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## Profiler V3 Operation Manual CS-8500 Profilograph System Version 3.3.0.2.



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## **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.

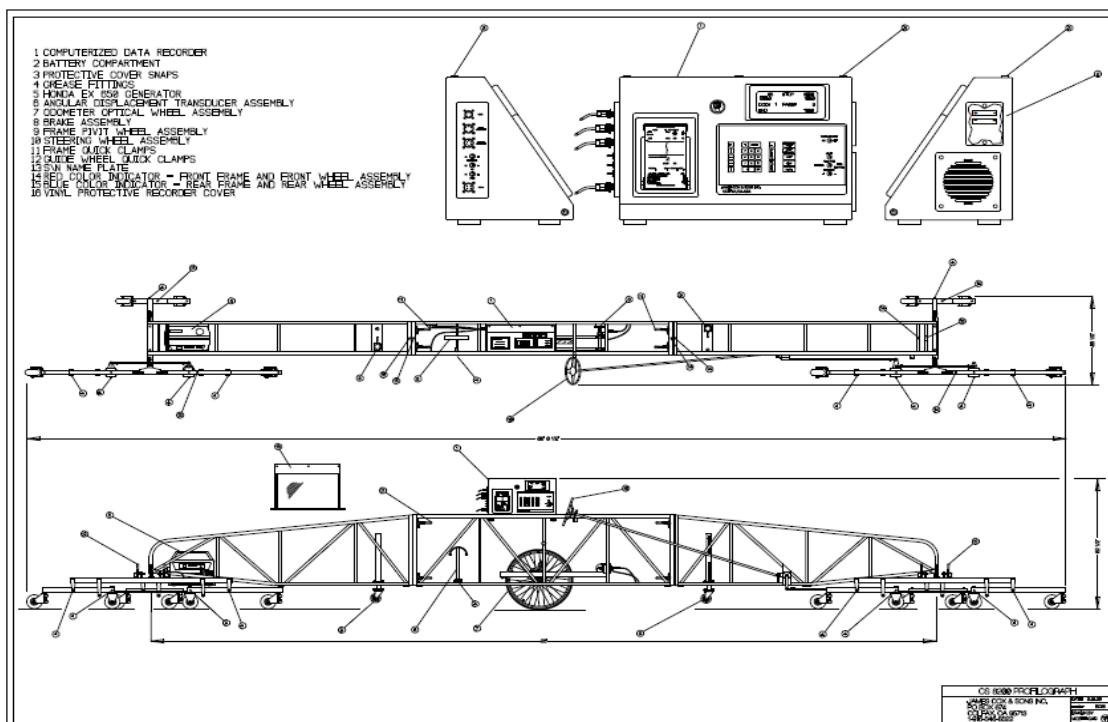


Figure 1: The top and side view schematic for the Profilograph system

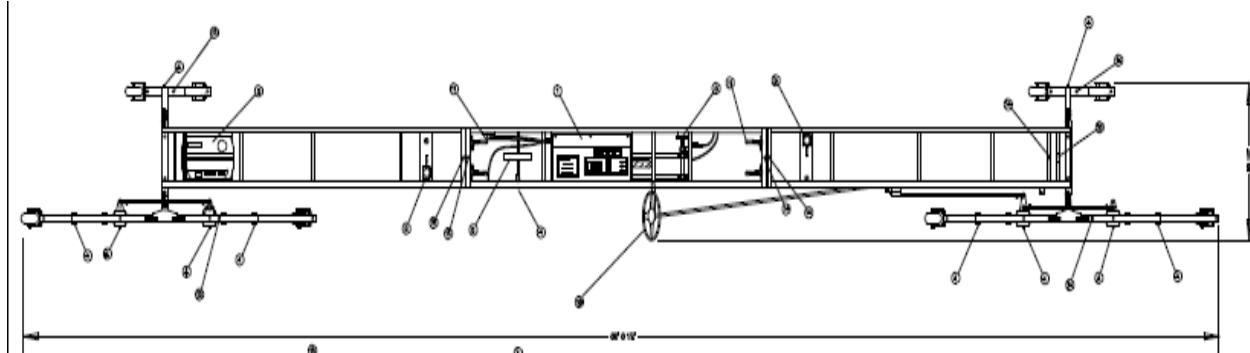


Figure 2: The top view of a correctly assembled Profilograph

### **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.

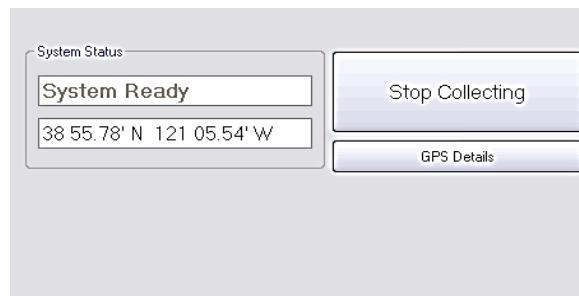


Figure 3: System Status and GPS

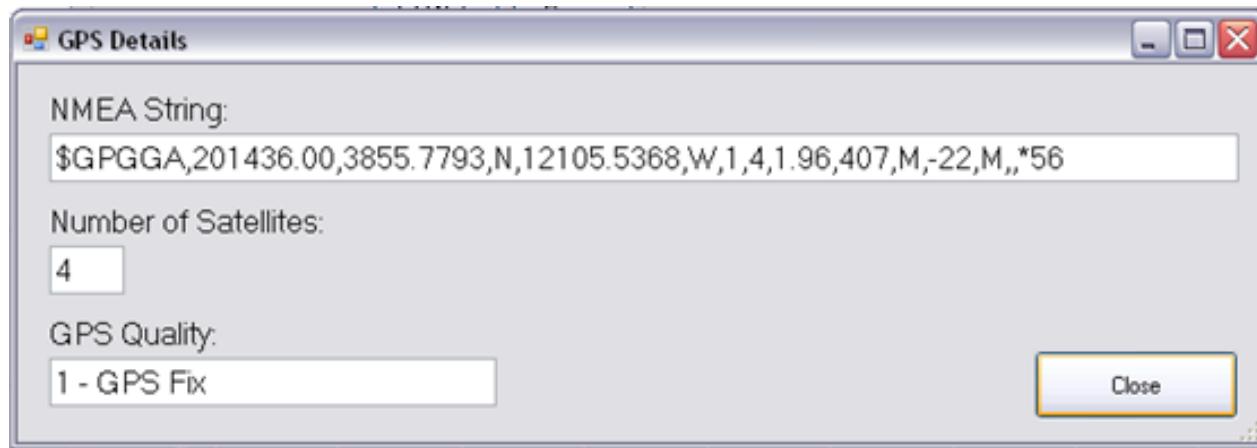


Figure 4: The GPS Details window

## Data Collection

### Collect

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

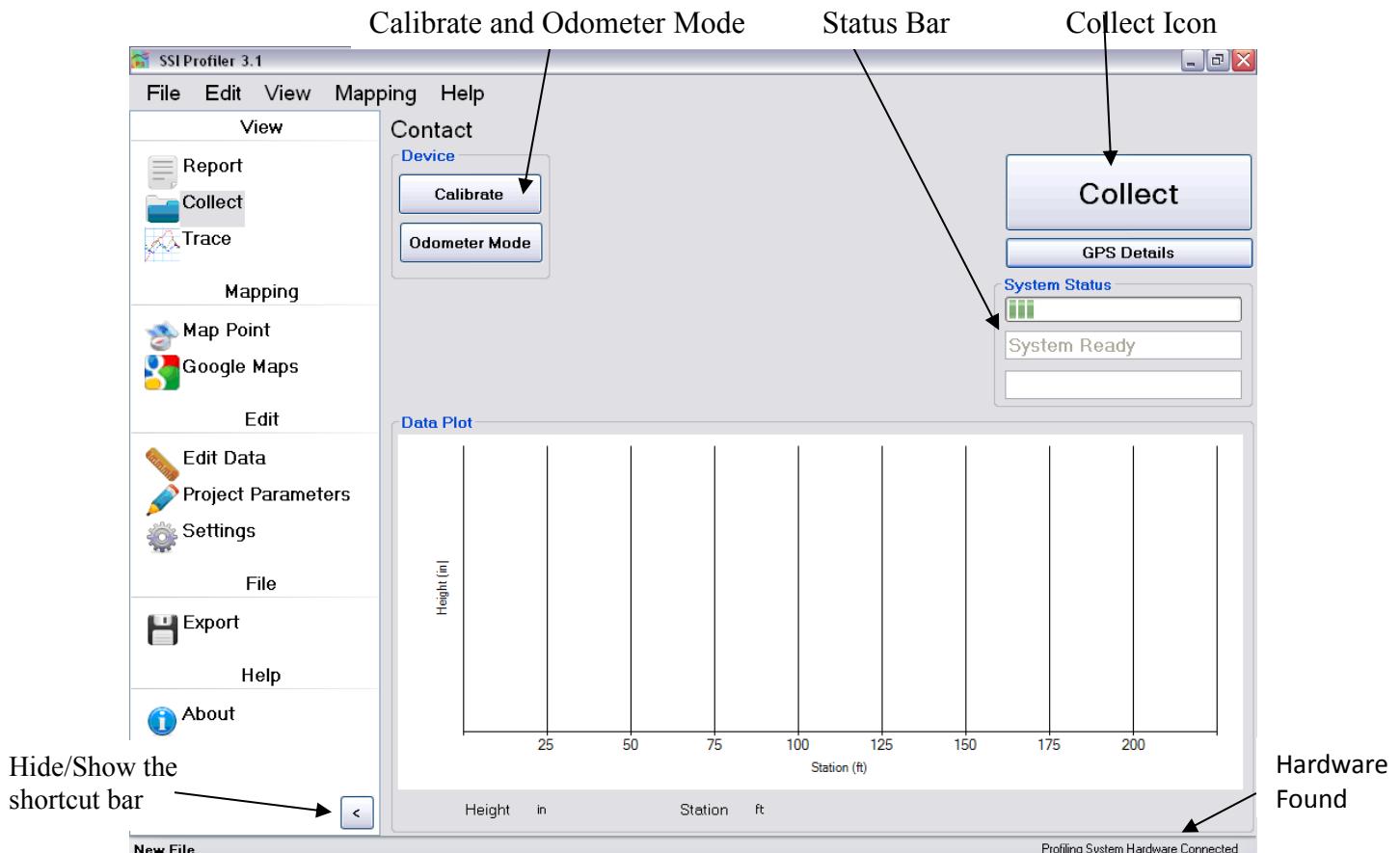


Figure 5: The Main Collection Window

### 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

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.

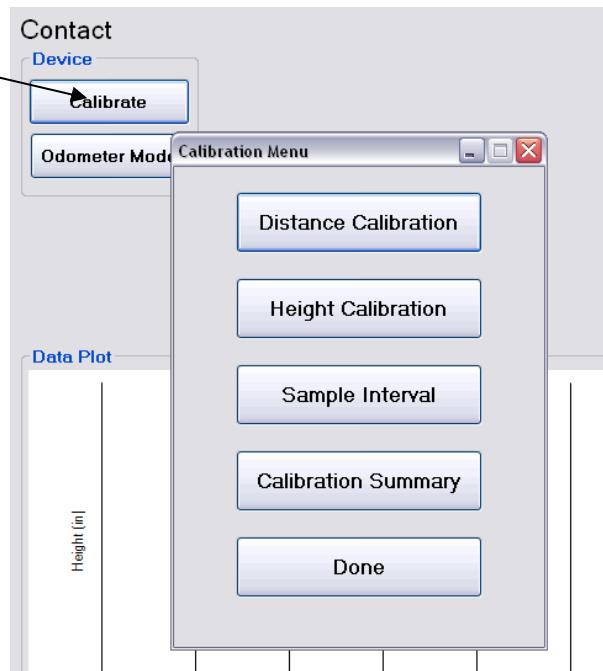


Figure 6: The Main Calibration Window

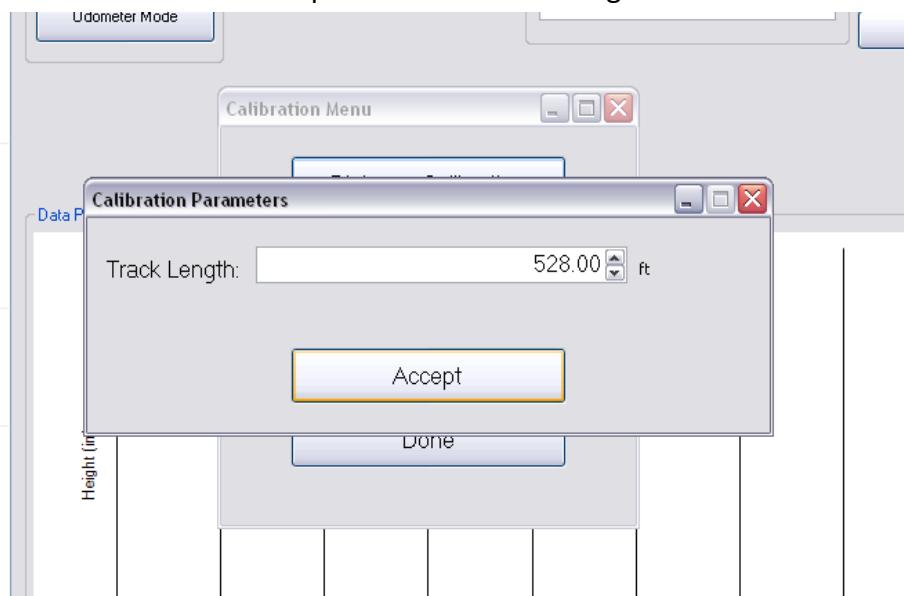


Figure 7: The First window of the distance calibration

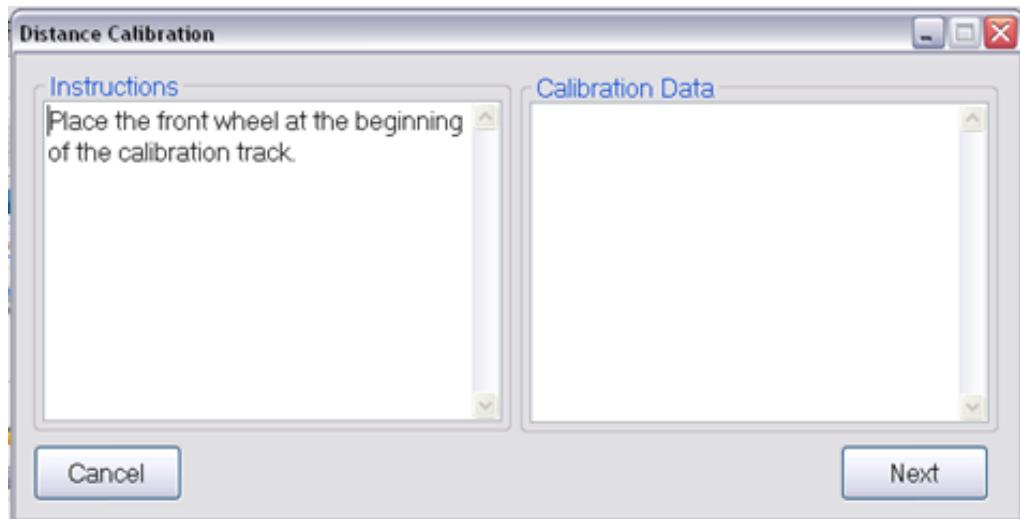


Figure 8: The instructions for the distance calibration.

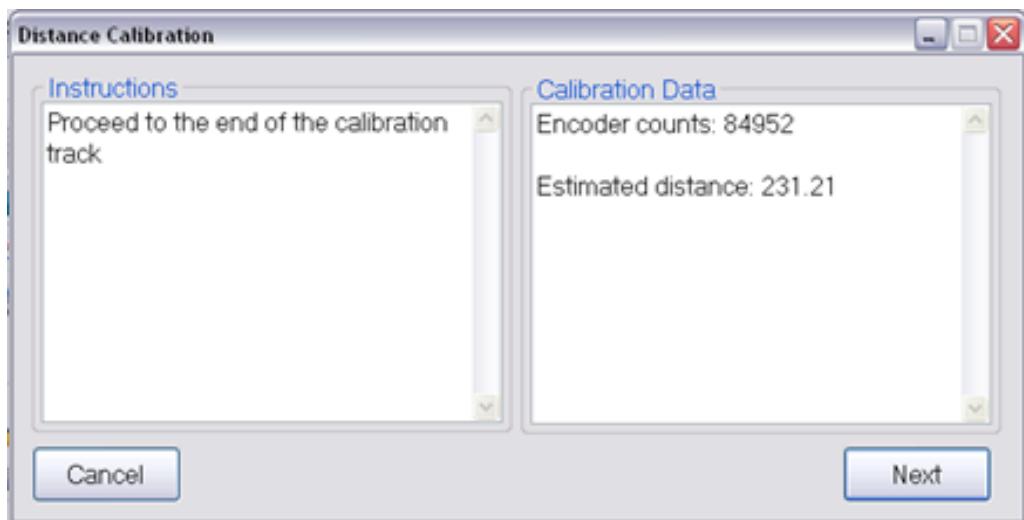


Figure 9: Screenshot taken near the halfway mark of the distance calibration

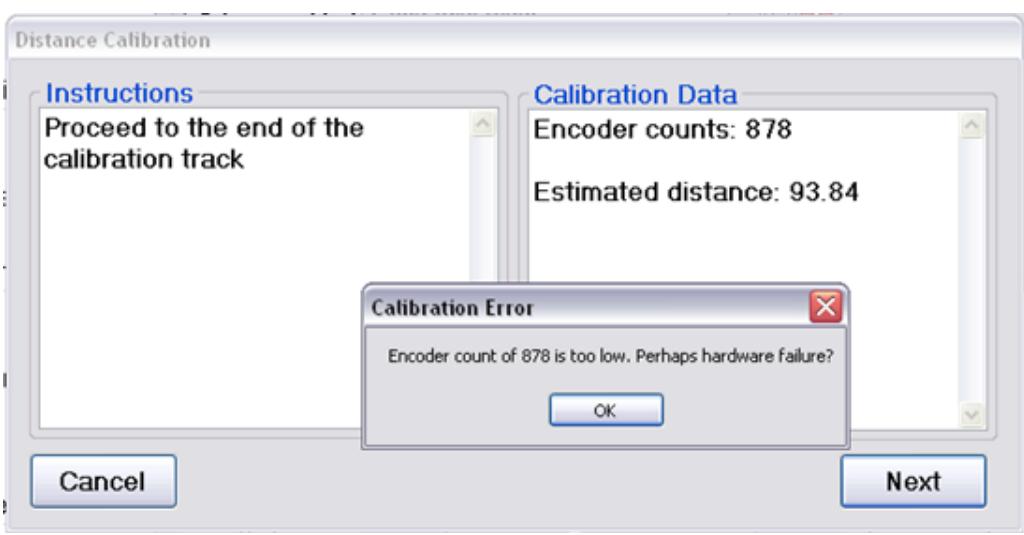


Figure 10: Distance Calibration Error

### 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.

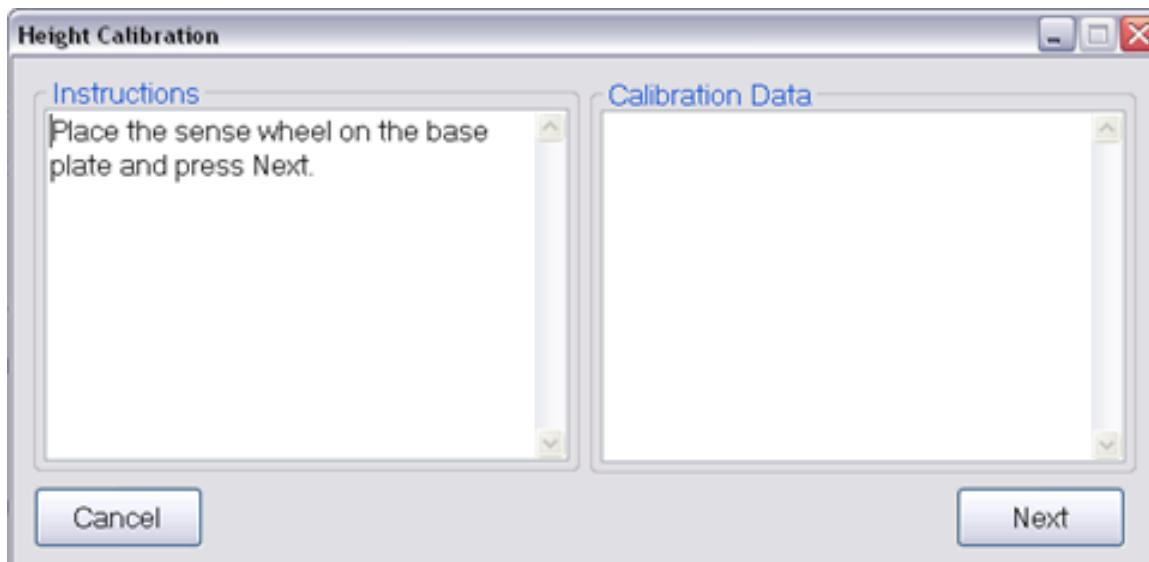


Figure 11: The initial step of the height calibration

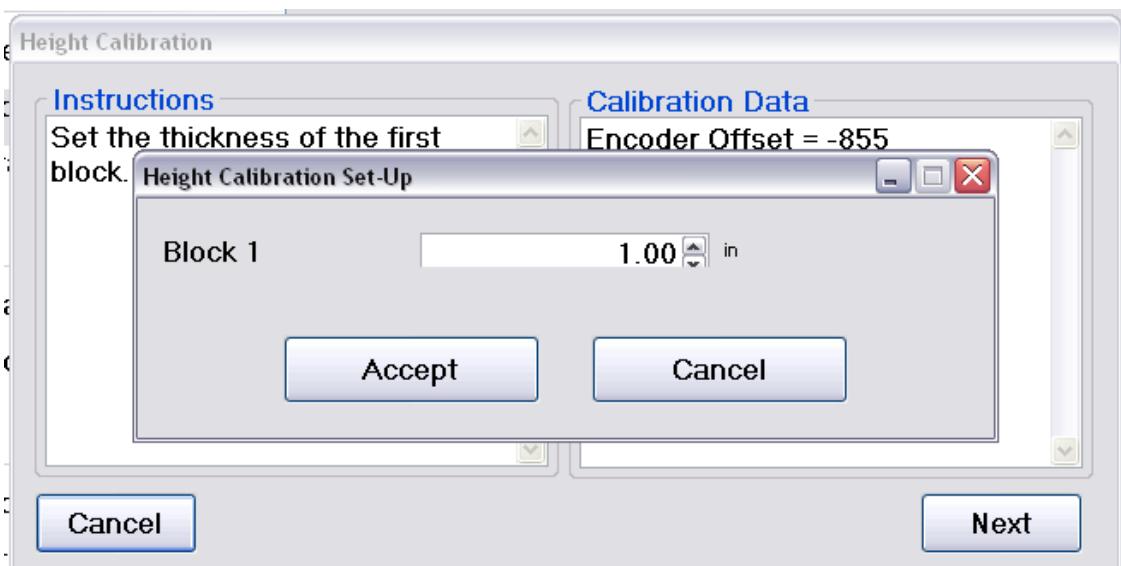


Figure 12: Enter the first block thickness for height calibration

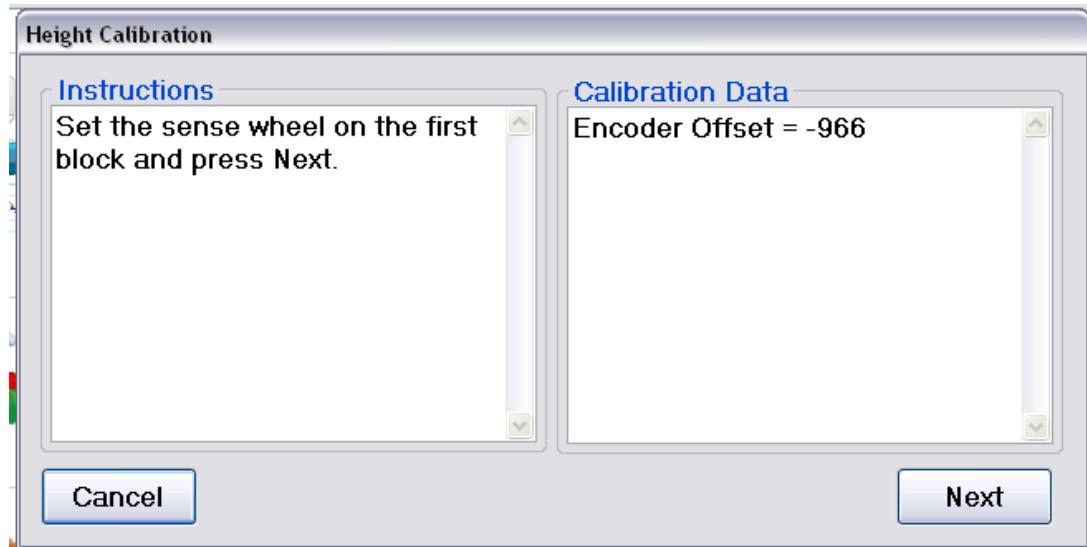


Figure 13: Place the first block under the measurement

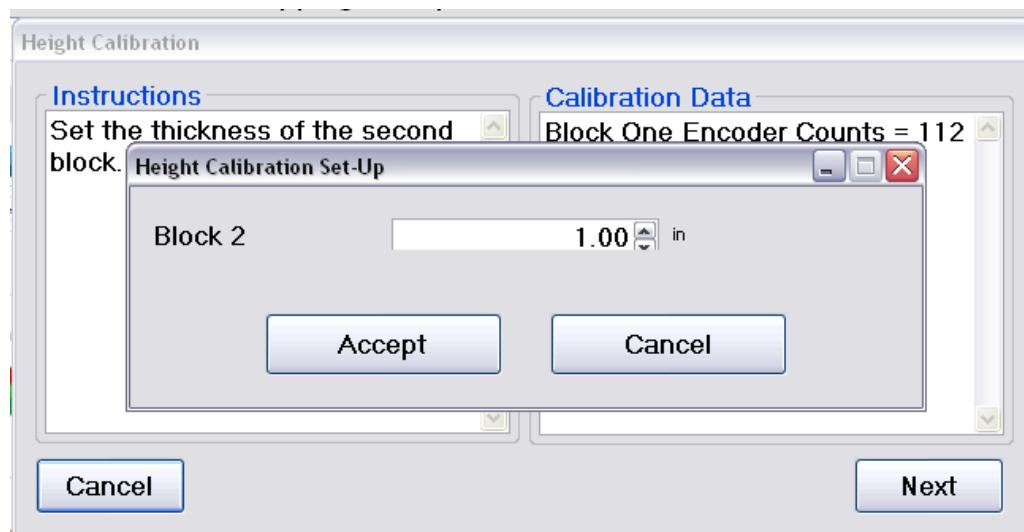


Figure 14: Set the height of the second block as **1 inch**

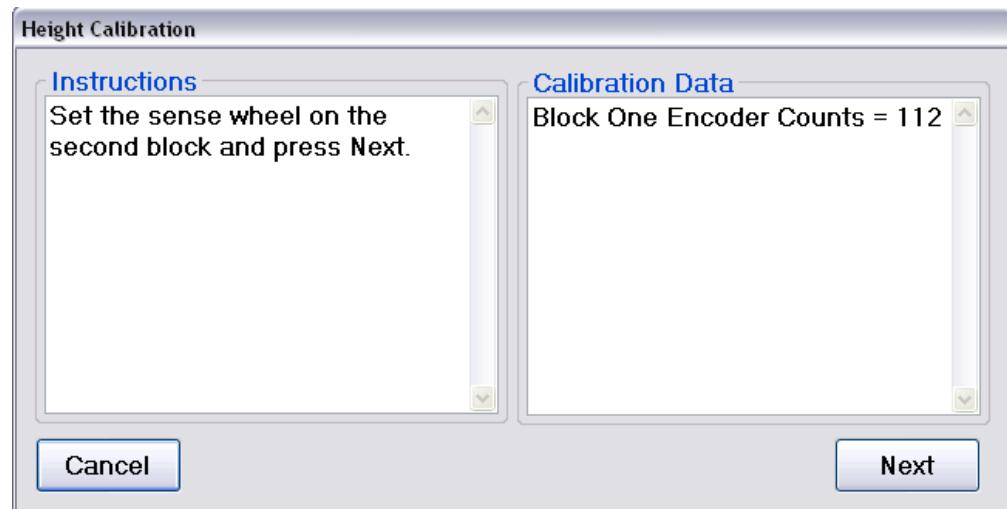


Figure 15: Place the measurement wheel upon the second block

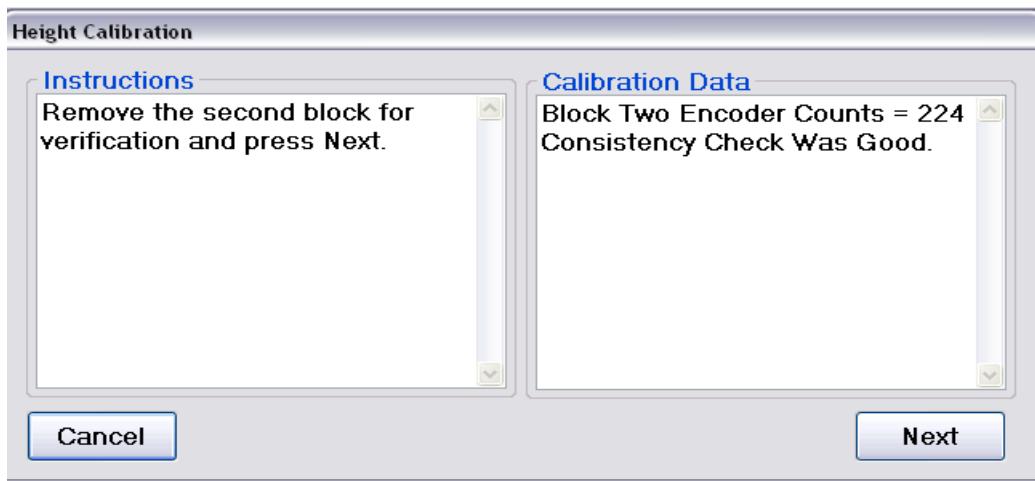


Figure 16: Calibration block removal

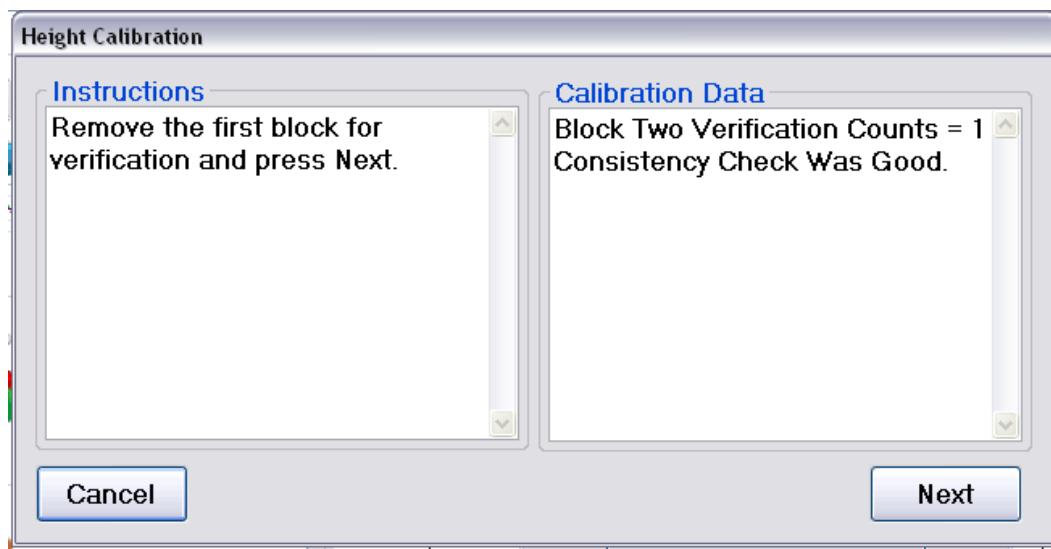


Figure 17: Removal of the first calibration block

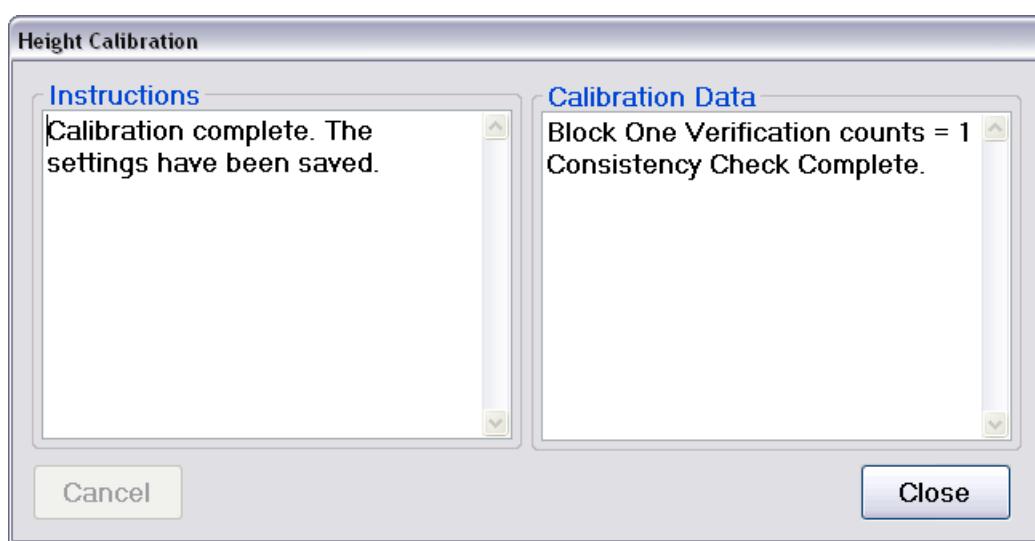


Figure 18: If the consistency check is a success, the calibration settings will be saved.

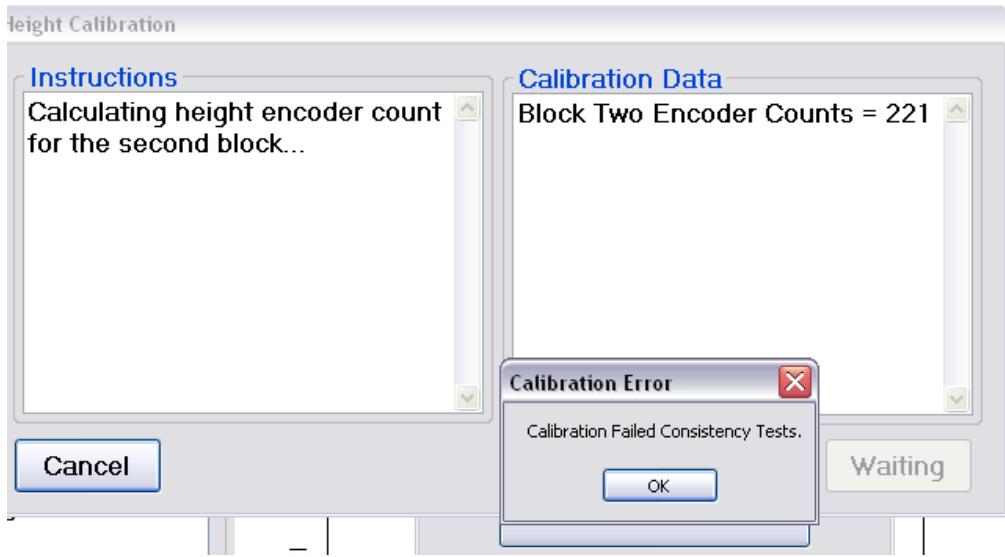


Figure 19: A failed consistency test for the height calibration. Perform correct procedure.

### 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.

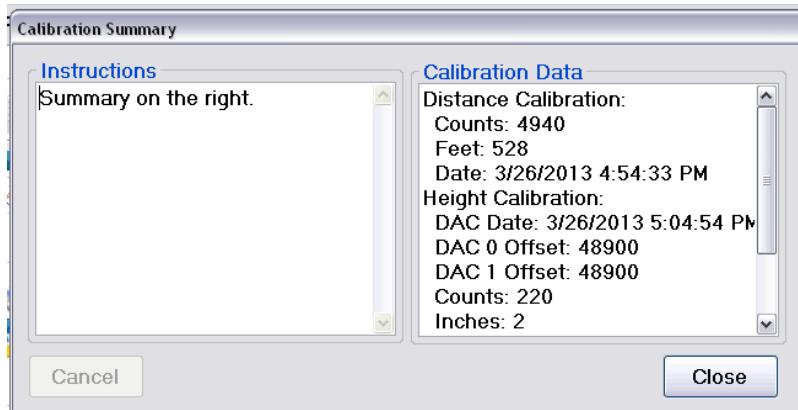


Figure 20: Calibration Summary

### 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.

To open the odometer, select Odometer Mode from the main Collect window.

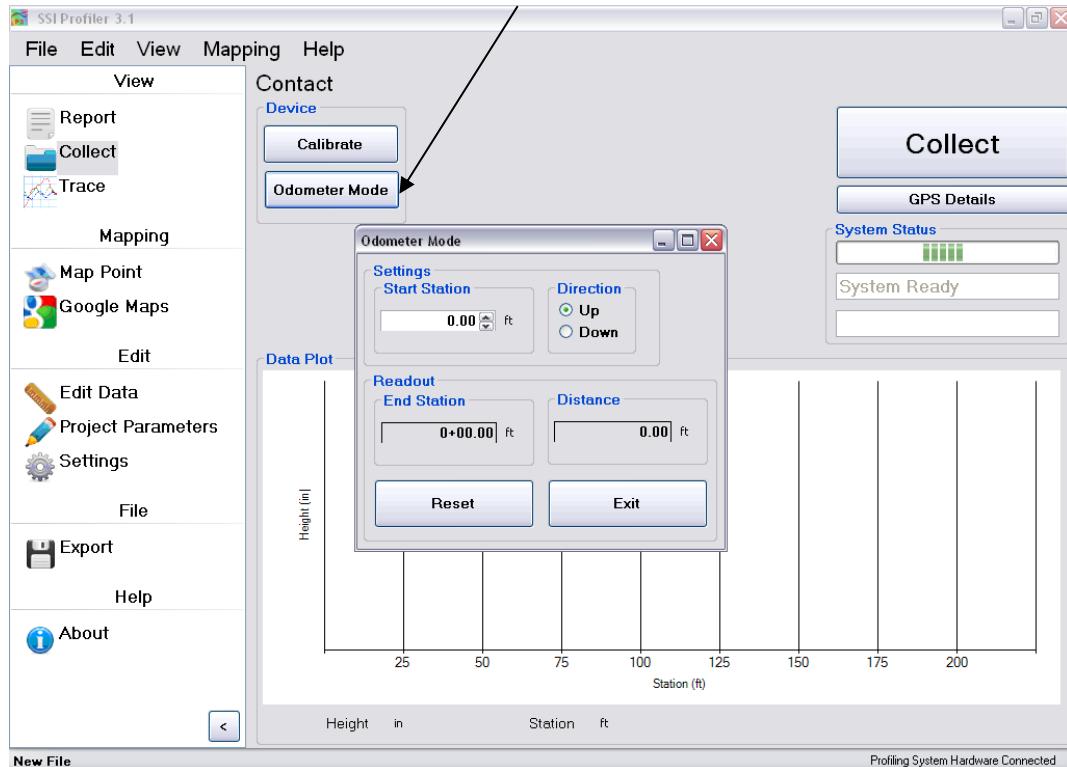


Figure 21: The odometer mode

### **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.

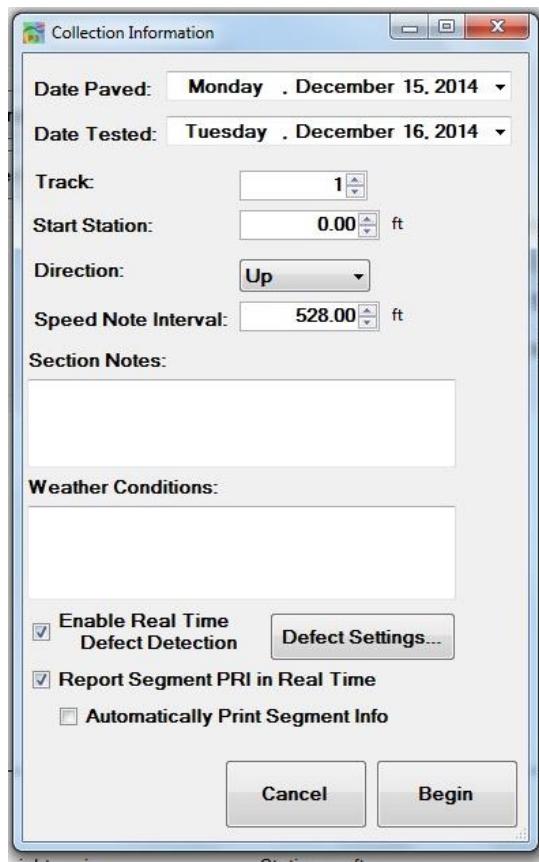


Figure 22: The Defect Detection Parameters after selecting “Defect Settings” in figure 22

Figure 23: The Collection Information window



Figure 24: 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 25: 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.

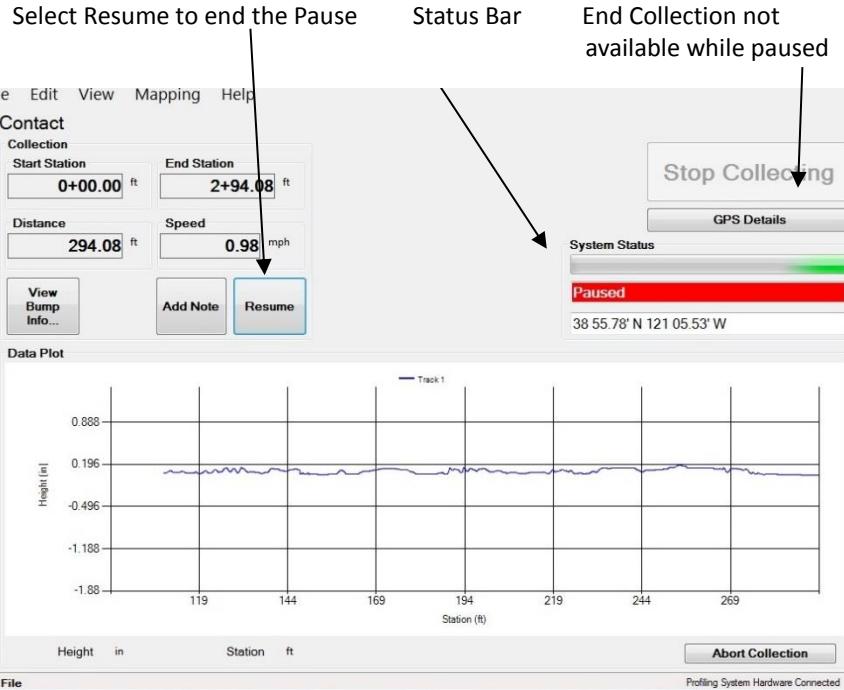


Figure 26: A paused collection

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."

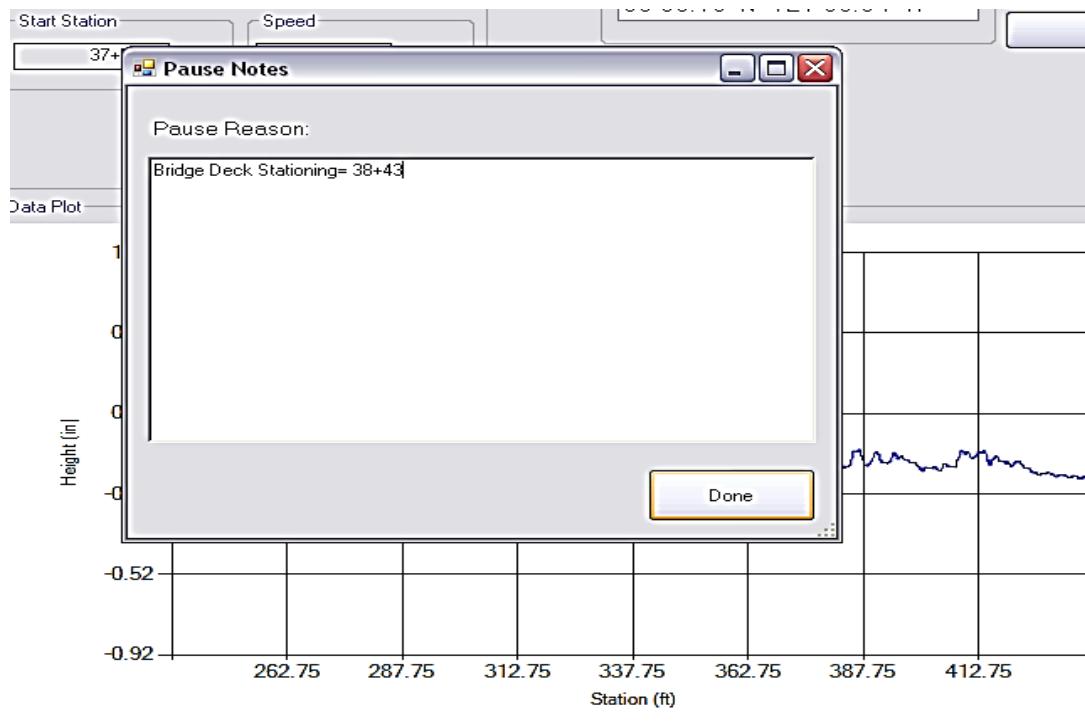


Figure 27: The pause note

### 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.

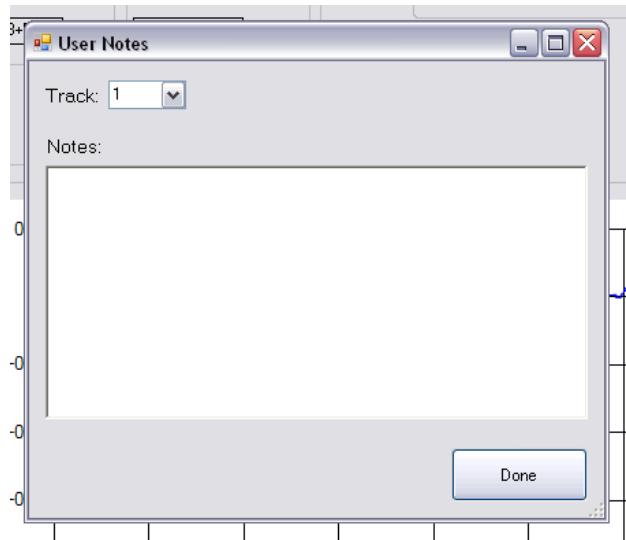


Figure 28: The add notes window

### Start Station

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

### 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.

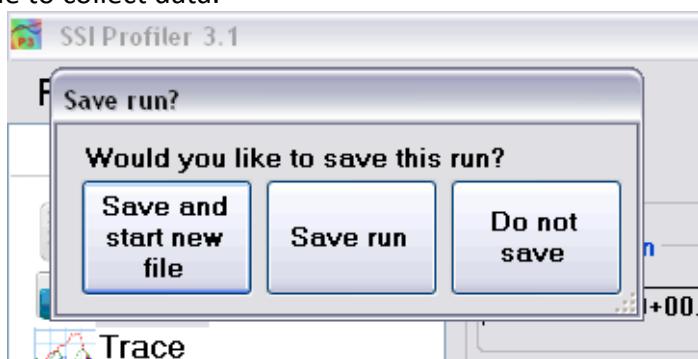


Figure 29: Saving Options After a Collection

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

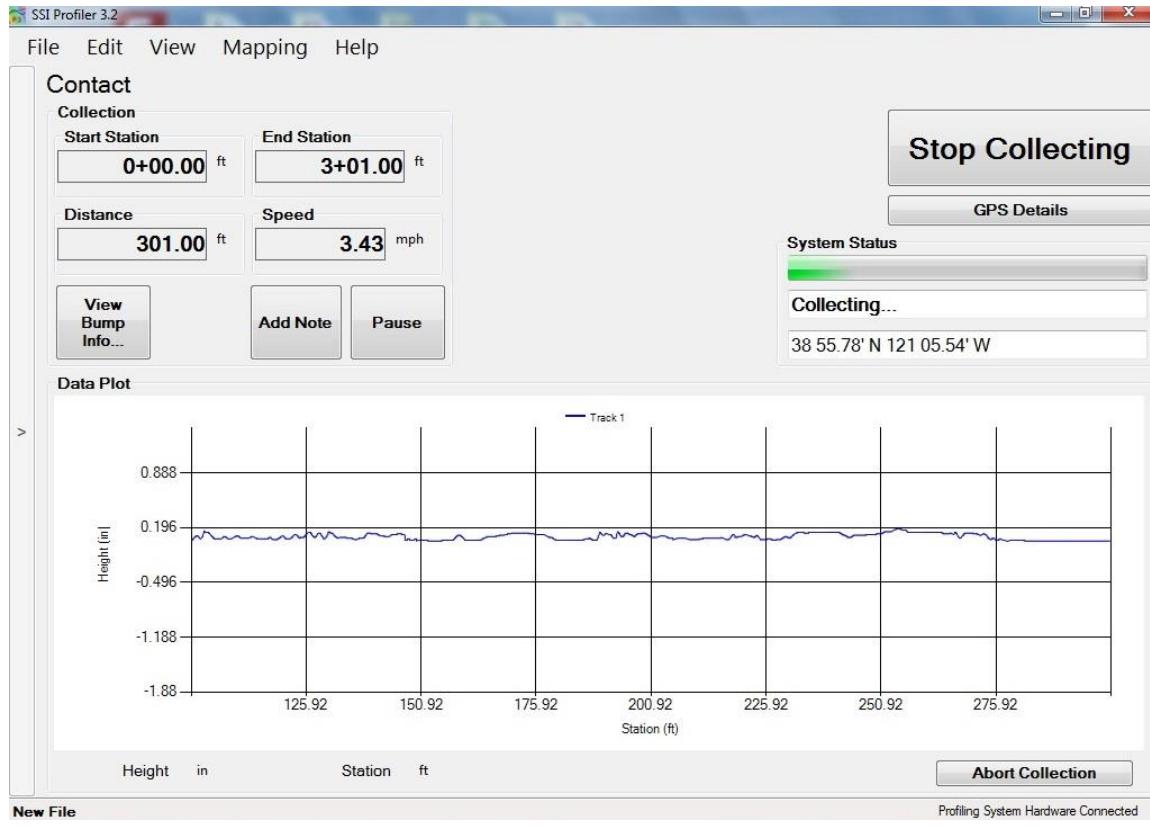


Figure 30: The start and end stations, distance traveled and the speed are displayed in the

### 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.

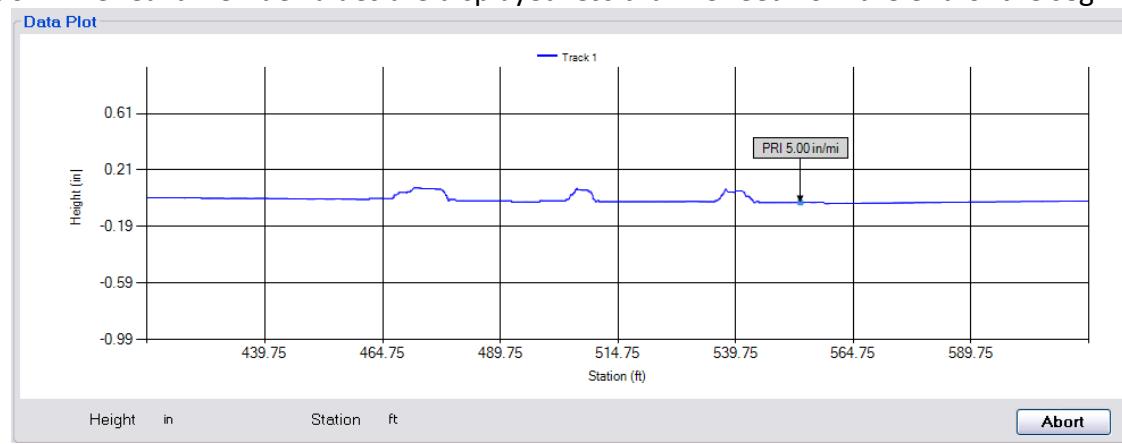


Figure 31: The Ride Values of PRI after segment length

## 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.

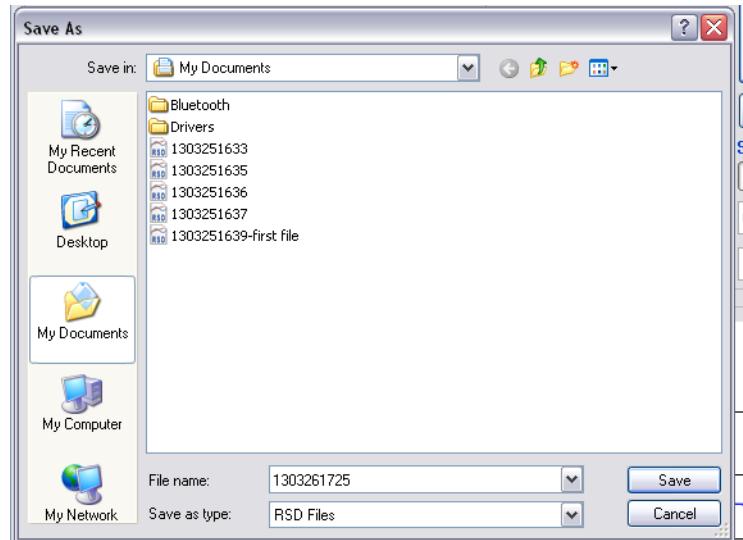


Figure 32: The "Save as" Window for saving files

## Post-Collection

### Reporting

#### File Tab

##### 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\*."

##### 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 in Profiler V3. If your file is in another format, use the appropriate translators found on the support website (<http://www.smoothroad.com/support/download.asp>) or contact S.S.I. Customer Support. The only two file formats used in the Profiler V3 program are RHD and RSD. Profiler V3 only collects data in the **RSD** format.

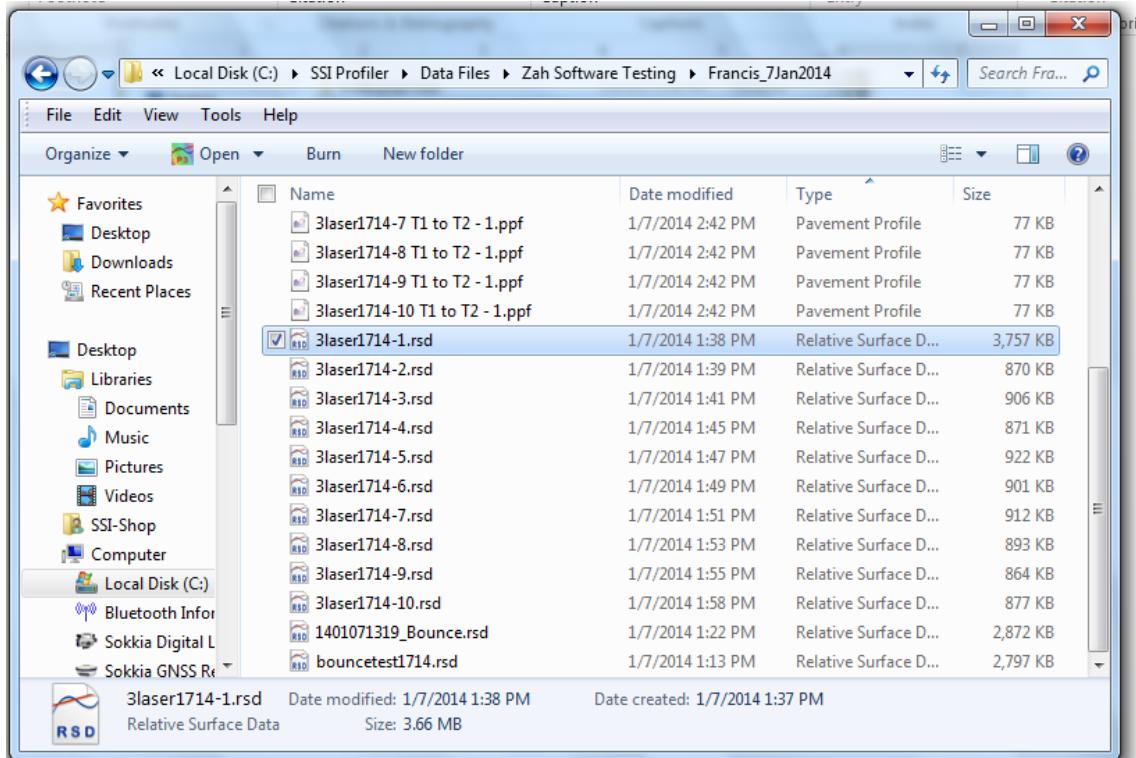


Figure 33: Opening a data file in the Profiler V3 program

## 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.”

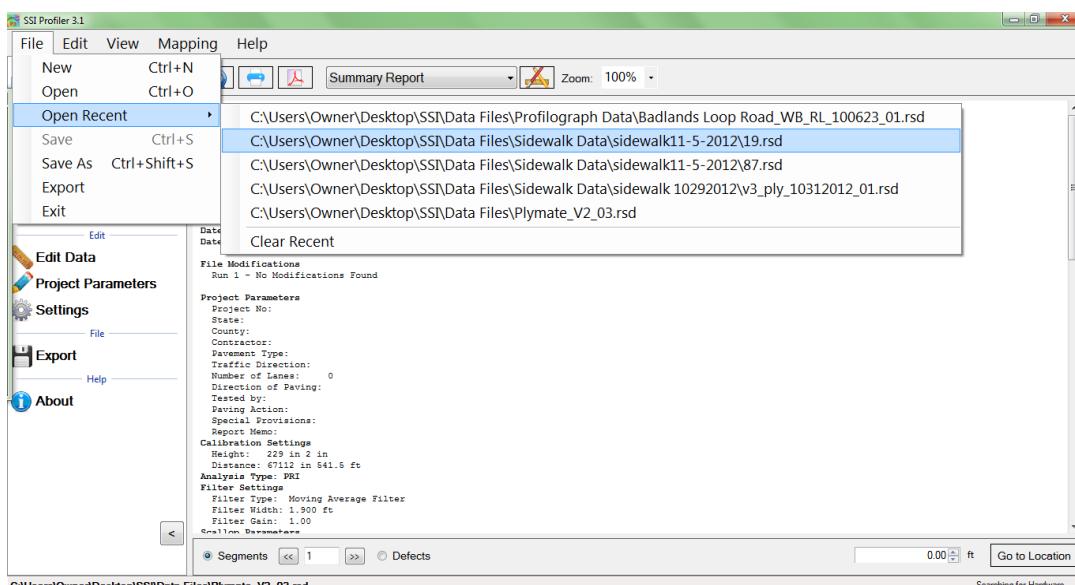


Figure 34: The Open Recent feature

## **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.

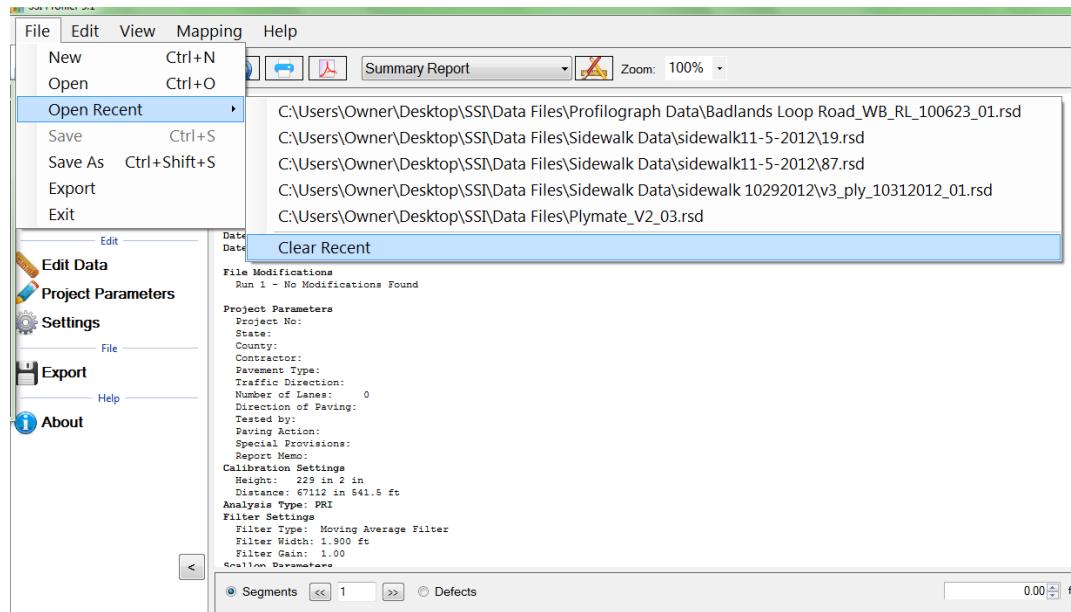


Figure 35: The clear recent feature

## **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.

## **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 (<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.**

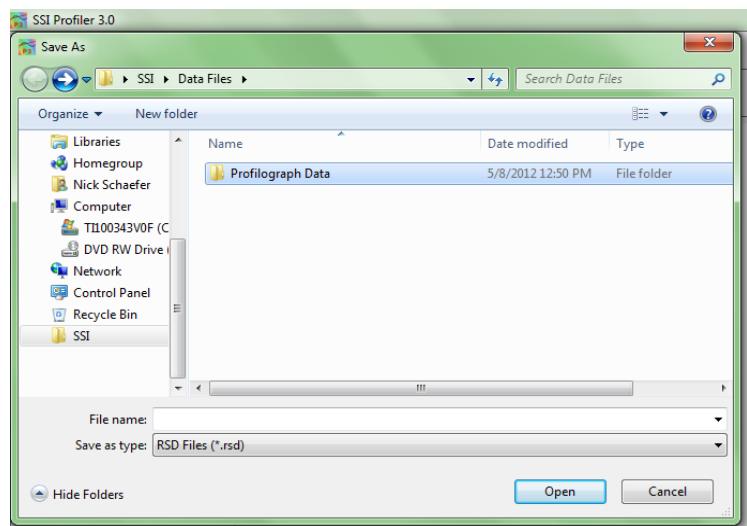


Figure 36: Saving a file through Save As in RSD format

## Exporting

Exporting allows the operator to create files in **ERD, PPF, PRO, Survey, GPS Matching, 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.

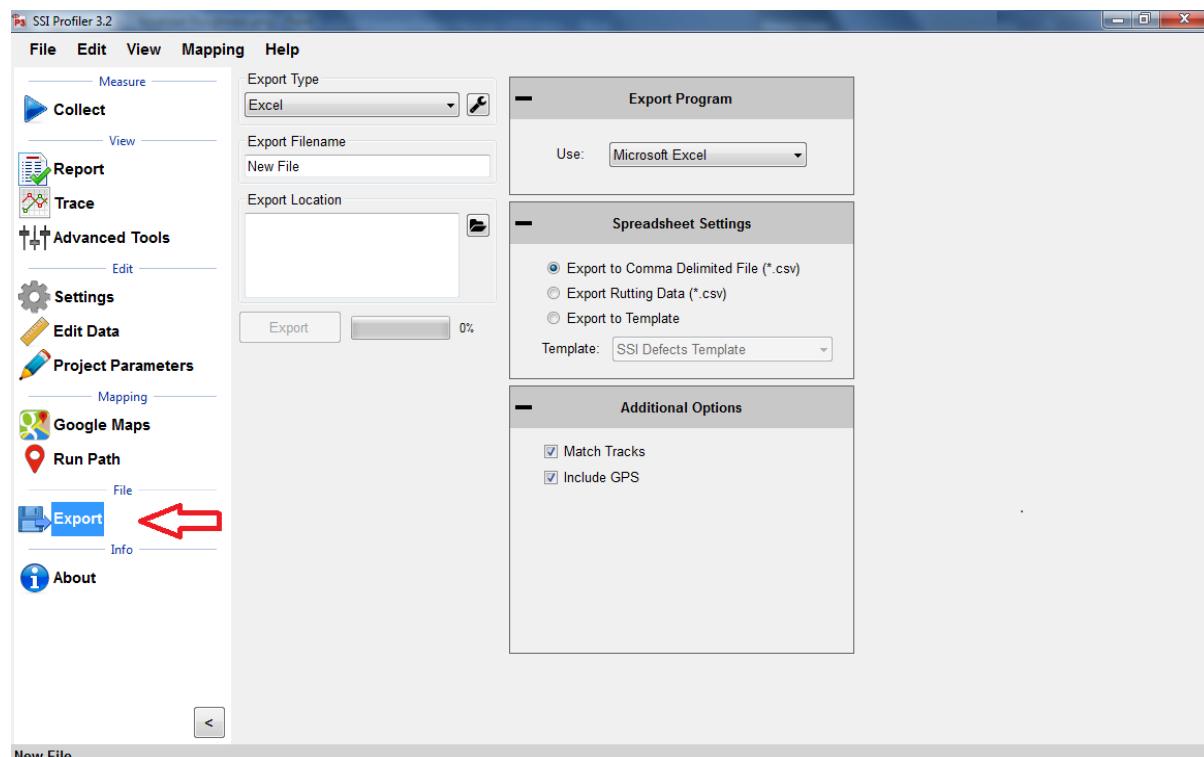


Figure 37: Window for exporting the data into Excel format

### Export Location

To select 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.

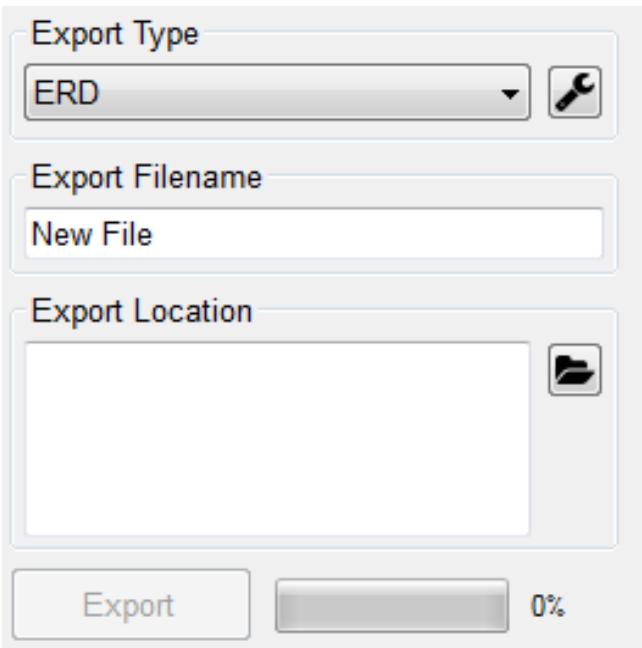


Figure 38: Select location to save the exported file

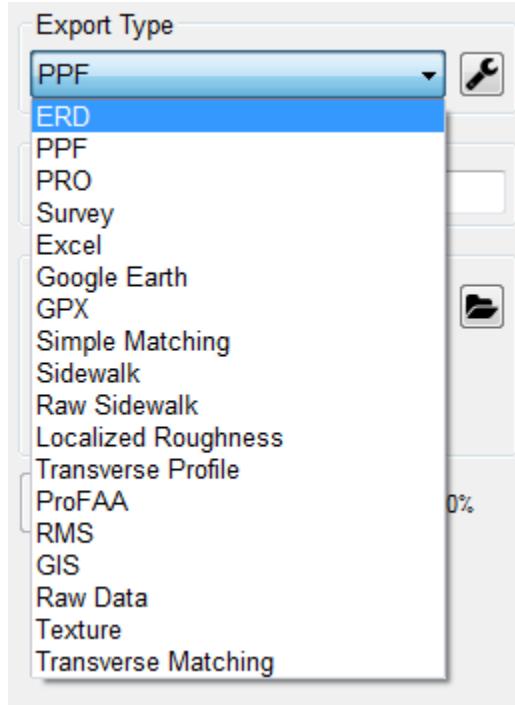


Figure 39: The export type drop down menu

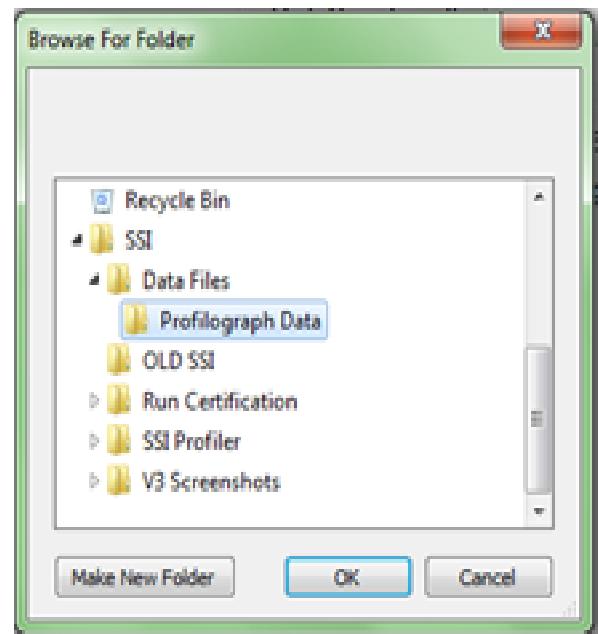


Figure 40: The export folder location selection

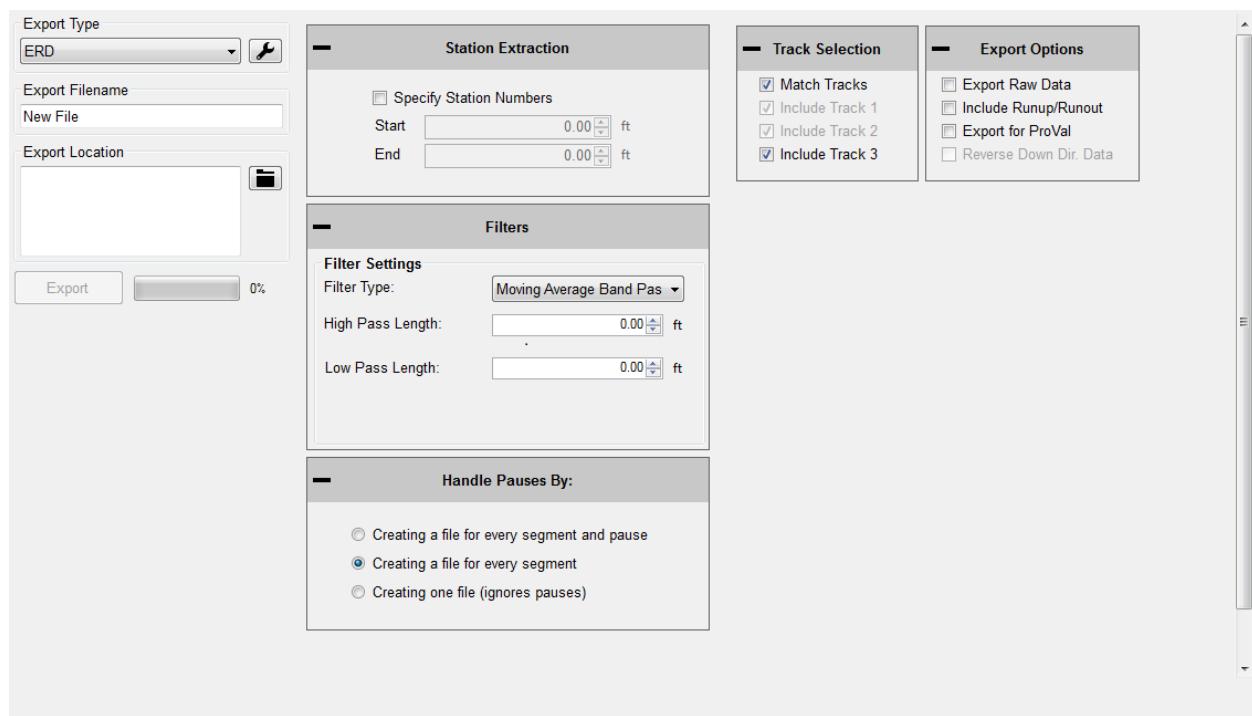


Figure 41: The ERD format export window with match tracks selected

## Exporting to ERD Format

### Station Extraction

The operator has the option 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. 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.

#### ***Moving Average High Pass Filter***

A high pass filter will remove any trend that is shorter than the selected length. Typical range of length for this filter is one hundred feet (100 ft.) through two hundred feet (200 ft.).

#### ***Moving Average Band Pass Filter***

This filter only allows the desired frequency of data to be shown. Adding this filter will adapt the profile trace to remove the high frequency motions. Moving average filters are typically used for short data runs less than two hundred feet (200 ft.).

#### ***Butterworth High Pass Filter***

High pass filters allow the high frequency characteristics of the data plot to pass through while blocking the lower frequency attributes of the data run. Butterworth filters do not introduce a phase shift into the plot like moving average filters. Butterworth filters are traditionally used for longer data runs over two hundred feet.

#### ***Butterworth Band Pass Filter***

This filter will perform both a high pass and low pass Butterworth filter operation on the data. The result is a run that has frequencies within the lower and upper bounds. Butterworth filters do not introduce a phase shift into the plot like moving average filters. Butterworth filters are traditionally used for longer data runs over two hundred feet.

### 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 in the data file, 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. Use run up and run out to stabilize the electronics before the starting location is reached.

### 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. 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 tracks that are exported 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 Profiler V3 software. To omit pauses from the exported file, select the check box, “Ignore Pauses.”

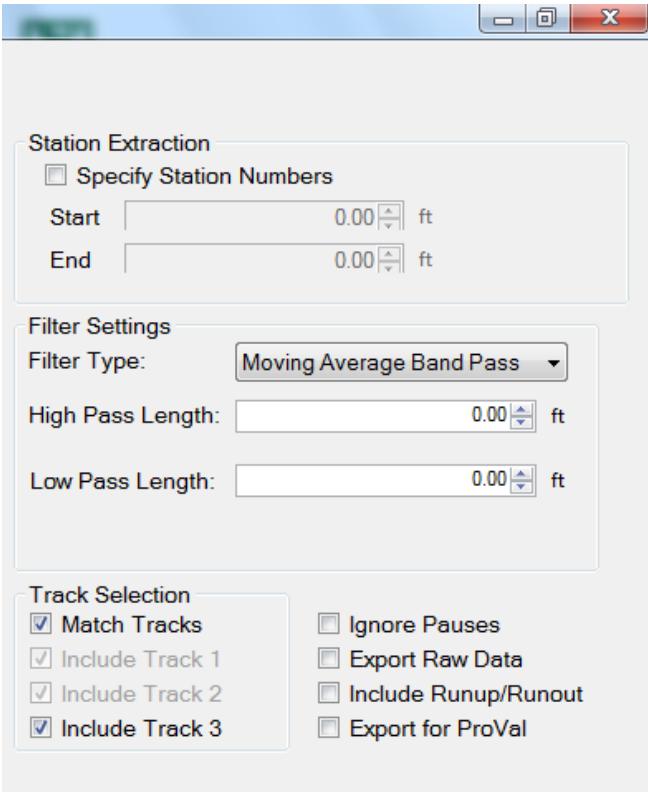
#### Include Run Up/ Run out

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 changes the file’s default filters and settings to more accurately match the values in ProVal.

Figure 42: The ERD export window settings



## 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.

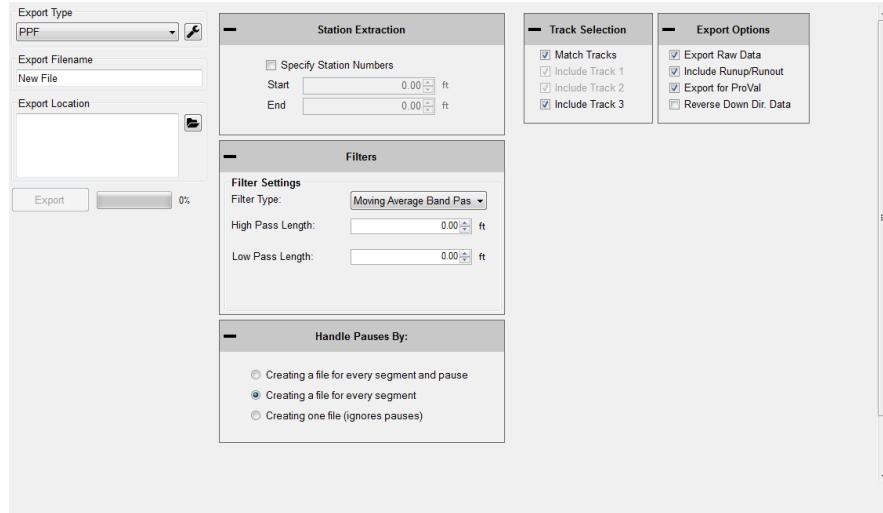


Figure 43: The PPF export window

### 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.

### 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 a 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.**

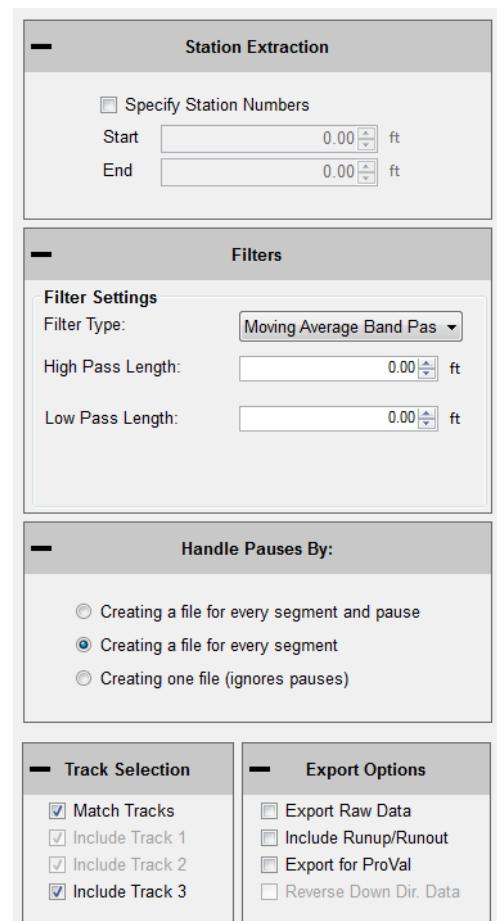


Figure 44: : Optional settings when exporting in PPF format

Figure 45: The PRO format window

## Exporting to PRO Format

### 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.

Details			
District Number	01	Reference Marker	0000
County Number	001	Reference Offset	00.000
Highway Descriptor: HH000H			
Lane Descriptor: L0			
Certification Number:			
Certification Date: Sunday, March 18, 2018			
Comment	Comment		
Certification Level:			
Serial Number:			
Operator Name:			
Profiler Model	SSI_CS9100		

Figure 46: The Details tab contains information about the project

## 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.

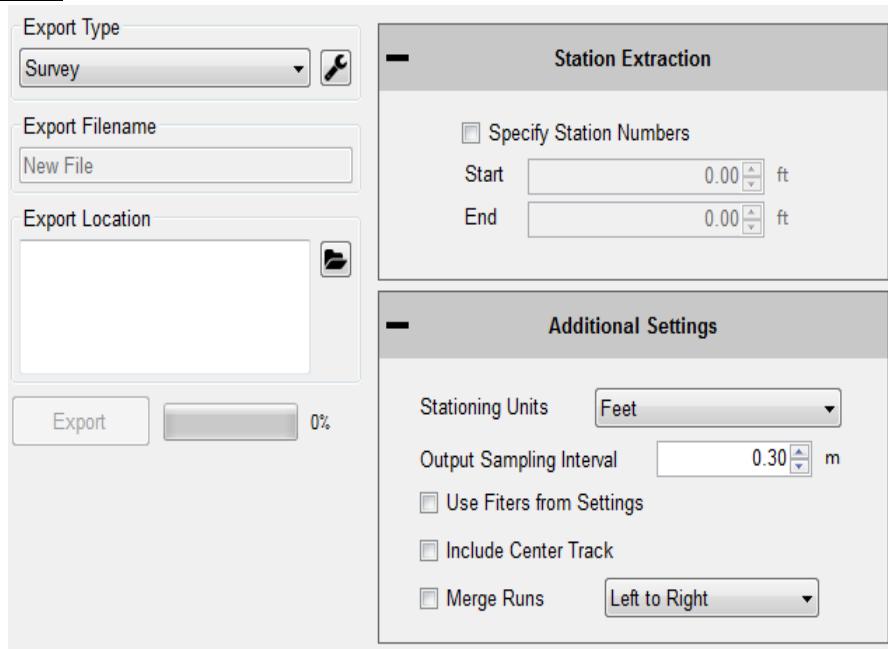


Figure 47: The window for exporting in Survey format

### 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.

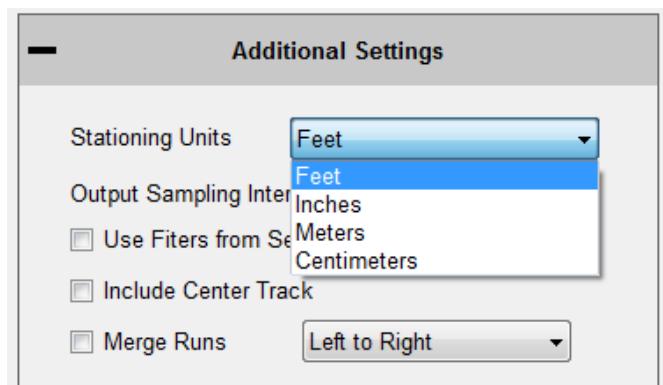
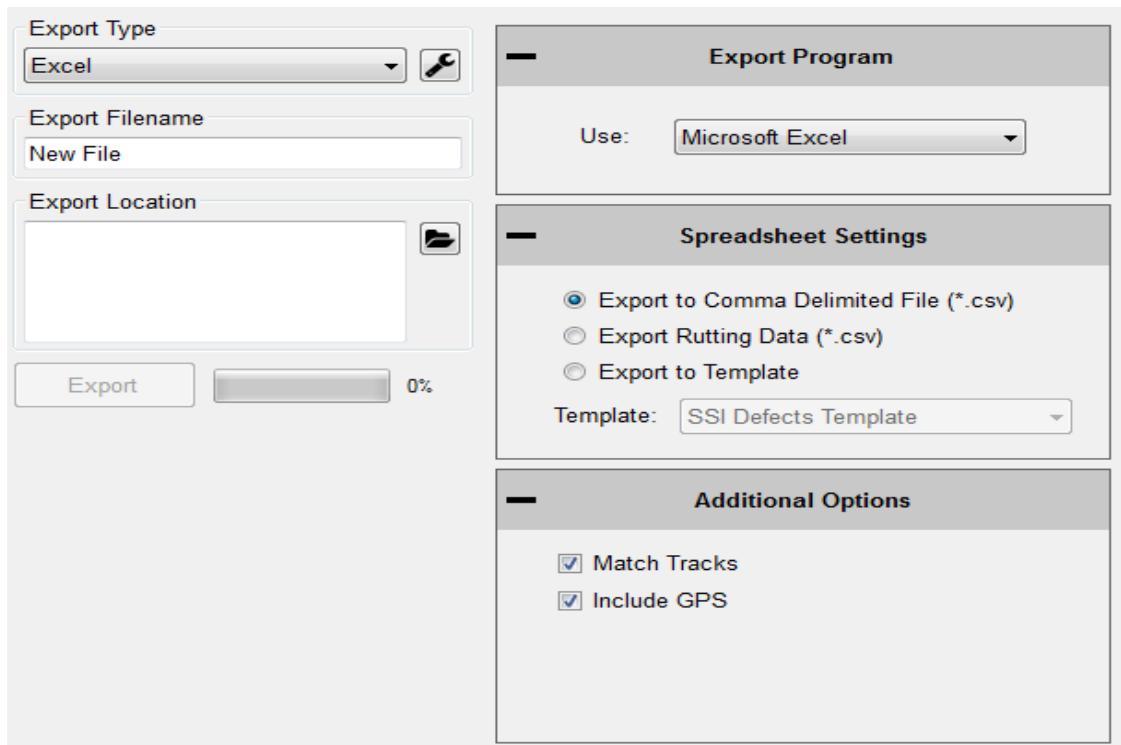


Figure 48: Stationing units dropdown menu and options

## Exporting to Excel Format

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



### Export to Template

Figure 49: Exporting the data into Microsoft Excel format

To choose a SSI Excel Template, select "Export to Template."

### 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.

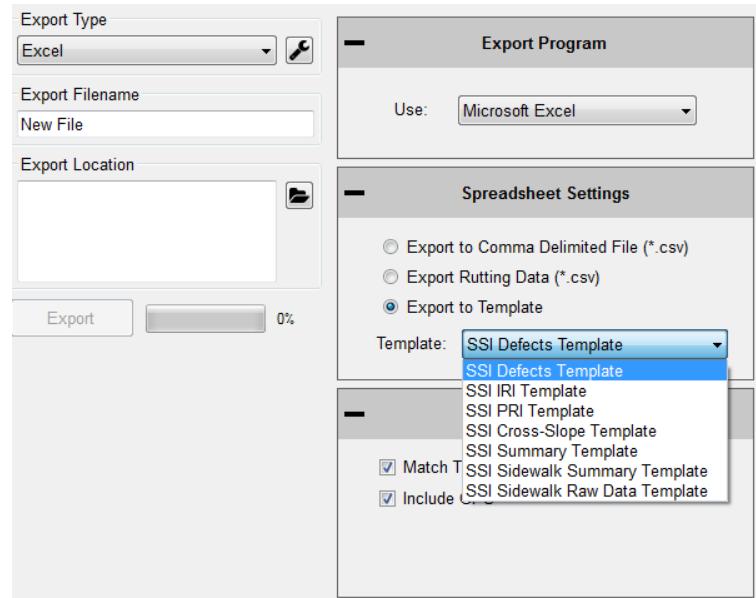


Figure 50: The types of excel formats are listed

### Summary Unmatched

The Summary Template shows a version of the summary report the calculated PRI for each track along with the bump heights, locations and settings in spreadsheet form.

*Note: Sidewalk templates are reserved for Sidewalk Profiler. For more info visit [www.smoothroad.com](http://www.smoothroad.com)*

### Exporting to Google Earth

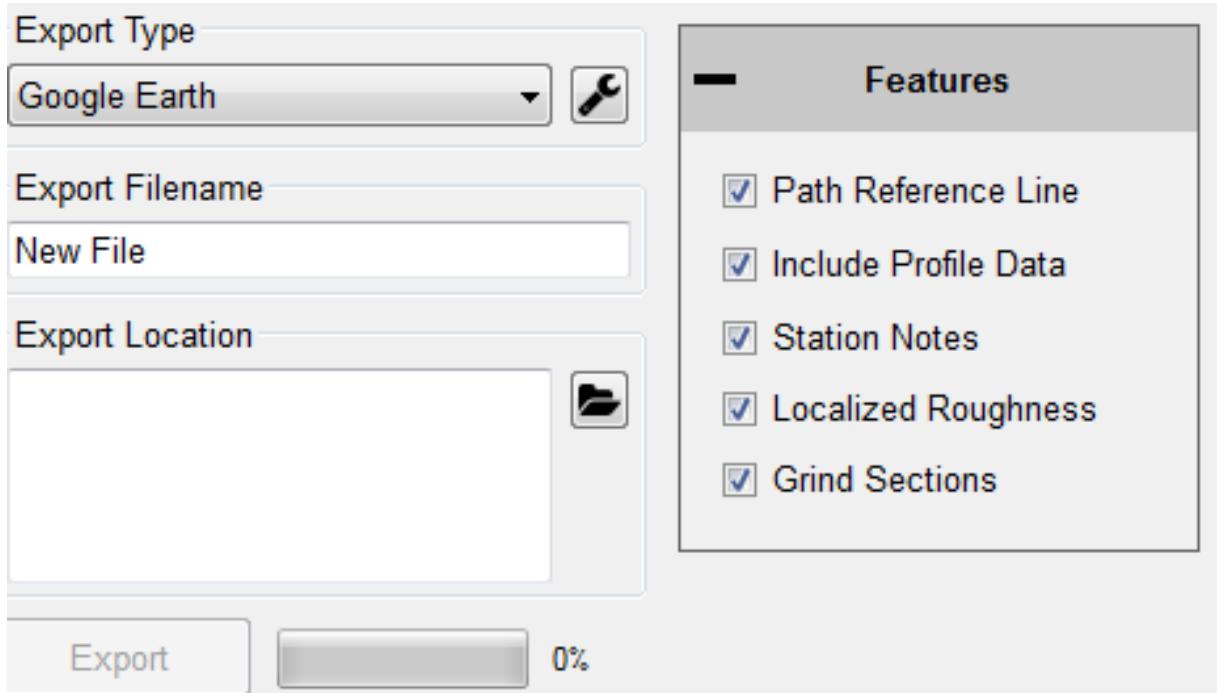


Figure 51: Google Earth export settings

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.

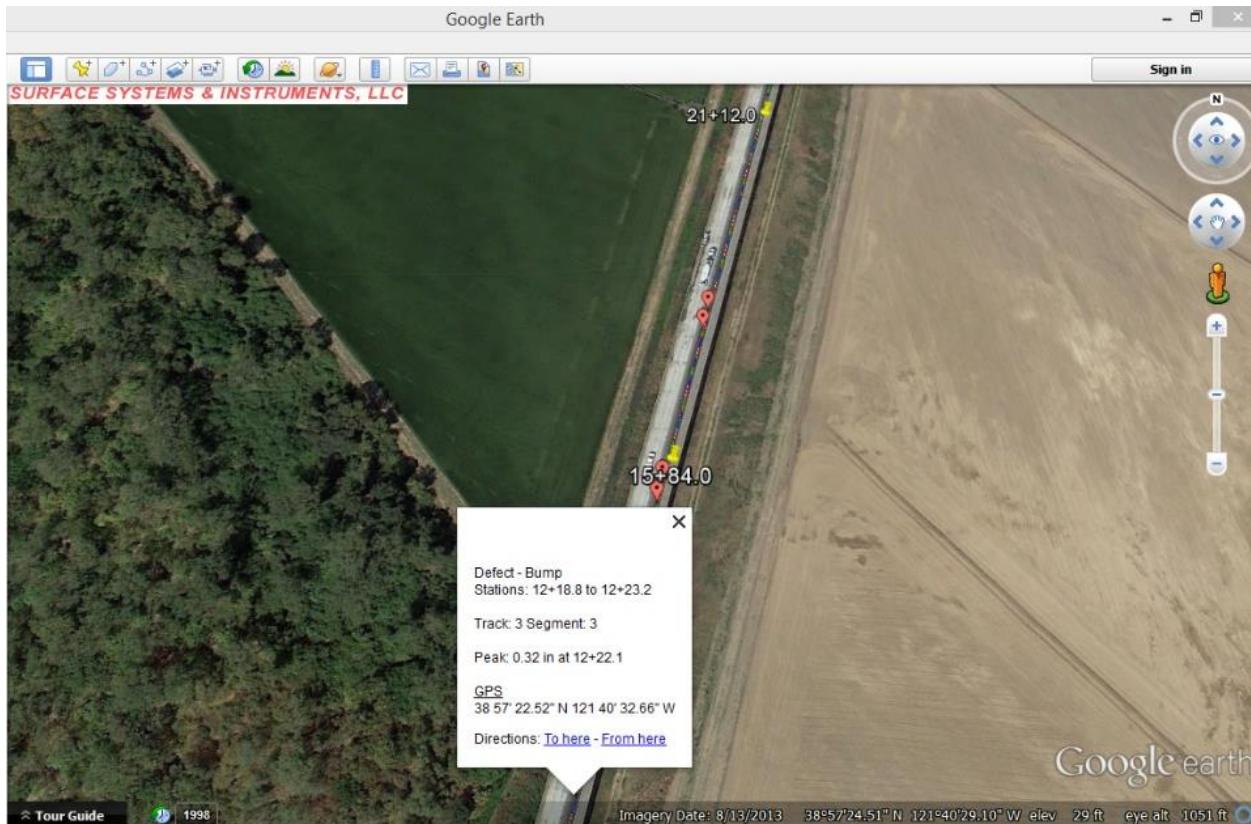


Figure 52: Google Earth view on laptop

### 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.

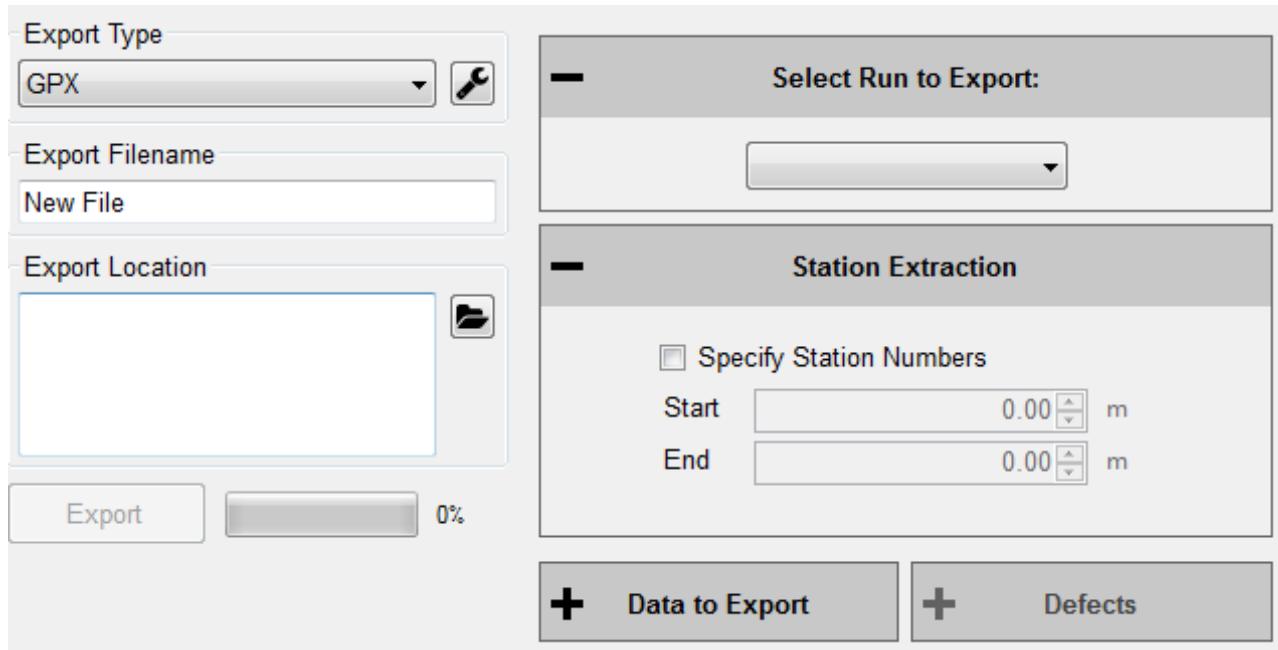


Figure 53: The export window for GPX format

## **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. The file types and the corresponding information (See Glossary for explanation) are:

**Ngd:** Contains synchronized distance, time, and gyroscopic data for a specified collection interval.

**Pxyzd:** The three dimensional profile derived from the travel grade and gyroscope.

**Pxyzdg and Pxyzdinc:** Same as pxyzd, except without column headers for the data.

**Rmpslp:** Rmpslp is the ramp and running slope exceptions. The column headers are travel distance, marker distance, time, ramp type, and casename.

**Rmpslpg:** Rmpslpg contains the same data as the file rmpslp, except rmpslpg does not have column headers. This format contains travel distance, marker distance, time, ramp type, and casename.

**Rmpslpg\_ls:** Rmpslpg\_ls is a line segment version of rmpslpg without column headers.

**Uba:** This file contains the bump height and bevel slope data. The column headers are; travel distance, bump type, bump height [inches], bevel slope, and the casename.

**Ubag:** Ubag contains the same data as uba, but ubag does not have column headers for the data. This format contains travel distance, bump type, bump height [inches], bevel slope, and the casename.

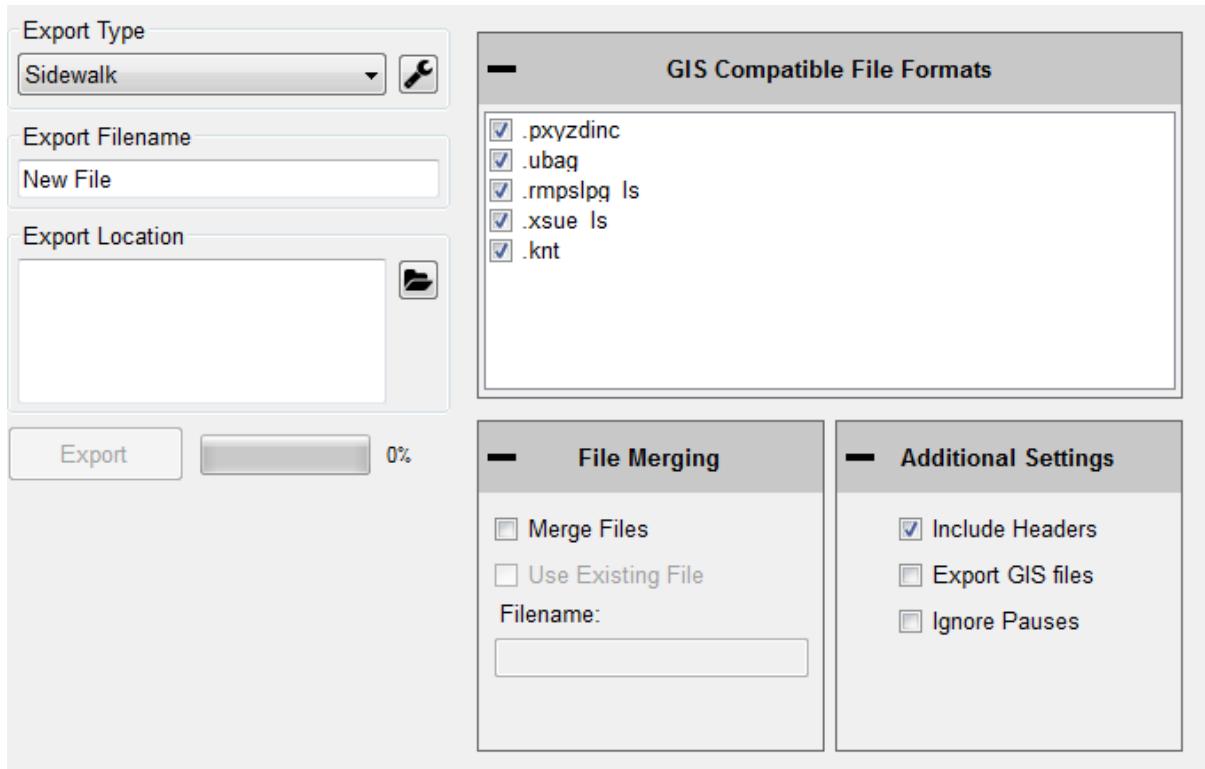


Figure 54: Export to Sidewalk window

## 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.

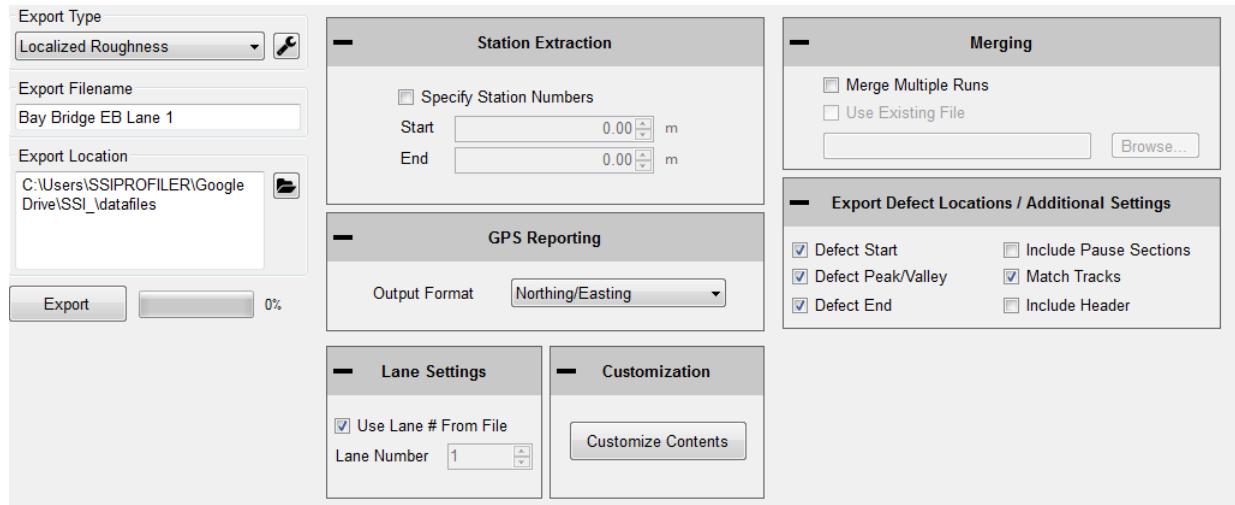


Figure 55: The Localized Roughness export options window

### 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.

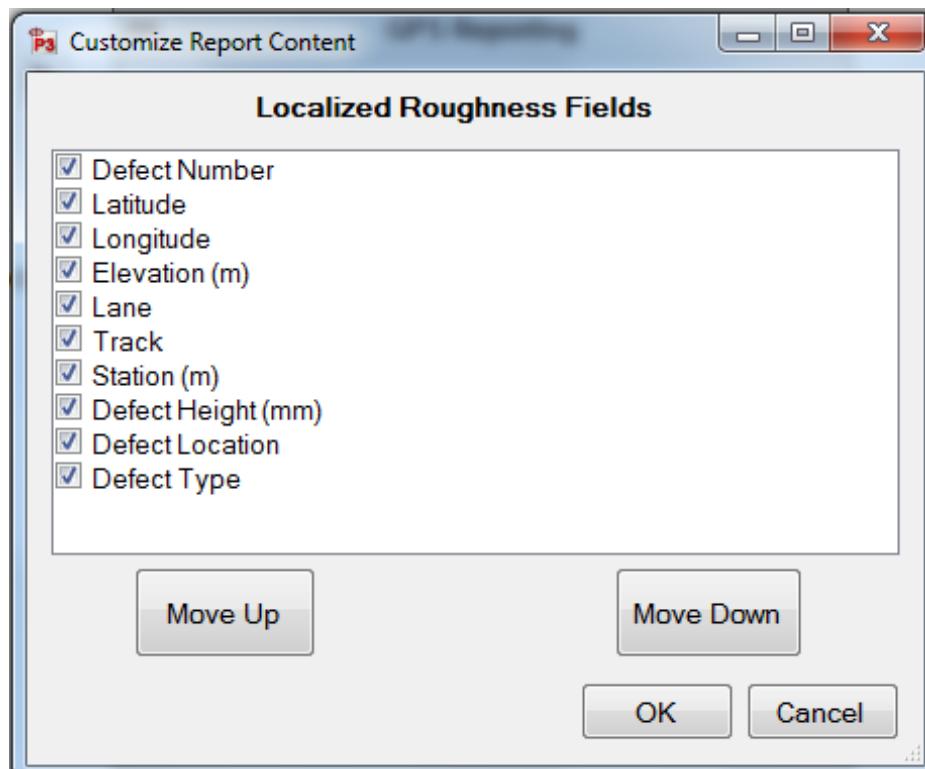


Figure 56: The Customize Window

### 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.

### 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.

## 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.

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.

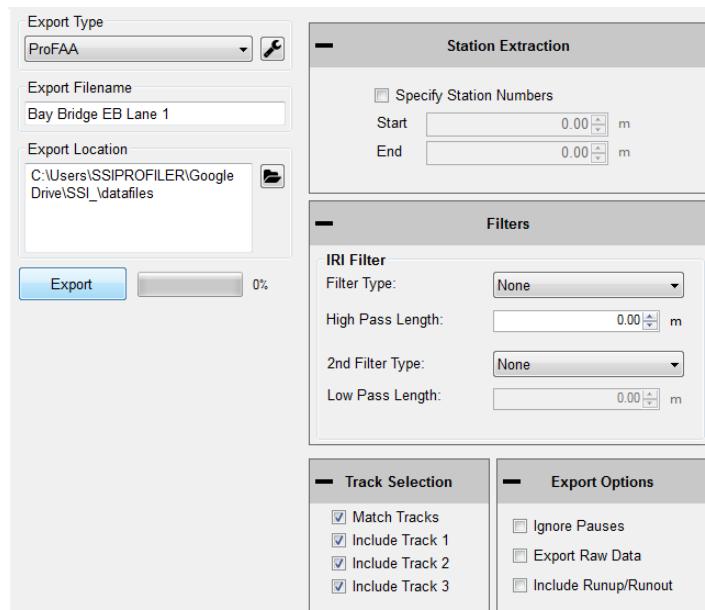


Figure 57: ProFAA window

## 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.

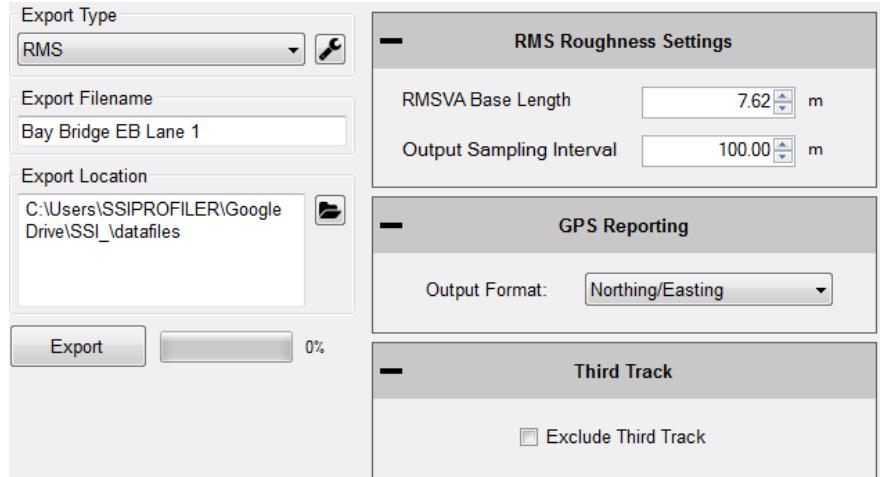


Figure 58: RMS export settings

## 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.

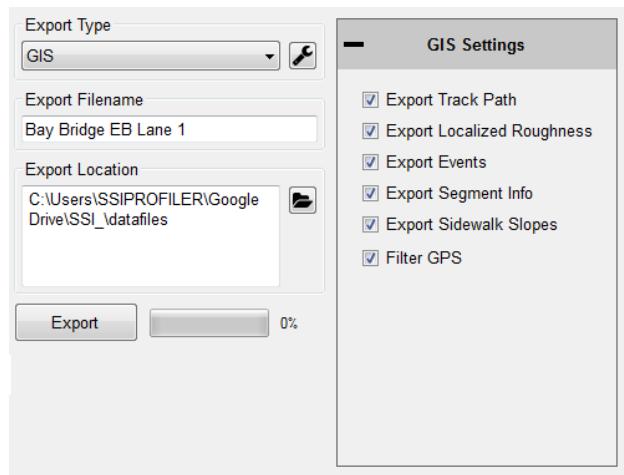


Figure 59: GIS export settings

## 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.

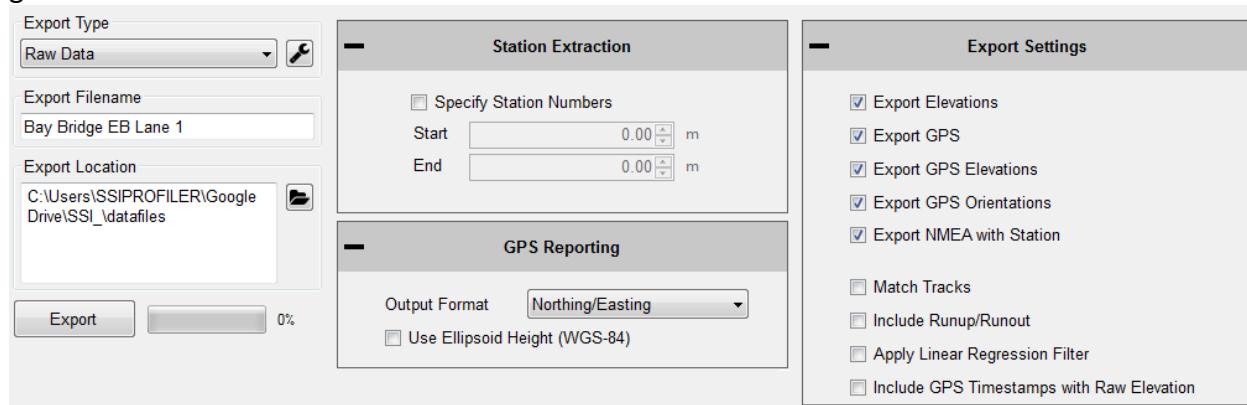


Figure 60: Exporting Raw Data Settings

## 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 the program, select cancel and the program will remain open.

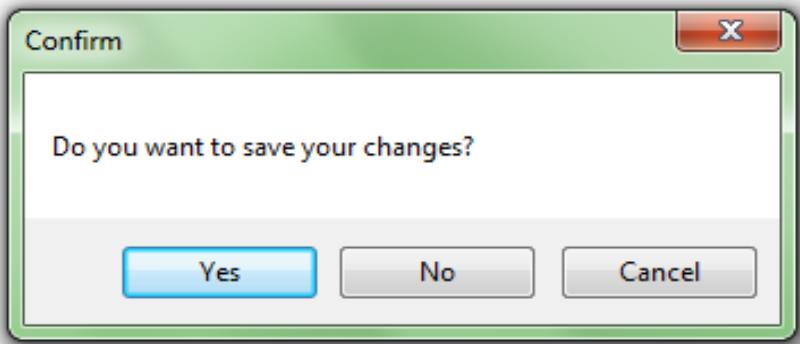
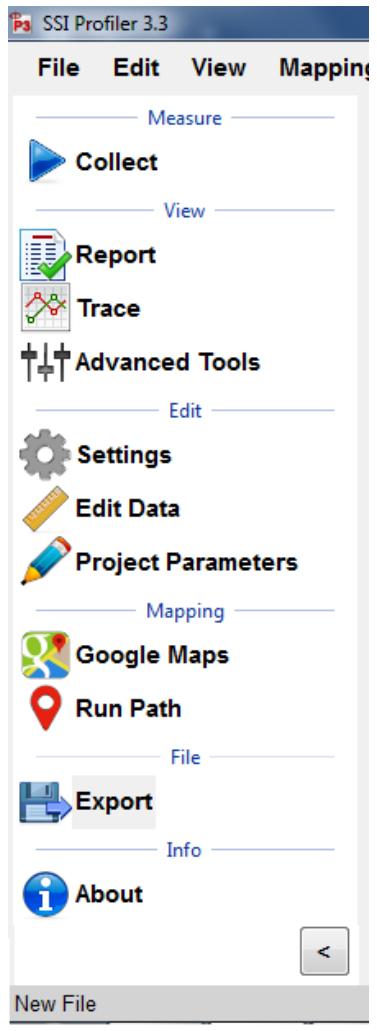


Figure 61: Exiting the program- Saving



## 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 62: The shortcut bar with all of the frequently used windows

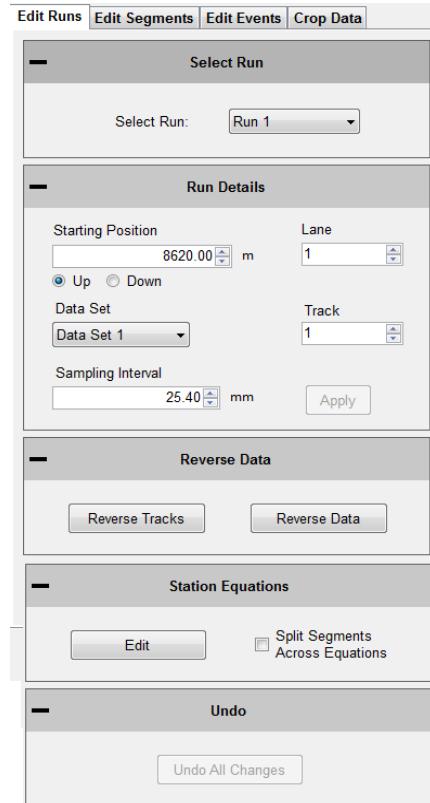


Figure 63: The Edit Run Options

## 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 Run Up or Run out data.
- 4) **Select apply.**

## Edit Run

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."

## 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.**

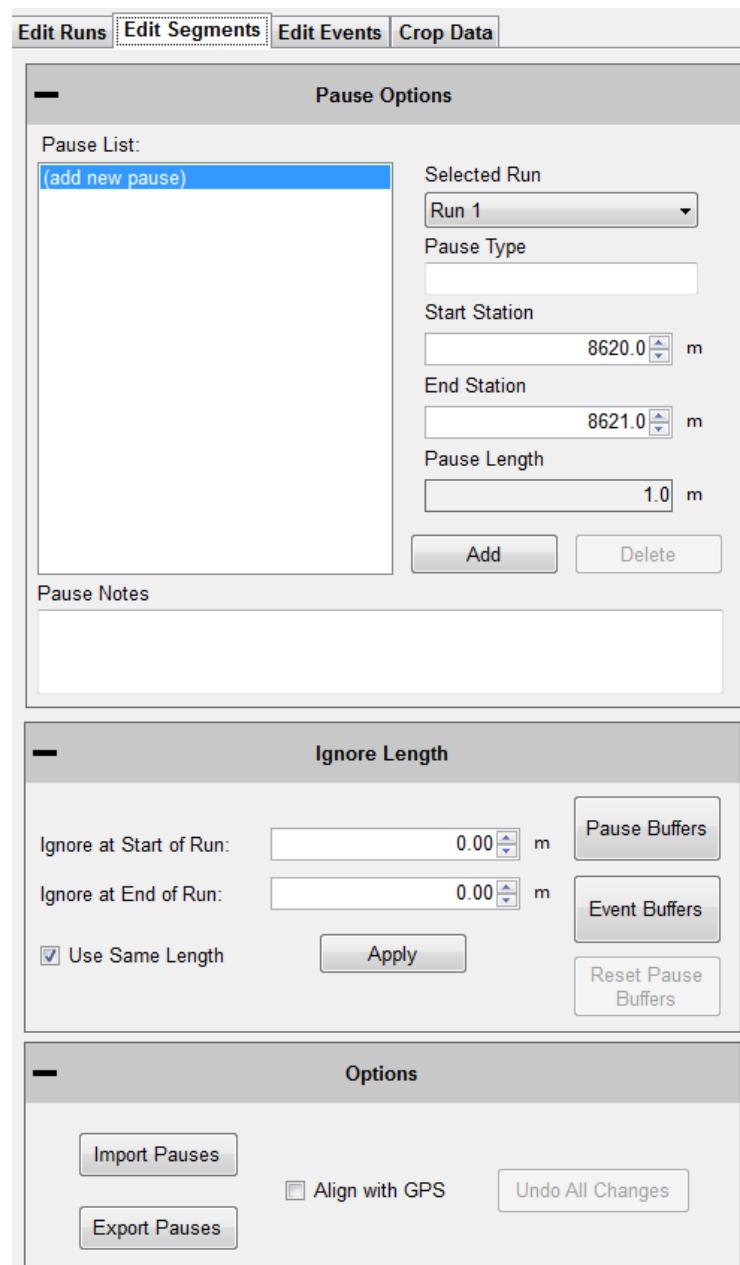


Figure 64: Adding or removing pauses from the collection

### 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 used 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 in 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.

### Event 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.

### 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.)
7. **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**

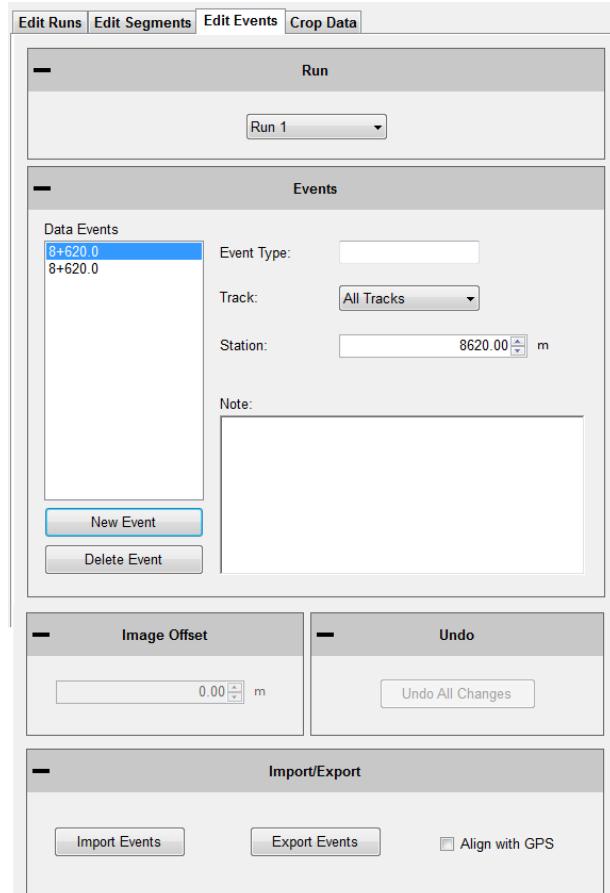


Figure 65: Edit Events Tab

### 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**.

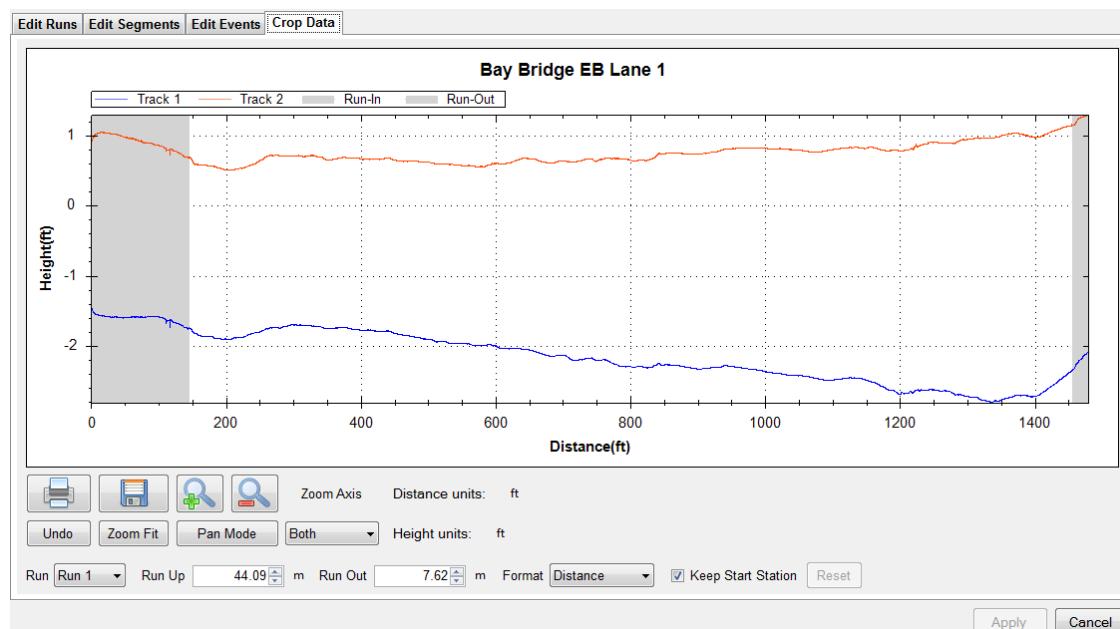


Figure 66: The Crop Data Tool

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.

It is recommended to use the dropdown menu and choose the “Station” option instead of the distance option for cropping data.

## **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.

### **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.

The screenshot shows the 'Job Information' tab selected in the top navigation bar. Below it are three other tabs: 'Report Memo', 'User Defined', and 'Run Notes'. The main area is divided into four sections:

- Project:** Contains fields for Project Number, County, State, and Contractor.
- Paving:** Contains fields for Pavement Type, Paving Direction, Paving Job (set to 'Corrected'), Paving Action, and Date Paved (set to 'Run 1' on 05/20/14 at 02:08 AM).
- Road:** Contains fields for Number of Lanes (set to 1), Traffic Direction (set to 'EB'), and Roadway.
- Additional:** Contains fields for Tester, Date Tested (set to 'Run 1' on 05/21/14 at 02:08 AM), Provisions, and Report Specification.

Figure 67: The Project Parameters window

## **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.

### **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.

<b>Job Information</b>	<b>Report Memo</b>	<b>User Defined</b>	<b>Run Notes</b>
<p>— Memo</p>			
<p> </p>			

Figure 68: The Report Memo window

## 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.

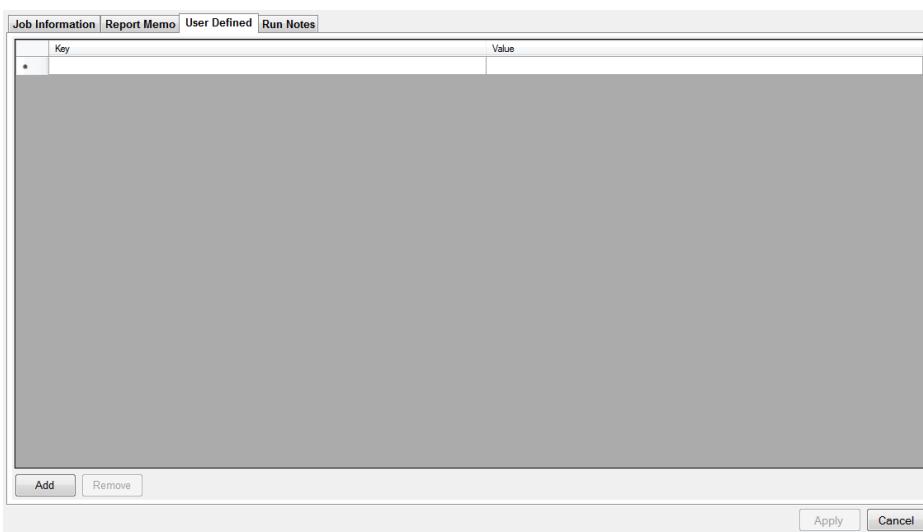


Figure 69: The User Defined section

## Settings

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

### 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.

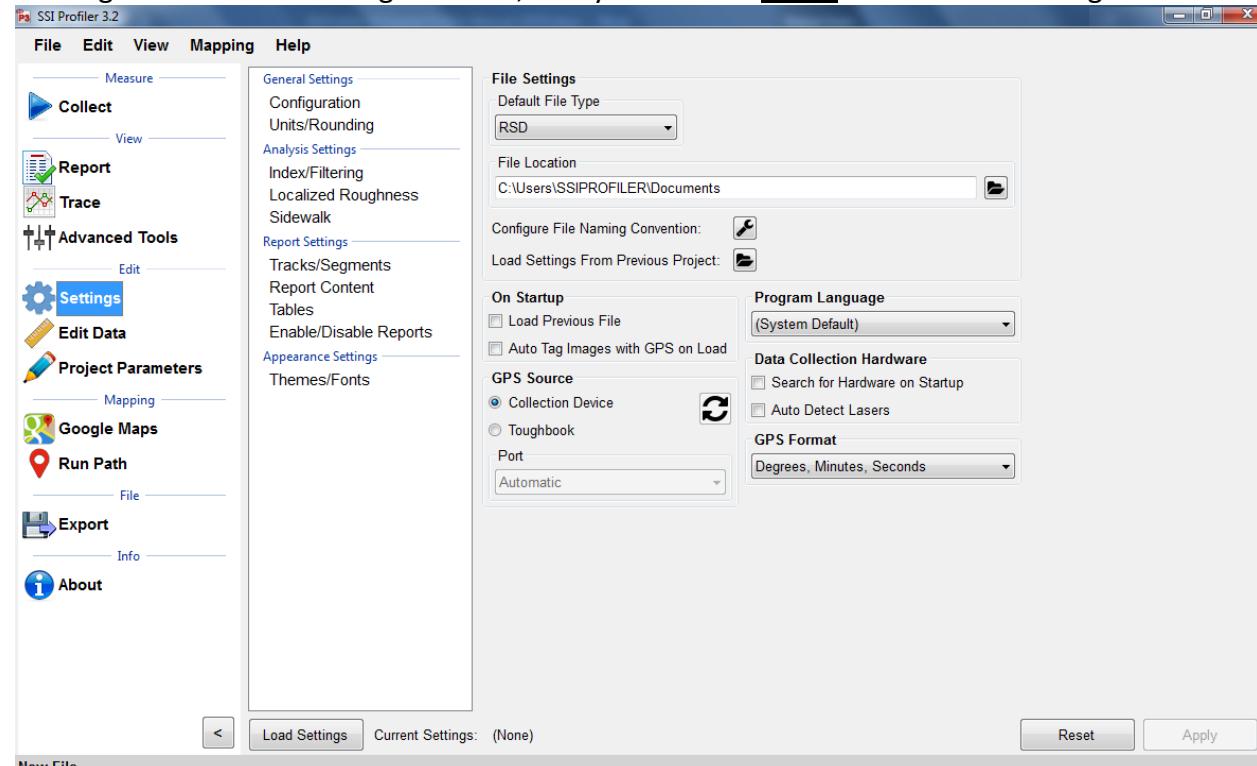


Figure 70: The General Settings window showing the Configuration

## File Settings

### 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 opening files since 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.**

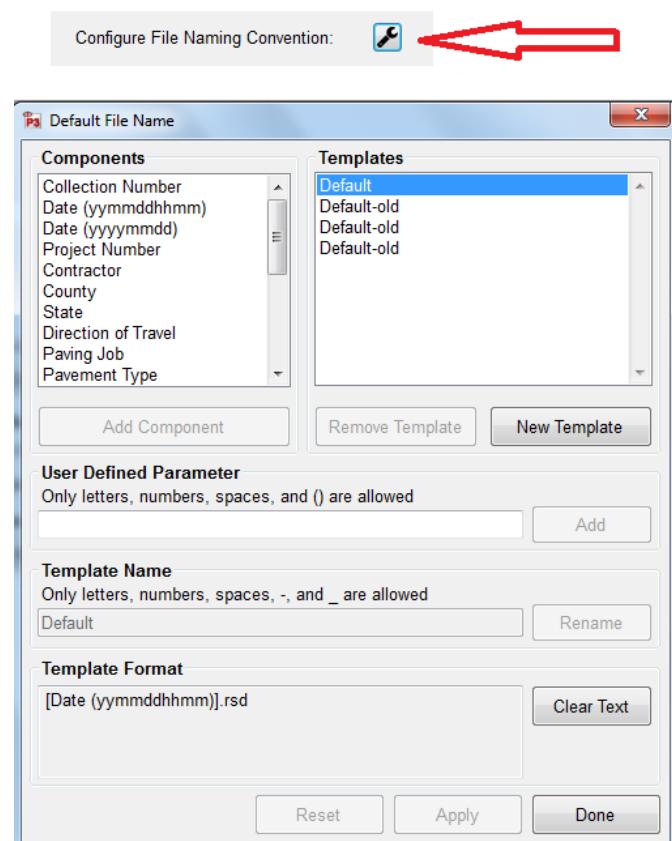


Figure 71: The custom file naming convention

## On Startup

### Load Previous File on Startup

If this box is selected in figure 85, 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 in figure 85, 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.

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

### Image Scaling

The default for the image scaling 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.

### 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.

## Program Language

Choose between English, Spanish (North/Central America) and, Spanish (South America)

## Analysis Parameters (Ride Values)

### Profiling Units

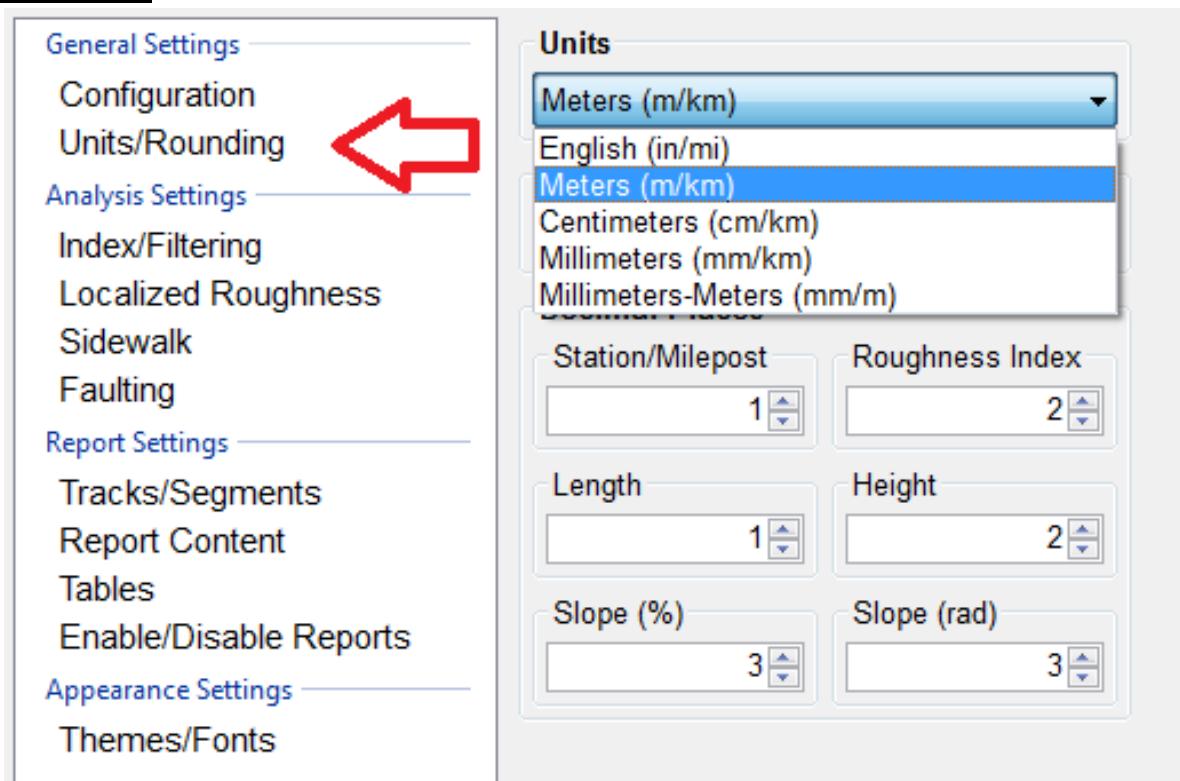


Figure 72: The units and rounding section of the General Settings

## English

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

## Metric Meters

In Metric Meters units, the blanking band, scallop height and scallop resolution are all in cms. 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 applyddd.

## Metric Centimeters

Selecting Metric Centimeters units, 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

Selecting Metric Millimeters units, 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 the California Bridge Profilograph spec, which is 12 ft long instead of the California Profilograph's 25 ft. The CA Bridge setting is in English units and has a segment length of 100 feet. After every adjustment of units, select apply.

## CA Bridge Metric

This setting is used for simulating the Bridge Profilograph's 12 foot frame. 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.

## 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 Less Than

If the last segment is shorter than the segment length, it can be merged into the segment before. This prevents large ride values from short distances. Only use if your spec doesn't require a specific segment length for pay incentives. The last segment length will be changed with this feature.

## Exclude Paused Sections

When 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.

## Analysis Type

### IRI

The International Roughness Index is a universal ride index for concrete and asphalt roads around the world. 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.

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

### 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. Once the settings are correct, select Apply and then view a report to observe the PRI ride values.

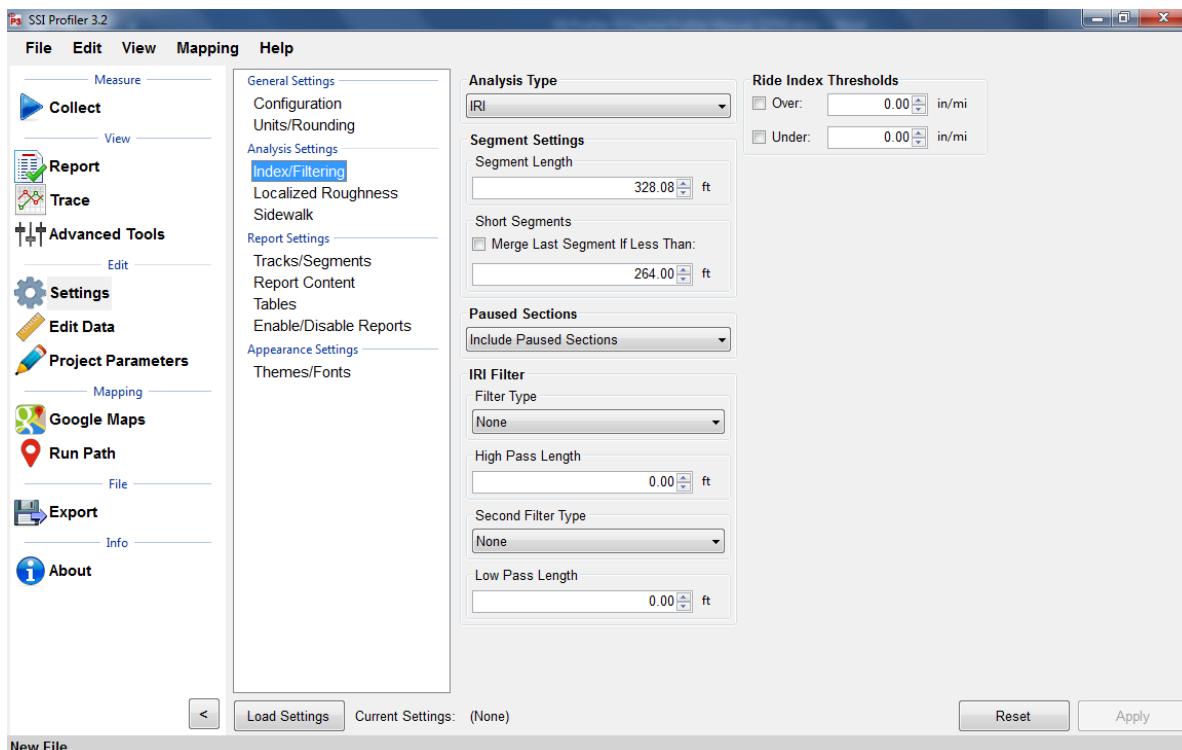


Figure 73: The IRI Analysis Parameters window

## 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*.

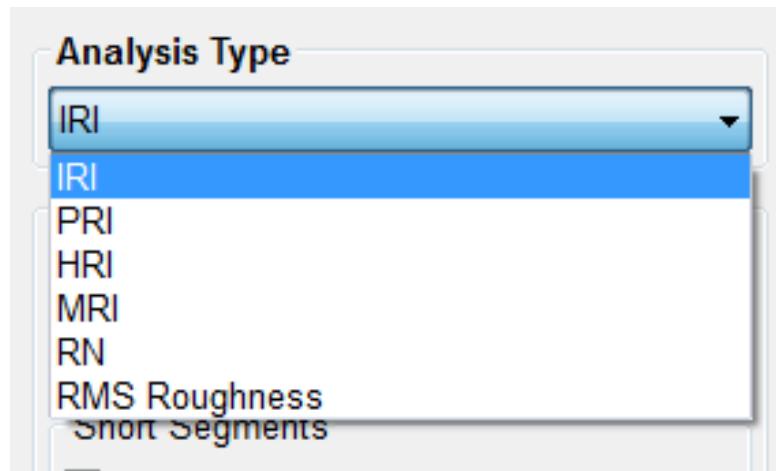


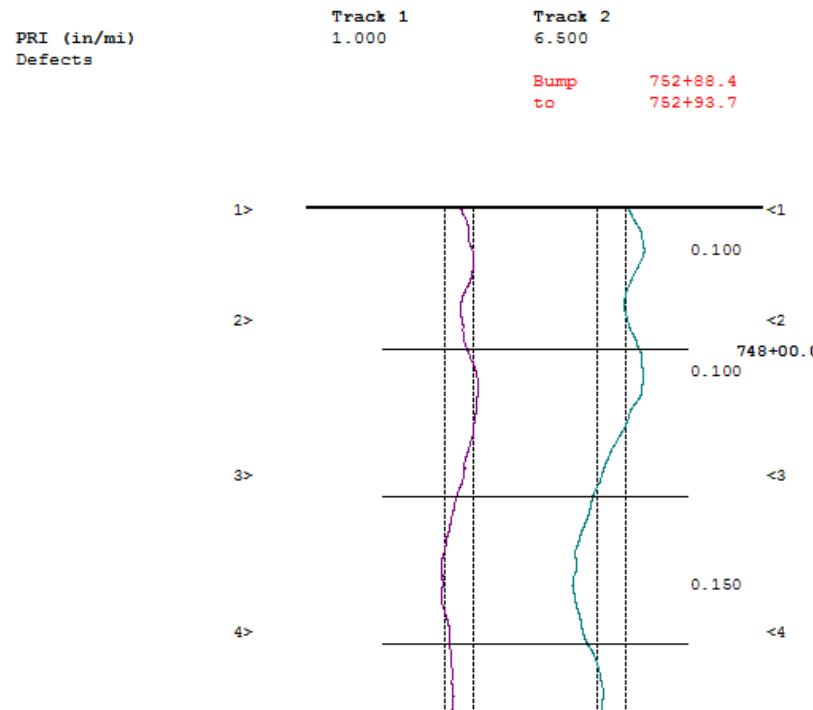
Figure 74: The Analysis type drop down menu

## Scallop Definition

Scallops are the deviations of the profile trace from the blanking band. 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 defects are not included in Ride Values, if the deviation still exceeds the defect height parameter, it adds to 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 deviation height from the blanking band or 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.

Figure 75: An example of the blanking band in the trace report

### 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. 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 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.

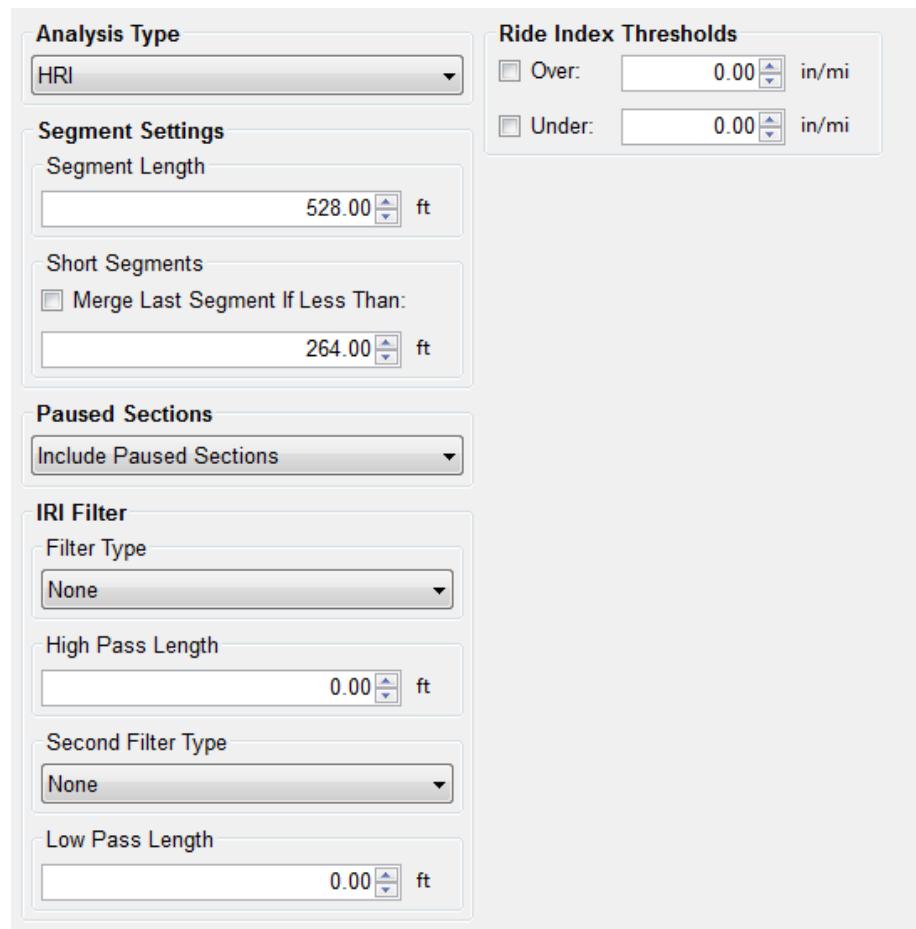


Figure 76: The HRI analysis window with the available filter

## 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.

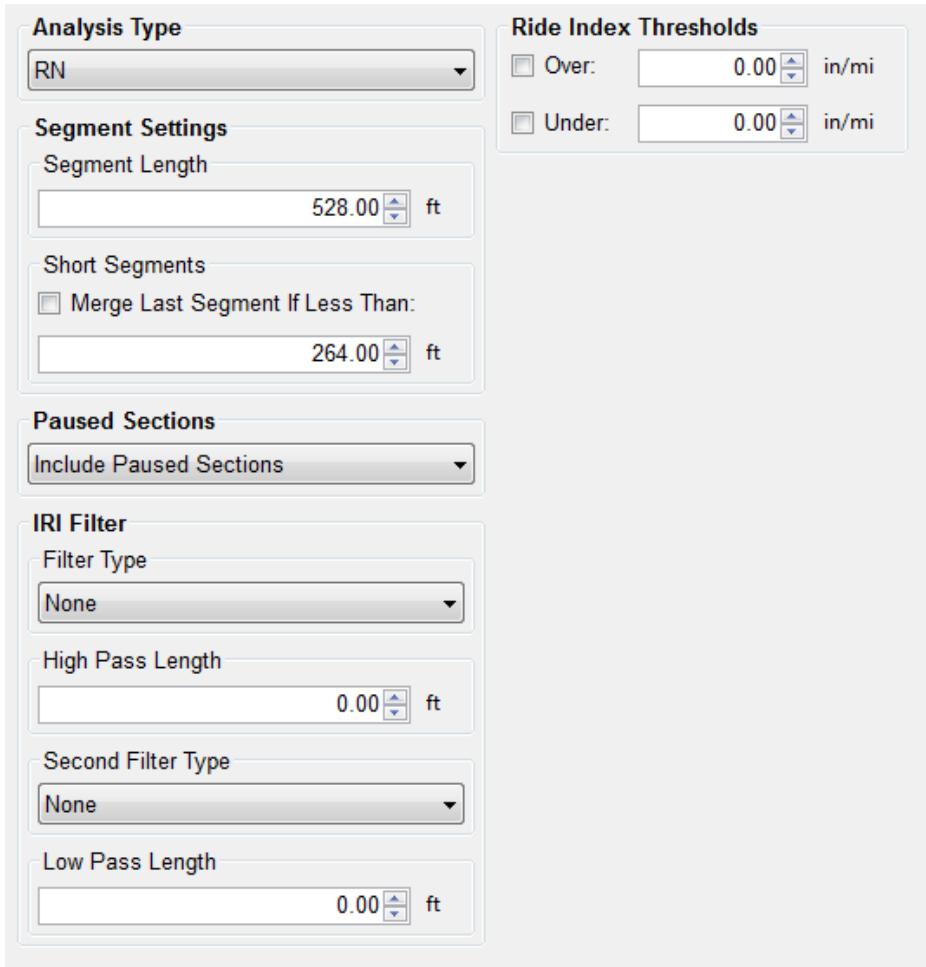


Figure 77: The RN analysis window with the filter options shown

## RMS Roughness

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

## 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.

## Analysis Parameters: Filters

### 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 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.

### PRI Filter

#### Moving Average

A length of 2.0 feet can be chosen for the Moving Average Filter, depending on the contract specification. The use of the moving average filter was initially used by the 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 only used for necessary adjustments 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. A filter gain setting of 1.00 does not affect the collected data. For typical profiling, use the default setting of 1.

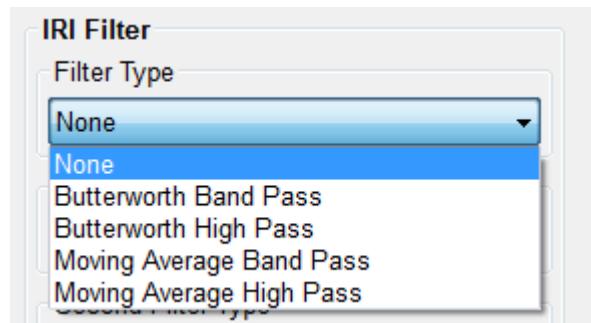


Figure 78: The filters within the IRI analysis parameter window

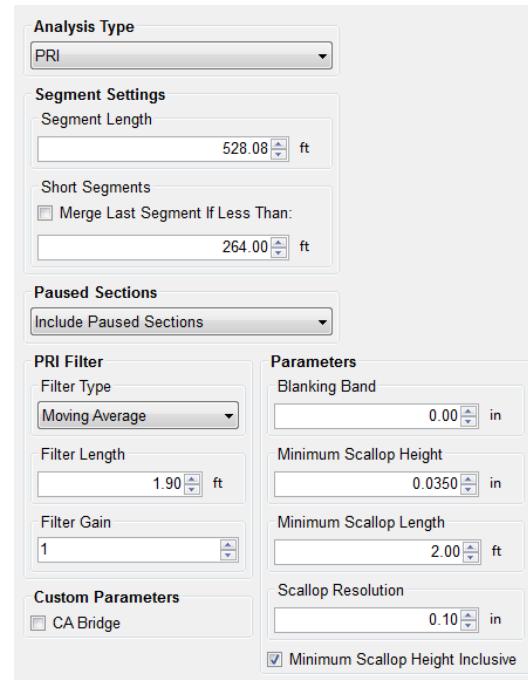
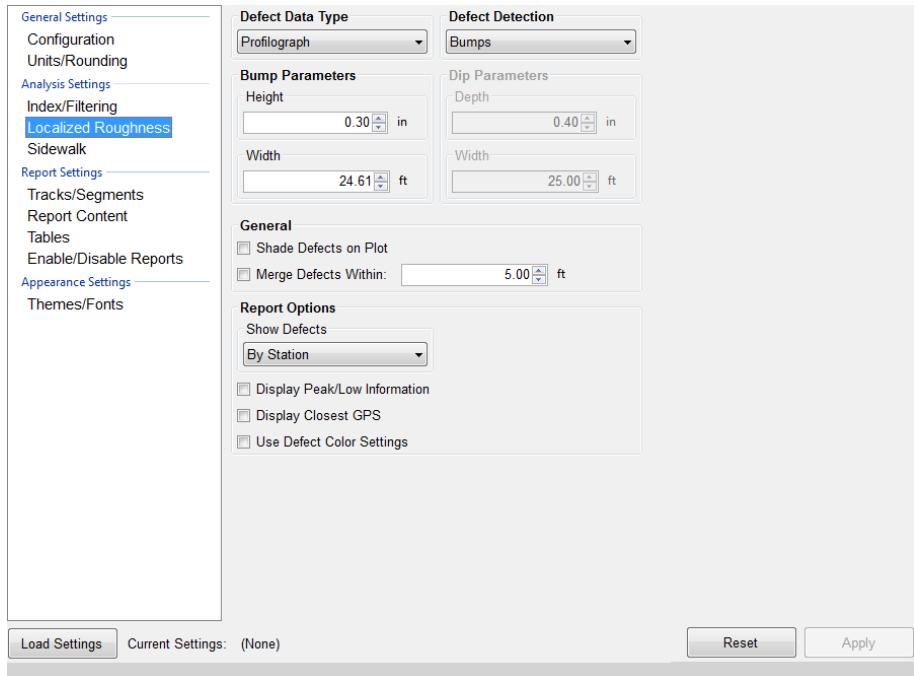


Figure 79: The filters for the PRI analysis parameter

## Localized Roughness

Localized roughness refers to the bumps and dips that occur over a determined distance.

Figure 80: The Localized Roughness window with the defect settings



## Defect Detection

The operator may choose the mode of defect detection 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.

If only one defect type is chosen, be sure to change the correct settings. Do not change the dip parameters instead of the bump parameters by mistake. The report section of Profiler V3 can be used to review the settings and traces of the collection.

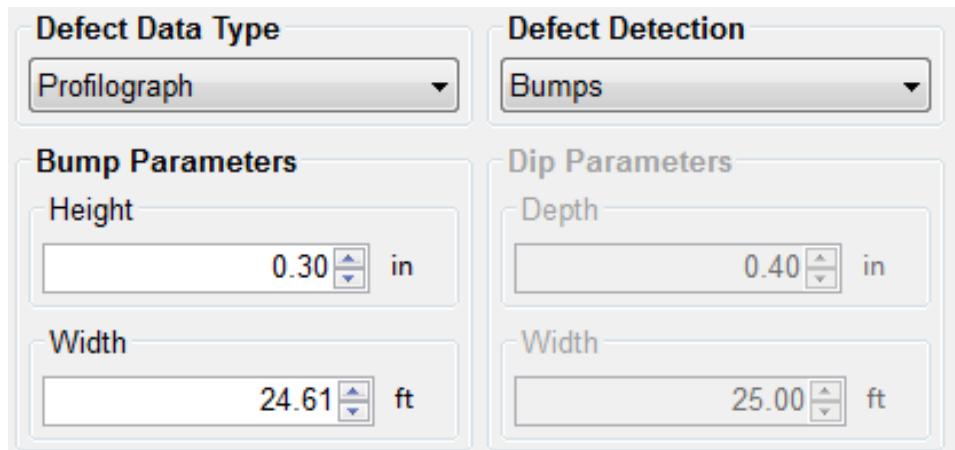


Figure 81: When only bumps are selected, dip parameters are unavailable

## 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.

### 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.

Defect Data Type	Defect Detection
Profilograph	Dips
Bump Parameters	
Height	0.40 in
Width	24.61 ft
Dip Parameters	
Depth	0.40 in
Width	25.00 ft

Figure 82: When only dips are being tested for, the bump parameters become unavailable.

#### 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.

### Localized Roughness Report Options

#### 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.

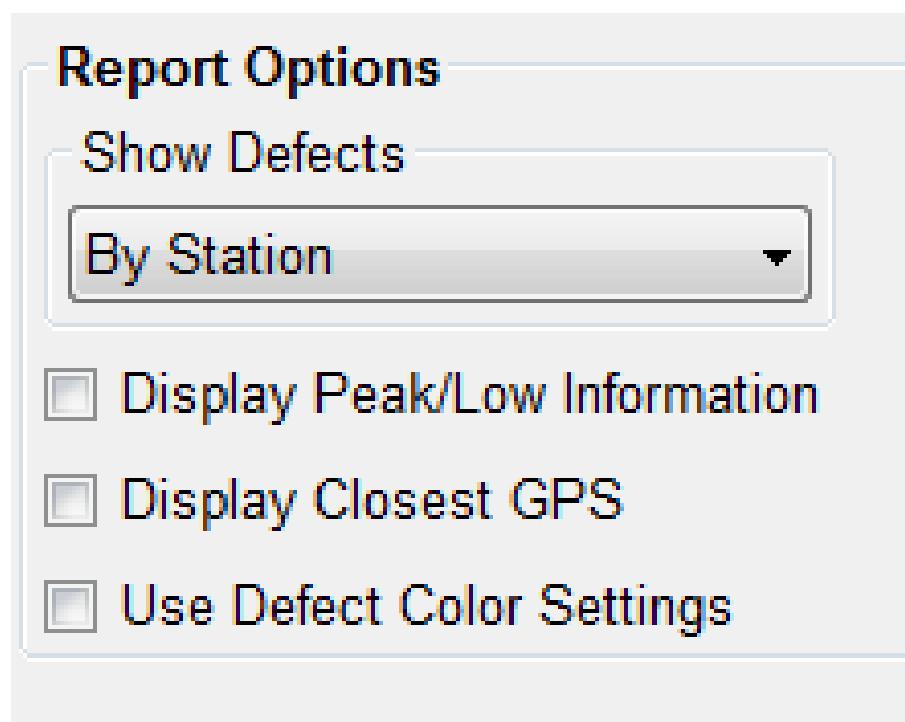


Figure 83: Localized roughness settings

### 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

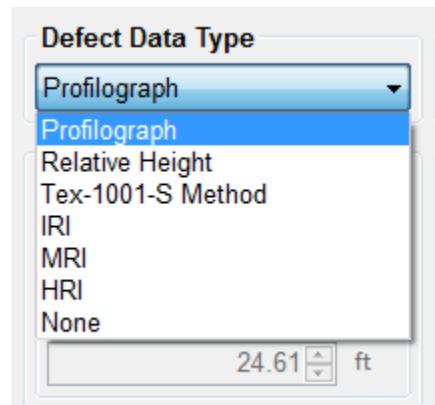
To show the closest GPS reading to each defect, select this check box. When viewing the summary, the GPS coordinates will be in the table with Defect Type, Track, Segment, and Stationing of the defect.

## **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 84: Types of testing available for finding defects



### 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](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.

## General in Localized Roughness

### 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."

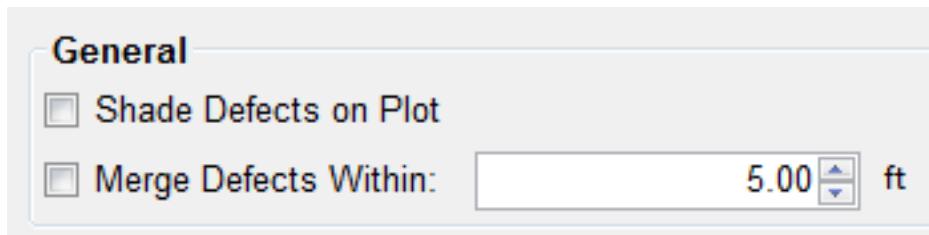


Figure 85: Merge Defects

### Shade Defects on Plot

The operator may use this feature to help identify defects.

## Report Settings

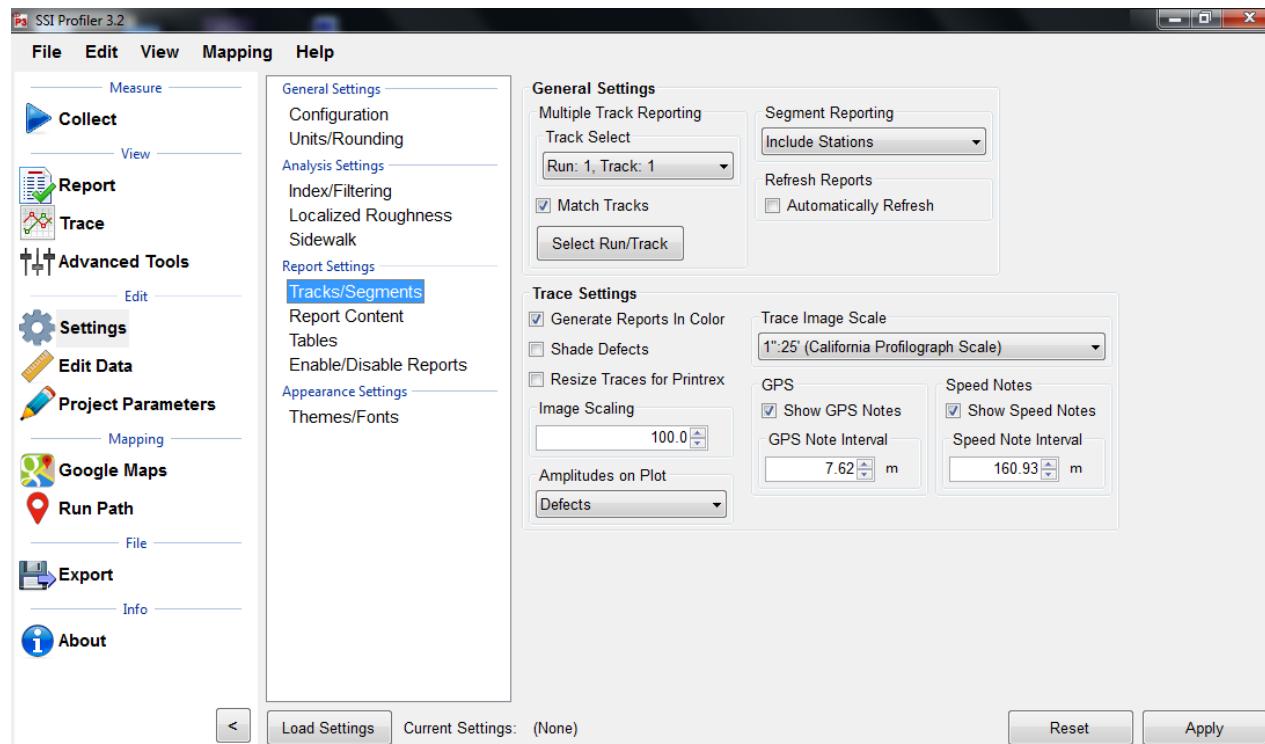


Figure 86: The report options window

## Track/Segments General Settings

### 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.

### 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.”

### Trace Settings

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

### Amplitudes on Plot

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.

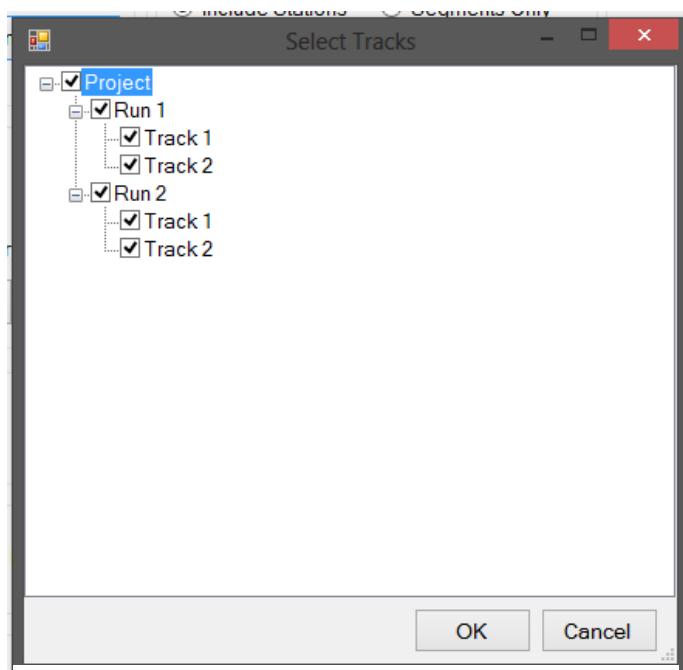


Figure 87: The Track and Run Selection Window

## 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 (GPS/Speed Notes)

The reporting intervals are the distances traveled while collecting data to between a GPS and or the Speed 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:

#### GPS Note Reporting Interval

Chose the interval that you want the program to report the GPS notes.

#### Speed Note 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.

## Report Content

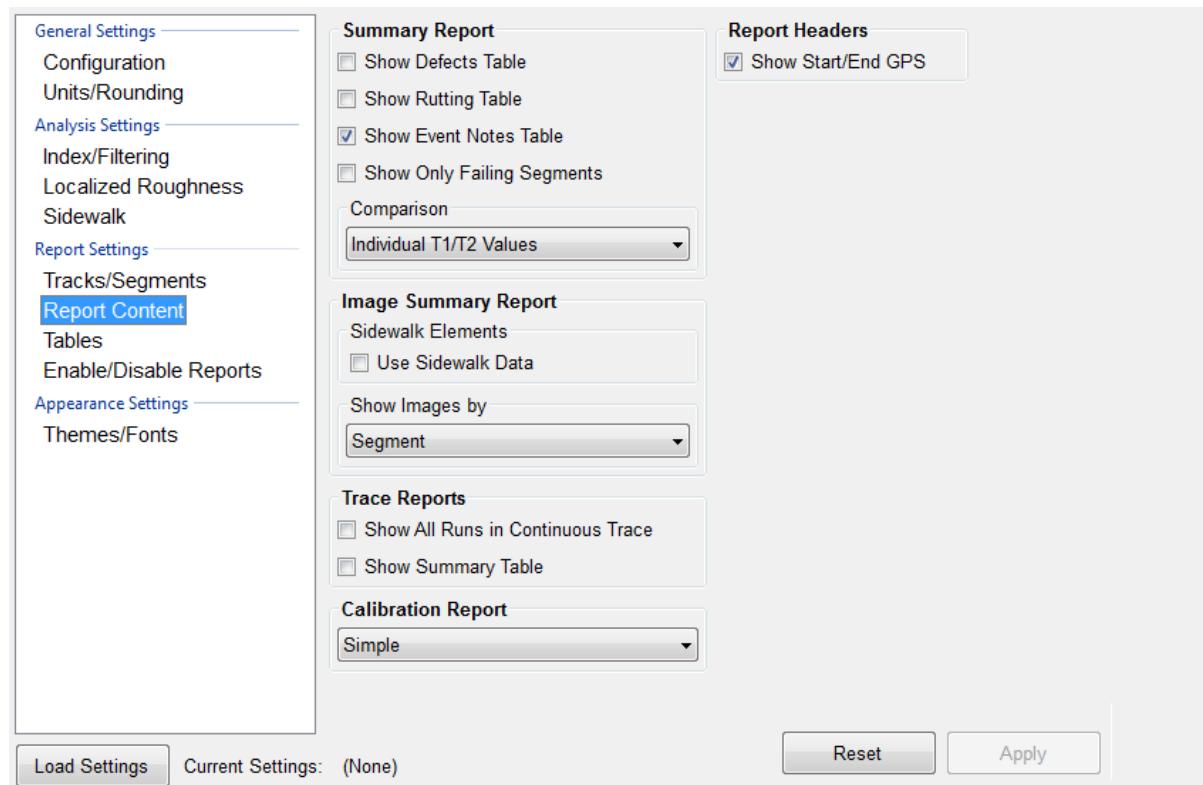


Figure 88: The Report Content window

## Summary Report

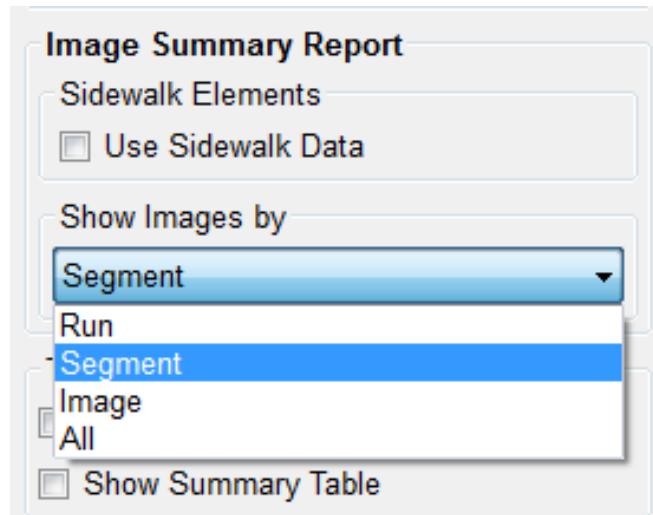
The operator can decide the data to report in the summary report. These include: The Defects Table, the Rutting Table, the Events Note Table or to Show Only Failing Segments. The data can be

compared by individual Track 1 and Track 2 values or using the average of these. The Report Headers option lets the operator choose the Show Start/End GPS coordinates for the run.

## **Image Summary Report**

This section of the Report Content Tab allows for the operator to choose how to show the images collected (applicable to systems with a camera). The images can be shown by Run, Segment, Image or All. For Sidewalk Profilers, the operator should select the checkbox above the drop-down menu.

Figure 89: The Image Summary Report options under Report Content.



## **Trace and Calibration Reports**

The operator can choose to **Show All Runs in Continuous Trace**. 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.

### **Show Summary in Table**

When this box is selected, the summary header will be included in the All Traces report.

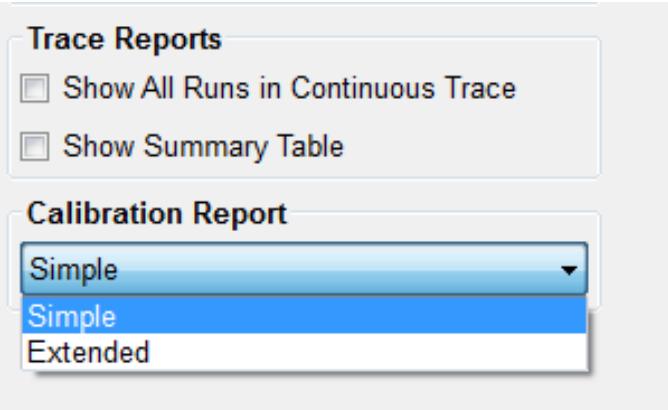


Figure 90: The Trace and Calibration Report options

### **Simple Calibration 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 Calibration 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.

## Tables

The screenshot shows the 'Tables' section of the Report Settings. On the left, a sidebar lists settings like General Settings, Configuration, Analysis Settings, Report Settings, and Appearance Settings. Under 'Report Settings', 'Tables' is selected. The main area contains five tables:

- Summary Table**: Includes checkboxes for 'Show Number of Defects' and 'Show Rutting Info'.
- Rutting Table**: Includes a dropdown 'Show Ruts By' set to 'All Ruts', a 'Rutting Interval' input field showing '10.00 ft', and sections for 'Ignore Ruts' (Over: 0.00 in, Under: 0.00 in) and checkboxes for 'Show GPS Notes' and 'Show Lane Dropoffs'.
- Slope Table**: Includes a 'Slope Interval' input field showing '10.00 ft' with a dropdown arrow, and a list of checkboxes for 'Show GPS Notes', 'Average Over Intervals', 'Use Transverse Inclines', 'Show Slope Radians', 'Show Laser Readings', 'Show Running Slope', and 'Show Slope Min/Max (Avg Only)'.
- Trace Notes Table**: Includes a checkbox for 'Link Event Notes'.
- Events Table**: Includes a 'Sidewalk Items' section and a list of checkboxes for 'Show Cross Slope Data', 'Show Running Slope Data', 'Show Level Change Data', and 'Show GPS Data'.

Figure 91: The Table options under Report Settings

The table options under report setting lets the operator chose what tables to include in the report. **The Summary, Trace Notes and Events Table** are used thought SSI's Profiling systems. The Summary Table section includes the 'Show number of Defects' and the 'show Rutting Info' checkboxes. **Show GPS Data** is selected by default in the Events Table.

## Enable/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. These reports will be reflected in the dropdown menu to the right and also in the Reports Section of Profiler V3. See figures 128 and 129.

The screenshot shows the 'Enable/Disable Reports' window. On the left, a sidebar lists settings like General Settings, Configuration, Analysis Settings, Report Settings, and Appearance Settings. Under 'Report Settings', 'Enable/Disable Reports' is selected. The main area shows a list of reports with checkboxes and a dropdown menu for 'Default Report'. Arrows point from specific checkboxes in the list to their corresponding entries in the dropdown menu.

Report Type	Default Report
Single Trace	Summary Report
All Traces	Single Trace
Continuous Trace	All Traces
Proscan Trace	Continuous Trace
Localized Roughness Report	Localized Roughness Report
Calibration Report	Calibration Report
Rutting Report	
Slope Report	
Events Report	Events Report
Sidewalk Report	
Text Report	
QA Suite Report	
Events Text Report	
Image Summary	
ALR Image Report	
Airfield Report	
Grind Report	Grind Report
Profile Design Report	
Texture Report	

Figure 92: The Enable/Disable Reports window

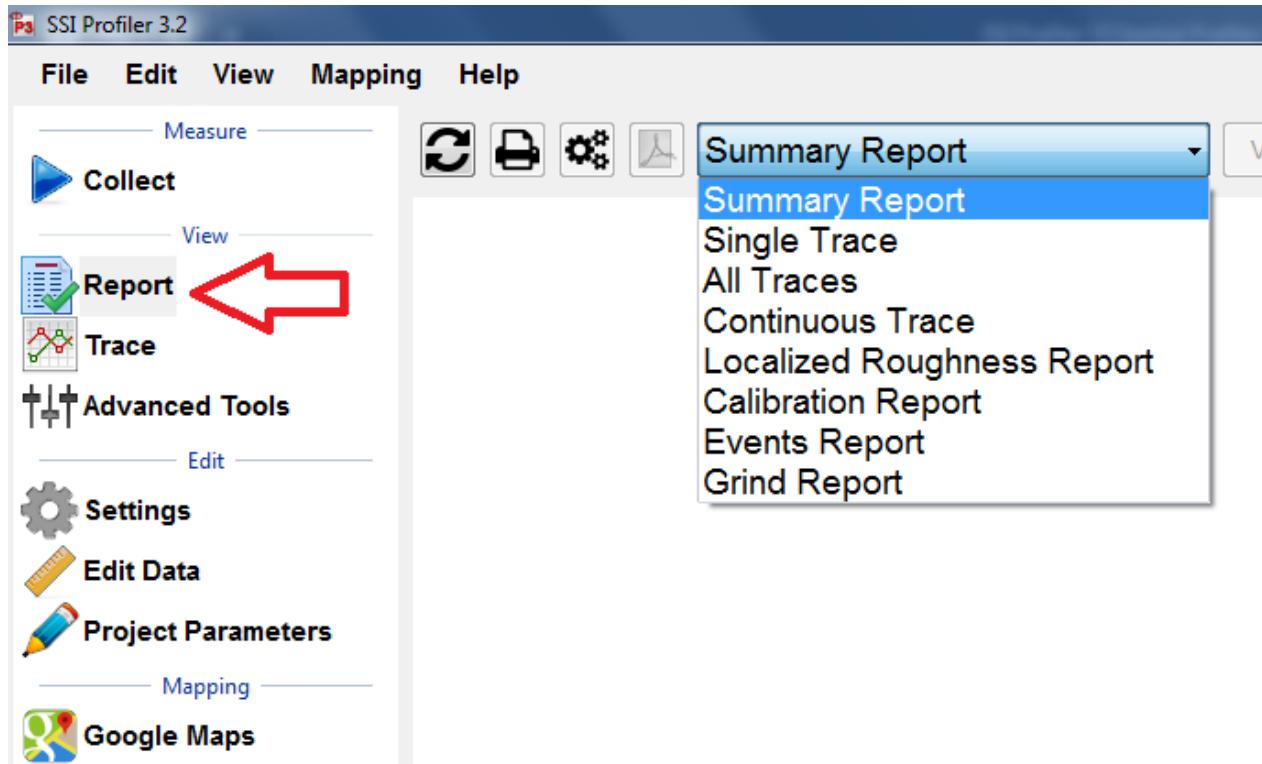


Figure 93: The Reports selections after Enable/Disable configuration is set

## Themes/Fonts

Profiler V3 lets the operator choose between two different Reports Themes: Classic (default) and Light. The Font can also be changed along with the Threshold Colors and the Defect Colors.

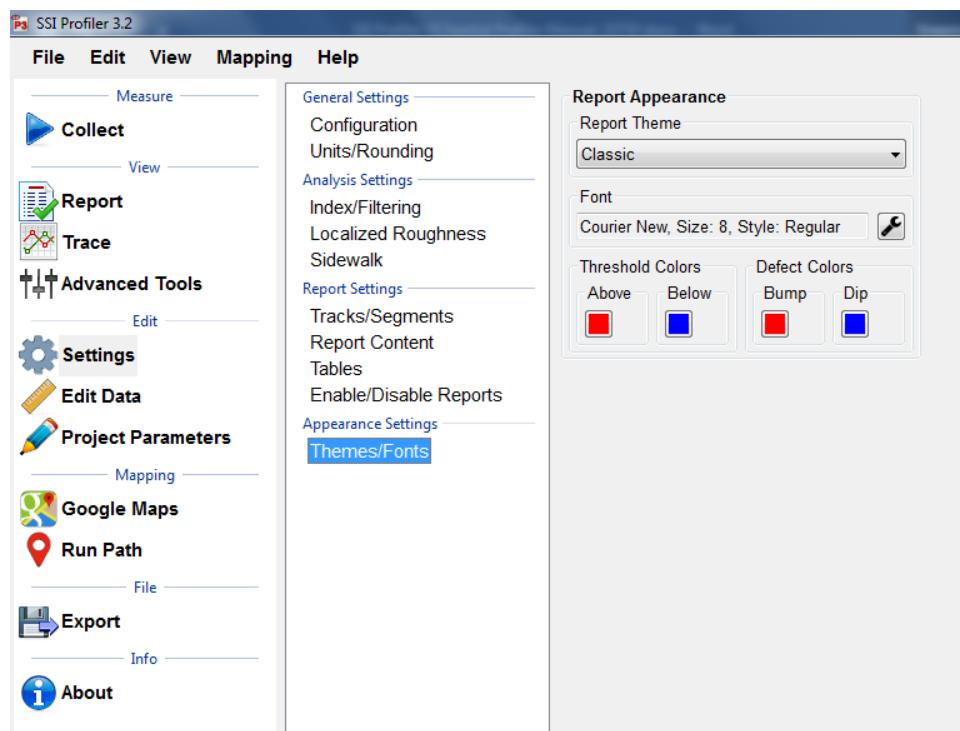


Figure 94: Themes and Fonts option under Appearance settings.

## View

Refresh Icon Print Icons Page Setup PDF Drop Down Report Menu

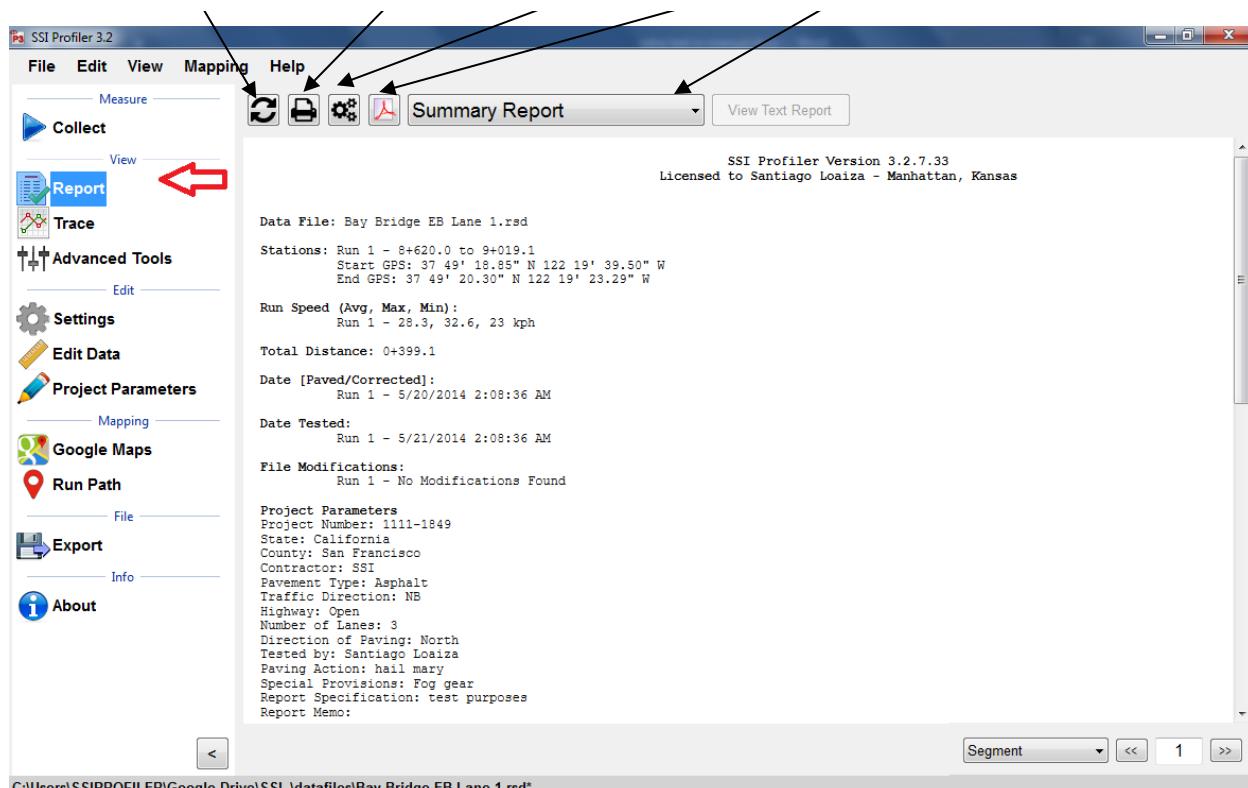


Figure 95: The summary header of a single trace report

## 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.

### 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.

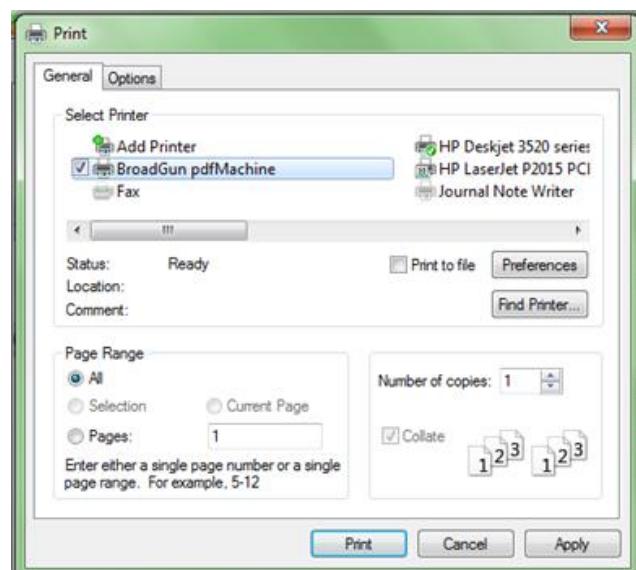


Figure 96: Printing Options Window

## 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 Traces, Continuous Trace, Proscan Trace, Localized Roughness Report, Calibration Report, Rutting Report, Slope Report, Events Report, Sidewalk Report, Text Report, QA Suite Report, Events Text Report, Image Summary, ALR Image Report, Airfield Report, Grind Report, Profile Design Report, Texture 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 97: The drop-down menu for the report options



## **View by Segments**

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. 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 98: The segment or defect navigator

## 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.

## Trace

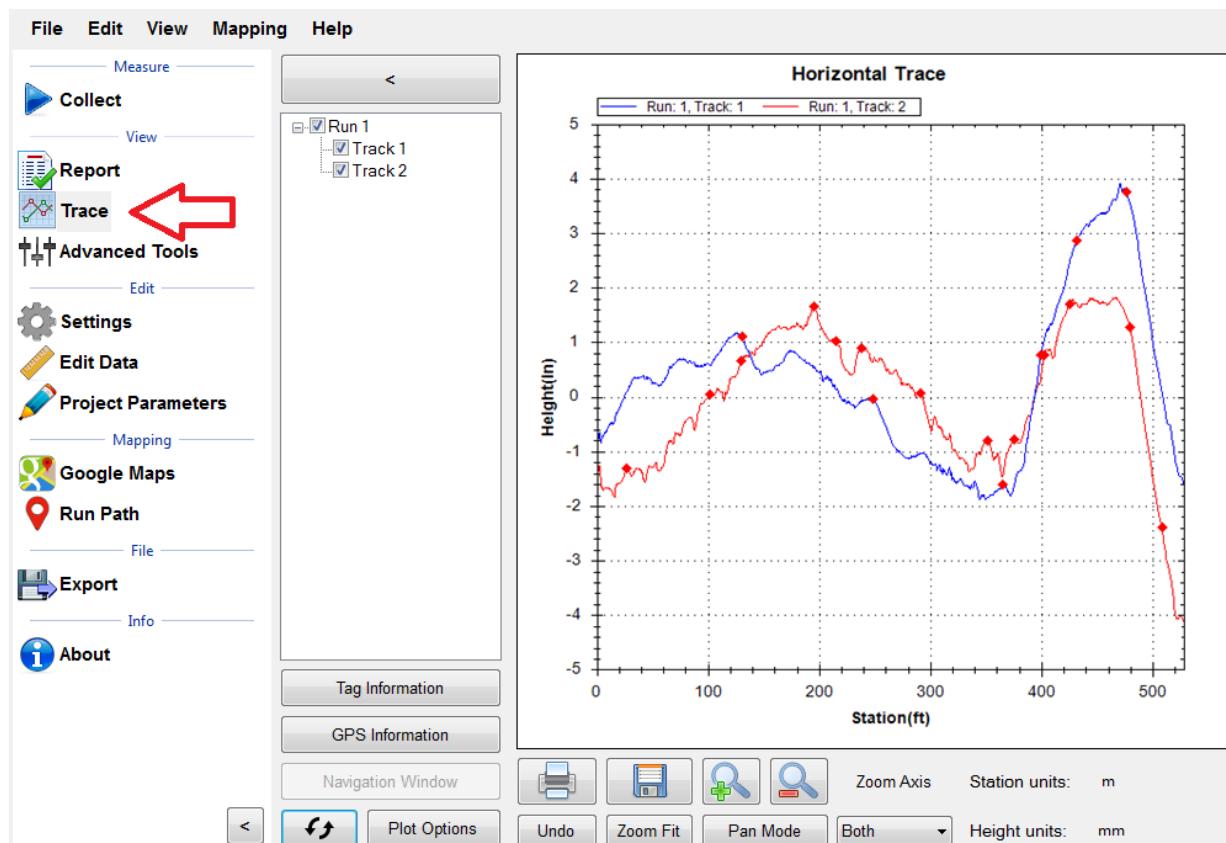


Figure 99: An example of the profile trace

### 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 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. Select the refresh button and verify that the trace is accurate before a print is made.

## Plot Options Icon

### Profile/Continuous IRI

The drop-down menu allows the user to select options of Profile and Continuous IRI, MRI or HRI, Median Profile, Segmented Bar IRI and Birds Eye View. It is recommended to use the median profile option when reviewing the collected relative elevation profile. The operator may view two graphs simultaneously by selecting the secondary plotter option.

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

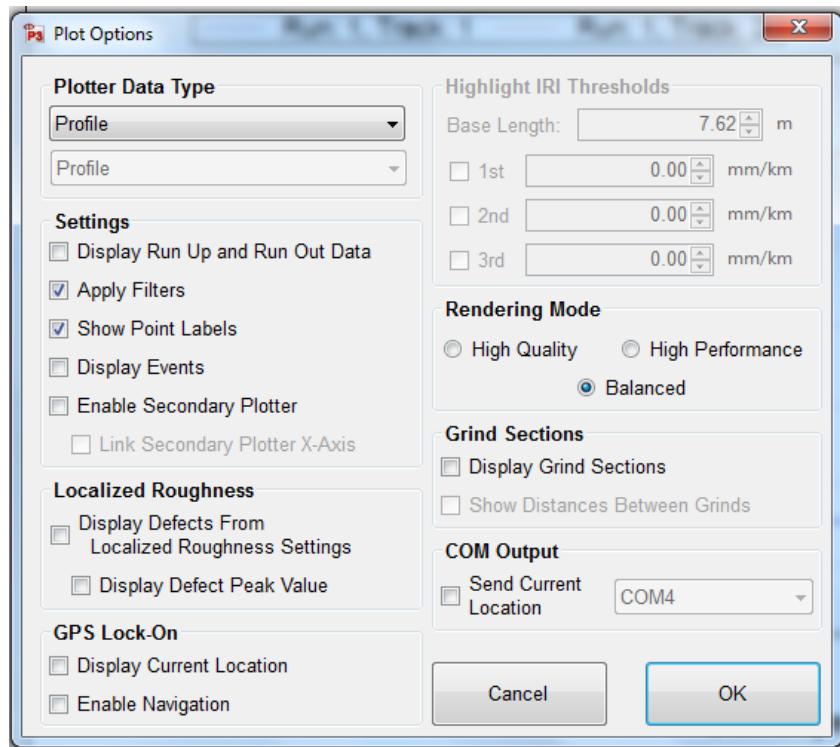


Figure 100: Recommended Plot Options window

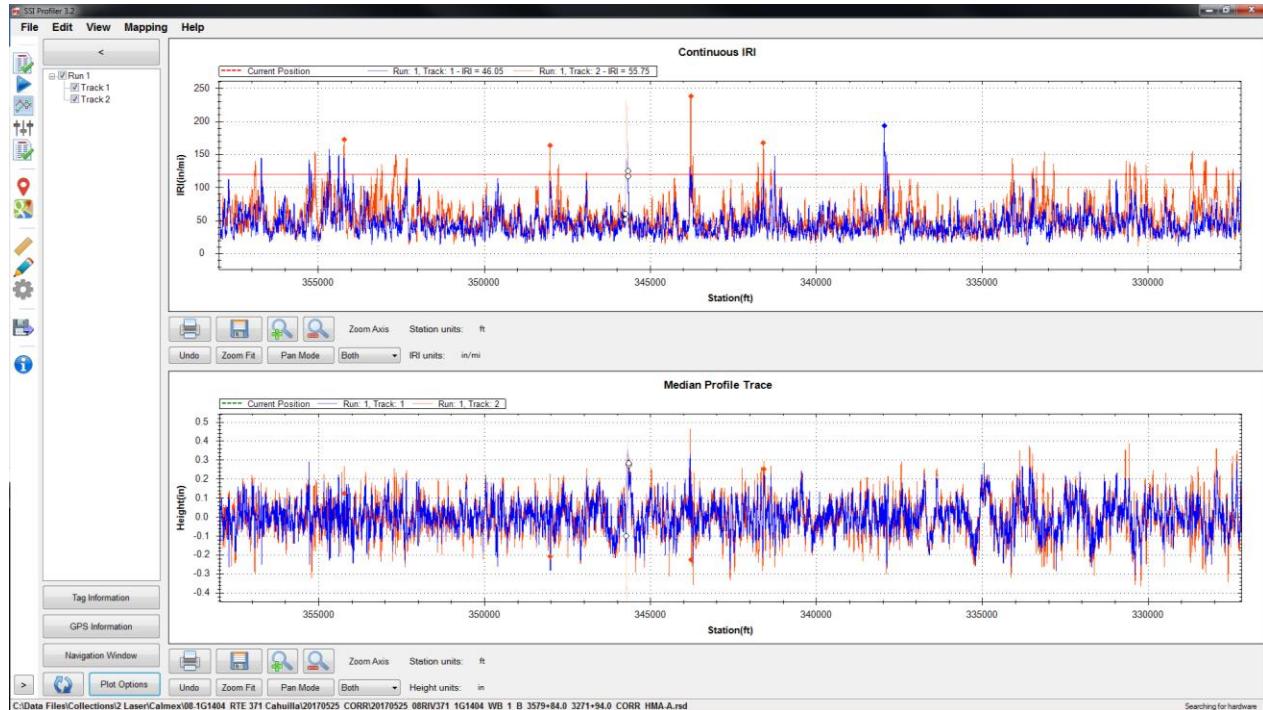


Figure 101:The dual plot of the Continuous IRI and Median Profile

## 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.

### 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> [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 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.**

Threshold

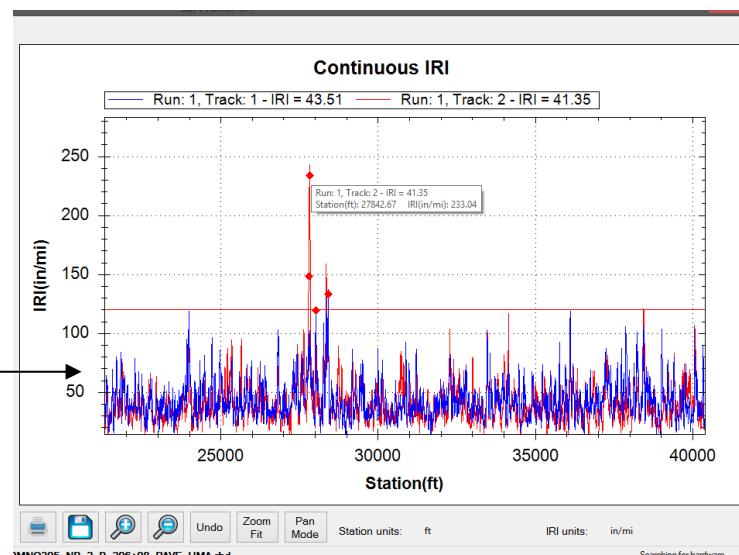


Figure 102: The Continuous IRI trace with the localized roughness diamonds shown

## 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 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.

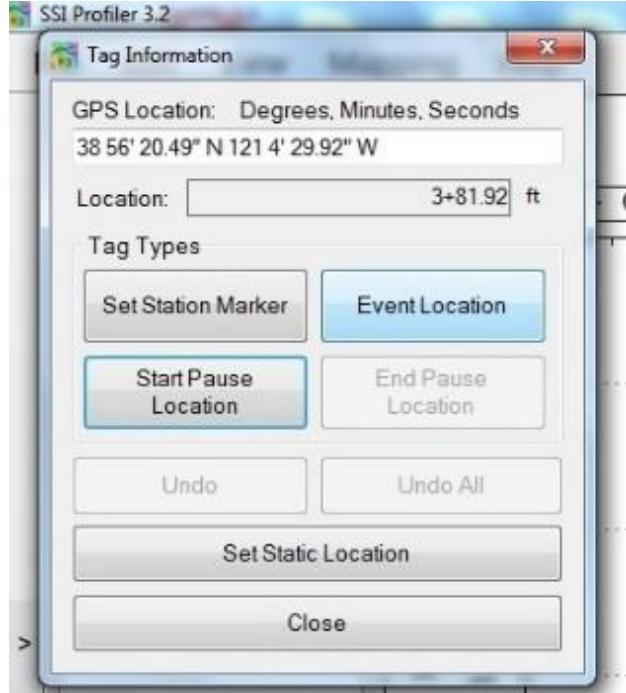


Figure 103: Dynamic Tagging Feature

## 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.***

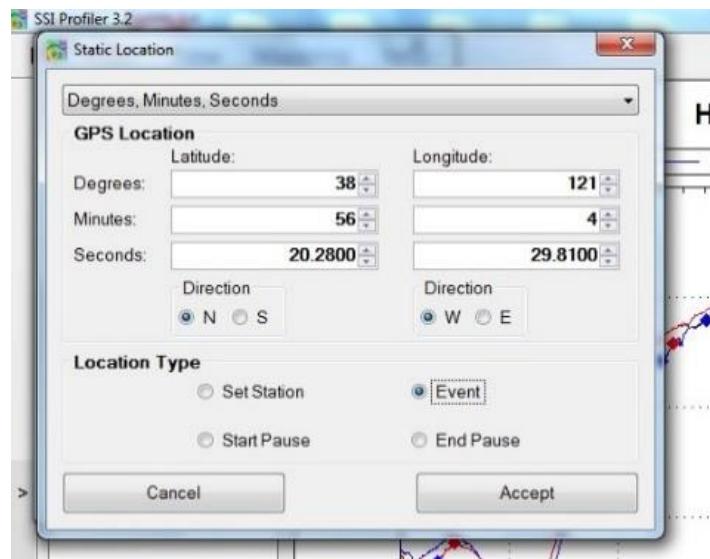


Figure 104: Static Tagging Feature



Figure 105: Grinding Navigation with green current location displayed

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.

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 a notepad file and saved for the lane and wheel path. This notepad file can be imported into the SSI Profiler program within the Advanced Tools>Grind Sections>Manage Grind Info. 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, in order to layout the location on the pavement.

Under the navigation window icon in trace view you may choose to auto-center the current location and choose the Simple Grinds option. The simple grinds window displays the location of the grinds relative to the current position through numbers and colors.

## **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.

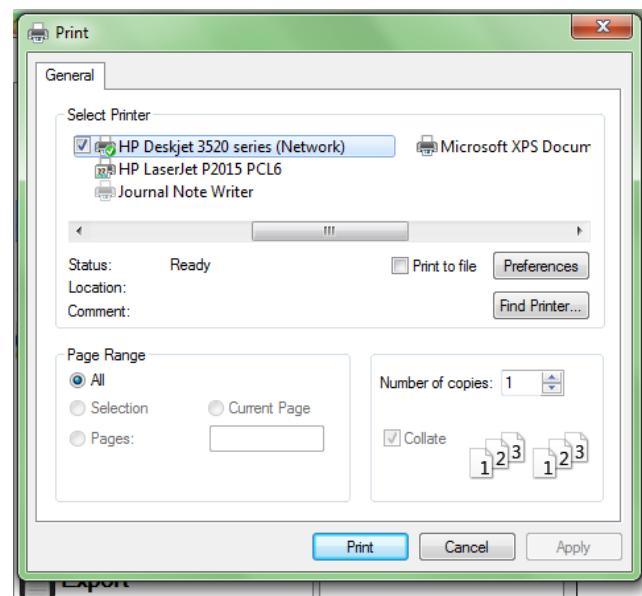


Figure 106: The Print window after the print icon is selected

## **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.

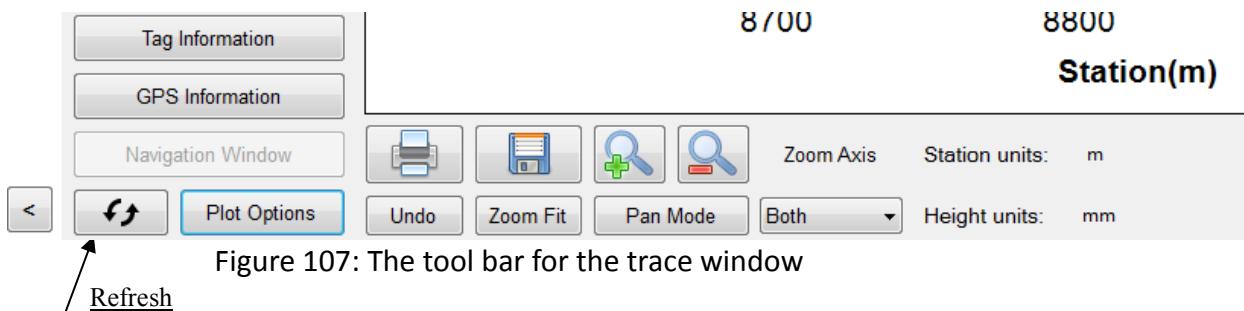


Figure 107: The tool bar for the trace window

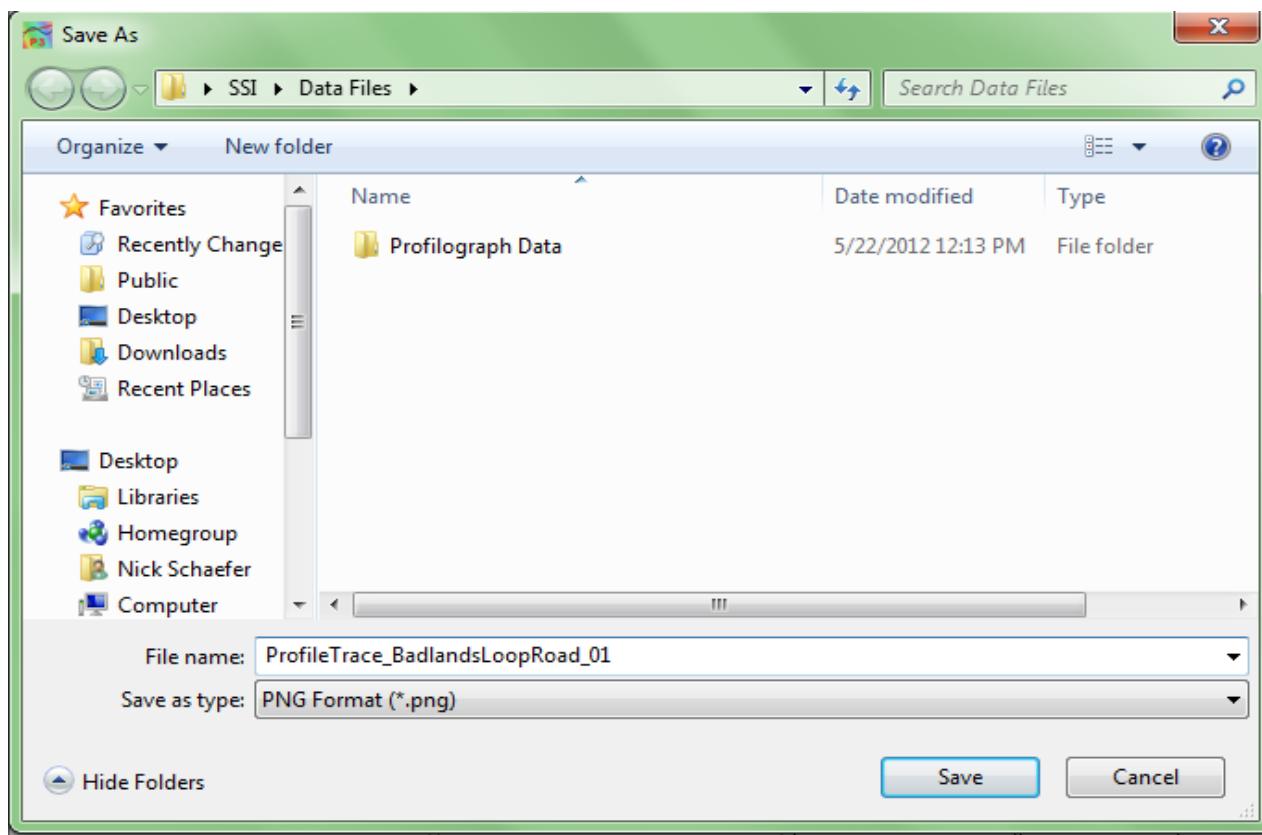


Figure 108: Windows explorer to save

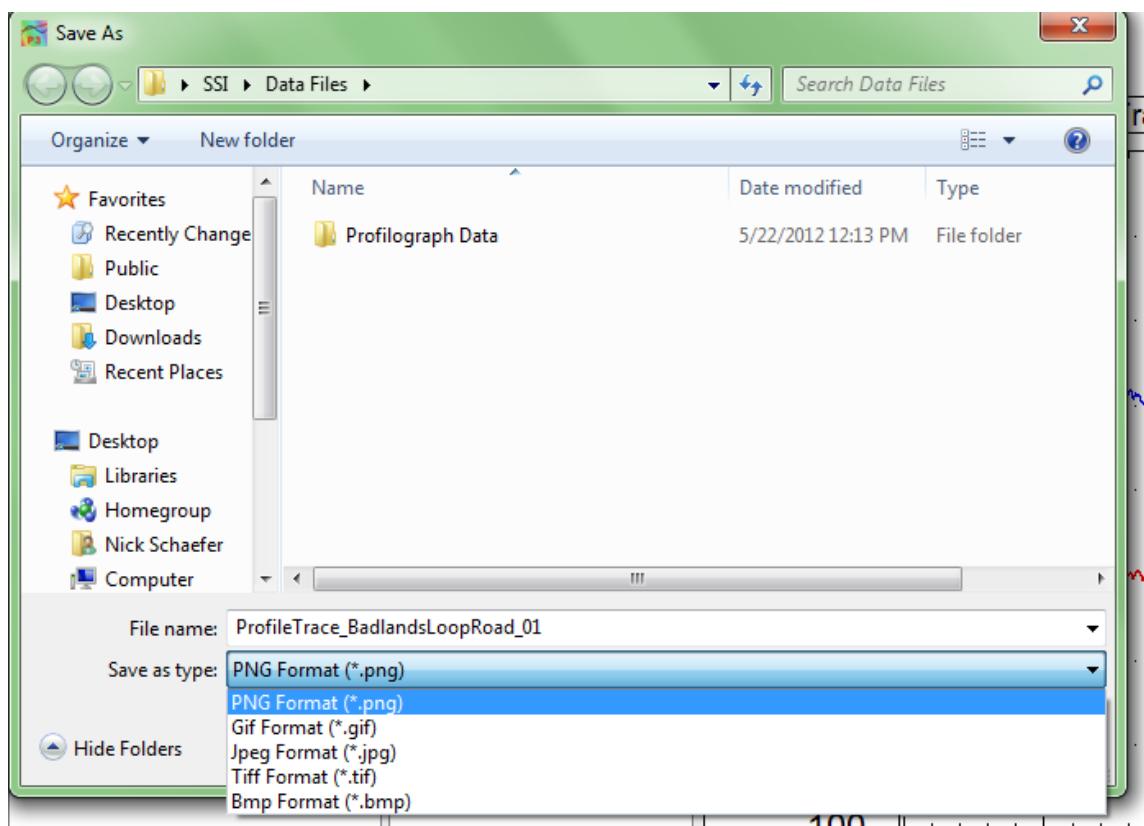


Figure 109. The available picture formats to save the trace graph.

## **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.

## **GPS Editing and Tagging**

The operator can use the GPS signal to edit the start and stop locations of the collections and add events to the collection.

## **Advanced Tools**

The Advanced Tools window contains options for images, transverse profile viewer, grind sections and profile design. These options will only be available if the user license permits this additional analysis. Contact SSI for a license upgrade.

## Images Window

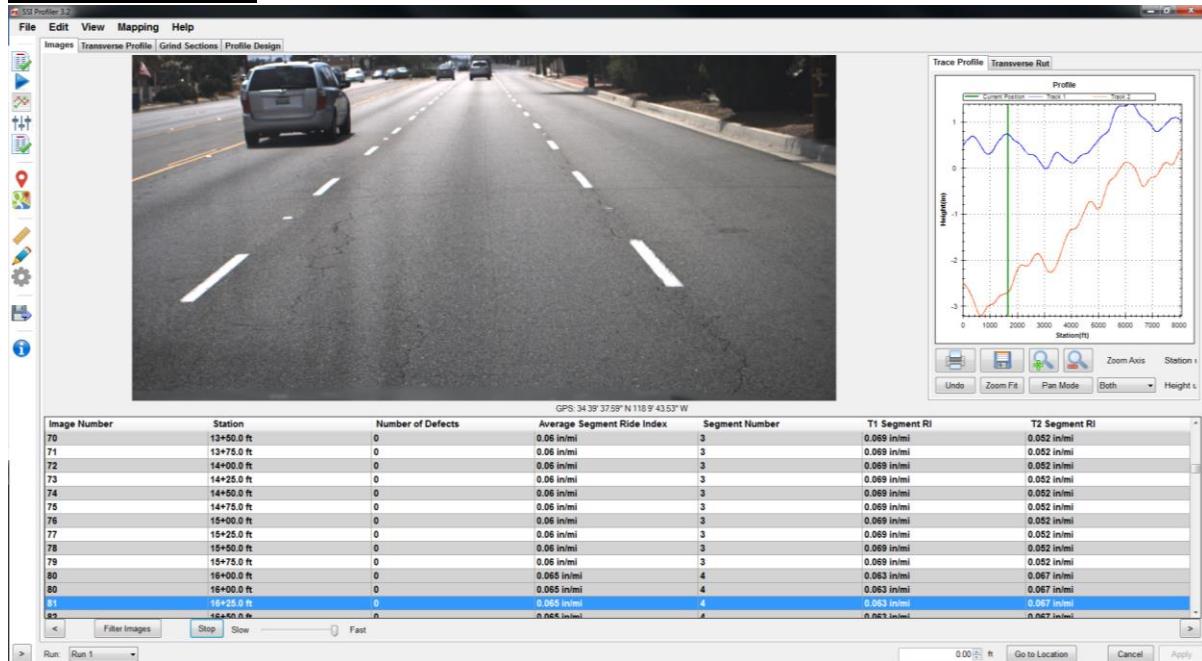


Figure 110: The Images Window under Advanced Tools

Within the images window the user can perform multiple filtering options to show only certain characteristics of the collection. The data can be filtered by station, defects or ride value. The software automatically enters the minimum and maximum values for each of these three fields. The units of these parameters can be changed by selecting the current units to enable to drop down menu to choose new units. After the operator has changed the parameters according to the range desired, select “Filter”. The images will reorganize and the new images will not be reverted until the parameters are changed to the original setting (“Reset”).

The information in the table below the image will be populated as long as the location is not in the run up distance and there is sufficient data. If the system was not a full lane width 5-laser system the rutting depths will read ‘N/A’.

The arrow keys on your computer’s keyboard can be used to advance the images. There will be a lag using the computer’s keyboard until the images are populated from the files. After the images are loaded the operator will be able to constantly hold the up/down arrow keys to view a slide show of the collection.

*The GPS string of the Images Window is based off of the nearest GPS coordinate and should not be used as a reference station.*

### Images in the Report

The images captured during data collection can be viewed alongside the trace within the any of the three trace reports. The user can view the images with the trace in the Single Trace, All Traces, and Continuous Trace reports. If the user hovers the cursor over the camera icon the image will appear.

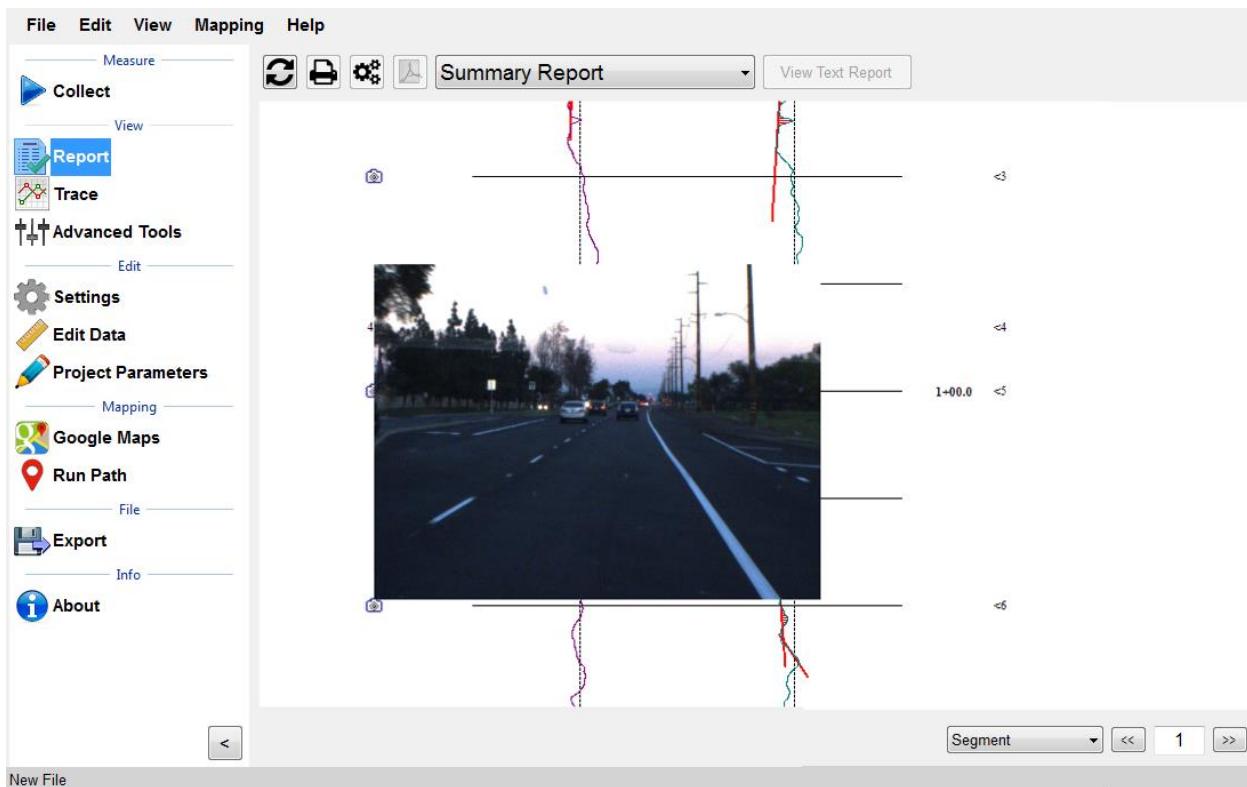


Figure 111: The Continuous Trace Report with Images.

The user can right click on the image in the image window or on the trace to save it to the computer or other external device. As long as the user left-clicks above the image, windows explorer will open to choose where to save the image file. The following formats are available: BMP, JPEG, GIF, PNG, TIF. Right click to save image.

### **Grind Sections**

Corrective grinding locations can be imported from a grinding plan into SSI Profiler through a text or CSV file through the grind sections tab of the Advanced Tools under “Manage Grind Info....” Grinds should be imported using wheel path (track 1 and track 2) or full lane width grind plans. After the grinds have been imported, the user can merge grinds within a certain length or combine all grinds transversely across the lane (merge tracks 1 and 2). The grind locations can be edited or deleted within the manage grind info icon.

### **Navigation (Map Views)**

The Profiler V3 program two methods of location navigation: Google Earth and Trace View. They 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*.

## Google Maps.

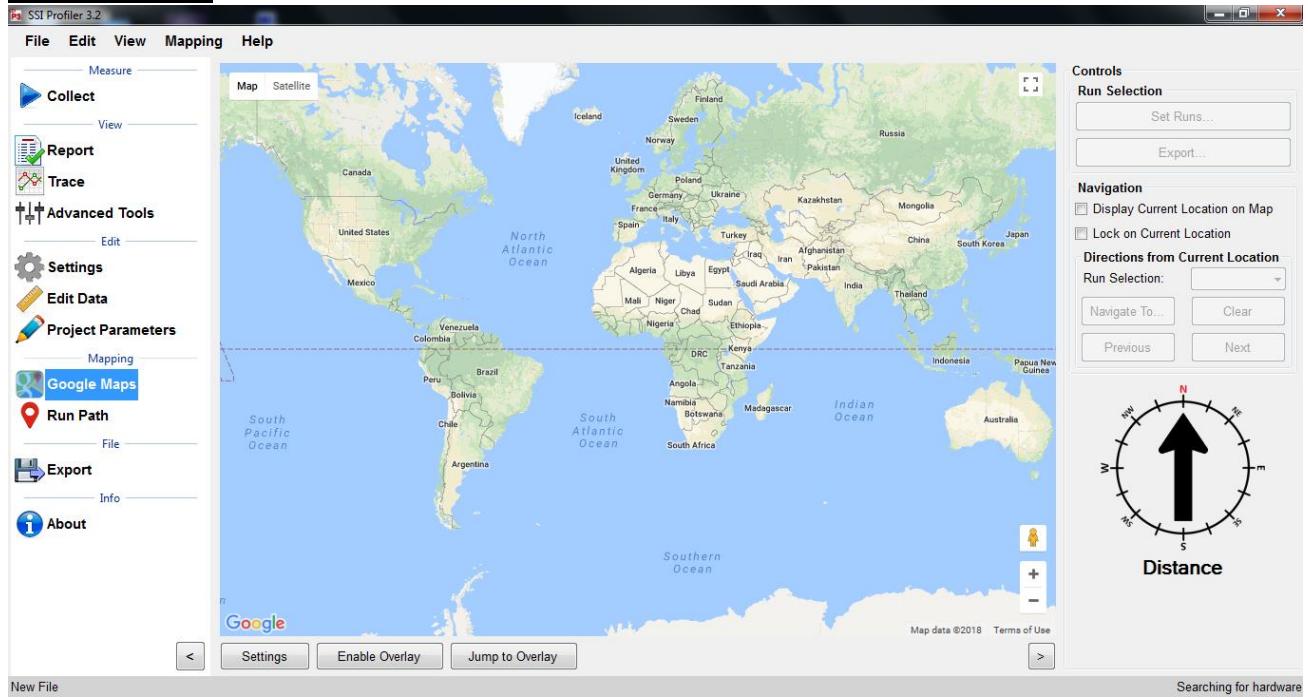


Figure 112: The Google Maps start window.

### ***\*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."

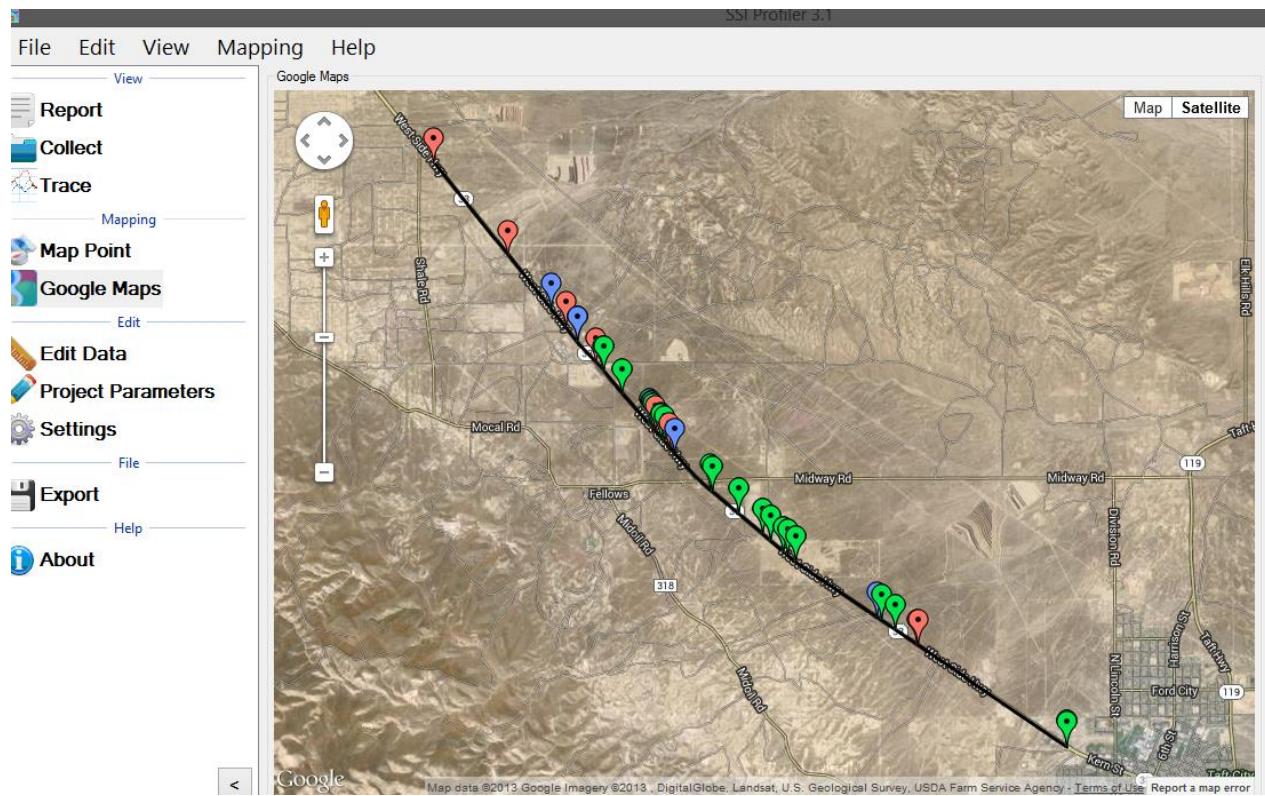


Figure 113: Google Maps showing the localized roughness

#### 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.**

## About

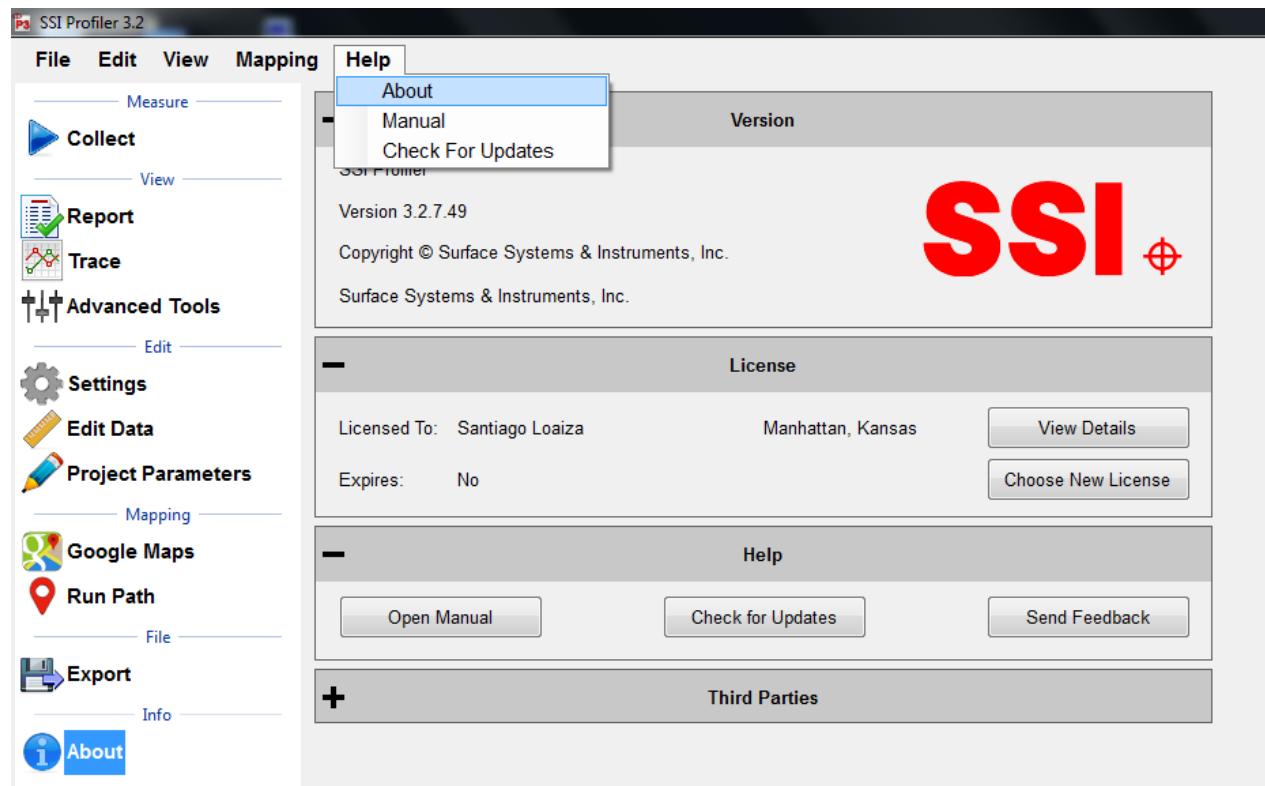


Figure 114: The About Window

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 update to the latest version of 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.

## **Recommended Tools**

### **Create a personal default file name convention for you project**

Under General Settings the operator may select “Configure File Naming” to create a new file name convention for FHWA and State DOT submissions.

### **Load analysis parameters and settings from previous projects**

When a previous file has the correct project information and settings saved within it, the operator may load the previous file’s settings into the current file. By selecting “Load” under General Settings the user may select the previous RSD file and load its settings into the current project.

### **Set a default file location**

The user may select a default folder to save all files and reports under General Settings. It is recommended paste the folder destination into the address input.

### **Use the extended calibration report to print PDFs**

The extended calibration report option is located under Settings>Report Options. The extended calibration report adds the bounce and laser height verifications to the calibration report.

### **Use dual plotter in trace view**

Under trace view the plotters can be viewed to see the elevation and the IRI roughness. This is useful when determining if an area of roughness is caused by a bump or a dip in the profile trace. It is highly recommended to use this feature for correction operations. The trace view can be chosen under Trace>Plot Options and Enable Secondary Plotter. It is also recommended to link the secondary plotter X-axis.

### **Use GPS navigation within trace view**

During correction operations it is important to be accurate. The SSI Profiler system allows for the user to navigate along the collection path using GPS. Depending on your GPS system you may have to connect to hardware and have your antenna attached. The GPS accuracy can be found

listed on your profiling documents or by calling your SSI representative. The GPS navigation can be enabled under Trace>Plot Options>GPS Lock-On options. The check boxes should be enabled for Display Current Location and Enable Navigation.

### **Use hot keys during collection**

During collection the operator can assign a command to any keyboard key except for the space bar and the enter key. The keys can start or end a collection, arm and electric eye or create an event for various types of scenarios such as pavement distresses or debris.

### **Import grind locations into Profiler for use in trace view navigation**

Once grind locations are created the grinding plan can be imported into Profiler through the Advanced Tools>Grind Sections tab. The locations can be added through the Manage Grind Info Icon. Once the locations are added, they will appear within the trace view to be used with the GPS navigation. Under Trace View>Navigation>Simple Grinds the window can display the distance to the grind locations per wheel path.

### **Use Google Maps to crop and edit data based on stationing and pin information**

Google Maps can be used to compare multiple runs to each other and determine the stations to crop an RSD file back. The operator may use landmarks, a collection event or a previous collection to adjust a starting location.

## **Troubleshooting and Support**

### **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 Profiler Software and Replacement Parts**

For technical support with the High Speed Profiler (HSP) software contact SSI to obtain a User ID and Password to download the most recent updates from the [www.smoothroad.com](http://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); or (785) 539-6305 (Manhattan, KS).

Parts can be ordered online from SSI at <http://www.smoothroad.com>. For support issues involving the profiler hardware (DMI, Pelican cases, hardware, cables, etc.), contact the SSI office in Auburn, California at (530) 885-1482 or by email at [support@smoothroad.com](mailto:support@smoothroad.com).

### **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.

## **Is your Software Up to Date?**

Contact SSI to upgrade your software if your problems reoccur after support assistance.

## **Do Not Attempt To Repair Electronic Components**

All of the electronics within the SSI Profiler systems are built custom for Surface Systems and Instruments. Do not attempt to fix issues without contacting SSI.

## **Is your Power LED Illuminated?**

No power to the system would cause the hardware to disconnect from the software.

## **Hardware Not Found**

Check the cables of your system for any wire breaks. If the Amphenol connections are twisted, it can break the soldered wires. If problem persists, contact SSI Support Staff.

## **Example Diagnostics**

By selecting the button on the upper right of the Collect screen with a single digit number on it. The single digit number will be the same as the number of lasers on your system. The button is colored green for systems without an issue, yellow for systems with a device disconnected and red for connectivity issues.

### **SSI Profiler 2.1: Q0g0r0r0x0x0x0**

'0' means that the device is connected.

Q is the encoder symbol

g is Trimble GPS

r is for a Roline laser. The order is Track 1 laser, Track 2 laser, Track 3 laser (if equipped).

x is an open port

### **Topcon V2.1: Q0G0r1r0d0P0P0x0**

'0' means that device is connected

G is Topcon GPS

'r1r0' means that the electric eye is disconnected.

d is the symbol for a dot laser

POPO is the symbol for connected inclinometer (only for 3 laser survey systems).

## **Failed Height Verification**

- 1) Check block Orientation. Do not block receiving laser sensor.
- 2) Check Laser Type in System Settings
- 3) Check the integrity of the cables and pins. Make sure the pins are not bent inside the connectors and that the cables are not damaged.

- 4) Check the height of the lasers from the measurement surface. For Roline and low stand-off spot lasers the minimum height is 200 mm (7.8 inches). For high stand-off spot lasers the minimum height is 12.8 inches (325mm).
- 5) Is there a glare on the verification blocks?

## **Failing Accelerometer Calibration**

**Main Cause:** Not rotating both accelerometers at the same time or a connection issue.

**Are you:**

- Rotating both accelerometers during calibration?
- Matching the white lines on the accelerometer and cable disconnects?
- Check the condition of the small pins within the disconnect cable and the secureness of the serial connections to the grey box.

## **Lasers Not Firing**

**Main Cause:** None/ not sufficient power reaching the lasers

- Is the blue light flashing on the Roline laser
- Is the blue LED on the white housing emitting light?
- Are the red lights on the grey box serial ports emitting solid red light?
- Check the condition of the pins in the cables.
- Is the vehicle off or running?
- Does the same problem happen with the engine running?

## **Failed Bounce Test**

When were the accelerometers calibrated?

Are the front wheels straight?

Is the vehicle moving forward and backward while bouncing?

*This causes the lasers to read additional height differences, adding to the ride value.*

Is the bouncing only vertical? (No transverse rocking)

Is the laser type correct under System Settings?

What are the shift calibration values?

*If none of these work, try the Simulated Travel option under the 'Advanced' tab of the Collection Parameters window. Follow AASHTO R57 to complete the bounce test.*

## **Distance Not Correct**

When was the last calibration performed?

Was the actual distance traveled during calibration entered correctly?

Is the DMI damaged or loose?

Is the DMI Amphenol cable attached correctly?

How long is your calibration track?

Is there a large temperature gradient?

Is the calibration track a straight line?

## **High IRI/Ride Value**

Are the lasers firing and streaming?

What does the diagnostic string look like?

Are the lasers or accelerometers loose and/or vibrating?

When were the last accelerometer calibration and height verifications performed?

Is the laser type correct in the System Settings? (Check with a laser verification)

### **Electric Eye Events/Pause/Start/Stop Collection Did Not Work**

Is the correct EE turned on?

***There will be an amber or green light on the back of the EE. Flip the switch on the white housing if it is not on.***

Is DOT-C2 reflective tape being used?

Is the angle of the reflector matching with the EE orientation?

### **GPS Navigation Timed Out (Map Point, Google Maps, Trace View)**

- 1) Check if the system lost GPS signal (Open the Collect window then GPS Options to check the satellite reception).
- 2) Disconnect hardware and reconnect hardware.
- 3) Check that all cables are securely connected.
- 4) Check power source for consistency.
- 5) If using a Topcon system, review the MC-R3 rover settings for accurateness.

### **The Camera is not taking color pictures**

- 1) Choose another pre-formatted option (Low, Medium and High Resolution).

#### **Advanced User Options (Custom Resolution)**

- 1) The camera settings can be found under the Collect window in System Settings.
- 2) Go to the Camera Settings tab
- 3) Open Advanced Camera Settings
- 4) Review Custom Video Mode to affirm that Raw 8 is the pixel type.
- 5) Select Standard Video Mode
- 6) Select the button for resolution and pixel type to be Y8 (Raw 8) and 1280x960.
  - a. Once this change is made the preview will also be in color