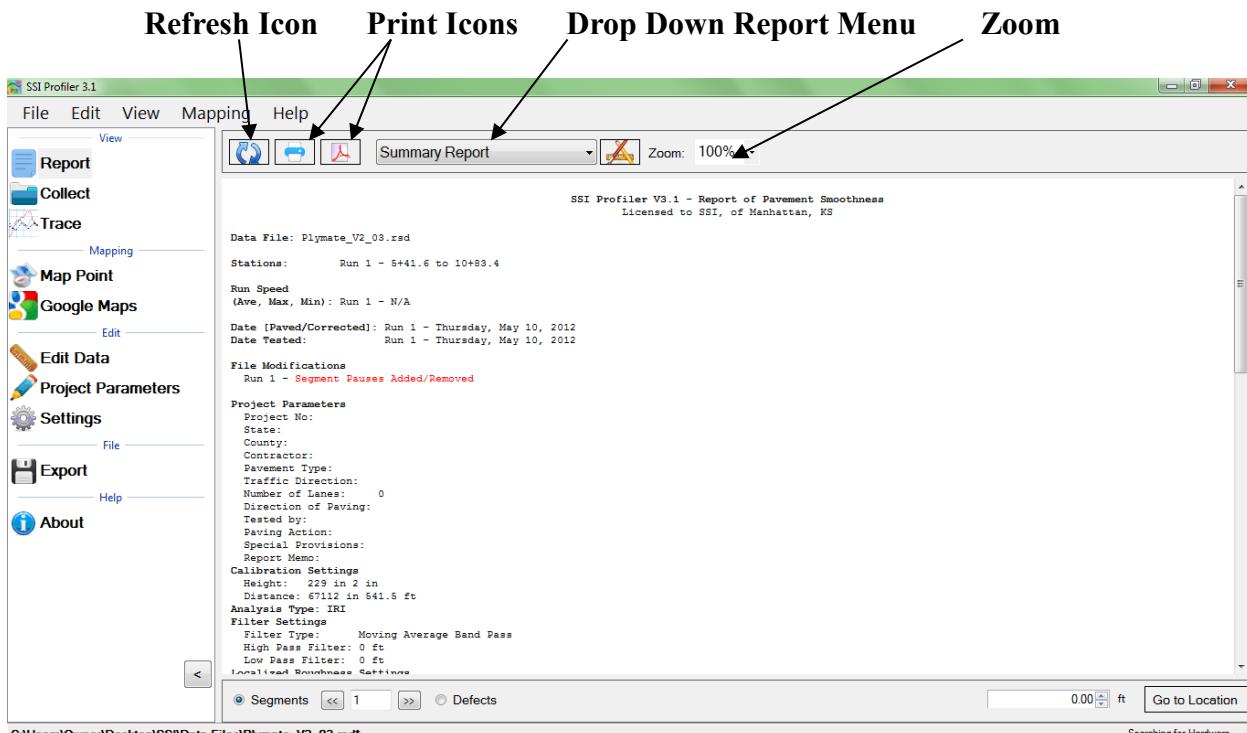


Figure 88: The tool bar for the report window

Print

Always confirm the correct report is being printed by selecting the refresh icon.

A Connected Local Printer

To print a report, select the print icon in the Report window or select CTRL+P on the keyboard. The print window will appear. Within the window, select the printer to be used and verify that the printer settings are correct. When ‘Print’ is selected, the document will be sent to the printer.

If more printing options are needed, select the ‘Preferences’ icon. This icon will open a window that is printer specific that contains information about the orientation, paper size, and image quality.

Printrex 422 Thermal Printer

Confirm under the settings for the Printrex 422 that the paper size is 4 inches wide on a 150 foot roll. This setting can be chosen under Preferences>Advanced Settings. It is recommended to use Contiguous as the end of page control.

To PDF

The Adobe Symbol between the Printer symbol and the report type will print the report to PDF format if the Broadgun PDF printer is installed. Contact SSI support if Broadgun is not installed or you are having issues with your PDF printer.

Report Options

The Report Options available in Profiler V3 are Summary Report, Single Trace, All Trace, Continuous Trace, Proscan Trace, Defects Report, Calibration Report, Rutting Report, Cross-Slope Report, Text Report, and QA Suite Report.

Unless directed by the overseeing agency, the frequently used reports are Summary Report, Single Trace, Continuous Trace and Calibration Report. These reports are commonly used due to the information provided within them. All of these reports have the locations of defects and the information entered in Project Parameters and Localized Roughness.

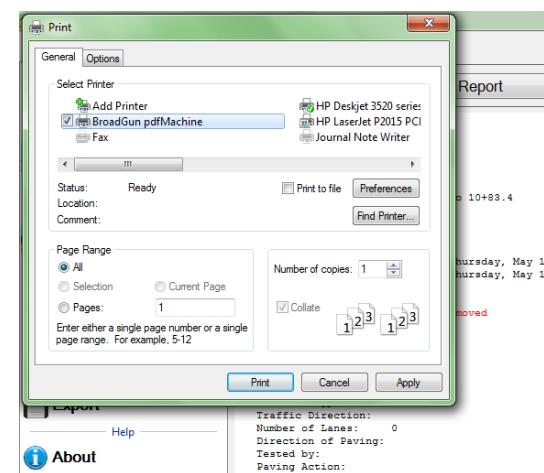


Figure 89: Printing Options Window

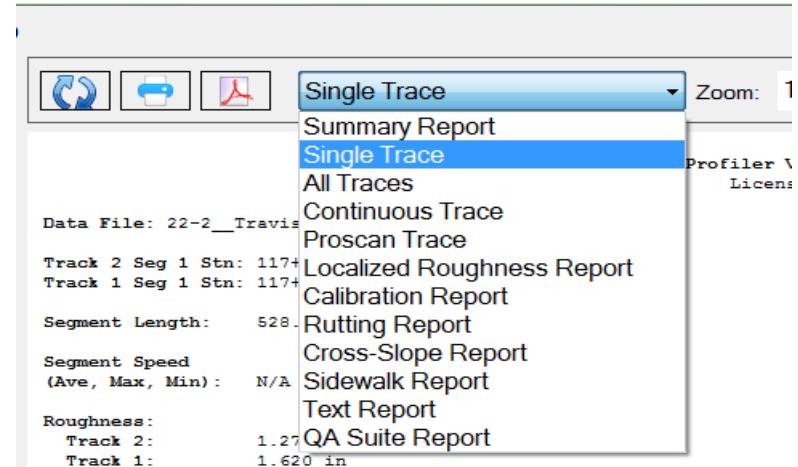


Figure 90: The drop down menu for the report

2012

Zoom

The zoom feature is used to adjust the size of the Report window. To change the view of the Report window, left click on the Zoom box or on the arrow to the right of the box. Selecting the arrow will only allow the window to change to the preset values of 50%, 75%, 100%, 250% and 500%. If the

operator chooses to left click within the zoom box, the keyboard can be used to type in the desired zoom percentage. After the zoom percentage is entered, select ‘Enter.’

View by Segments or Defects

By selecting Segments (the default setting) the operator may navigate through the segments of the file by typing in the segment number and selecting ‘Enter’, or by using the arrow keys to the right of the box. When Defects are selected, the same procedure is used to navigate throughout the file to the defect locations. This is a shortcut for moving throughout segments and finding defects while in the Single Trace report option.



Figure 92: The segment or defect navigator

If the operator is not in Single Trace while using this feature, the program will adapt and open Single Trace when the Report window generates.

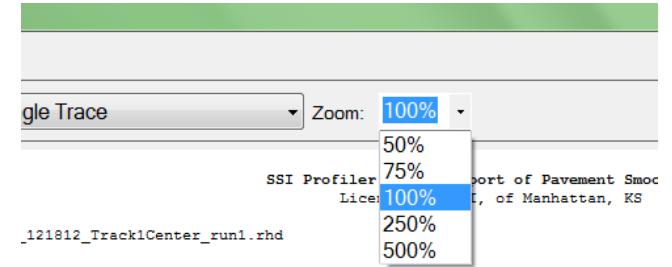


Figure 91: The built in zoom ratios

Go to Location

The Go to Location Feature moves the report window to the position of the profile (a distance) entered in the box. By entering the station number in decimal form and selecting ‘Go to Location’ the segment containing the entered station number will be displayed in the Report window.

3.2 – Collect

To collect data the operator should select the Collect Icon when the hardware is attached. Once the hardware is found, the data collection may begin. See the Collection section of this manual for procedures to perform prior and during a collection.

3.3. – Trace

Choosing Tracks for Plotting

To choose tracks for plotting in the trace window, select the check box next to the desired tracks. Once all of the necessary tracks are checked, select the refresh icon to view the tracks within the plot.

Whenever a change is made by deselecting a track or checking a new track, select the refresh icon to have it appear in the trace. *If the refresh icon is not selected, the trace*

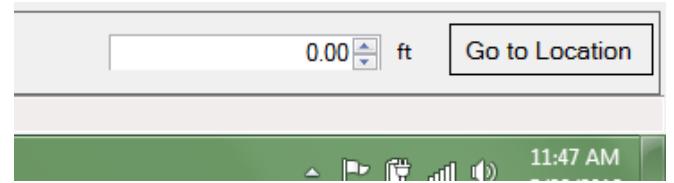


Figure 93: Go to Location Feature

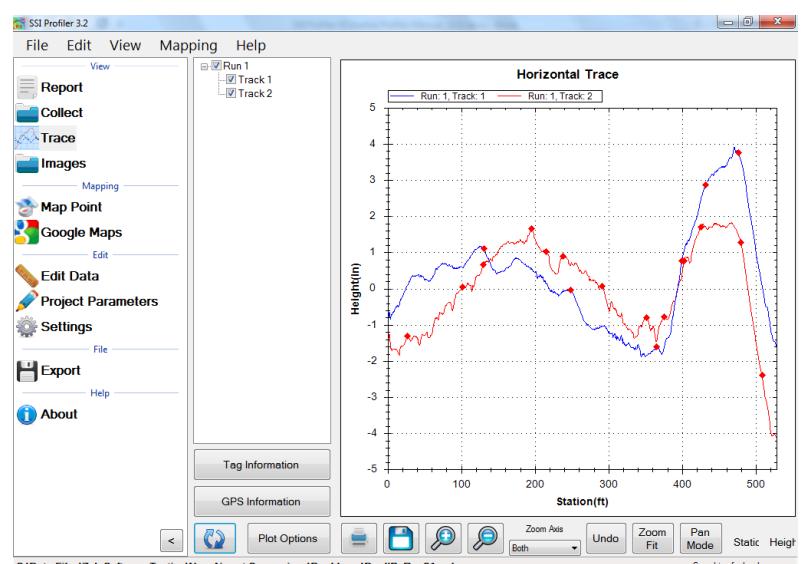


Figure 94: An example of the profile trace

will not update and the changes will not be shown. Review the legend to verify that all of the selected tracks are shown in the plot.

Refresh

It is required to refresh the Trace window whenever a change is made to the track selections. The refresh icon is located at the bottom left of the Trace window.

Plot Options Icon

Profile/Continuous IRI

The drop down menu allows the user to select options of Profile and Continuous IRI, MRI or HRI.

When Continuous IRI is selected, the operator may not choose the option to include Run Up and Run out data.

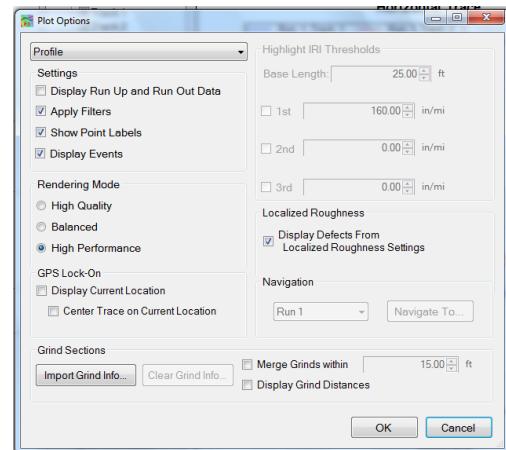


Figure 95: The plot options window

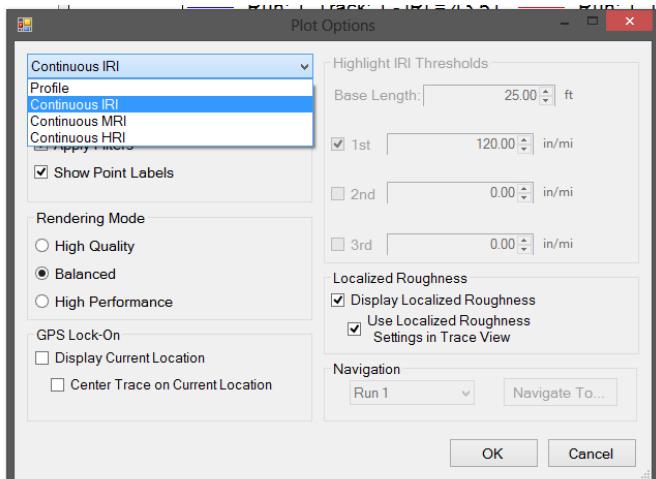


Figure 96: Plot Options Window

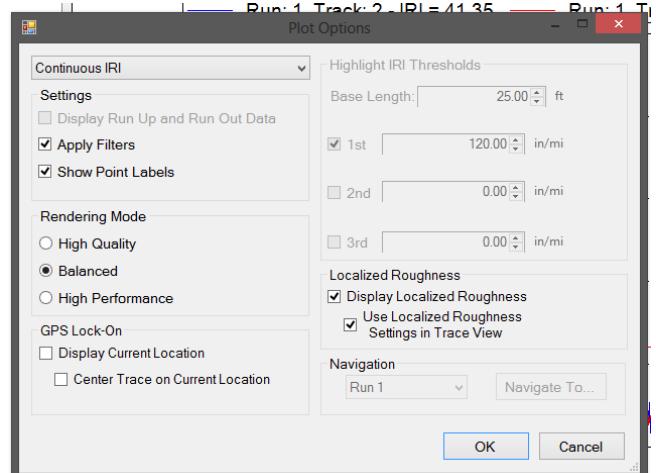


Figure 97: The Continuous IRI Plot options window.

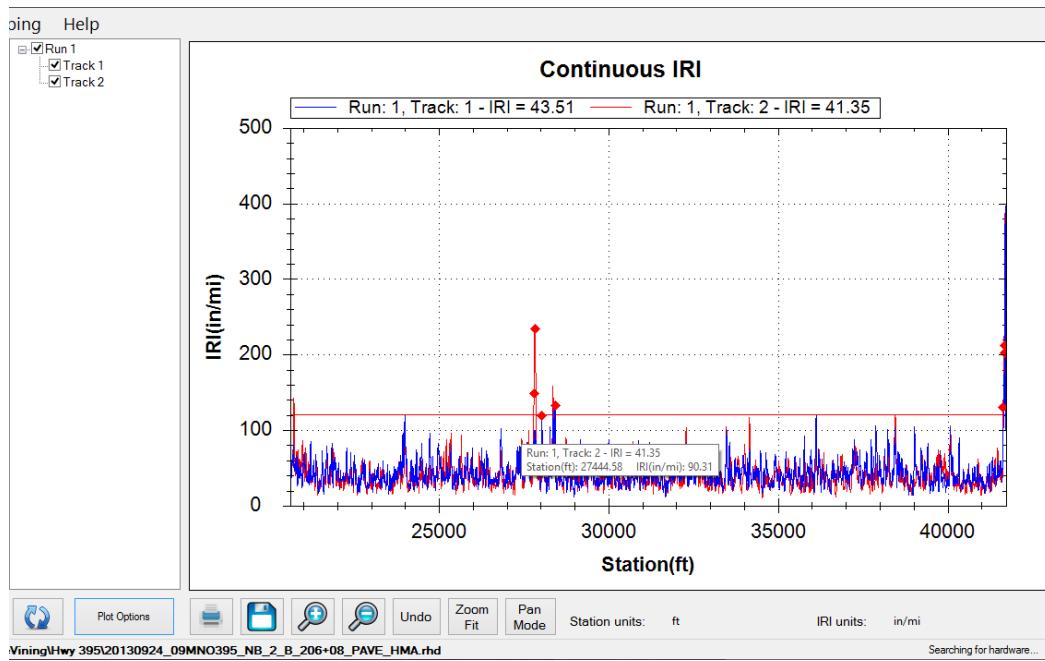


Figure 98: The plot of the Continuous IRI trace

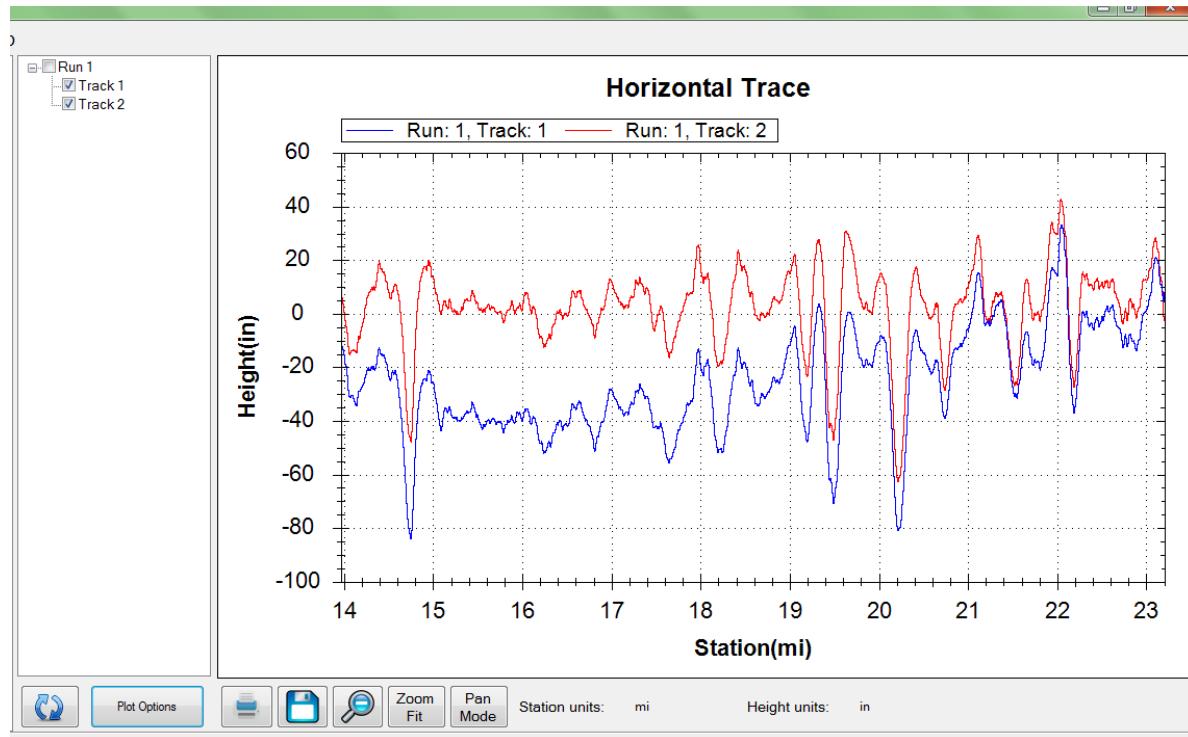


Figure 99: The plot of the profile trace

Plot Options Settings

Display Run in/ Run out Data

Many High Speed Profiler data files have Run in and/or Run out data associated with them. To include this data in the trace, select the check box next to “Display Run Up and Run out Data.”

Apply filters

To apply the filters select the check box “Apply Filters.”

Show Point Labels

Showing point labels allows the user to move the cursor over the profile to find the stationing and height at a certain point of the plot. When the cursor stays over a point for one second, a dialogue box appears that gives information on station number and height at the cursors current position. The units of the stationing and height are the same as the units of the axes.

Rendering Mode

Under the Rendering Mode section the operator can choose the type of rendering to increase the speed or increase the quality when refreshing the graph. When using the high quality rendering, the time it takes to refresh will be longer, however the resolution of the trace will be optimum.

GPS Lock-On**Display Current Location**

This feature will display a vertical line at the vehicle’s current GPS location. This vertical line will move through the trace as the vehicle moves, allowing the user to locate the points of localized roughness.

Center Trace on Current Location

Then this box is checked, the trace will pan with the motion of the vehicle so that the current location is always in the center of the window. ***This option is required for any navigation feature.***

Highlight IRI Thresholds**Base Length**

The base length is the length of the California Profilograph or 25 feet. It will be the basis of the IRI localized roughness calculations.

1st, 2nd, 3rd [in/mi]

Three separate thresholds can be set to depict which plots exceed the thresholds on the graph. These thresholds will be plotted as a horizontal line across the trace graph at the IRI values of the threshold in inches per mile.

Localized Roughness in Trace View

Be aware that when using the localized roughness the defects can appear below the threshold line. This is because the localized roughness is based off of a 25 foot length and not the entire profile.

Display Localized Roughness

When this box is selected the trace view will have the localized roughness location marked with a diamond. If the user places the cursor over the red diamond, the information about the localized roughness will be displayed.

Use Localized Roughness Settings in Trace View (Recommended)

By selecting this box the IRI Localized Roughness threshold established under the Settings and Localized Roughness Tab will be used to find and display the localized roughness in Trace View. If the other **Threshold** thresholds are used, the number of defects displayed in the trace may be different than the number in the report. **This selection displays the same localized roughness as in the report.**

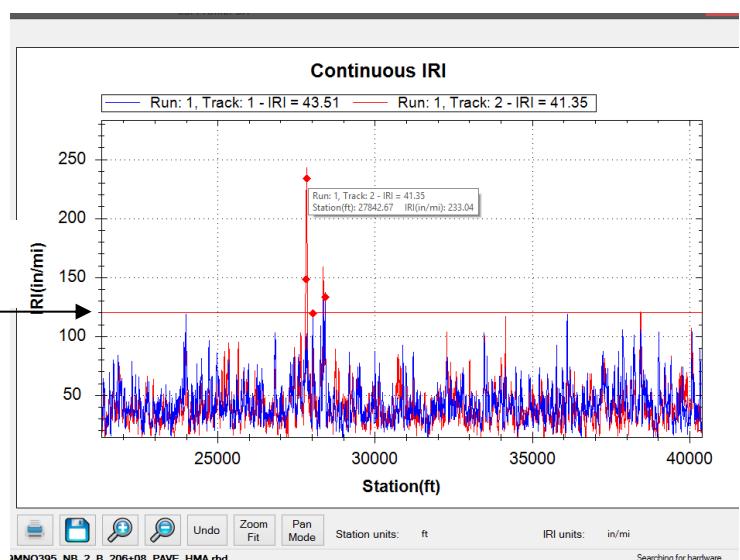


Figure 100: The Continuous IRI trace with the localized roughness diamonds shown

Navigation

Trace View has a navigation feature as long as the GPS is connected. See **Section 4.3. – Trace Navigation**

In order to use the Navigation feature in Trace View the GPS must be connected and you must select the “Display Current Location” check box under GPS Lock-On in the Plot Options Window.

GPS Tagging Tool

Based on the GPS coordinates that the profiler returned from the collection, the program can add events and pauses to the collection information. There are two ways of adding the events and pauses; dynamic and static tagging. The tagging tool is included in a deluxe Profiler license. **Tagging tolerances are dependent on the accuracy of the GPS system used.**

Dynamic Tagging

Dynamic tagging involves being physically at the location of the start or end of the pause or the event. The GPS string will be visible in the tagging window with the option of also having your current location displayed on the trace. Choose the type of location from the options and move to the next area.

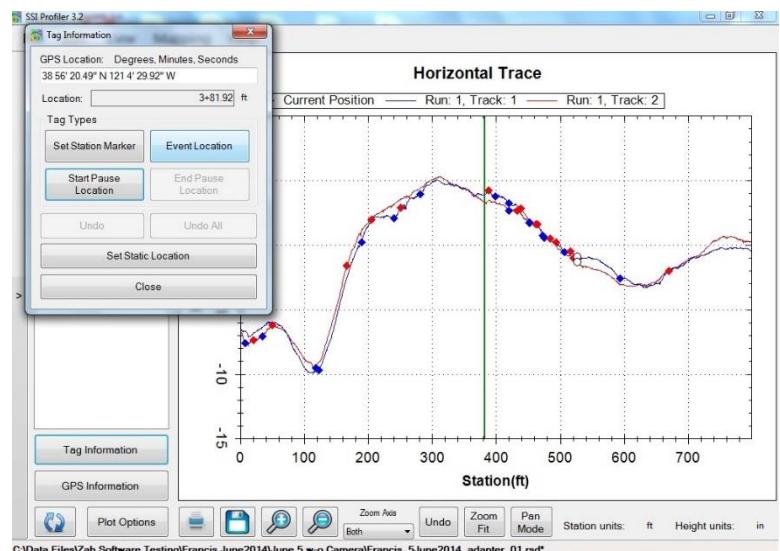


Figure 101: Dynamic Tagging Feature

Static Tagging

The static tagging feature allows the operator to enter a GPS location from a remote location, like your office. As long as the location's GPS coordinates are known, a pause or event can be created.

Grinding Simulation and Navigation

SSI has developed a feature to assist contractors in the removal of IRI Areas of Localized Roughness (ALR). The Grinding Simulation is included in a deluxe license of Profiler. ***Navigation tolerances are dependent on the accuracy of the GPS system used to collect and layout roughness.***

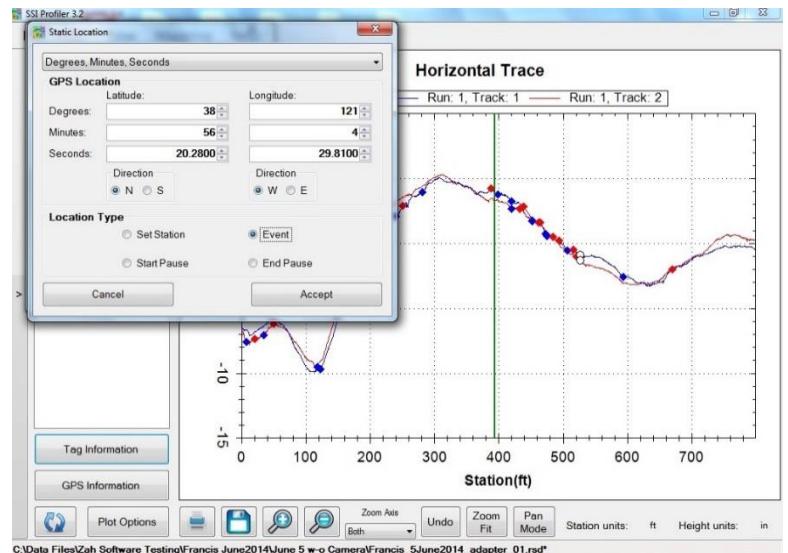


Figure 102: Static Tagging Feature

After collecting the data ALR can be determined from the amount of suspension movement over certain locations. These areas can be determined in SSI Profiler's Localized Roughness section. However, grinding the ALR does not have the best result in removing roughness. This is because ALR can now include dips and bumps. Grinding dips takes a special procedure.

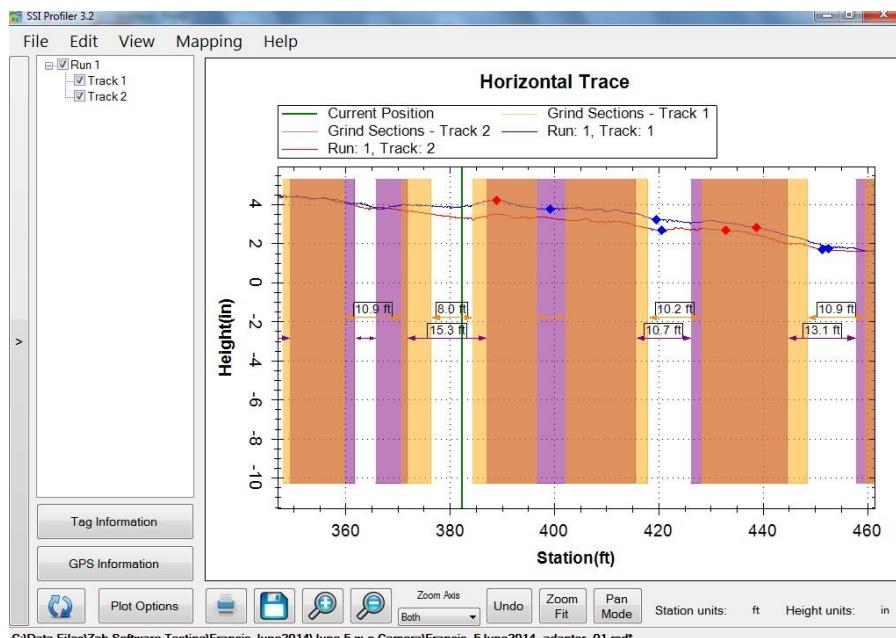


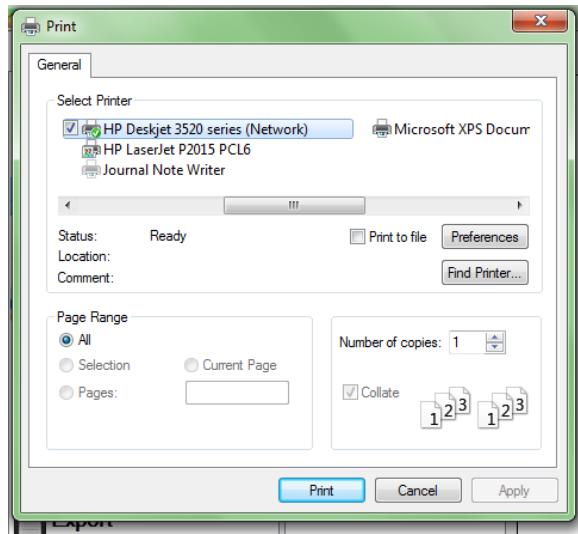
Figure 103: Grinding Navigation with green current location displayed

The FHWA program ProVal (roadprofile.com) has a tool to simulate the best grinding strategy for grinding. Input the correct settings for the IRI tolerances in ProVal's SAM analysis and choose AutoGrind, then Grind. This will give you locations along to profile to grind. Unfortunately ProVal does not accept GPS coordinates so the table can be copied (right click in the grind table) and pasted into the Import Grind Locations window in Profiler V3>Trace>Plot Options Window. Confirm that the track is correct before applying these locations.

The locations for track 1 and 2 will appear in the trace window with paired GPS coordinates. You can use the green line to display current location and visually track your position until you get to the beginning and end of a grind to layout the location on the pavement.

Print

To print the trace, select the Print Icon in the window or select CTRL+P on the keyboard. The print window will appear at this time. Within the window, select the printer to be used and verify that the printer settings are correct. When ‘Print’ is selected, the document will be sent to the printer.



If more printing options are needed, select the ‘Preferences’ icon. This icon will open a window that is printer specific containing information about the orientation, paper size, and image quality.

Figure 104: The Print window that appears after the print icon is selected

Save

When the Save icon is selected, the user is able to save the trace as an image in png, gif, jpeg, tiff, and bmp format. The image can be saved on the operating computer or on a connected external device.

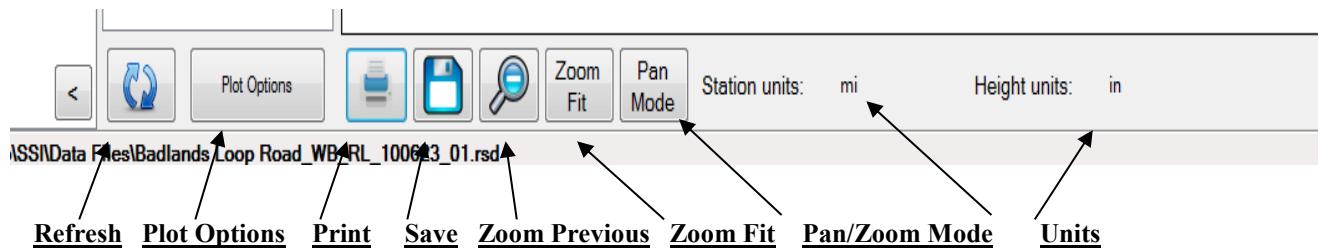


Figure 105: The tool bar for the trace window

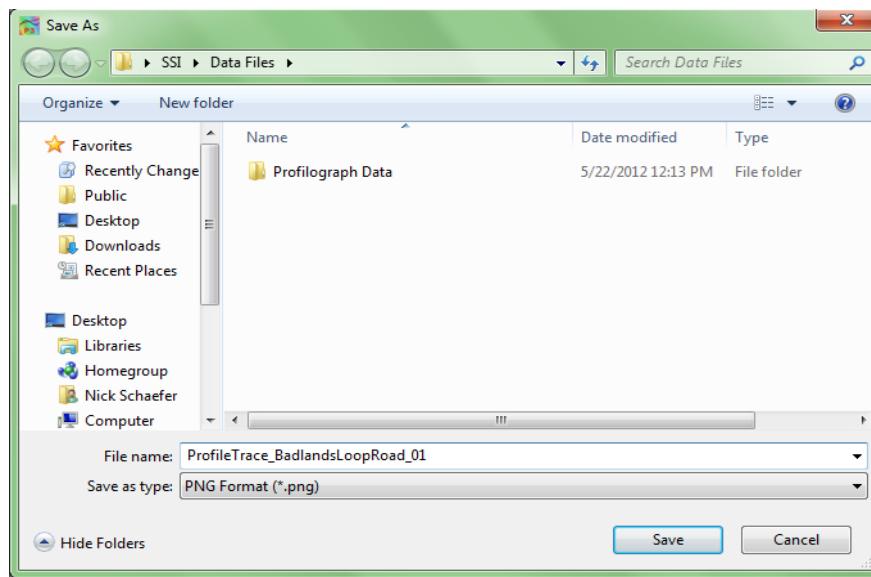


Figure 106: Windows explorer to save a picture of the graph.

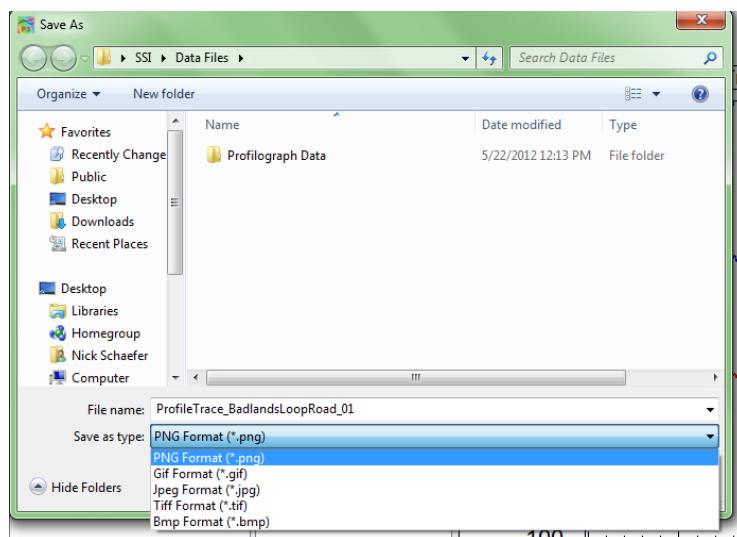


Figure 107: The available picture formats to save the trace graph in

Zoom

To zoom in the trace window, verify that the Pan/Zoom Mode icon displays ‘Pan Mode.’ To zoom in on the plot, left click and hold while dragging the cursor over the area to be blown up. While dragging the cursor, a dotted box will appear. This dotted box contains the area of the plot that will be blown up, by being fit to the size of the plot window.

Zoom Previous Icon

When Zoom Previous is selected, the last ‘zoom in’ action is undone.

Zoom Fit Icon

To return to the original aspect ratio, also known as the home view, select Zoom Fit.

Pan/Zoom Mode Icon

The Pan/Zoom Mode icon has two functions. When Pan Mode is displayed, the cursor may be used to zoom in on the plot. To zoom in on the plot, hold down the left mouse button and move the cursor over the plot area to be blown up. The dashed box contains the area that will be enlarged.

When Zoom Mode is displayed, the operator may use the cursor to pan across the plot area. The pan mode allows the user to navigate through the plot area without changing the aspect ratio, or zooming out.

Units for Height and Station

The units for height (y-axis) and stationing (x-axis) can be changed by left clicking upon the current units and selecting the necessary units from the dialogue box that appears. The units available are mils, inches, feet, yard, miles, millimeters, centimeters, meters, and kilometers. The units scale the plot area.

4.0. – Navigation

The Profiler V3 program has three methods of location navigation. Map Point, Google Earth or Trace View can be used to travel to the point of localized roughness, Segments, Events, or a GPS coordinate. For this reason, *all three navigation options require a GPS device to function.*

4.1. – Microsoft MapPoint

MapPoint is used to navigate to points of interest along the path of collection.

MapPoint must be installed on the computer with a valid license.

The MapPoint feature can be used to navigate to locations in the profile based on the GPS coordinates. MapPoint can be used in trace view or through the compass and distance readout on the MapPoint window. To navigate to a defect using Mapping:

- 1) Open a file in SSI Profiler with GPS coordinates
- 2) Open the MapPoint window through the shortcut bar or through View>MapPoint
- 3) Select the Run MapPoint check box. Wait for the MapPoint to load
- 4) At the top, select a run and click on the “Navigate To” icon.
- 5) The user may choose to navigate to an area of localized roughness, station, segment, or a specific GPS coordinate. Choose the option from the drop down menu. Select a location and click on the green Start Navigation icon.
- 6) Follow the Map Point instructions and compass to get to the destination.

Note: A GPS signal and a collection using GPS is required to use mapping feature.

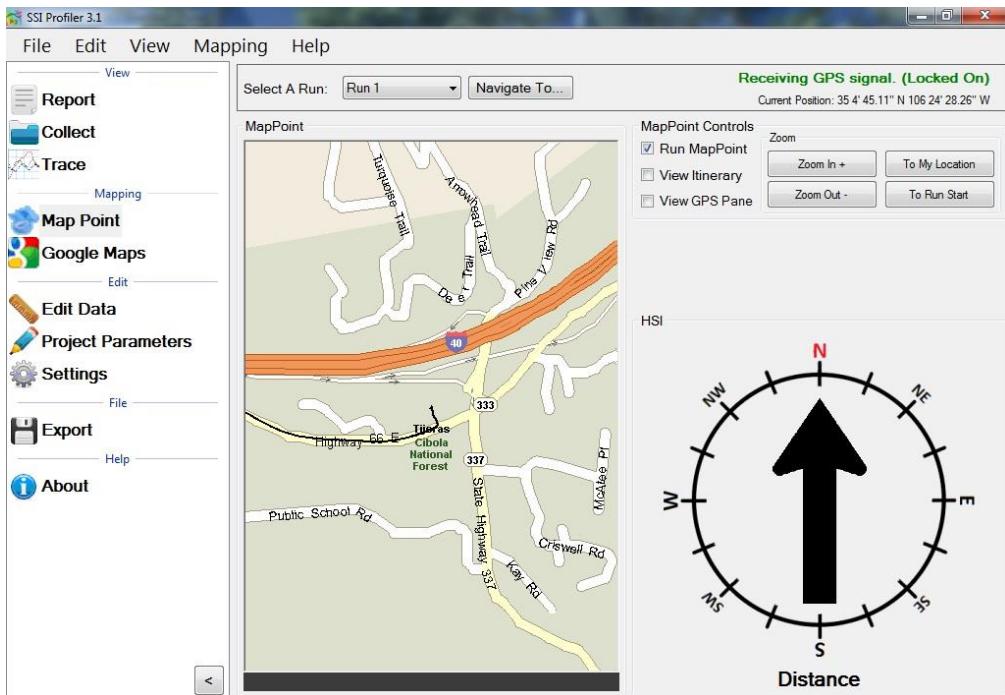


Figure 108: Main Map Point Window

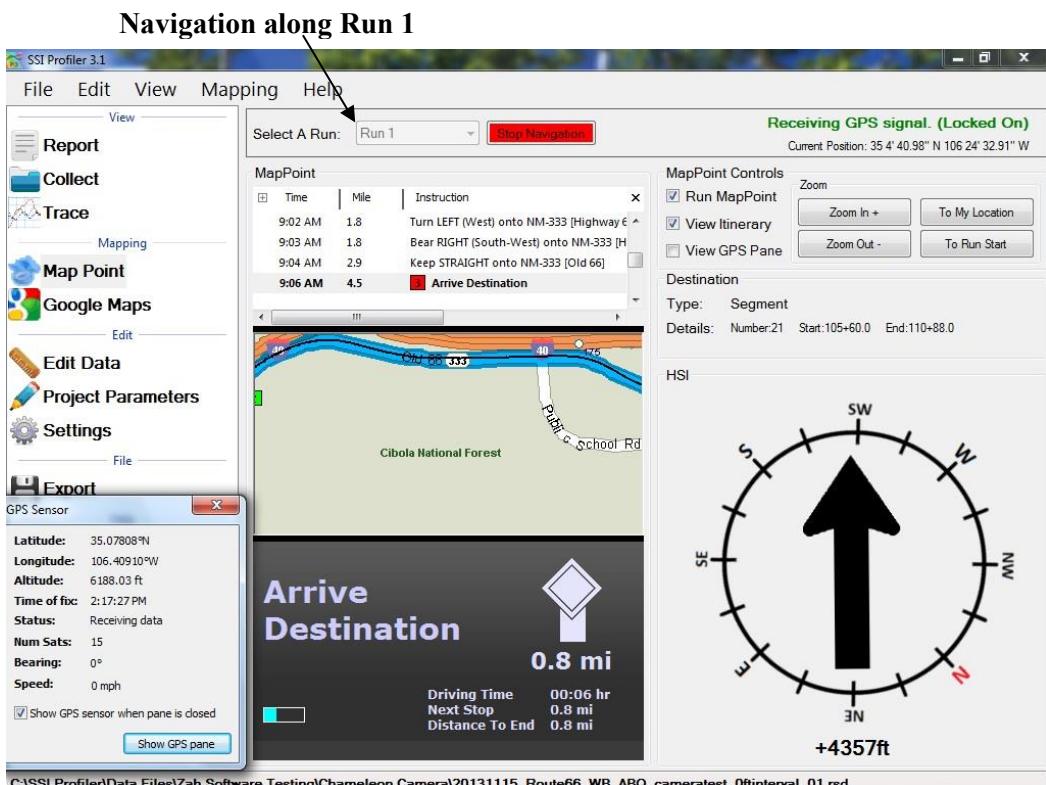


Figure 109: Map Point Navigation

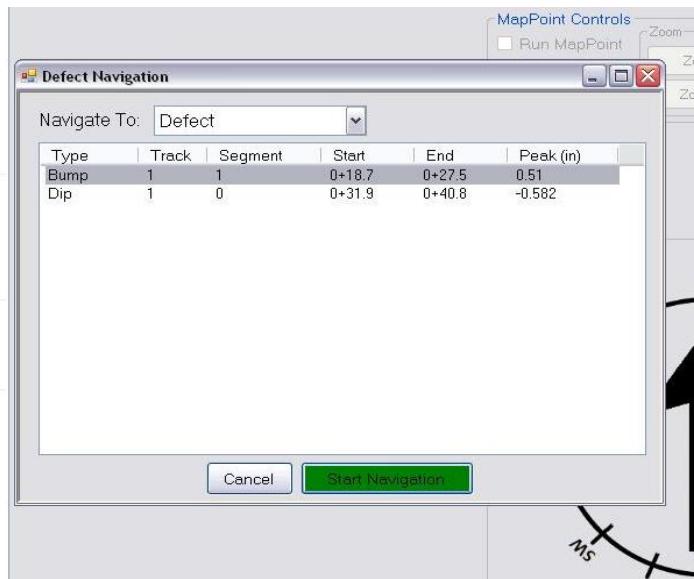


Figure 110: A bump is selected in Mapping

4.2 – Google Maps

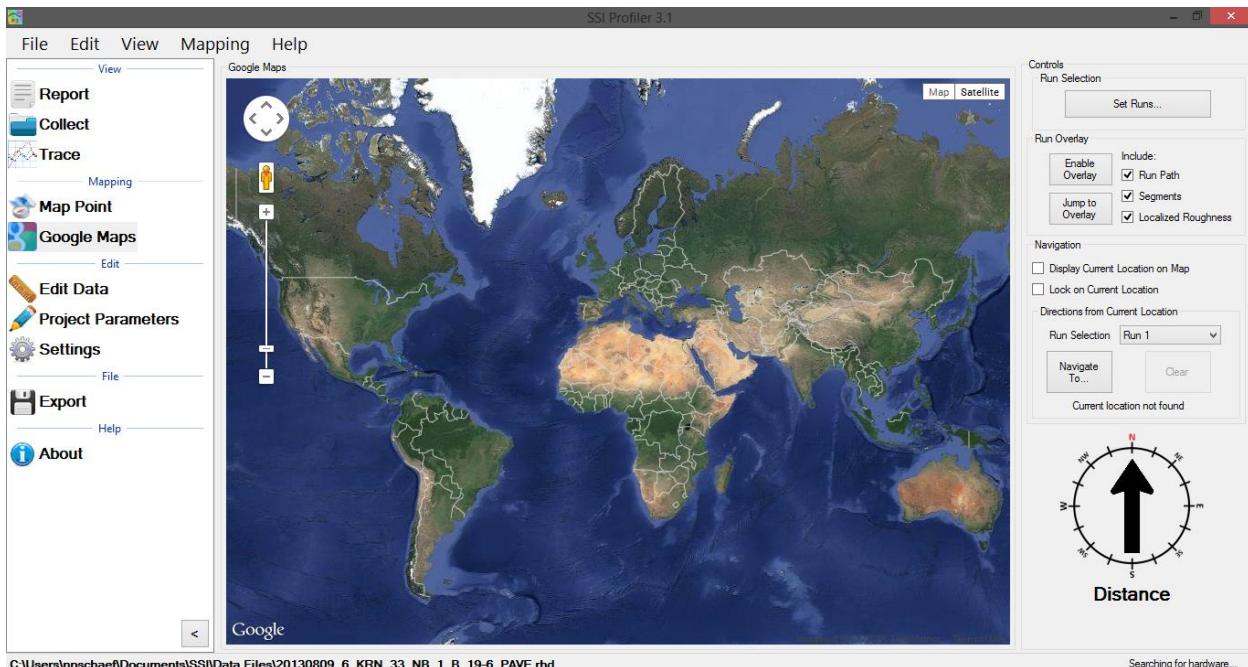


Figure 111: Initial Google Maps Screen

*An internet connection is required for use of Google Maps

Google Maps can be used to show the location of the run path, segments, and localized roughness. Google Maps can also be used within Profiler V3 to navigate to defects, the start of the run or the end of the run.

To view the location of the collection without any collection information displayed:

- 1) To begin, select the Google Maps icon in the shortcut bar.

- 2) The world view will be the initial view in the window.
- 3) The right side of the window has the controls section. Choose the run number of the collection to be viewed in the map.
- 4) Select Jump to Overlay or “Navigate To...” and select an event.

To view the Run Path, Segments, and Localized Roughness:

- 1) Select their corresponding check boxes of the parameters. If one parameter is not desired, do not select its check box
- 2) Select the “Enable Overlay” icon.
- 3) Select Jump to Run
- 4) If the push-pin is selected, the statistics and information for that location will be displayed.

For Localized Roughness: Red Pin is Track 1, Blue Pin is Track 2, and the Green Pin is Track 3. To deselect a track to not show it on the map, select the “Set Runs” icon and uncheck the box next to the unwanted track.

Once the run is displayed in Google Maps, use the scrolling and cursor to navigate through the run. The run path, segments and localized roughness are shown if their respective box is selected. These features can be shown if the box is checked reading, “Disable Overlay.”

Display Current Location on Map

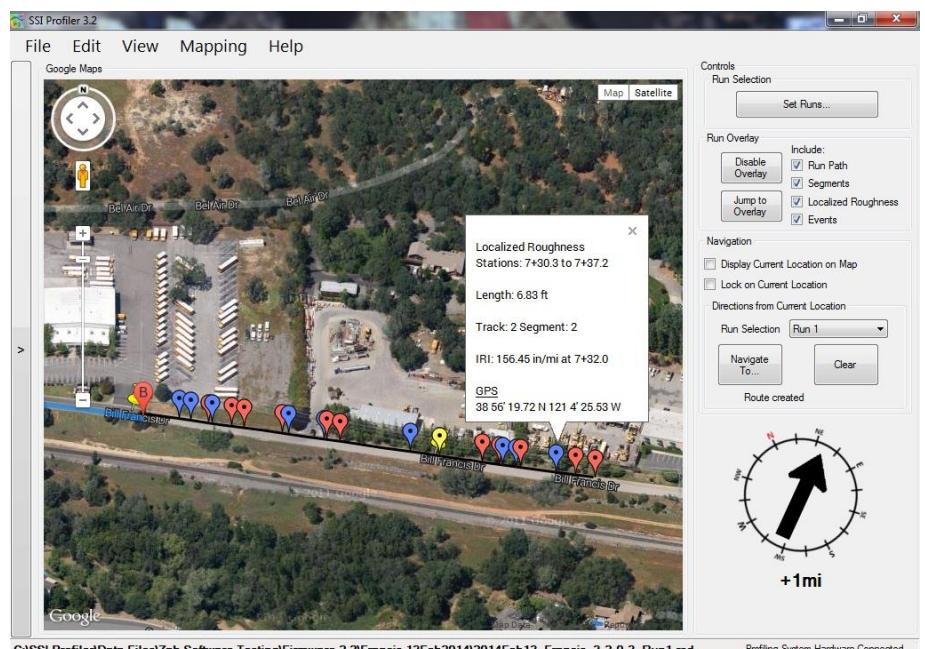
If this check box is selected, the current location of the profiler is marked by a large green arrow in the map window.

Lock on Current Location

If the check box for “Lock on Current Location” is selected, the location of the profiling system will remain in the center of the map window.

Directions from Current Location

The V3 program will navigate to the start or end of the run and any defects found during collection. Select the destination from the drop down menu and select the calculate icon. The route will appear as a black line from your current location to the “B” landmark.



To navigate to an event, pause, segment, or defect, select the correct run number and then the “Navigate To” icon. If GPS is connected the program will ask the user where to be navigated to. Once the location is selected Profiler will direct the device to the location.

Note: GPS must be connected to use the Google Maps and Map Point features.

4.3. – Trace View Navigation

The trace navigation can be run over any of the Plot Options Views: Profile, Continuous IRI, Continuous MRI, and Continuous HRI. Open the Trace Window to begin. Select the Plot Options Icon to open the plot options icon. To start navigation, select “Display Current Location” under GPS Lock-on. This will make the “Navigate To” icon available (As seen at the bottom of Figure 114: The Trace Navigation Options).

- 1) Select the Run Number from the drop down menu in the Plot Options
- 2) Select Navigate To
- 3) From the drop down menu, select the type of location to navigate to: Localized Roughness, Segment, Event, or GPS coordinate.
- 4) Select the location to highlight it within the window.
- 5) Select Start Navigation once GPS and profiling hardware is connected
- 6) The pink line is the destination, the green is the vehicles location

If the vehicle goes off-route the green line will turn into a dotted green line.

If there is no green line, open the Collect window and the GPS Options to check the GPS reception.

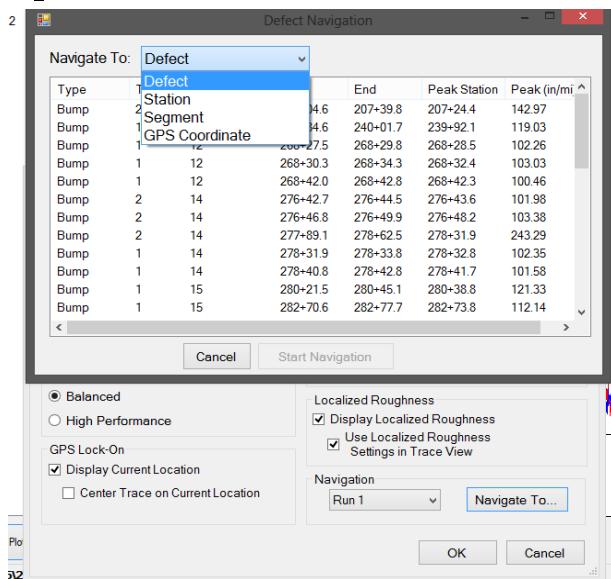


Figure 114: The Trace Navigation Options

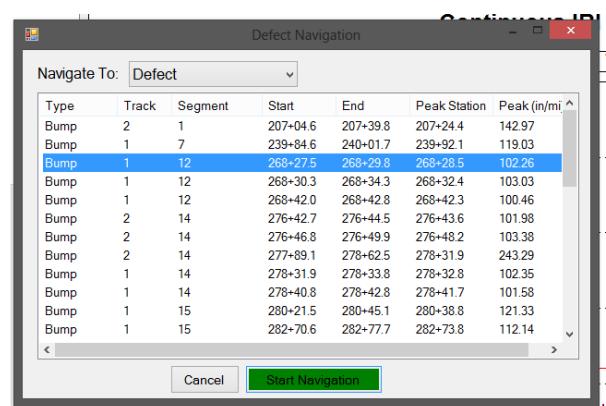


Figure 113: A Location selected and ready to start navigation

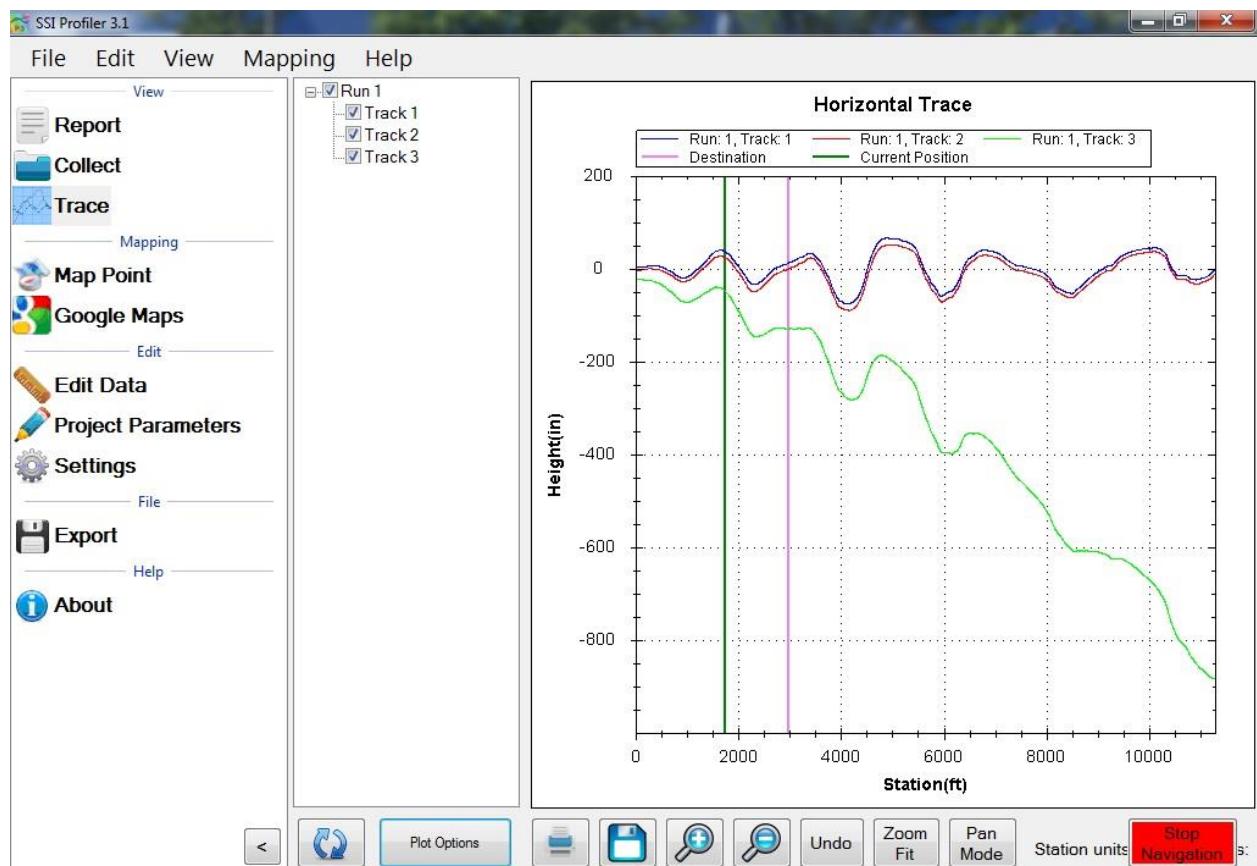


Figure 115: Trace Navigation with current and destination

5.0 – About

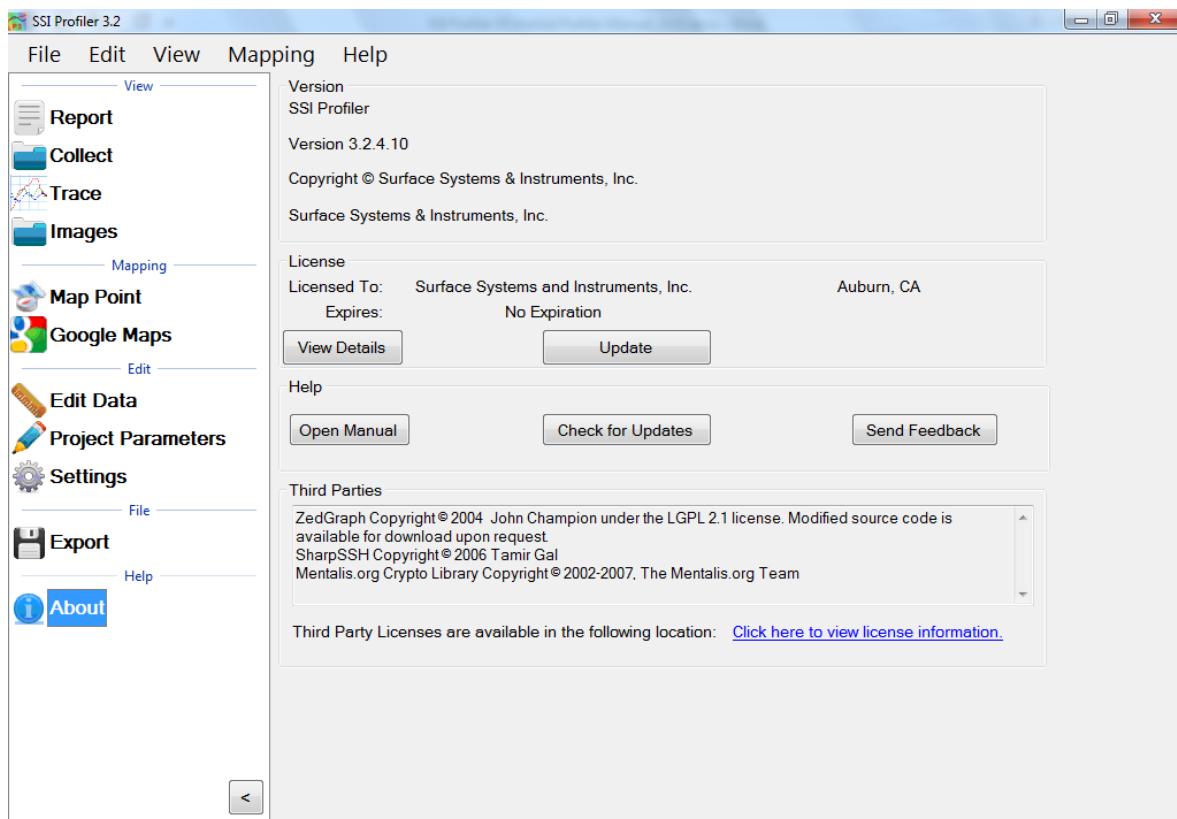


Figure 116: The About Window

The About section has information concerning Profiler V3 software and its licenses. The software version, copyright and license can all be found in the ‘About’ window. Additionally, third party software licenses are listed in the About window.

The About window is where the user can view the terms and features enabled with their license. Select View details to see the applicable collection devices and software features that are enabled. The update icon allows the user to select a file to update the software.

Manual

The manual can be found under the Help Tab or on the About Section window.

Check for Updates

The operator can manually check for updates through Help>Check For Updates. By default, the program will check for updates every time it is opened. To not check for updates at each opening, deselect the check box in this window.

Send Feedback

If SSI should be informed of issues or advancements of the software, please send us feedback so we can improve our services.

Third Party Components

The Third Party Components of Profiler V3 are:

ZedGraph Copyright © 2004 John Champion under the LGPL 2.1 license.
Modified source code is available for download at:
<http://www.smoothroad.com/support/download.asp>.

SharpSSH Copyright © 2006 Tamir Gal

Mentalis.org Crypto Library Copyright © 2002-2007. The Mentalis.org Team

Full copies of all third party licenses can be found in the Licenses folder located inside the Profiler V3 installation directory.

Troubleshooting

Check Current Calibration Settings

It is important to have accurate distance and height calibrations. If the calibrations are not performed correctly, the profile will not be a model of the pavement surface. Review the settings for the current calibration under the Calibration Menu, Calibration Summary.

With a distance 600 pulse encoder, the current calibration should be 528 feet (160 meters) and have about 188,500 encoder counts.

The height calibration should be 110 counts per 1 inch ± 2 counts. The Profiler program will know the tolerance based on the consistency of the calibration.

Distance and Height Connections

If the trace is flat lining or the hardware cannot be found, check the cable connections at the Amphenol connectors. The schematic for the wiring can be found below. If the wire was twisted, the small lead wires can break easily.

Check wires and that power is reaching the electronics

If the hardware is not found, the problem may be with the power cable or with worn out electronics. Contact SSI if the problem is not resolved.

Computer

Prior to updating SSI software, update the operating computer through windows update. Surface Systems and Instruments, Inc is continuously developing new program versions. For your operating computer to function properly, install windows updates regularly.

No Hardware Found

In the instance that the hardware is not found, check the connections of the cables into the suitcase and the power supply. If the electronics have been damaged, or in the rare event that the encoder has worn out, contact SSI for service and replacement.

Higher than normal roughness values

If the localizes roughness and ride values are larger than expected, it make be the calibration settings or an out of round wheel. To view the calibration settings, open the distance and height

calibration window while a device is attached. Then select the current calibration tab to view the current saved settings.

If the tire pressure is correct, the measurement wheel may be out of round. To test if the wheel is out of round, lift up the wheel and spin it is suspended in the air. View the changes of the wheels shape while it is spinning. If the riding surface of the wheel does not appear to make a perfect circle, the wheel is out of round. Call Auburn-SSI for more information and replacement parts. The measurement wheel is an integral piece of the Profilograph. Do not replace the SSI measurement wheel with a store bought bike tire.

Encoder Malfunction

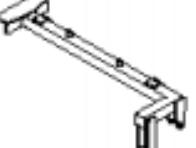
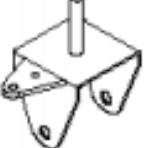
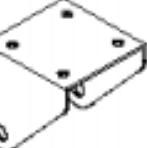
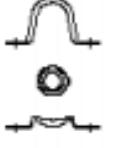
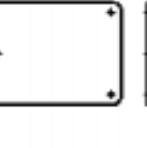
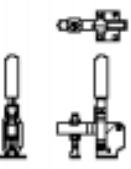
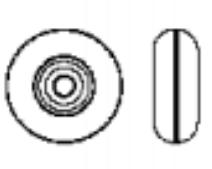
Encoder malfunction may appear as a flat-lining trace. The causes of this problem may be related to:

- Incorrect Calibration Procedure,
- Loose Hardware,
- Damage to Cables,
- Power Failure,
- Defective Encoder,
- SSI Electronics that are worn out or outdated.

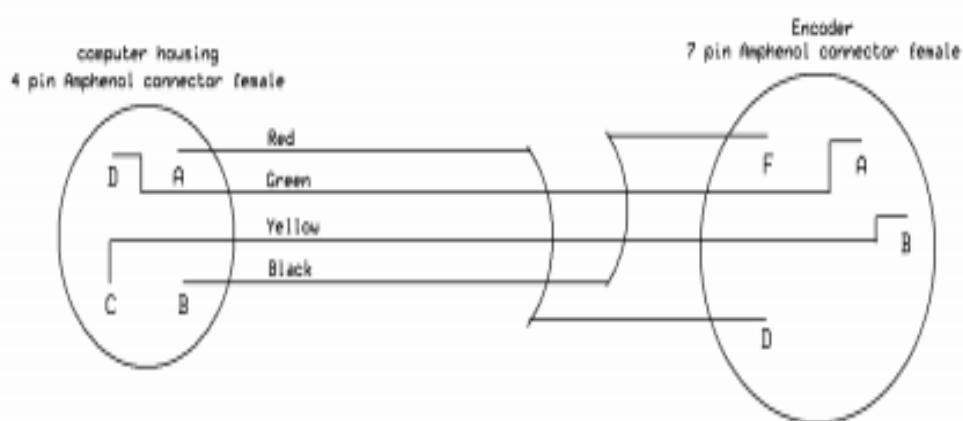
Contact SSI technical support for information and replacement parts.

List of parts

APPENDIX A
PROFILOGRAPH SPARE PARTS LIST

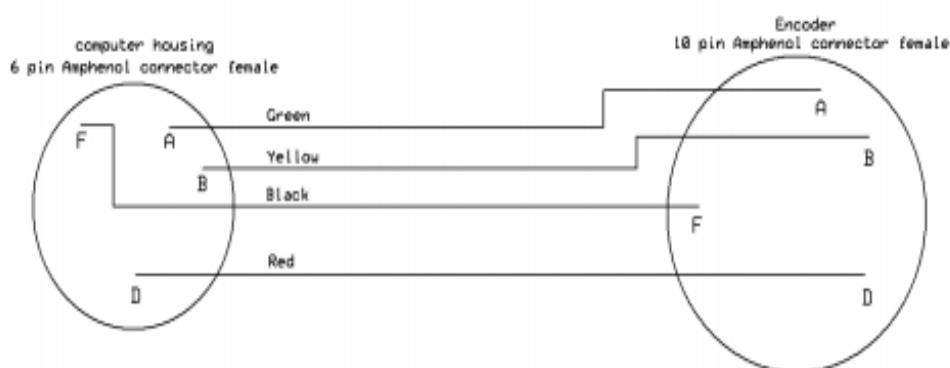
			
WHEEL PIVOT BAR (2175 LONG) PART NO: PRO-118	WHEEL PIVOT BAR (27.375 LONG) PART NO: PRO-119	WHEEL PIVOT BAR (36.125 LONG) PART NO: PRO-120	WHEEL PIVOT CROSS SUPPORT WELDMENT ASSEMBLY PART NO: PRO-121
			
STEERING WHEEL PIVOT BAR ASSEMBLY (35.0 LONG) PART NO: PRO-122	MAIN WHEEL PIVOT BAR ASSEMBLY (62.0 LONG) PART NO: PRO-123	BRAKE ASSEMBLY PART NO: PRO-131	2F TIE ROD PART NO: PRO-132
			
41" TIE ROD PART NO: PRO-133	STEERING WHEEL HOUSING ASSEMBLY PART NO: PRO-141	WHEEL HOUSING PIVOT BRACE PART NO: PRO-142	BEARING HOUSING SET PART NO: PRO-146
			
WHEEL AXLE PART NO: PRO-179	VERTICAL MEASUREMENT BLOCK PART NO: PRO-228	MEASUREMENT BLOCK PLATE PART NO: PRO-229	PAPER TAKE UP TUBE PART NO: PRO-161
			
MEASUREMENT WHEEL PART NO: 0200-004	WHEEL CLAMP PART NO: 0200-018	FRAME CLAMP PART NO: 0200-009	BALLOON CUSHION WHEEL PART NO: 0200-008

SSI Profilograph Distance Measurement Cable



SSI	
387 Plunate Lane Manhattan, KS 66502 785-539-6385	501 Park Way Mill Valley, CA 94941 888-662-5656
Flint Hixon 84/03/86	Rev 1.0 DR# 2.01

SSI Profilograph Height Measurement Cable



SSI		
387 Plumate Lane Manhattan, KS 66502 785-539-6385		581 Park Way Mill Valley, CA 94941 800-662-5636
Flint Hixon	Rev 1.0 04/03/86	DR# 2.02

When Contacting SSI Technical Support

If possible, have the profiler system type, profiler software version, operating system, computer model number, and company of ownership ready. If an internet connection is available, SSI staff may request your data files for comparison and troubleshooting.

Attaining Profilograph Software and Replacement Parts

For technical support for the computerized Profilograph software (either the Contact collection software or Profiler data analysis software), contact SSI to obtain a User ID and Password to obtain the most recent version updates from the download area on SSI's www.smoothroad.com website. Software issues should also be reported to SSI by email at support@smoothroad.com, with a copy of any data files to be reviewed by SSI technical support staff. SSI support staff can also be contacted by telephone at (530) 885-1482 (Auburn, CA); (415) 383-0570 (Larkspur, CA); or (785) 539-6305 (Manhattan, KS).

Parts can be ordered online from SSI at www.smoothroad.com. For support issues involving the profilograph hardware (frame, wheels, steering parts, clamps, cables, etc.), contact James Cox & Associates office in Auburn, California at (530) 885-1482 or by email at mchadd@sbcglobal.net.

Panasonic Toughbook Computer

For technical support for Panasonic Toughbook computers, contact Panasonic Technical Support at 1-800-Laptop5 (800- 527-8675) or go to the Panasonic support website at:

<http://www.panasonic.com/business/toughbook/support.asp>

Paper Supplies or Printer Servicing

For printer paper supplies or printer servicing, contact SSI at support@smoothroad.com or (530) 885-1482.

RECOMMENDATIONS FOR RECONCILING RESULTS BETWEEN DIFFERENT PROFILOGRAH OPERATING SYSTEMS

Background: Older automated profilographs, including the James Cox & Sons CS8200 and Besser/McCracken computerized profilographs used capacitor-driven analog transducers to acquire the profile height readings. Those sensors are more susceptible to line noise and electronic component eccentricity that can introduce extra noise or "chatter" into the profile trace. Such analog electronics/sensors are more susceptible to internal deterioration and eventual variance in the degree of calibration accuracy. The CS8500 system uses optical encoder sensors that are more immune to such vulnerabilities. In addition, older computerized systems were programmed around a two-tenths blanking band and employ older filtering methods, including the methodology for determining the movement of the raw profile data in and out of the blanking band. For example, Cox 8200 internal scallop settings included a nonadjustable minimum height at 0.035 with the duration of the event set at a minimum of 2.0 feet. Many of the CS8200 systems were only capable of a scallop rounding resolution of .05, while some later 8200 systems can be set to .01 rounding.¹ Plus the 8200 used a third order Butterworth filter and with a Data filter adjustment for both High and Low filtering. The Low setting simply sets the length of the Butterworth filter (usually set to 2 feet or such length as the operator chooses). The High filter setting was meant for testing on surface areas with curves and elevations, but an appropriate value was never determined, so it was disabled by the manufacturer and is usually set by default at 0). For all of these reasons, the profile traces and computer generated profile index results may vary slightly between older systems and the new CS8500 profilograph system that uses digital electronics and more advanced filtering methods.

Recommendations for Reconciliation of Ride Values: The current model SSI-Cox CS8500 system uses a default setting of 0.01 for the Resolution, which compares to the "rounding" setting on CS8200. SSI's recommendations on how to best correlate old and new profilograph systems if the identical data analysis settings do not produce matching results include: (1) use the Butterworth filter on the CS8500 system if required by specification, or if attempting to match a profiling device that is using a Butterworth filter, (2) increase the Butterworth filter length to 4.5 on both the older and new systems (or use the preferred Moving Average filter on the CS8500 system with a 2.0 – 3.0 foot length)(NOTE: some states specify the 2.0 ft Butterworth filter, which requires use of that filter on both systems), (3) match the agency's requirements on rounding (either 0.01 or 0.05 as the scallop Resolution setting on the CS8500 system), (4) on the CS8500, decrease the scallop height incrementally from 0.035 downward in 0.005 increments to 0.030, 0.025, etc. (which will count more of the scallop as roughness and tend to slightly increase the PRI value, (5) on the CS8500 incrementally decrease the Scallop Minimum Width from 2.0 ft downward by .25 ft increments (which will count more of the scallop as roughness and tend to increase the PRI), (6) attempt a combination of the above-described adjustments to the scallop minimum height and minimum width, and (7) adjust the Filter Gain² incrementally up (to increase PRI) or down (decrease PRI) as a last resort.