California	Kansas
1845 Industrial Drive	307 Plymate Lane
Auburn, California 95603	Manhattan, Kansas 66502
Telephone: (530) 885-1482	Telephone: (785) 539-6305
Facsimile: (530) 885-0593	Facsimile: (415) 358-4340

SURFACE SYSTEMS & INSTRUMENTS, INC. smoothroad.com

Custom Test Equipment • Mobile Technology Solutions • Inertial Profilers • ADA Compliance • FF/FL Testing

Profiler V3 Operation Manual
CS-9100/9300/9400
Version 3.3.8.0.

Hardware Design & Fabrication	Sales & Administration	Electronics & Software
1845 Industrial Drive	P.O. Box 790	307 Plymate Lane
Auburn, CA 95603	Larkspur, CA 94977	Manhattan, Kansas 66502
Tel: (530) 885-1482	Tel: (415) 383-0570	Tel: (785) 539-6305
Fax: (530) 885-0593	Fax: (415) 358-4340	Fax: (785) 539-6210
Email: info@smoothroad.com	**Email:** info@smoothroad.com	**Email:** info@smoothroad.com

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Data Collection

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.

Storage

Truck Mounted Inertial Profilers

When the inertial profiler is not in use remove the lasers and store them in a dry, shock protected place. This will protect the glass sensor windows that are commonly damaged by rocks. Remove the DMI (Distance Measurement Interface) when the IP will not be used for long periods of time or during long distance traveling.

Lightweight Inertial Profilers

Place the lightweight profiler on stands with the wheels elevated off the ground. This will ensure that the wheels remain true and round. Remove the lasers and protect them in a shock proof case when not in use. When parking the lightweight in a trailer or truck bed, focus on the DMI and the front of the cart so they are not damaged.

System Setup

Run as Administrator (Windows 7)

Certain laser models with ethernet connection require Profiler to be run as Administrator. Go to the Desktop, right click on the SSI Profiler icon and select the "Compatibility" tab. At the bottom of the window under "Privilege Level", select the check box for "Run this program as an administrator."

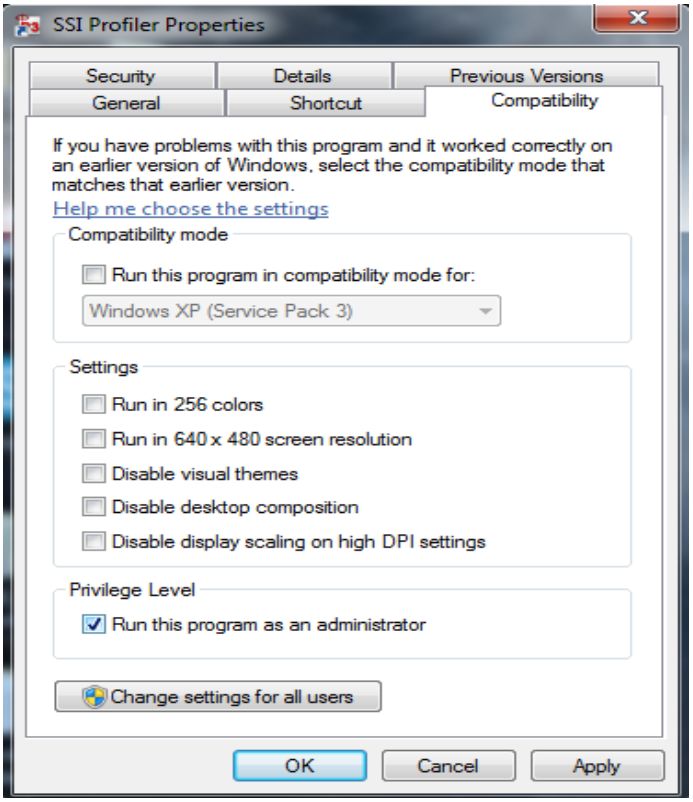


Figure 1: Compatibility window for running Profiler software as an administrator in Windows 7.

Run as Administrator (Windows 10)

Certain laser models with ethernet connection require Profiler to be run as Administrator.

Right click on the Profiler V3 icon ‘P3’, go to More>Open File Location.

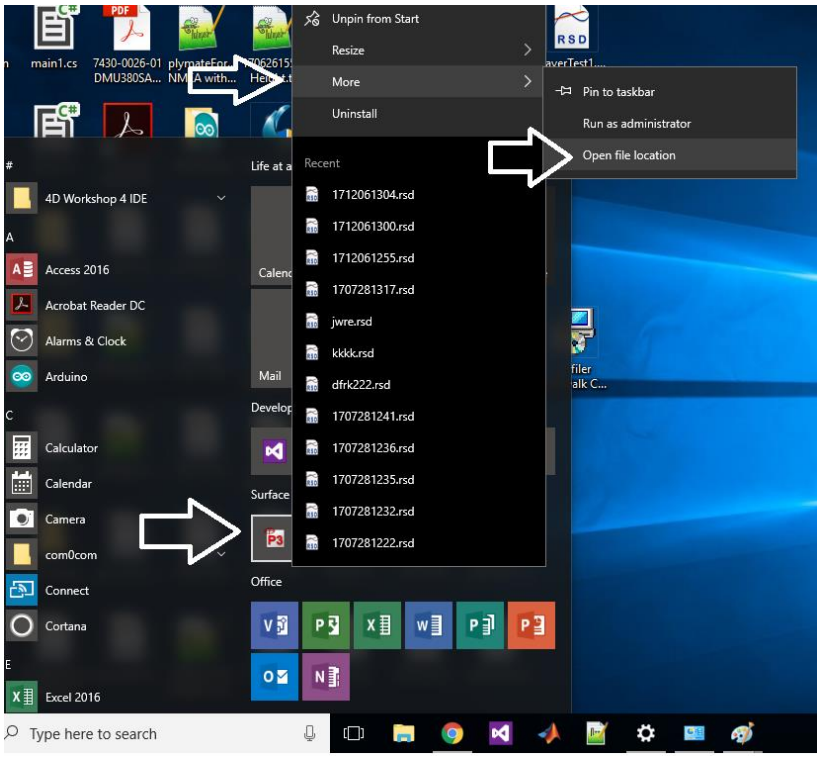


Figure 2: Searching for Profiler V3 program file.

Right click on SSI Profiler shortcut, go to properties

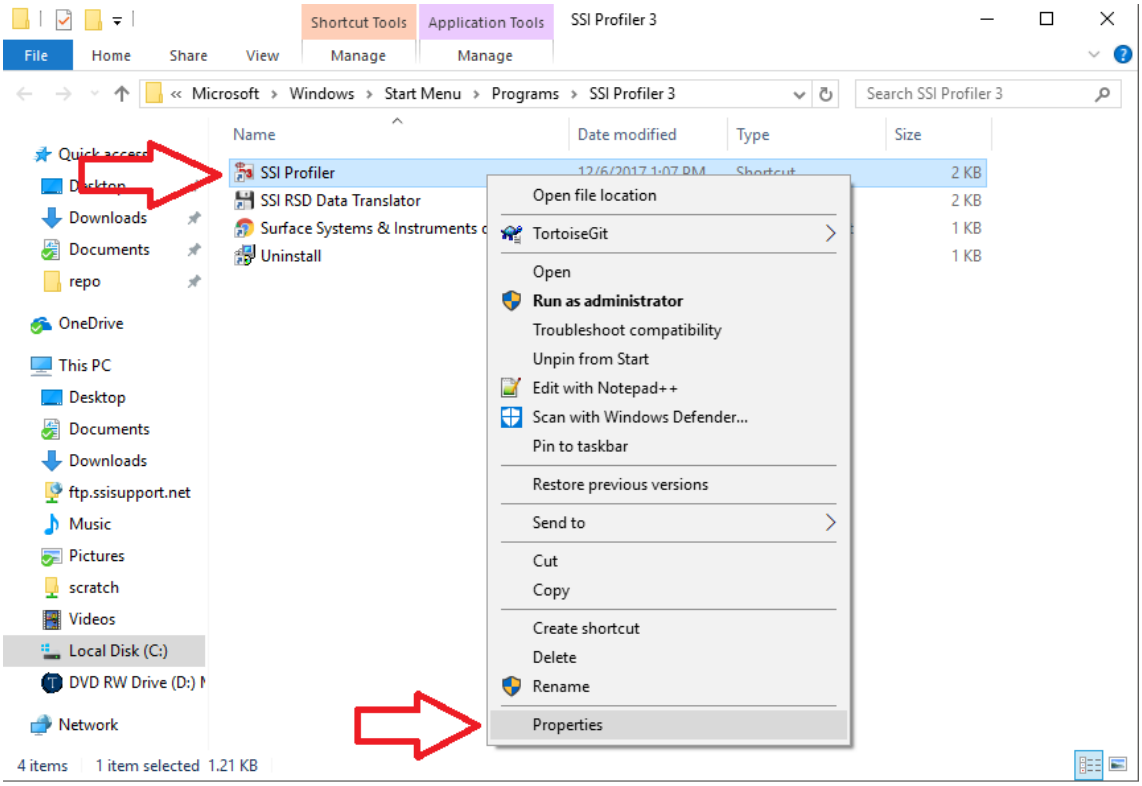


Figure 3: Selecting ‘Properties’ from drop down menu.

In Shortcut tab go to Advanced... Check ‘Run as Administrator’ and then ‘ok’.

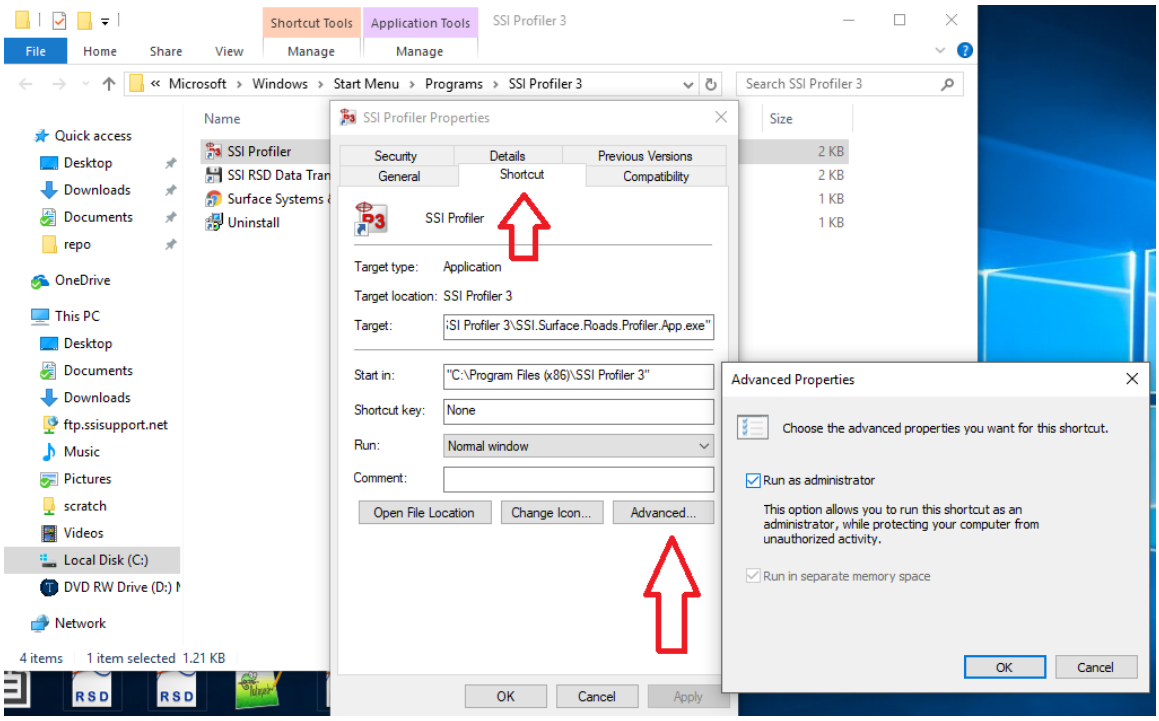


Figure 4: Check ‘Run as Administrator’ in the Short Cut tab.

Click ‘Continue’, in Access Denied window for Profiler to run as Administrator every time.

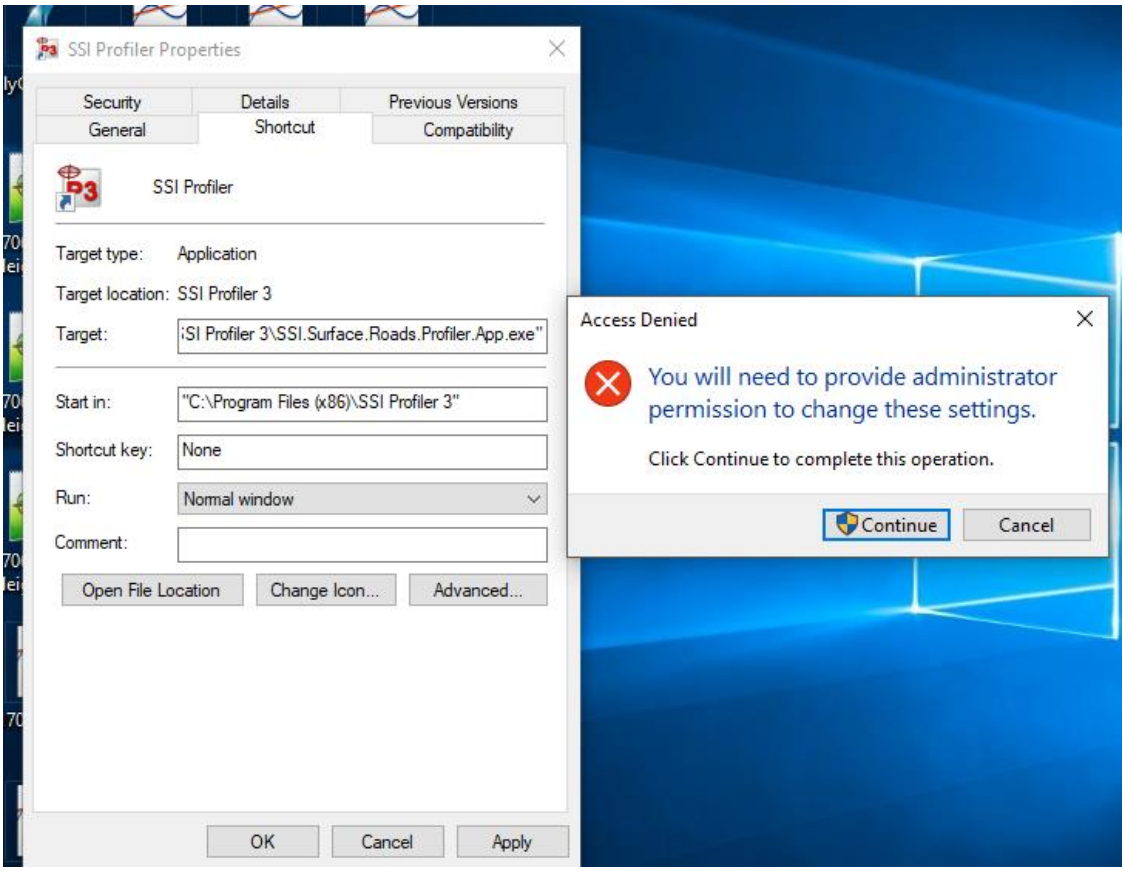


Figure 5: Click ‘OK’ and ‘Continue’ to confirm and run Profiler as Administrator.

After setting Profiler V3 to run as Administrator, a popup with appear every time you open the program. To get rid of the popup search "user account control" and set to "never notify" (this is

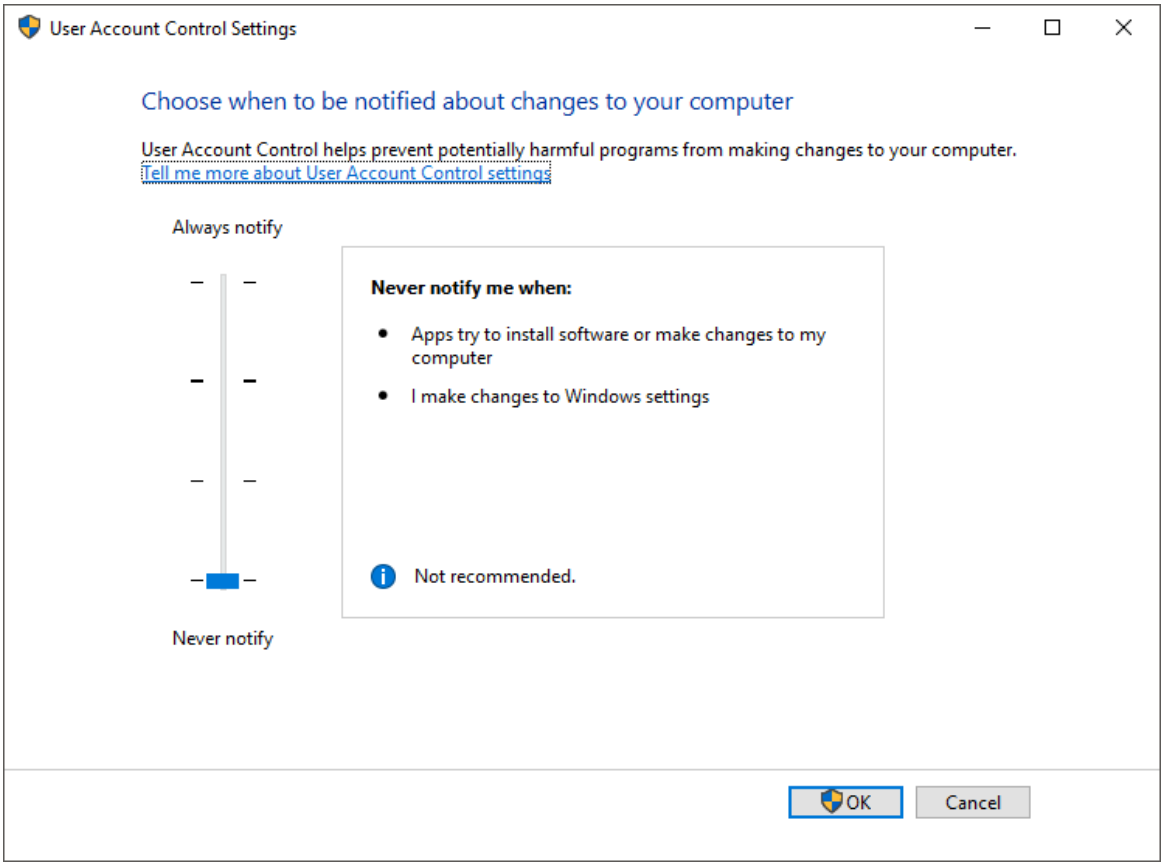


Figure 6: Window for disactivating notification of changes to computer.

Optional)

Note: The settings.xml file goes in C:\Users\SSI PROFILER\AppData\Roaming\SSI\SSI.Surface.Roads.UDP.LaserRec

DMI Assembly

The installation of the DMI encoder assembly to the vehicle rim is the initial step of distance calibrations. If the vehicle is a Polaris 570 the DMI may be embedded and does not require assembly. Install the supplied collets onto the lug nuts of the vehicle. The collet assembly includes the collet, the housing and a machined bolt with both male and female ends. Space the collets depending on the number of lug nuts. For a six-lug wheel, use three collets in an approximately equilateral triangle formation. For an eight-lug wheel, use a square collet formation. There are machined numbers on the internal ring of the DMI disk to determine to correct placement and number of collets. The design of the DMI forces the collets to center themselves if the collets are in the correct position. If the DMI is installed off-center, the vertical movement of the position pole will be large. The wire harness for the encoder can be tied to the vertical position pole to avoid damage from tangling with the vehicle. Keep slack in the wire at the top of the pole using gear ties or zip ties so there will be no tension on the wire. To install the position pole correctly, insert the pole into the delrin guide attached to the vehicle body before attaching the DMI disk to the lug extenders.

Figure 8: The DMI pole and receiver

Figure 7: The DMI wheel attached to an 8-lug vehicle with a 4-lug extender configuration.

Main Electronics Housing

CS9300 Bumper Mount

The main housing for the 9300 systems is mounted to the hitch receiver. The 9300 hitch receiver is bolted to the back plate of the housing. The height of the profiling system can be adjusted through the machined slots on the hitch receiver. The laser heights can be changed by adjusting the dovetails mounted on the laser plates by loosening the ½ inch set screw with a ¼ inch allen wrench. The receiver hitch bolt is used to secure the system to the vehicle along with the supplied receiver tube brackets. The thicker end of each bracket is bolted against the white receiver tube. Always use both brackets and the receiver bolt to mount the profiling system. If the brackets are mounted backwards, the face of the brackets will not be parallel to the walls of the vehicle's hitch receiver. Power to the main housing is supplied by the seven pin connection through the trailer wiring. To determine if power is reaching the profiling system, check the LED at the top of the housing. The LED will illuminate when power is being supplied.

CS9300 Hitch Receiver Mount

The hitch receiver tube is connected to the vehicle using the hardware supplied with the system. There will be four 5/16"-24 bolts supplied with the system that mount the receiver tube to the aluminum back plate. The supplied bolts and bracket for the hitch receiver are oriented so that the thicker end of the brackets are in contact with the profiler's male end of the receiver tube. This assembly can be seen in **Error! Reference source not found.**.

Front Mount Hardware

When the system is mounted to the front of the vehicle by the tow-hook mounting tubes, there are six bolts supporting the system; four 5/16"-24 bolts (1/2" wrench) and 2 U-bolts at the ends (9/16" wrench). The U-bolts are paired with the plastic sleeves. Make sure that the system is as level as possible when attaching the U-bolt supports.

CS9100 Mid Mount

The main electronics housing is mounted under the back seat for the CS9100 mid-mount profiling systems. The laser heights can be changed by adjusting the dovetails mounted on the laser plates by loosening the ½ inch set screw with a ¼ inch allen wrench. Power to the housing is supplied by a 12V DC cigarette lighter plug. When power is reaching the housing the blue LED will be illuminated.

Note: Connect the Amphenol harnesses to the housing without torsion being applied to the wire. Turning the entire harness instead of the threaded connector will break off the soldered wires within the harness.

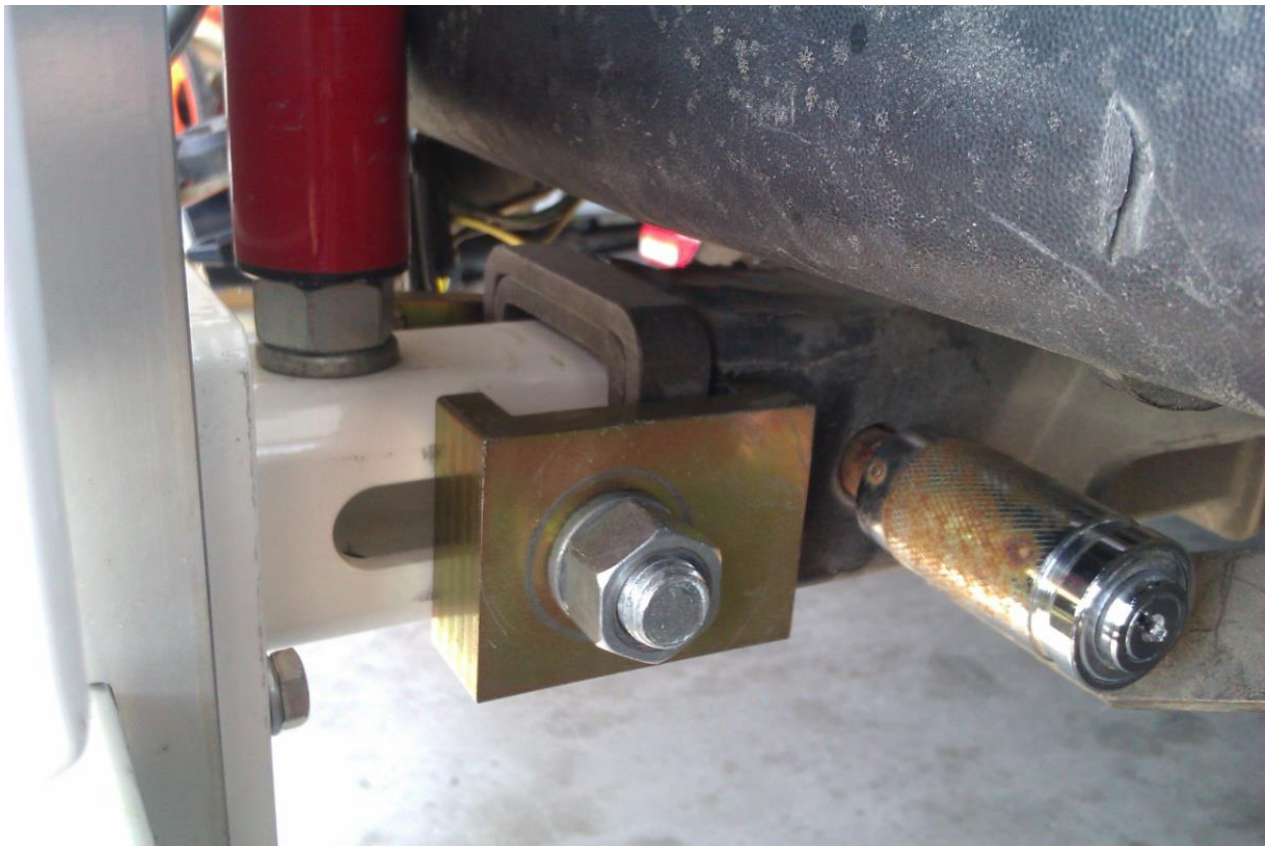


Figure 9: The hitch receiver mount with lock brackets.

Connecting Hardware

During assembly, connect the serial cable coming out if the pelican case or the white housing (6 pin amphenol) to the computer's DB-9 serial port. Once the program is opened and Collect is selected the software will search for hardware.

Disconnecting Hardware

If the hardware, lasers, GPS, and DMI do not need to be used while the system is connected through the serial port then the operator may use the Hardware Disconnect button at the bottom right of the collection screen. To reconnect the hardware again, select Collect and the software will search for hardware.

Figure 10: The LED power indicator

GPS Setup

Models with high resolution GPS for survey and cross slope applications may have additional steps to set up GPS. For all internal GPS receivers built into the SSI electronics the operator will use the USB cable to send commands. Otherwise, the commands will be sent through a serial or USB cable directly connected to the GPS receiver. If the receiver is powered on and connected with no signal, the SSI Profiler program wil display "No GPS Signal."

9350 Survey System

The survey consists of three key components: base station receiver with tripod, pole with receiver and the rover or embedded GPS board. The base station is the main transmission point. It receives static GPS points for corrected GPS. The position of the profiling system is referenced off of the base station to determine the corrected GPS coordinates.

Note: The base station in not needed for profile smoothness data. It is used only to receive corrected GPS for survey data.

The GPS pole is secured by threading the pole to the bracket mounted to the backside of the white housing. The cable from the antenna receiver is connected to the rover or SSI electronics box. If no GPS signal is found, make sure the baud rate for the GPS receiver is matching the SSI electronics at a rate of 9600, 38400 or 115200. This can be changed in the GPS manufacturer software. For more assistance contact SSI Support.

Novatel GPS Setup

The Novatel GPS receivers used on the CS7900 and most high and mid-resolution GPS options have multiple platforms for programming. Contact SSI if you are unsure which system you have and the electronic limitations. Novatel systems can be mounted as stand-alone receivers, embedded inside the SSI electronics or mounted in a self-contained Pelican case as in the CS7900. If the receiver is embedded within the SSI electronics housing do not attempt to open the electronics or program the board. Contact SSI for a technician assist. All external receivers (Flex2, Flex6 and Span-CPT) can be programmed through a USB or direct cable.

Inertial Systems With Novatel External GPS Receiver

These systems run at 10Hz with a GPGGA string through the serial port on the outside of the White SSI housing. If the receiver needs reprograming, enter the following commands in Putty or Novatel Connect. You should see an "OK" after each command is entered.

1) unlogall
2) com com1 38400 n 8 1 n off on
3) log com1 gpgga ontime 0.1
4) saveconfig

Note: Newer systems with the latest firmware have a baudrate of 9600. Note the baud rate in which you connected to the receiver and use the same number.

CS9300 Bumper Mount GPS Setup

Measurements must be taken to set up the GPS in order to accurately pinpoint the defects detected by the inertial system. For this process a tape measure is required. There is only a need to re-measure when the system changes dimensions or changing the vehicle host. A new dimension is mainly from a change in the length of the arms from disassembling the system for storage. The measurements are from the left laser (track 1) to the center laser (track 3), from the track 1 laser to the track 2 laser, and the elevation measurement. The elevation measurement is the distance from the bottom of the center laser (track 3) to the top of the GPS pole. The top of the GPS pole does not include the antenna and is only to the end of the cylindrical pole.

The "GPS Distance Forward" is the distance from the center laser to the GPS antenna going from back to front of the vehicle for rear mounted systems (it is a positive value when the GPS antenna is closer to the front of the vehicle than the laser). For front mounted systems, this measurement is from front to back of the vehicle (it is a positive value when the GPS antenna is closer to the vehicle's body than the laser).

Trimble 5kHz GPS

The Trimble GPS system is fully integrated to the profiler system. The coordinates will be found when the collection program is initiated as long as the GPS antenna is not obstructed. The GPS coordinates will be shown in the Main Collection Window beneath the status bar. Details about the GPS system and the coordinates of the system can be viewed by selecting the GPS Details icon. The electronics is searching for GPS signal when the GPS status bar displays, "No GPS Signal."

Arm Adjustment and Laser Placement

The arms or dovetails of the profiling system can be used to move the lasers over the tracks that need to be profiled. To adjust the arm length on the CS9300 and CS9350, all three brackets must be loosened, a total of four bolts. If the profiling system has three lasers, the center laser is mounted in front of the center 2 bolts. To adjust the arms, the center laser must be removed so that the two bolts at the center of the system can be accessed. The laser heights (vertical distance to the ground) can be adjusted through the receiver tube plate or the dovetails mounted to the laser plates. The dovetails are secured by tightening the 1/2“set-screw which acts on nylon bushings to compress the dovetail pair together.

High standoff spot lasers (Selcom SLS5000 325/400) have a recommended height of 15 inches above the ground. The range is plus or minus four inches of the recommended height (±4 inches).

The Selcom RoLine 1145, LMI Gocator 2342, and the Selcom low standoff (Selcom SLS5000 200/300) lasers have a recommended height of 11 inches above the ground. This is the reason the RoLine three laser systems use a low standoff spot laser in the center track (Track 3). The minimum height above the ground is 200mm or 7.8 inches. The height range is between 7.8 and 15 inches.

Gocator 2375 high standoff infrared lasers should be mounted 26 to 78 inches above the ground.

Be aware of the minimum laser range when performing the height verification. Always place the lasers at the correct height. Be aware of your systems laser type if you fail the height verification. The operator can view the laser type when System Settings is selected.

Even if the laser configuration is set to auto detect, review the laser type under system settings to confirm its accuracy. The laser type can be reviewed under the Collect Window, after selecting the System Settings icon.

To adjust the height of the lasers, loosen the set screw in the center of the female dovetail with a ¼ inch allen wrench. The set screw does not need to be completely removed. When tightening the set screw, do not over-tighten. The nylon bushing can be damaged when excessive force is used. Tighten the set screw so that the laser plate cannot slide vertically when pulled.

Figure 11: The vertical dovetail and laser plate assembly

For the CS9100 Mid-mount systems the operator must slide the horizontal dovetail outside the truck body to install the vertical dovetail and laser plate assembly. The horizontal and vertical dovetails of the mid mount assembly can be adjusted by loosening the set screw with a ¼ inch allen wrench. Set the laser height and spacing with this method. Only tighten the set screw so that the dovetails cannot move when firmly pushed.

Calibration

Distance Calibration

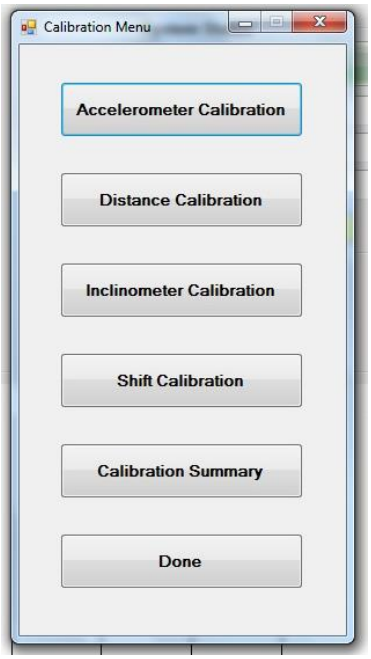


Figure 12: The Calibration Menu

A precise distance calibration is crucial to collecting accurate surface profiles. The distance calibration is traditionally performed on a tenth of a mile track (528 feet or 160 meters). The key component of the distance calibration is the DMI assembly and encoder. Prior to calibrating, measure a tenth of a mile track over an ideally straight, flat and clean area. Open the distance calibration within Profiler V3 and line the lasers on the starting line of the calibration track. Follow the calibration instructions to complete the distance calibration.

It may be necessary to perform multiple distance calibrations within a day of profiling. As temperature changes the air pressure within the tire also changes, modifying the wheel circumference. Whenever this happens, the collected data will become further and further from the actual distance depending on the temperature gradient and the distance traveled. If the distance seems to be deviating from the actual stationing, take the time to recalibrate.

Always calibrate on a straight 0.1 mile section of pavement at the speed you will be collecting.

Distance Calibration with the Electric Eye

If an encoder distance calibration is selected, a traditional distance calibration, not an electric eye calibration, will be performed.

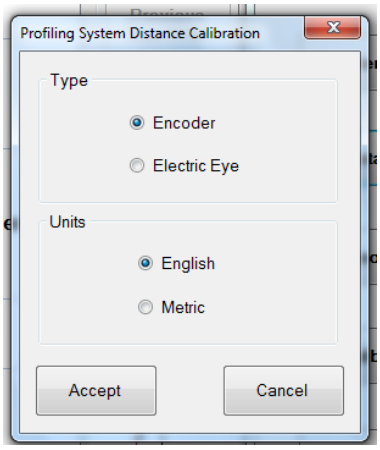


Figure 13: Distance calibration options

Distance calibrations can be completed quickly and efficiently by using the electric eye (EE) to mark the beginning and end of the calibration length. This feature requires two points with **DOT-C2** compatible reflective tape in range of the electric eye sensors. These two points should be at least 528 feet apart, or another distance given by the resident engineer. It is important that the two reflective tape stations are at accurate positions for the calibration track.

To begin the calibration, follow the message prompts in the instruction window. Select "Next" and drive past the start position electric eye to begin the calibration. After the EE begins the calibration, an estimated distance will be shown (do not be alarmed if the distance is way off from the actual distance). Near the final reflective tape location, arm the EE by selecting "Next" again. The calibration will finish when the EE is triggered. The user will then be prompted to enter the actual distance traveled.

Averaging the counts with previous calibration is a way to reduce error. The average of two correctly calibrated runs will be more accurate than a single calibration run. Even so, this feature is not required since one accurate calibration will work for the distance calibration. When the information is entered the distance calibration may be started. Select accept to end the distance calibration.

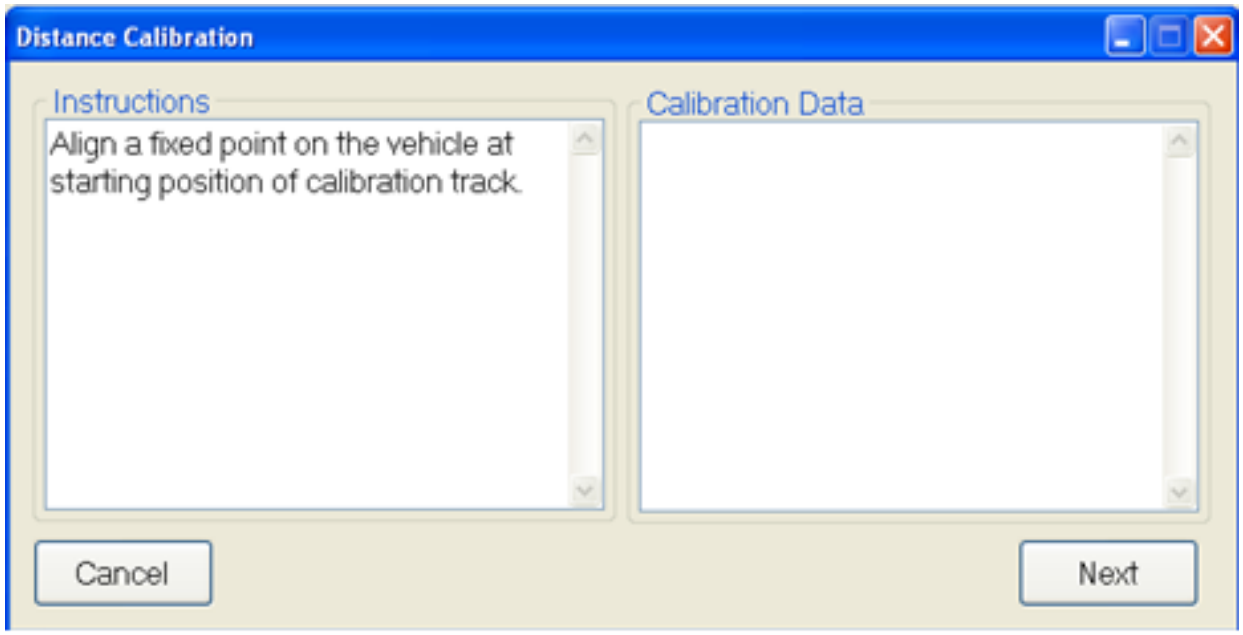


Figure 14: The first step towards a distance calibration

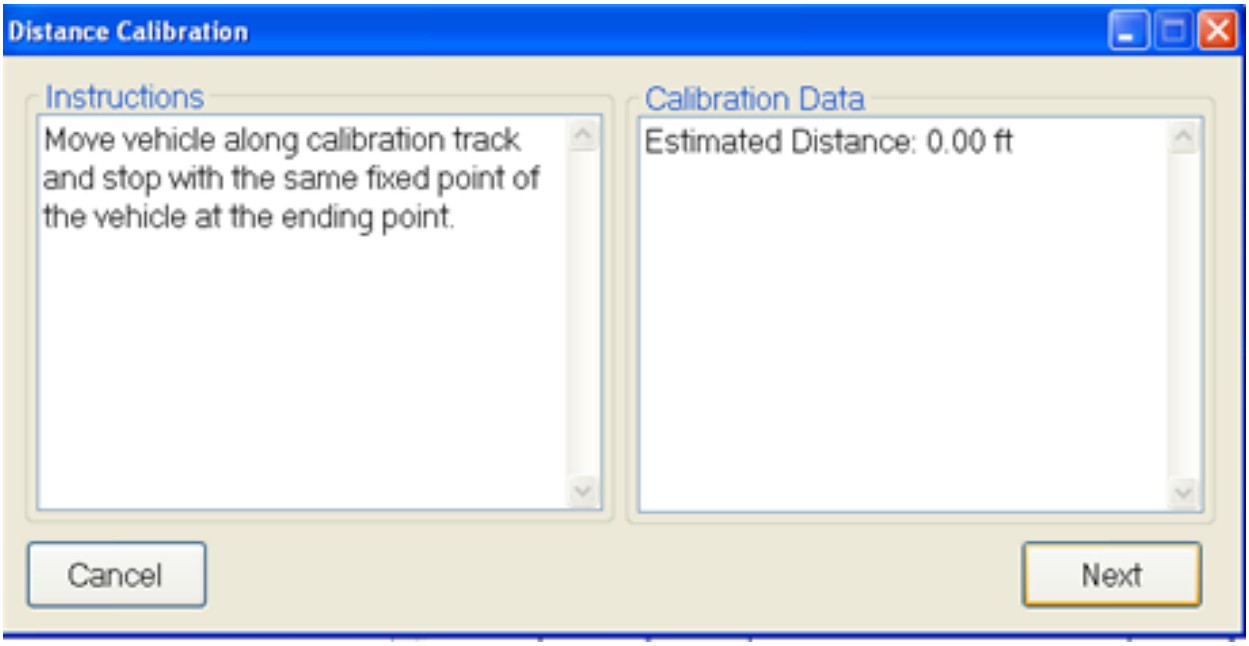


Figure 15: To end the calibration, align the lasers (or other fixed point) on the end line

Accelerometer Calibration

The accelerometers are an important component of the inertial profiling system. They are used to determine the vehicle chassis' vertical motion. The vehicle's vertical motion is then subtracted from the laser readings to determine the profile of the surface (integrating this data with the distance encoder readings). It is important that the accelerometers are calibrated properly and their position on the profiler is constant and correct. The accelerometers should always be in the

upright position except during calibration (Accelerometer is upright when the arrow etched in the accelerometer on the opposite side of the wire is point up). If the accelerometer is oriented in any other way the data will be incorrect. Be aware of any vibration in the laser or accelerometer hardware. Vibration will cause anomalies in the data.

Note: Both accelerometers are calibrated at the same time. Make sure the vehicle is off (no vibration) and on a level surface. To calibrate the accelerometers start with both in the upright position (they should already be in this position). Follow the instructions on the computer screen to complete the calibration. The accelerometers will be rotated from upright, to upside down, to on their side and finally returning upright again to complete the calibration.
When placing the accelerometer on its side during calibration, the wire may face either up or down.

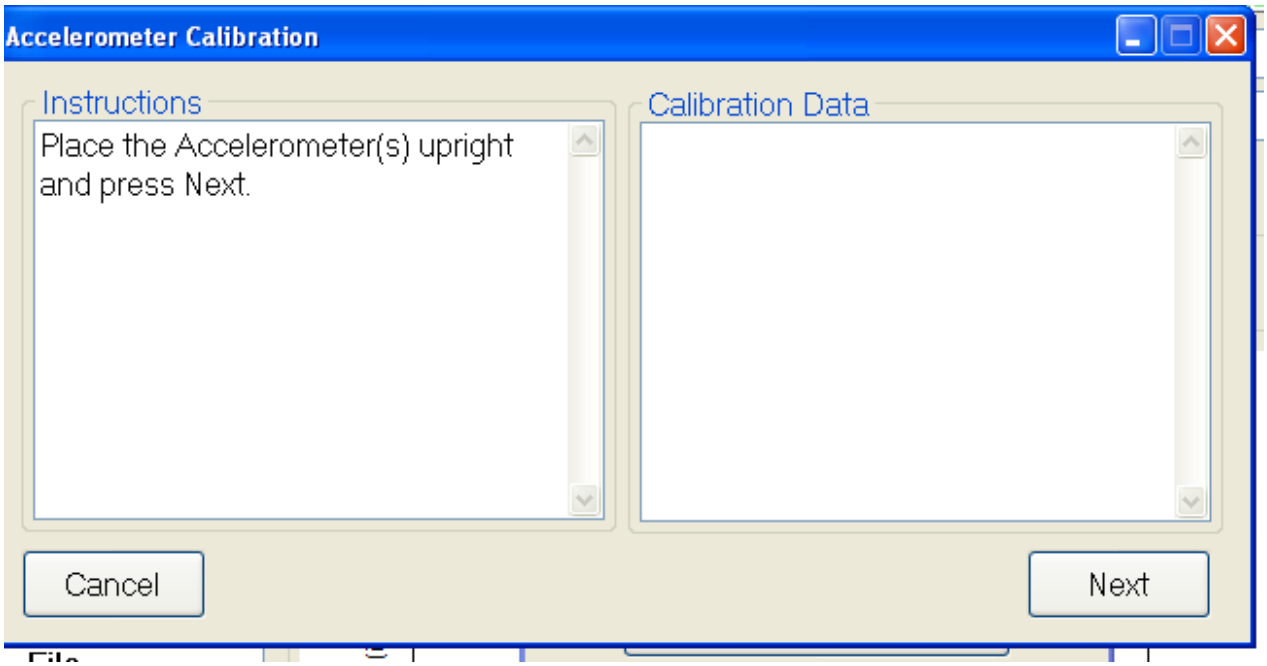


Figure 16: The first step of the accelerometer collection

Calibrate all of the accelerometers at the same time. The calibration is to begin with the accelerometers in the upright position. This is the normal functioning position, the position the accelerometers should be in during collections.

Figure 17: The upright accelerometer position

Figure 18: The accelerometer upside down

Figure 19: The accelerometer on its side

Inclinometer Calibration (If Equipped)

The inclinometer is used to calculate the cross slope of the profiled surfaces. All of the survey systems are equipped with some type of incline measurement device. The inclinometer is located under the grey electronics box inside the white housing or is embedded within the electronics housing. ***For the inclinometer mounted UNDER the grey box, the lead wire of the inclinometer is always pointed in the direction of forward travel for the vehicle. The high side of the angled block always faces the passenger side.***

Dual Axis Inclinometer Calibration

The initial step is to level the white housing when it is mounted on the front or back of the truck (or level the entire truck if the inclinometer is mounted to the truck body like on the mid-mount system). For survey systems, set the straight-edge below each of the lasers and use the bolts to level the bar. Set the inclinometer on the flat block ***while the entire system is level***. When prompted, enter the step block's unique angle. Follow the on screen instructions and move the inclinometer to the angled block (having the wire face the same direction of forward travel). Then remove the inclinometer and replace on the flat plate when prompted. Never move the vehicle while calibrating the inclinometer. Once the inclinometer is calibrated correctly, secure the inclinometer to the flat plate with the thumb screws.

The ***entire*** system must be level during an inclinometer calibration. For bumper-mount systems the white housing must be level. If the inclinometer is mounted to the truck chassis, the entire truck must be level. ***For three laser systems the level straightedge is required***. This level straight-edge is used to notify the system what the lasers see as a level surface. This information can be used with the inclinometer information to calculate the differences on slope for the profile data. The level straightedge is not needed for the dual or single laser systems.

At all times the high side of the angled calibration plate faces the passenger side and the wire of the inclinometer faces the direction of forward travel of the vehicle.

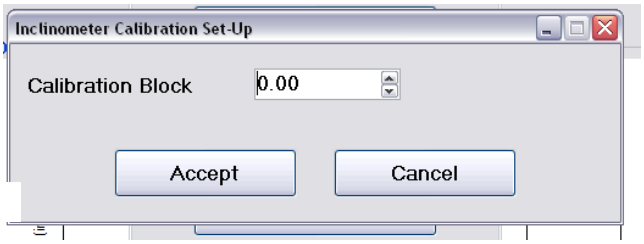


Figure 20: Window to Enter Inclinometer Angle

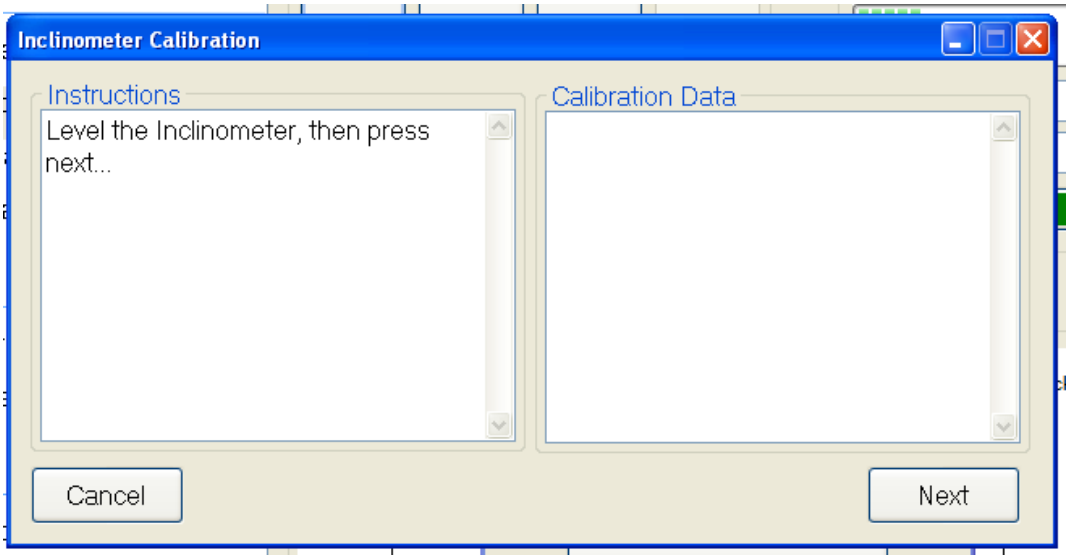


Figure 21: The inclinometer must be level before starting the calibration

The housing and the surface the lasers act on must be level. Use the straight edge with the bubble levels and bolts to level the surface the lasers act on.

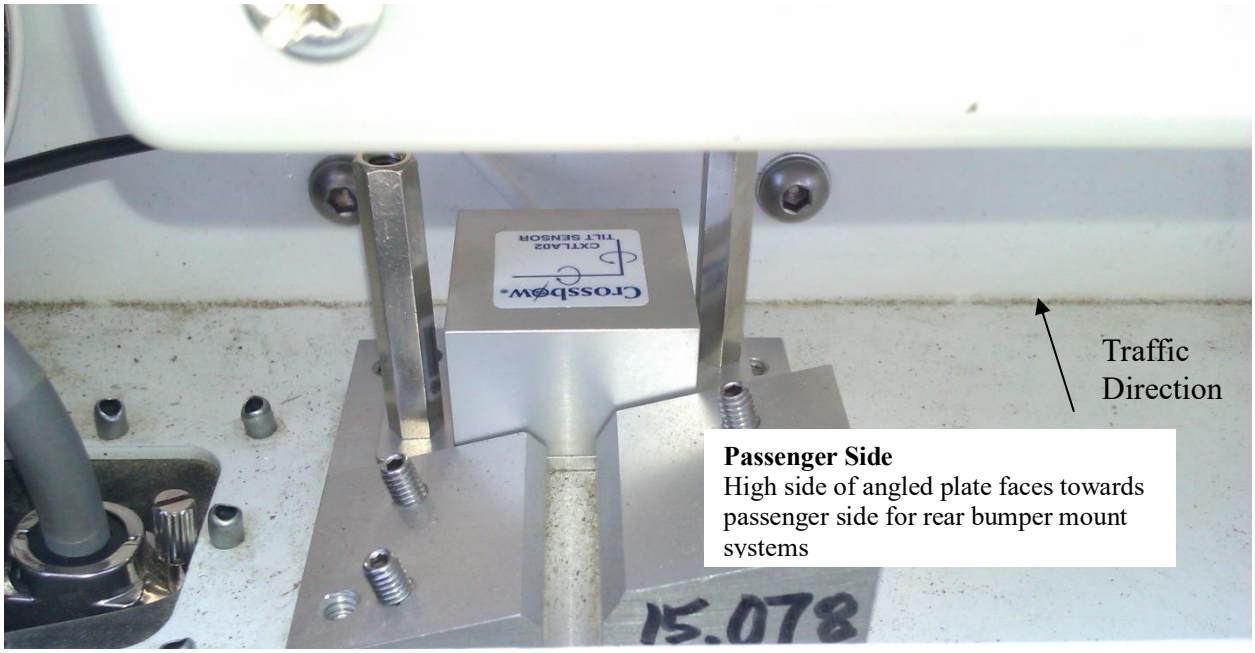


Figure 22: The inclinometer on the flat plate for a rear-mount.

Figure 23: The inclinometer on the angled plate for a rear-mounted system

Figure 24: A three laser system with a level straightedge for inclinometer

IMU Cross-Slope Calibration

The embedded IMU sensors are the high-resolution solution to measure cross-slope. All of the IMU sensors are controlled by the SSI UDP collector; a variant of the SSI Profiler program. When calibrating the IMU the first step is to align it with the satellites so the UDP collector displays, “Solution Good” with a low standard deviation. Once aligned the IMU must be leveled. This can be adjusted by getting close to zero on the UDP collector roll value and turning the tires of the vehicle. Once the IMU’s roll value is rapidly changing between negative and positive, place and

level a bar under all lasers. This is the level reference for the system. At this point you may run through the SSI calibration program under the calibration menu.

Transverse Calibration

The transverse calibration sets the Gocator 2375 transverse lasers at the correct offsets to measure a level line. ***This calibration is required only when the supporting hardware is changed or adjusted.*** This calibration shall be completed on a flat, level floor or long, flat and level straightedge. The laser beam can be found by using an infrared card indicator. **Do not look into the laser emitter at any time when the system is on.** Level the truck and IMU (if applicable). The calibration will first level all of the lasers through the calibration menu. Follow the prompts on the screen and verify that the post-calibration graph is acceptable within tolerance.

A secondary calibration within the Gocator browser window may need to be completed if the lasers are moved or the frame and mounting position is adjusted laterally. The lateral calibration starts at an arbitrary number like 7000 for the X-axis value of the Gocator measurement output. From the browser window, the two adjacent lasers are turned on and an object is placed between the laser within the overlapping beams. The laser reading is fixed for the left laser, but the right value is adjusted until the objects coordinates match between the two lasers. Save all changes within the browser window. The Gocator IP address will be specific to the laser position and will be with your profiler documents.

Calibration Summary

The current calibrations for the inclinometer, accelerometers, and distance encoder can be viewed be selecting the Calibration Summary icon under the Calibration Menu.

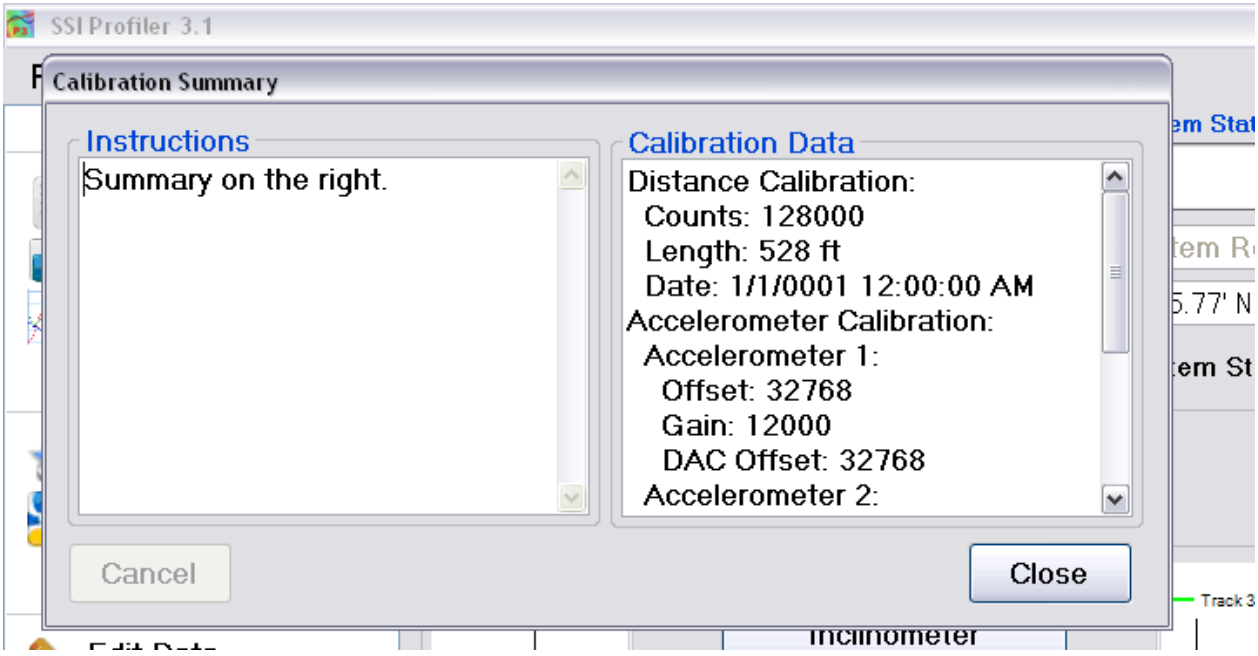


Figure 25: The Calibration Summary

System Settings

Laser Type

The laser type must be chosen within the System Settings. The choices are: Gocator/RoLine 1145, High Standoff Sport Lasers (Selcom SLS5000 325/400) and Low Standoff Lasers (Selcom SLS5000 200/300). If the system in your possession is a RoLine/Gocator three laser system, the center laser is a Low Standoff Spot Laser. If the laser type is saved incorrectly, the laser height verification will be inaccurate. If the laser height verification ever fails, review the laser type.

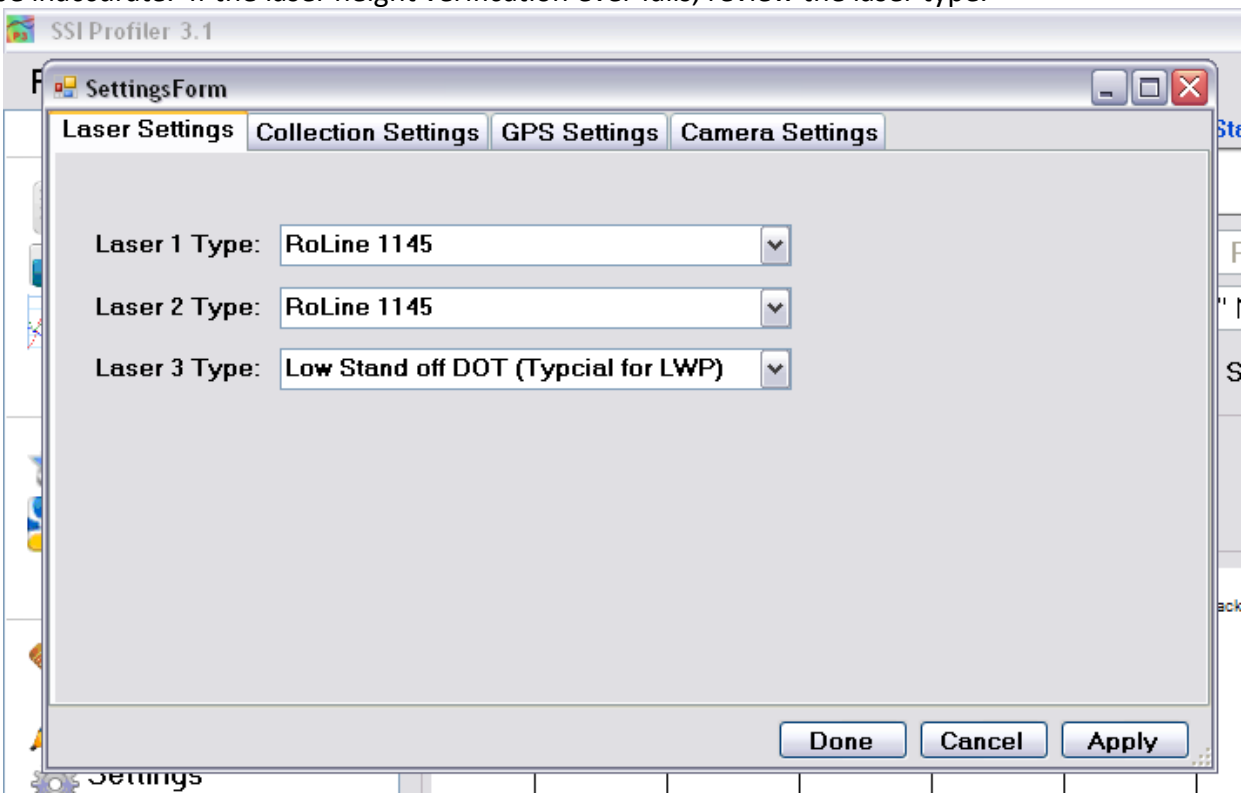


Figure 26: The laser type window for a Survey 3-Laser system

It is very important that the laser type is correct. Incorrect laser settings will cause inaccurate profiles and surveys. The inclinometer calibration will receive an error when the lasers are incorrectly set. The error will state that the laser heights differ more than 1.5 inches. Completing a height verification also determines the problem, which is resolved by changing the laser type to match the actual lasers.

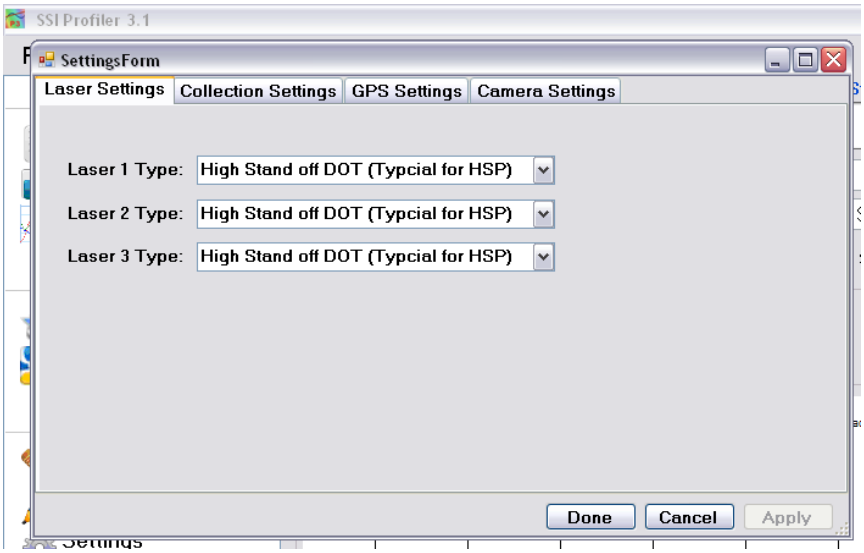


Figure 27: The HSP dot laser system laser options window

Collection Settings Tab

Simulated Travel is for troubleshooting and bounce tests. Simulated travel sends the system through a simulated profile collection without moving. Laser data is still collected, but real distance is not recorded. The sampling interval is the distance between measurements of the simulated travel option.

GPS Settings

The distance adjustments to make more accurate GPS data is found under this tab. Measurements must be taken to set up the GPS to accurately pinpoint the defects that the system detects. For this process a tape measure is needed. There is only a need to do this measurement when the system changes dimensions. A new dimension is mainly from a change in the length of the arms from disassembling the system for storage. The measurements are from the left laser (track 1) to the center laser, from the center of the track 1 laser to the center of the track 2 laser and the elevation measurement. The elevation measurement is the distance from the bottom of the center laser (track 3) box to GPS antenna.

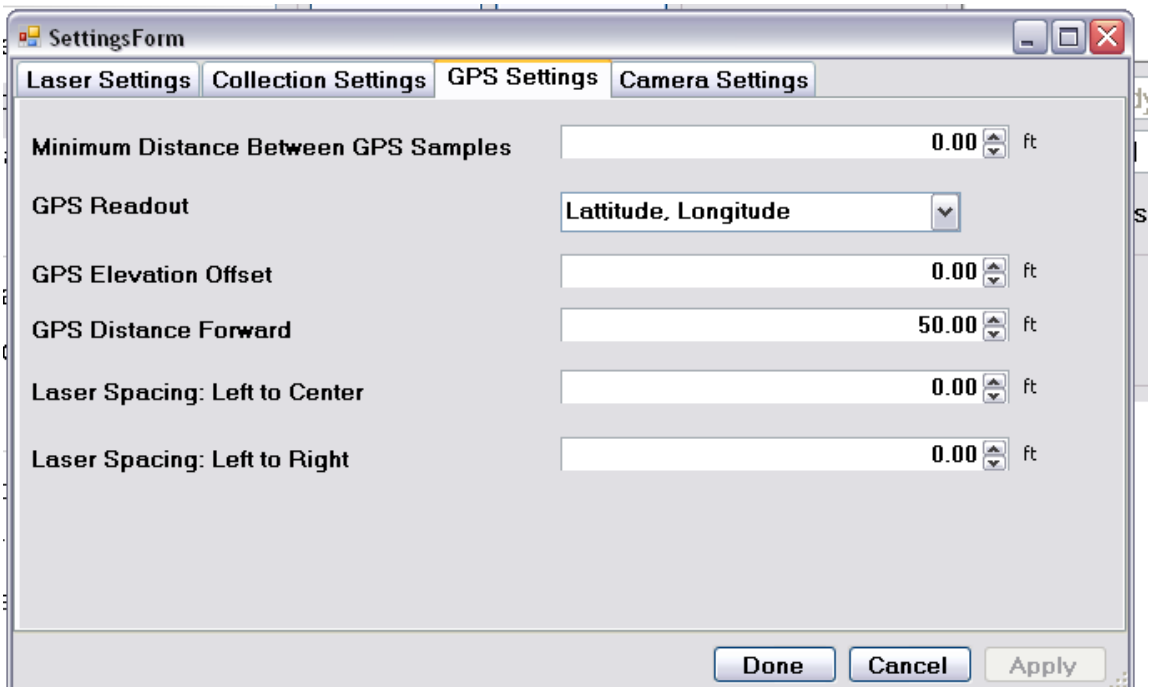


Figure 28: GPS setting window

The "GPS Distance Forward" is the distance measurement from the middle laser to the GPS antenna going from back to front of the vehicle for rear mounted systems (it is a positive value when the GPS antenna is closer to the bumper of the vehicle than the laser). For front mounted systems, this measurement is from front to back of the vehicle (it is a positive value when the GPS antenna is closer to the vehicle's body than the laser).

The distance between GPS sample should be left to the default value to collect the most accurate data. The default value in Profiler V3 is zero feet or meters. The GPS readout changes the GPS string in the collect window, ***not the GPS string within the reports***.

Camera Settings

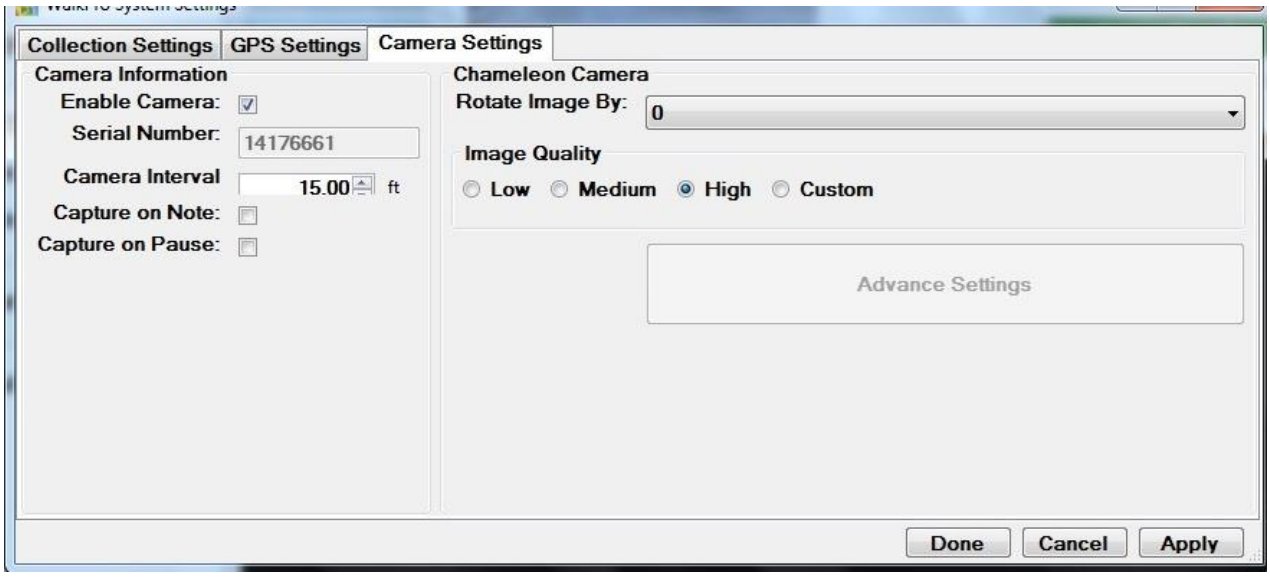


Figure 29: Camera Settings

How to Begin Using the Camera

Install the Flycap2Viewer driver located on the disk supplied by SSI (or already installed on the computer). The correct driver depends on if the computer is 32 or 64 bit. To check this, open the start menu and right click on My Computer (or My PC) and choose 'Properties'. On this window find the System Type and view if the system is 32 or 64 bit. If the computer is 32-bit, install the x86 flycap2viewer. If the system is 64-bit, install the x64 flycap2viewer. Once the driver is installed, plug in the Chameleon Camera to the computer's USB port.

Enabling Camera Settings

Once the profiling system is connected and the Collect tab is open, the operator can enable the camera. At this time make sure the flycap2viewer driver is installed and the camera is connected. Open the collect window and once the hardware is found, select System Settings. Under the system settings window, select the Camera Settings tab. To enable the camera feature select the check box under the Camera Settings Tab. The camera interval is the distance traveled between each picture. This can be set to any interval however, the more pictures taken results in more data saved to the computer and more time that post-processing will take. If the camera is not mounted upright, enter the correct rotation angle in degrees, selecting one of the four options. The camera is focused on the physical lens. Enter the serial number of the camera which is on the sticker on the back panel of the camera. Once apply is selected the camera will be found in under one minute for the first use. Once the settings are saved, the serial number will fade out, as seen below.

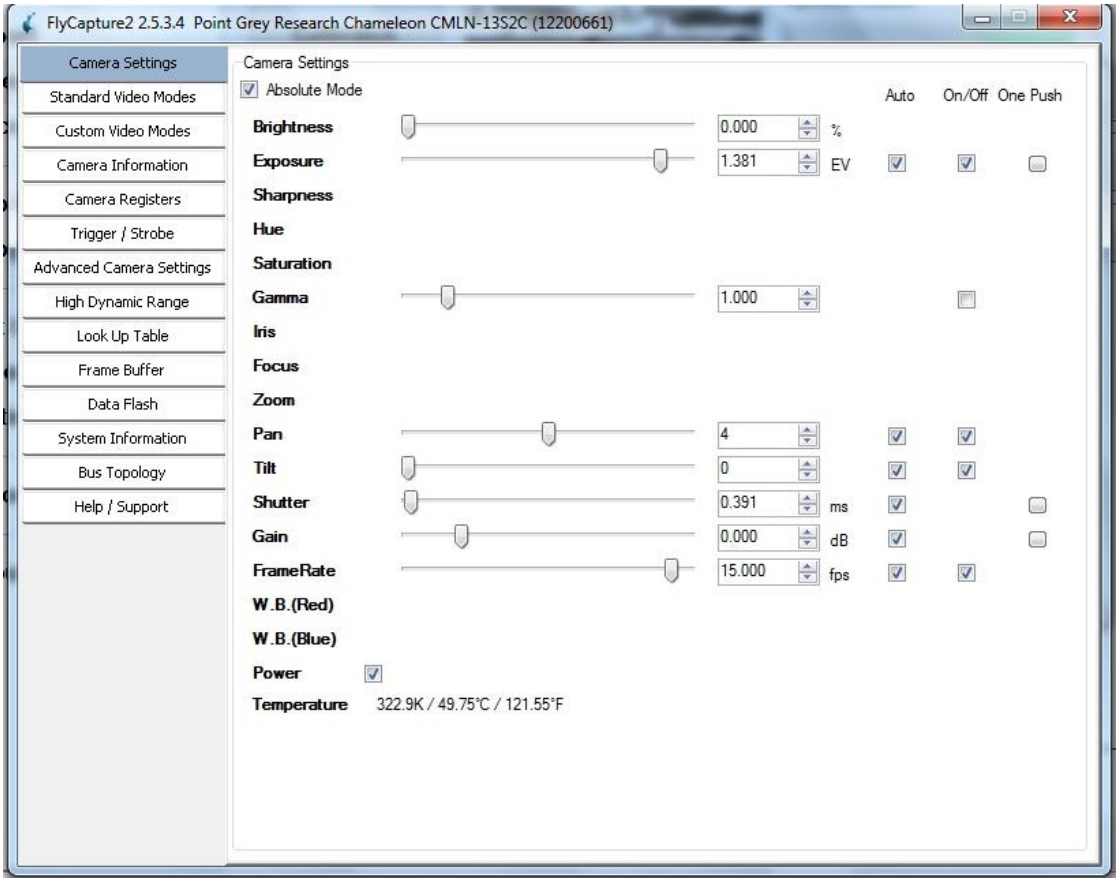


Figure 30: Advanced camera settings

The image preview should appear in the Collect window in color and at the correct orientation. If not, change the settings to the appropriate orientation or open the Advanced Settings.

To reduce the size of the image, change the resolution of the camera to 640x480. This will decrease the processing time and RSD file size. Under Custom Video Modes the operator can adjust the resolution and see the estimate of the file size.

Custom video modes can also be used to crop or adjust the viewable image area for each camera. There will be a red border for the active area for the camera. The user may adjust the height and top values to change the position of the camera frame. The end result should be to reduce the sky's influence on the picture to keep sunlight or other reflective surfaces out of the frame.

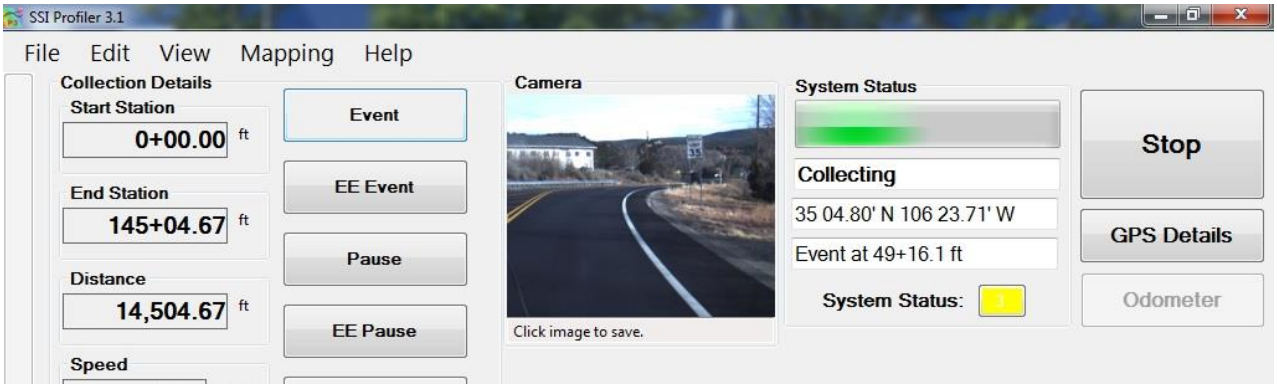


Figure 31: Camera Preview window in Collect Screen

Zero-Speed Systems Settings

Zero-Speed systems feature INS and additional laser sensors for stop and go inertial profiling in each wheel path. The Zero-Speed inertial profiling system collects longitudinal profiles like standard inertial profilers except that it allows you to collect accurate data through vehicle stoppages (stopping at stop signs, traffic lights, slowing down, and speeding up).

Set Up

(1) Connect associated RS-422 cable (for main electronics communication)

(2) Boot the system by going to collect button in Profiler (See main manual for Inertial Profilers).

(3) Obtain the IMU to GPS antenna offsets by measuring the distance from the IMU phase center to the GPS antenna phase center in the X, Y, and Z directions for each antenna. The IMU center can be found by locating the decals on the white housing, or separate INS enclosure. The GPS antenna phase center is described on a diagram on the antenna. The centrifugal center of the antenna is the X and Y center. The Z phase center (or L1 phase center) is located 0.050-0.062mm above the bottom of the antenna (where it meets the GPS mast) depending on the antenna used (These vary depending where the user mounts their antennas and where they mount the IMU or white housing.) *Note: Any changes made to the antenna offsets are not applied until the "Set Offsets" button in clicked*.

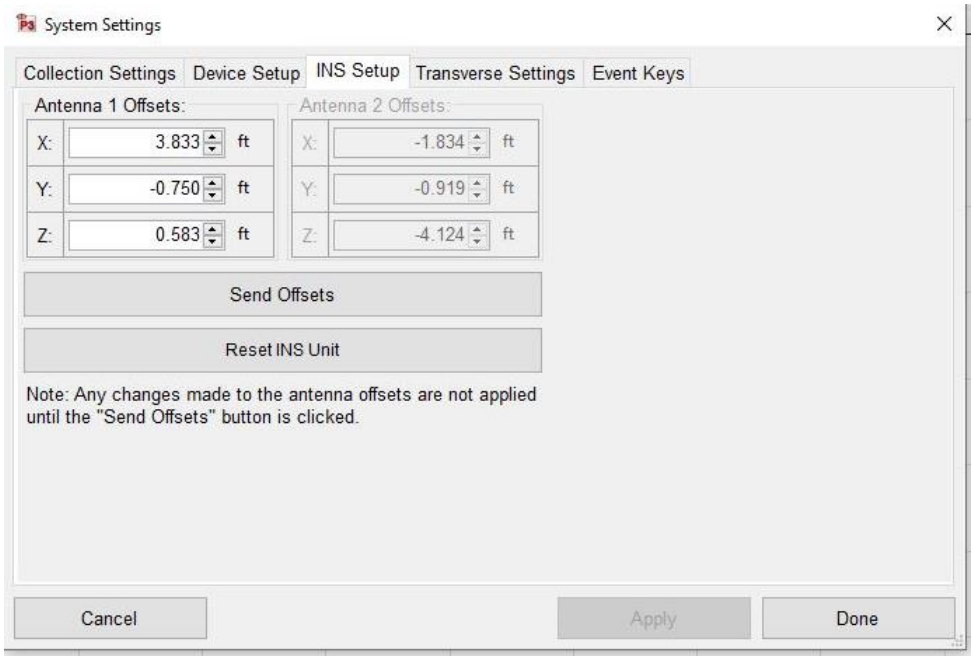


Figure 32. The INS Setup tab under Systems setting with Antenna Offsets entered.

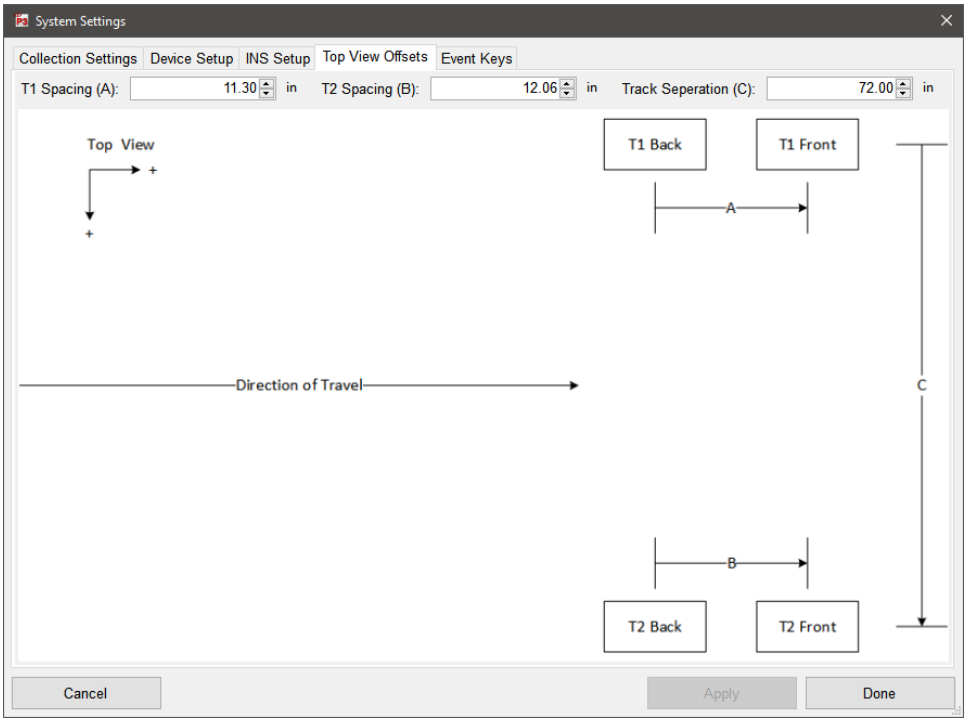


Figure 33. Top View Offsets tab in System Settings

(4) Enter the system offsets for the Left laser2 (Track 1) to Right laser5 (Track 2) Process A, and left laser2 to GPS antenna, Process E. Additional offsets can be entered for GPS height and GPS forward (Laser 1 to IMU phase center, Under side view. *Note. Process C and D including lasers 1 and 6 are only for Transverse systems. Mid-mount and 5 laser rut systems have their own diagrams.*

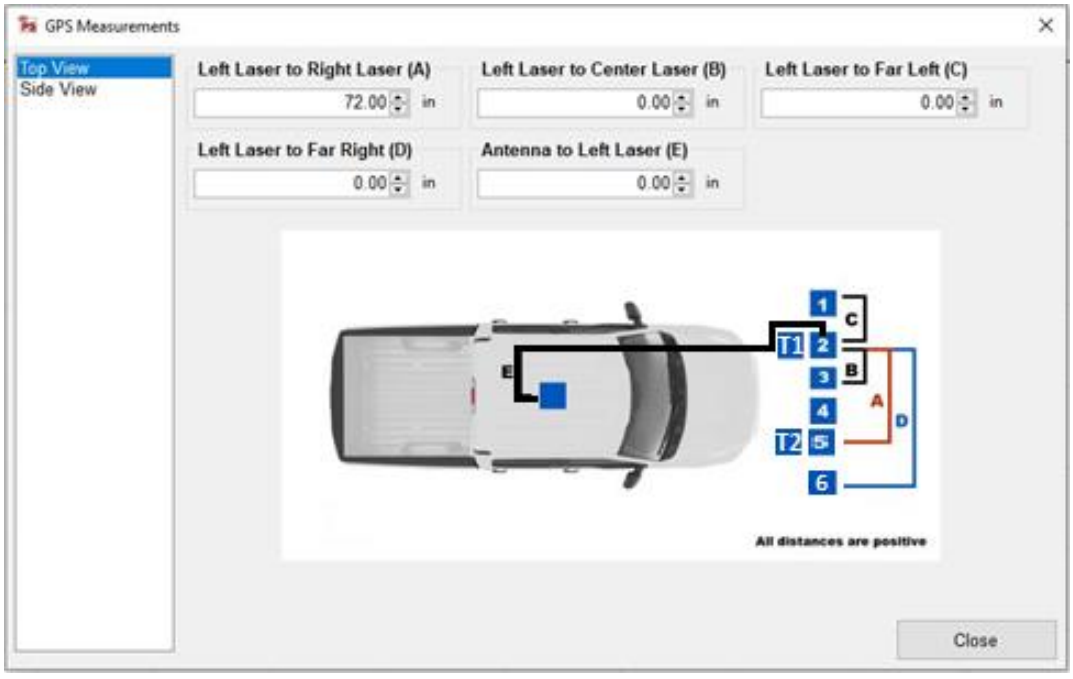


Figure 34. The Top View of the GPS Measurements window with values entered

(5) Make sure the Back to Front offsets between front and rear lasers are entered in the Device Setup. Also label where the accelerometer is mounted (with Front or Back laser).

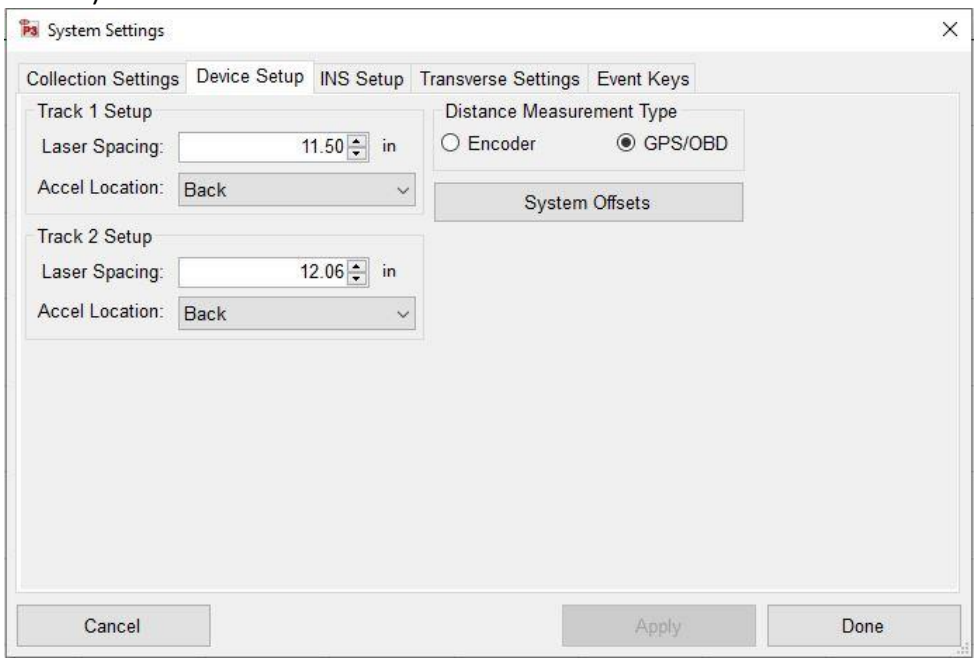


Figure 35. The Divice Setup Tab in System Setting with Laser Spacing and entered and Accelerometer Location selected.

(6) Perform the accelerometer calibration prior to doing any longitudinal profile collection (Please see the 'Accelerometer Calibration' section of the manual).

(7) Obtain GPS in open sky and allow INS solution to get to "INS Solution Good". For single-antenna systems, this may require driving the system around until alignment process is completed. Driving in figure 8s helps for single-antenna solution.

(8) After you have "INS Solution Good", you can park the vehicle on a level surface and perform the level calibration. **IMPORTANT: ALWAYS PERFORM THE LEVEL CALIBRATION BEFORE THE CLOSED LOOP CALIBRATION (Step 10). IT IS ONLY A RELATIVE CALIBRATION AND IS NOT TO BE USED FOR YOUR FINAL CALIBRATION OF THE SYSTEM.**

(9) You can then proceed by doing a distance calibration for the encoder (please the Distance Calibration section of the manual. If using GPS-DMI, you can move to the next step.

(10) The next and last calibration is the "closed Loop" calibration. **DO NOT PERFORM THE LEVEL CALIBRATION (Step 8) AFTER THE CLOSED LOOP CALIBRATION.** This calibration tunes the slope and pitch of the INS aligning it with

the lasers. Make sure the INS status is “INS Solution Good” and then perform the calibration by collecting in one direction, turning around, and then collecting in the opposite direction along the same exact lane. (Driver wheels where Passenger wheels were the first direction). To do this you will need a start cone at both ends of the track, but on opposite sides of the roadway. You will also need to know the exact distance between these two cones prior to starting the calibration.

a. At the end of this calibration you will be given a plot of the results. The operator can view the roll, pitch T1 and Pitch T2 profiles for the forward and reverse runs and make sure they are satisfactory before saving. It is good practice to do a second (or multiple) calibration(s) to verify yielding the same offsets.
b. **NOTE: DO NOT DO A LEVEL CALIBRATION AFTER THE CLOSED LOOP OR IT WILL DEGRADE YOUR “TUNED” CALIBRATION OF THE CLOSED LOOP.**

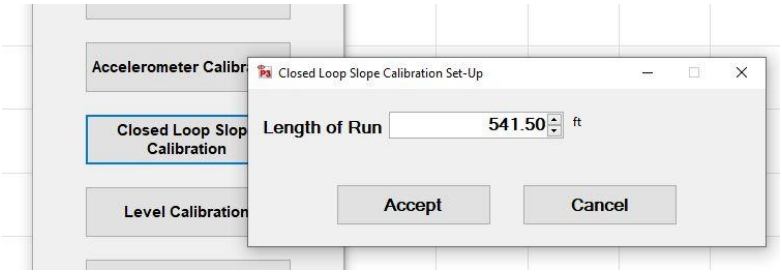


Figure 36. The Closed Loop Calibration Set-Up window

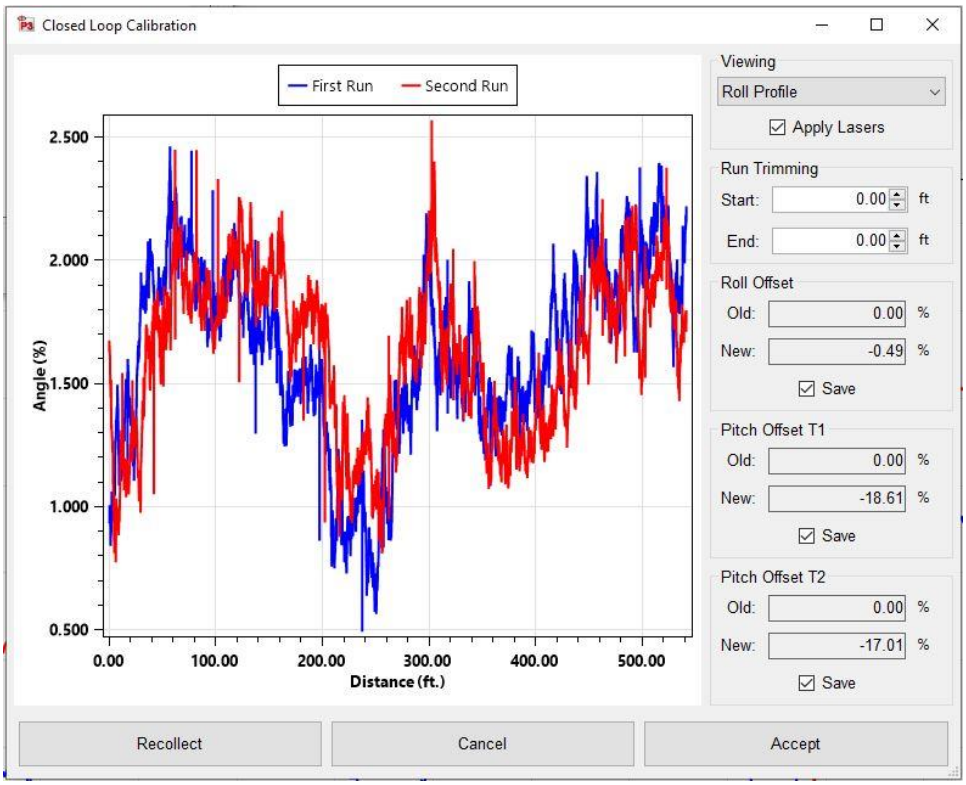


Figure 37. Results window for the Closed Loop calibration with viewing of the Roll Profile

System Verification

The system verifications of the Profiler program are the bounce test and the height verification. The bounce test checks the validity of the accelerometer calibration and the correct laser type. Depending on the values of the static and dynamic bounce tests, the health of the system can be determined. The height verification is used to diagnose potential problems with the lasers and the cables and/or if the correct laser type has been chosen. The verification will show if the lasers are connected incorrectly, or if the heights the lasers are set to outside of the recommended range. Another potential problem is the settings have the wrong laser type saved for the current system (e.g. Spot lasers saved instead of line lasers on a line laser system). The line lasers (Selcom 1145, Gocator 2342) should be 12 inches above the ground surface and their laser difference for the height verification should be less than one hundredths (0.01) of an inch. The dot lasers (Selcom SLS5000 325/400) should be 15 inches above the ground surface and have a measurement error of less than one hundredths (0.01) of an inch.

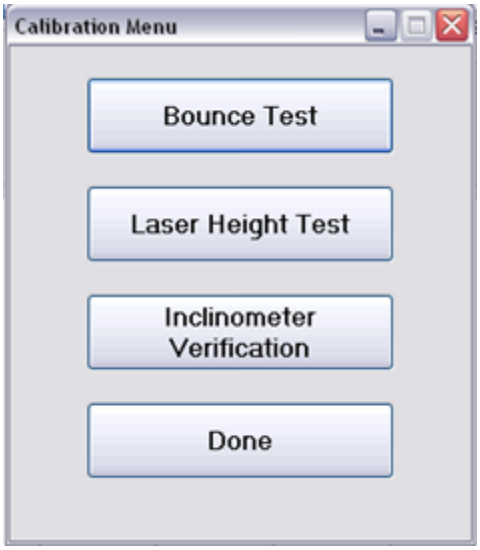


Figure 38: Verification Menu

If the laser type is saved incorrectly, the laser height verification will be inaccurate. If the laser height verification ever fails, review the laser type.

Note: These procedures are *not* calibrations, only verifications

Laser Height Verification

The height verification assures the operator that all of the lasers are working properly. The height verification is deemed a success when each individual laser deviates less than a hundredth (0.01) of an inch. The height verification will also determine if the laser types are correct. The laser types can be viewed under System Settings.

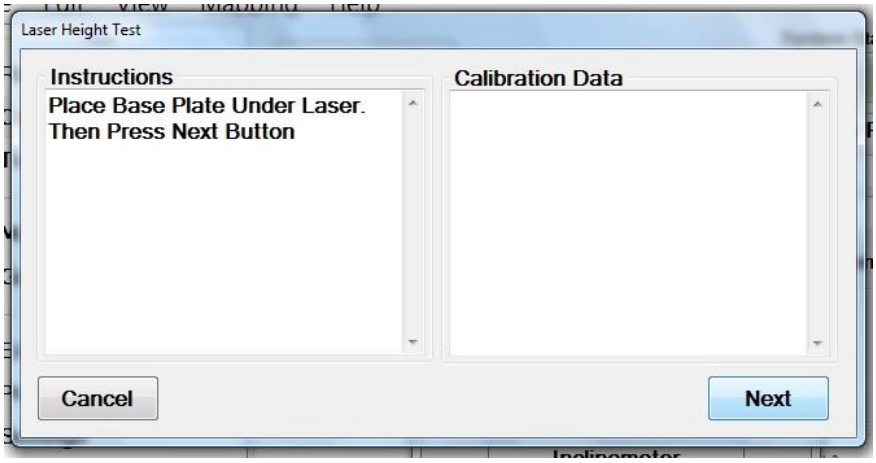


Figure 39: The initial step for a height verification is to place a base plate under the laser being tested.

The first step of a height verification is to choose the location on the computer to save the height verification text file. Once chosen the program will ask the operator to place the base plate on the ground below the laser beam. ***Check that the base plate does not wobble and there is not a glare on the measurement blocks***. Once base plate is firmly on the ground, select next and start placing blocks according to the verification procedure.

Once all of the blocks have been placed by following the procedure, select “No (Done)” to set the saving preferences in the next window. By shifting the bubble to “No” or “Yes”, choose the laser reading to save in the text file and if the user would like to view the report instantaneously.

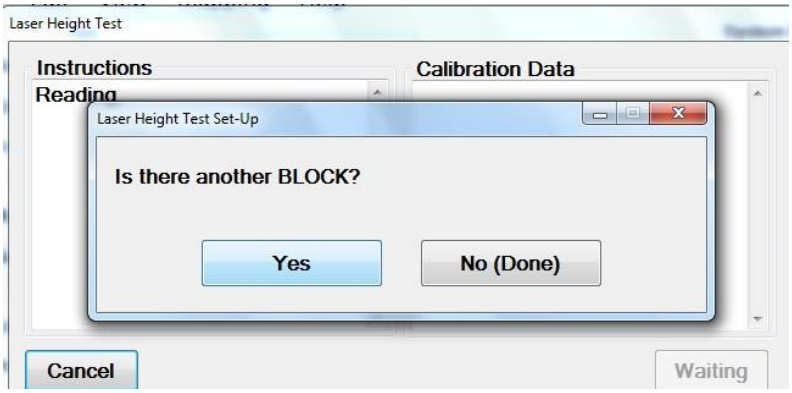


Figure 40: To continue height verification, select “Yes”

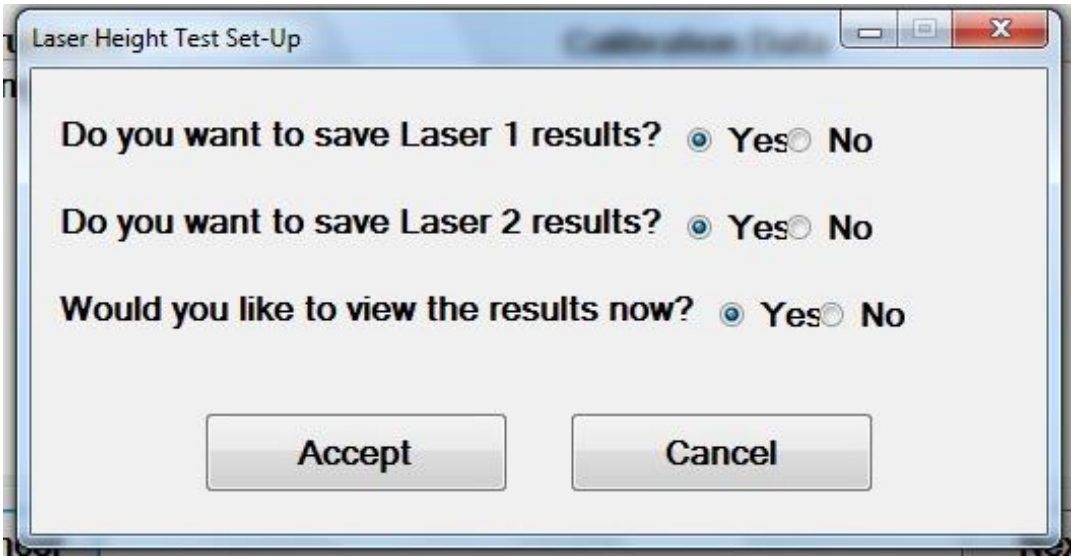


Figure 41: Saving Preferences after a Height Verification

After the laser verification the user will have the choice to save Laser 1, Laser 2, Laser 3 readings and to view the results instantaneously. Only choose the laser the height verification was performed under. If the results are viewed instantaneously a text file will appear showing all of the laser readings. The calculated height of the blocks will be displayed at the far right of the text file. These values must be within a hundredth on an inch (0.01”) according to AASHTO r57.

Bundling Multiple Height Verification Reports

If the operator is running two successive laser verifications they will have the option to add the results of the last verification to the current verification report. In this way there will be two or three verification results in the text file. If bundled reports are not desired then select ‘No’ on this option. The Profiler V3 program will ask the operator to choose to bundle the height verification at the beginning of the second verification procedure. Select ´yes´ to bundle the files and ´no´ to keep the next verification as an individual file. This option will appear after the

When performing the height verification make sure the receiving sensor has an unrestricted view of the calibration block, as shown in the figure below. The high side of the calibration block should be outside the body of the laser, not below the middle of the laser (see image below).

Figure 42: The correct block Orientation for the Height Verification

Bounce Test

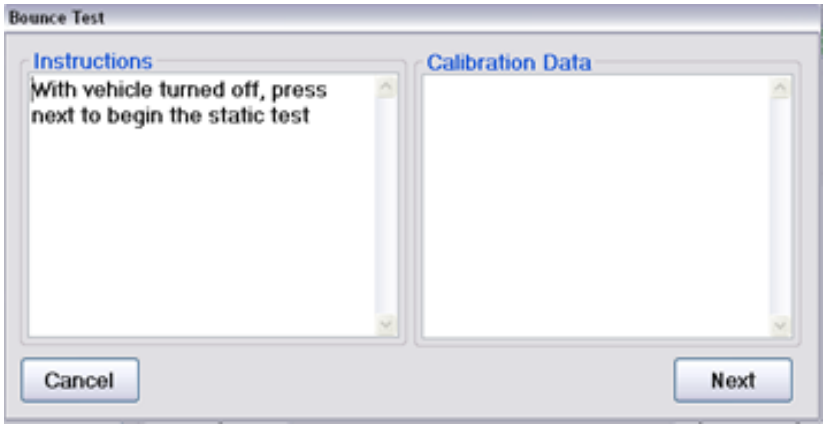


Figure 43: The static test of the bounce test. Do not touch or move the vehicle during this portion of the test.

The bounce test is a diagnostic procedure used to determine if the system's accelerometers and height sensors are working in unison and calibrated correctly. The bounce test is not a calibration procedure and its results are not used to reset or adjust the profiling system. After the bounce test has finished, three data segments will be saved within a data file; two static and one dynamic bounce test. The results of the bounce test consist of an IRI value and detailed profile for each of the three tests. The IRI value is displayed at the end of the test, and the detailed trace can be viewed like any other data file in Profiler V3. A successful bounce test results in a completely flat profile trace and low IRI values. Industry standards and requirements vary as to whether a bounce test is required, and as to the results required from the test. For SSI's inertial profiling systems, static bounce test IRI values below 5 in/mi (78.9 mm/km) and dynamic results below 15 in/mi (236.7 mm/km) are within manufacturer's specifications for a properly functioning system. Some agencies follow AASHTO R057, which specifies a static bounce test IRI under 3 in/mile (47.35 mm/km) and a dynamic bounce test IRI under 8 in/mile (126.26 mm/km). The bounce test procedure is sensitive and must be properly performed for successful results.

Procedure

Once a bounce test is initiated, the program will ask to name and save the file before the test begins. The static, dynamic, and again static data will be included in this file as Run 1, Run 2, and Run 3 respectively.

Verify before starting test that:

1) Only perform bounce test on a level surface, after accelerometers have been calibrated.
2) Vehicle's engine is off.
3) Front tires are straight and in-line; Parking brake is off; No wheel chocks or other braces are to be used
4) A smooth, non-metallic surface is beneath the lasers (at the appropriate standoff)
5) The operator should introduce 1 inch (25.4 mm) of vertical travel at the laser modules

With the vehicle turned off, begin the static test. **Do not touch the vehicle at this time**. No movement should be introduced to the vehicle (Do not perform the static test in heavy cross winds or during an earthquake). For the dynamic test, introduce one inch of vertical travel into the vehicle's suspension at a frequency between 1.25 Hz (which is a bounce every 0.8 seconds) to 2.5 Hz (which is a bounce every 0.4 seconds). Do not dramatically impact, or shock, the vehicle suspension when jumping on the profiling vehicle. Use only fluid movement. Only introduce vertical motion into the vehicle suspension during the dynamic portion bounce test. No lateral or side-to-side vehicle motion should be introduced. Make sure the wheels are in a straight line. Allow the vehicle to sit motionless for the final static test.

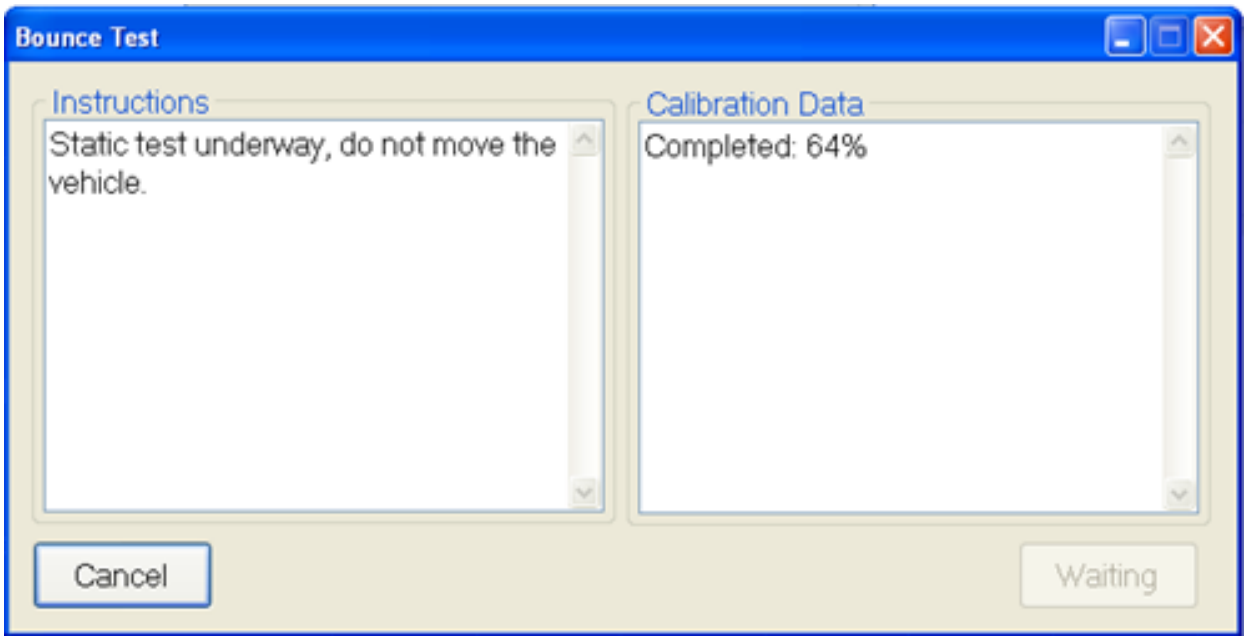


Figure 44: The static test being performed

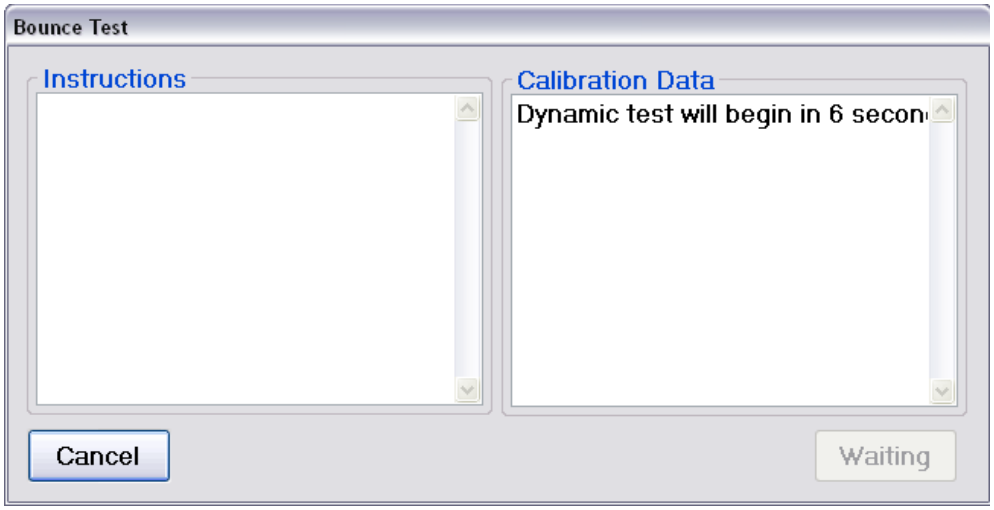


Figure 45: The beginning of the Dynamic Bounce Test

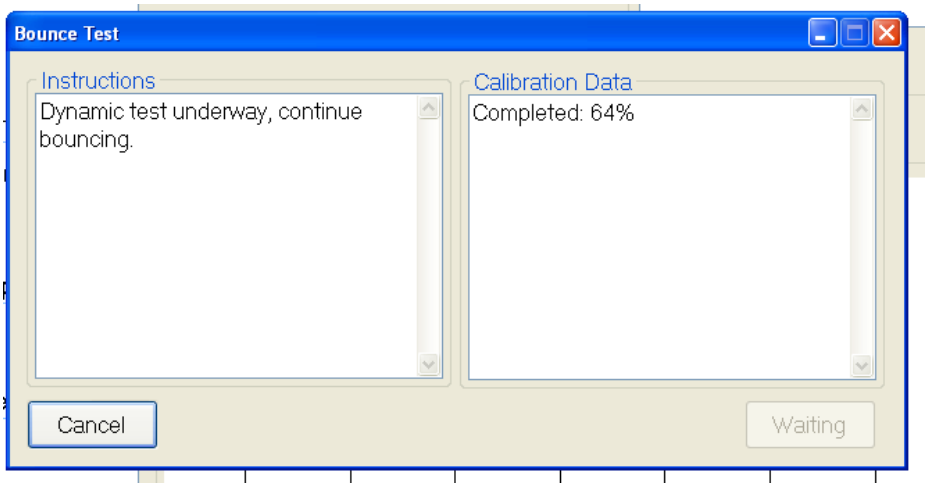


Figure 46: The dynamic test is performed by bouncing the vehicle vertically

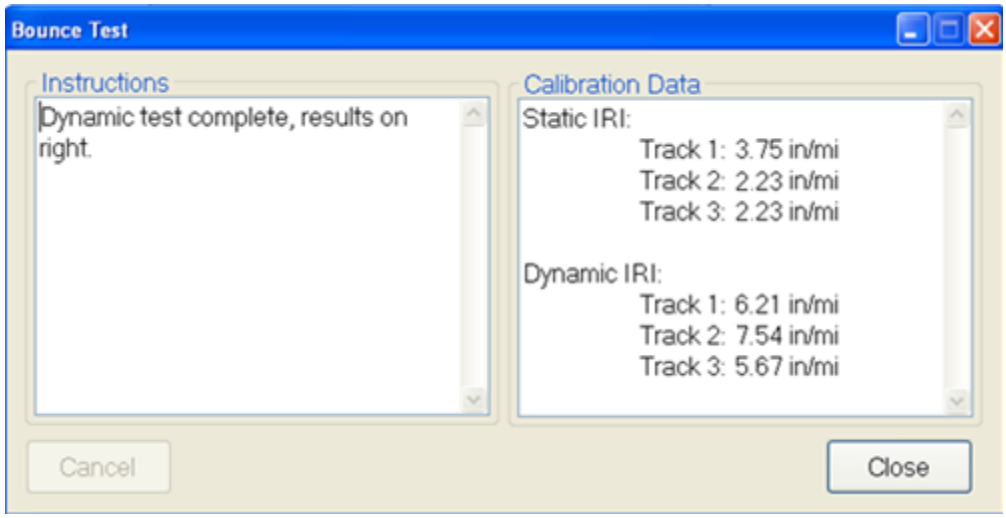


Figure 47: The Dynamic Test Results

Bounce Test Verification Graph

After performing a bounce test, the operator will be able to view a Laser vs Accelerometer data graph by using SSI's Validation Engine, opening the bounce test rsd file and using Raw Data Viewer. An ideal bounce test will appear as figure 42 below showing the laser data as an approximate opposite of the accel data. The Combined trace in the graph shows how both the Laser and Accelerometer traces should mostly cancel each other out. Variations from the figure below from either the Laser or the Accelerometer trace will indicate a possible fault with the sensor. Remember to calibrate accelerometers and make sure the lasers are at the correct height and have no obstruction at the lens (they must be out of the light and on a non-shiny surface).

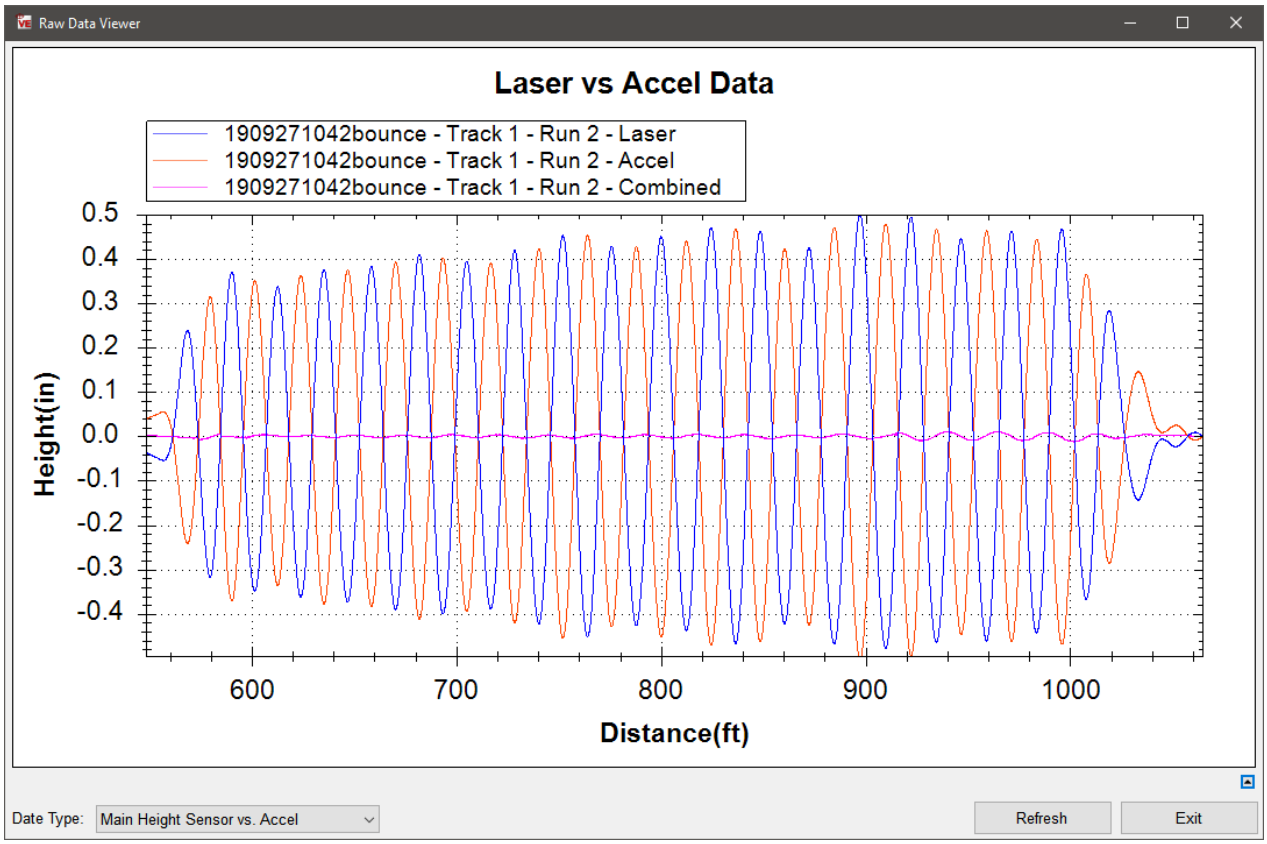


Figure 48. Bounce test Laser vs Accelerometer data graph

Inclinometer Verification

The inclinometer outputs can be verified by using the mounting block and a procedure similar to the inclinometer calibration. Enter the block angle when prompted by the program. The block angle is supplied with the system and can be found on the label attached to the grey box cover within the white housing.

Collect

The optimal speed of collection is ***20+ miles per hour***. The accelerometers are most accurate within the range of 20 to 55 miles per hour for high speed profilers and trailers. Height data cannot be collected if the vehicle is traveling slower than 5 miles per hour.

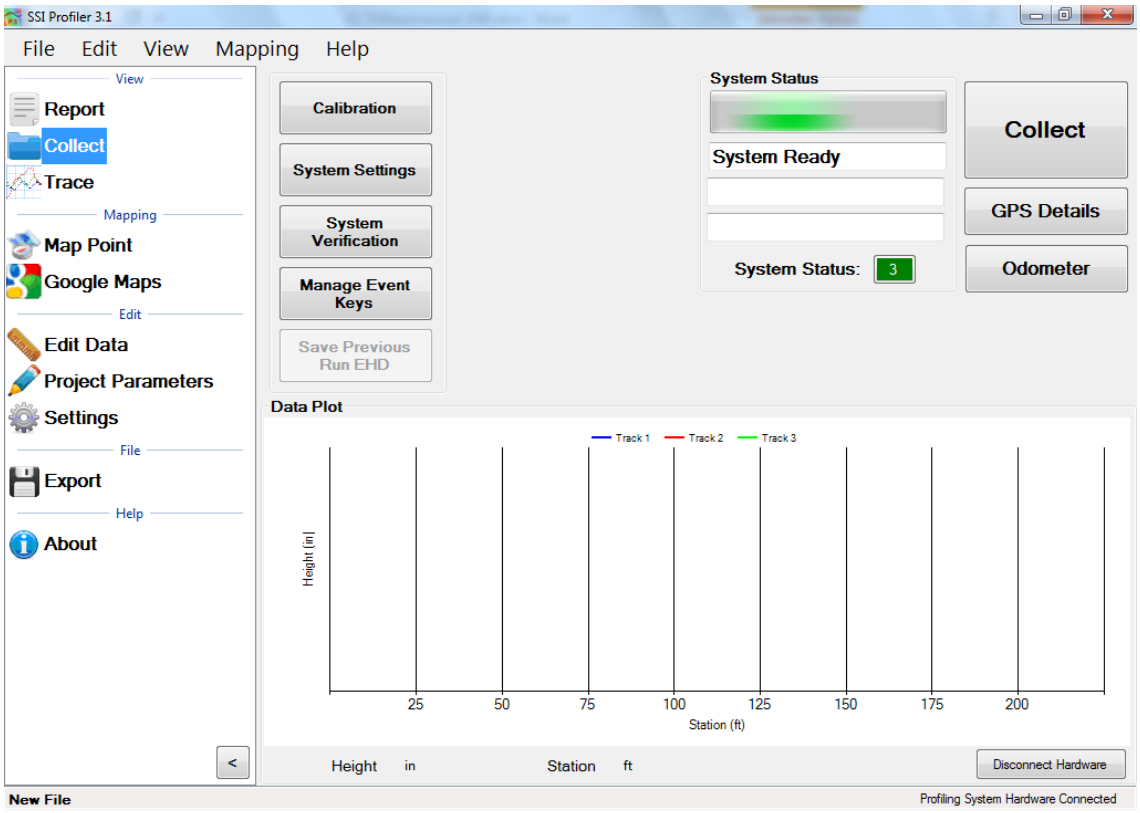


Figure 49: The main collection window.

System Status

The systems status icon (the colored box with a number inside) is used as a diagnostics tool for Profiler V3 collection systems. This window detects connection problems with the housing and electronics. SSI support staff may ask the diagnostic string (health string) while troubleshooting. ***The type of lasers connected should be shown correct automatically based on the type of system connected.*** Select the diagnostic information button at the top right of the window to better understand the purpose and meaning of the health string.

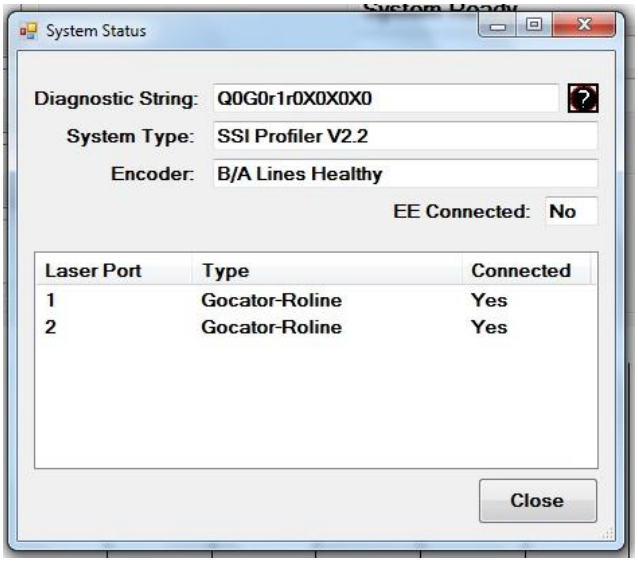


Figure 50: The System Diagnostics

Collection Information

The Collection Information window appears when the collect icon is selected. The most important information in this window is the start station, the direction, lane number and the run up lengths. Stationing, direction and run up/out lengths can be changed later through Edit Run. When "Begin" is selected, collection will initiate. Be in position to start collection when “Begin” is selected. The “Direction” is the direction of travel of the profiler (up station or down station). It is important that the direction is correct. The stationing can be changed at a later date if the direction of travel was incorrectly entered. To change the stationing or direction open the Edit Run feature.

When this window is open, the profiling vehicle should be at the location to start collecting. As soon as the operator selects begin, the collection will be ready to start. If the vehicle is not in position to profile, the self-start collection feature will start the collection at the wrong point. If the collection will be started by using ***Starting Forward*** or through the electric eye, “Begin” can be selected a reasonable distance before the actual start of the collection is to take place.

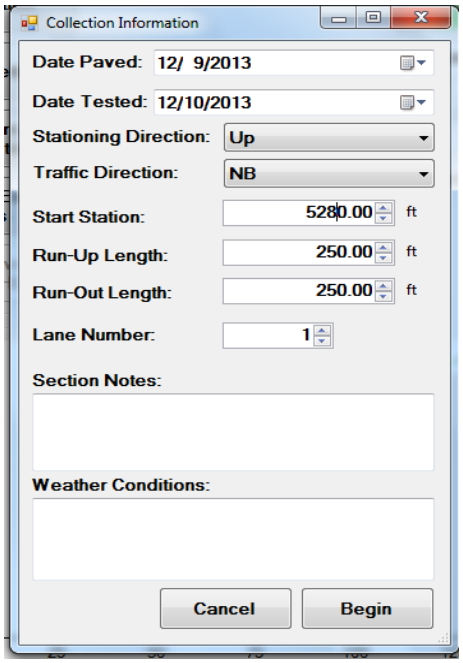


Figure 51: The Collection Information window

Collecting Data

The optimal speed of collection is ***20+ miles per hour***. The accelerometers are most accurate within the range of 20 to 55 miles per hour for the high speed profilers and trailers. Height data is not collected if the vehicle is traveling slower than 5 miles per hour.

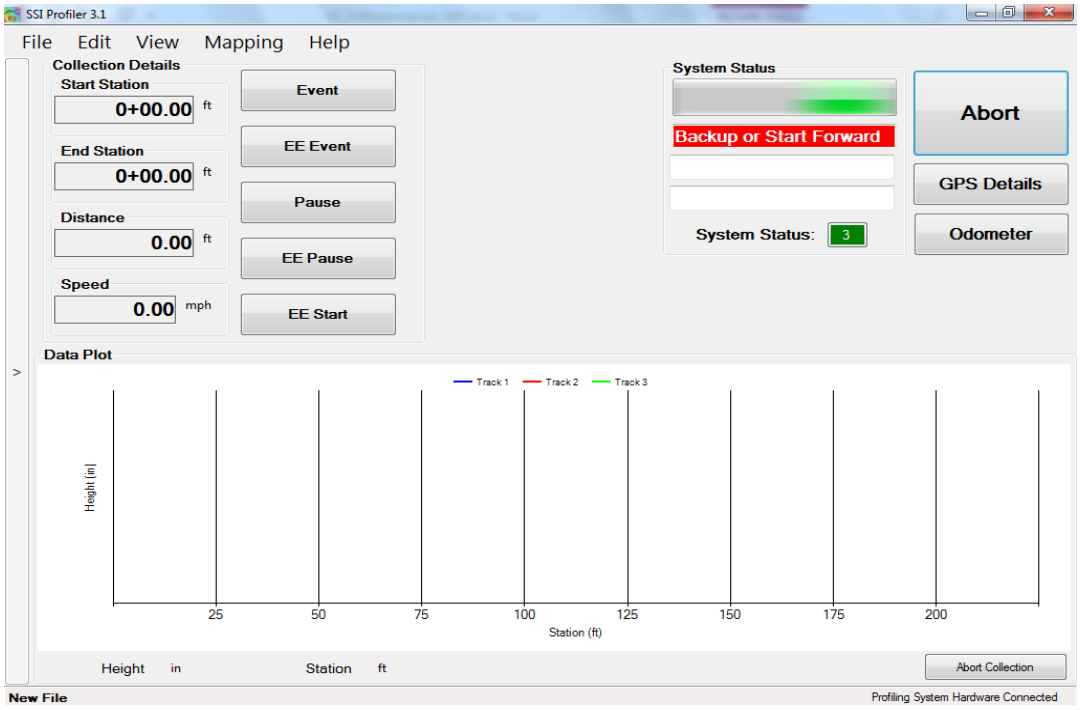


Figure 52: The collection screen after “Begin” was selected

The Three Ways to Start a Collection

The operator can travel forward or backward once a collection is started. If the operator accelerates forward the Run-up procedure will be used with or without an electric eye. If the operator moves in reverse, the back-up collection procedure will be used. Both of these procedures can use the electric eye to end the collection. The benefit of using Run-up is that traffic will not be stalled while the operator begins a collection. The forward motion Run-up option can be started on a shoulder or at a large distance from start point (a large run up distance).

If the operator uses the back-up option, the vehicle must begin over the starting point and then move in reverse. Back up until the program instructs the operator to accelerate. The collection will begin when the initial point is crossed.

1) Starting a Collection: Run Up

After "Begin" is selected from the collection information window the vehicle may move forward. Once the vehicle is moving forward over 5 miles per hour and the run up distance is completed, the collection can be started through an electric eye, selecting the start icon, or selecting a programmed hot key. The collection can be ended by selecting the stop icon or using the electric eye. The stop icon will replace the start icon once the collection has been initiated.

The electric eye is used by arming the eye after "Begin" is selected. Once the electric eye triggers the start of the collection, a new icon appears giving the operator the option to end the collection by using the electric eye. These buttons are labeled "Start EE" and "Stop EE".

2) Starting a Collection: Back up

After selecting "Begin" from the collection information window and the operator has the beams of the lasers over the starting point, the vehicle can be moved in reverse. The status bar will display "Back up or start forward" in a red fill, then "Backing up" as soon as the vehicle starts backward motion. The reverse distance will be measured by the profiling system. After 25 feet, the status bar will display "Accelerate". The operator should accelerate forward along the same path to reach a speed over 5 miles per hour. When the minimum speed and the run up length has been achieved, the status bar will display "Self Start" and the collection will begin when the odometer reaches zero.

Note: The path traveled in reverse should be the same path the vehicle makes when moving forward. If the paths are different, the collection's starting point will differ from the initial point the lasers were aligned to.

The collection can be ended by selecting the stop icon within the main window as the vehicle is moving. The collection can also be stopped by using an electric eye. To use the electric eye, select "Arm EE Stop" and the Profiler program will wait for the EE to be triggered before ending the collection. To trigger the EE properly and consistently, use the recommended DOT-C2 reflective tape and mount it near the path of the vehicle in clear view of the EE sensor. It is recommended to place the reflective tape within 10 feet of the electric eye and at the correct elevation of the sensor's beam.

3) Starting a Collection Using the Electric Eye

The electric eye can be used to start and/or end a collection or end the Run-up and Bach-up collections. The recommended reflective tape to use with the EE supplied by S.S.I. is the DOT-C2 grade tape. Contact SSI for supply information. The electric eye tape can be mounted on a cone or a stationing marker, as long as it is in reach of the EE sensor which has an optimal range of six feet. Sick EE's can sense the reflective tape 18 feet away. The closer the reflective tape is to the EE sensor, the more consistent the starting and ending of collections will be. If the reflective tape is too far from the EE, the sensor may not activate.

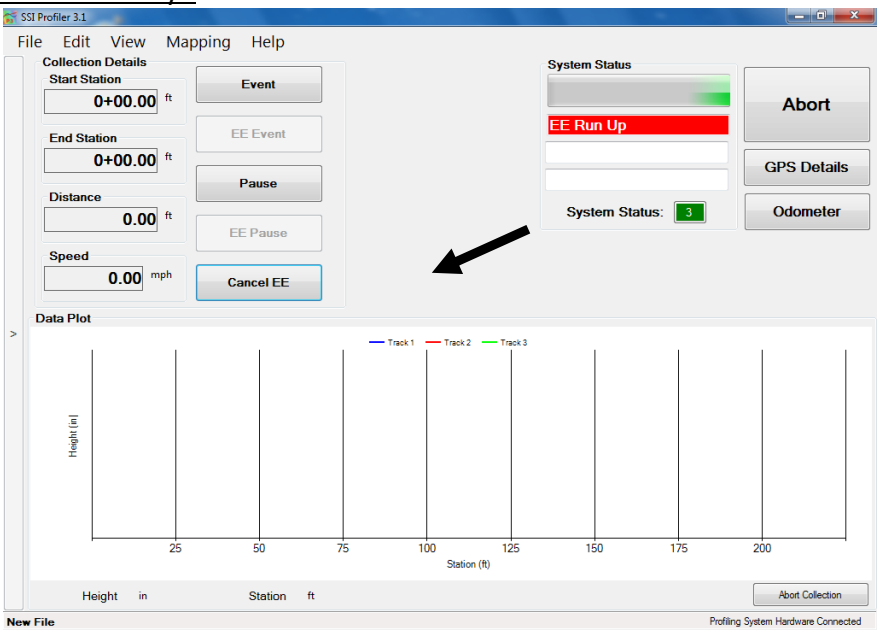


Figure 53: The Electric Eye (EE) is armed to start the collection

Most profiling systems have each side equipped with an electric eye. On the white housing there is a two-way switch with a label of left and right. The left side is the driver's side electric eye. To determine if an electric eye is on, look for the amber light on the top side of the electric eye near the outgoing cable. The diagnostic will also inform the user that the electric eye is attached. The diagnostic will not inform the user which side the vehicle the electric eye is powered on.

Use DOT-C2 grade reflective tape for the electric eye collections. The reflective tape can be mounted on a stationing marker or on a cone for repetitive use. Sick EE's can sense the tape 18 feet away. Other brand EE's should be placed 6 feet away to function.

Ending Collections

1) By Electric Eye

To end a collection using the electric eye, arm the electric eye after the collection has been started by selecting the Arm EE Stop icon on the screen or through a hot key. When the electric eye sensor detects a reflective surface, the collection will be ended and run out will be collected

2) Through the Stop Icon

The collection can be ended by the operator selecting the Stop and Save icon with a left click of the mouse. This option is not as precise as using an electric eye or backing up to end the collection, but it is more efficient when collection multiple runs of data with a loose tolerance and is sometimes necessary when collecting without traffic control.

3) Speed Drop Out and Backing Up – "Save"

When a speed drop out occurs (when the vehicle is moving less than 5 miles per hour) the operator has the option to back up and save the data. This option of ending a collection is an accurate alternative of completing a collection. The operator can just back up to the desired ending location. All of the surface data that was collected when moving forward is omitted while moving backward over the same surface. This creates profiles of the same length which are convenient when comparing the profiles to a reference file.

Aborting Collection

The collection can be aborted at any time before the file is saved. The abort icon is displayed at the bottom right of the Collect window. When a collection is not in progress the abort collection icon is the disconnect hardware icon.

Stopping a Collection

A collection can be ended using the **electric eye**, **selecting Stop Collection**, or **stopping the vehicle and backing up to the end point, then hitting Save**. If accurate end points are needed in a lane closure, it is recommended to use the electric eye or stop and back up option. If operating in traffic at highway speeds where stopping is not an option, use the electric eye end collection, select the stop collection icon on the screen, or select a user programmed hot key. When using the stop collection icon the distance collected may be off of your desired stop station. Post analysis can fix this through the Edit Data feature and crop data tool or the GPS tagging tool located in the Trace window.

Saving the Collection

When a run is finished Profiler V3 will open a window automatically asking the operator to save the file. The three options are to **Save as New File**, **Save File**, and **Do Not Save File**. If the file will be saved, windows explorer will open and the operator will be allowed to save the file to any folder location on the computer or external device. If the operator selects do not save, the collected data is still in the program until a new file is opened or the program is closed. If there is any unsaved data when the program is closed, Profiler V3 will ask the operator to save their changes. It is always possible to save the data by selecting File>Save or selecting Ctrl+S on the keyboard. ***To always save a run in a separate file choose Save as New. This is recommended for multiple runs and simple post-processing.***

Changing Units of Plot

To change the units, click on the current units and select from the menu.

Figure 54: The procedure to change units of the data plot is shown

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 as 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 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.

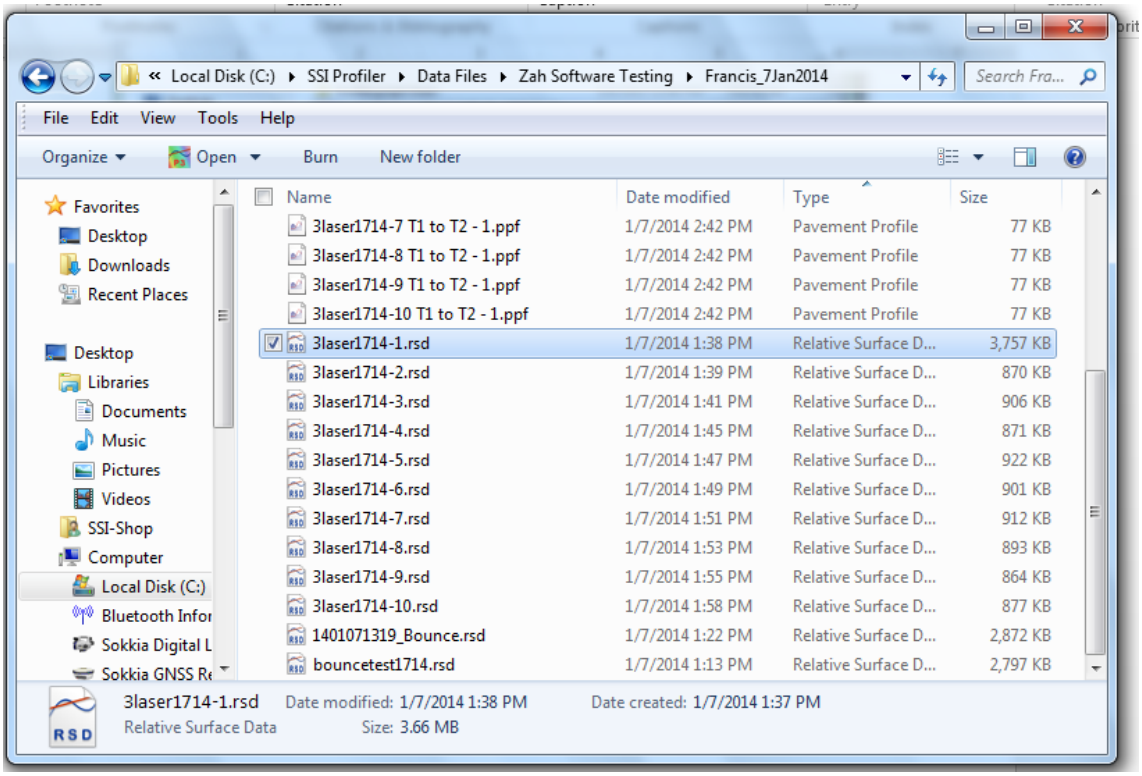


Figure 55: Opening a data file in the Profiler V3 program

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."

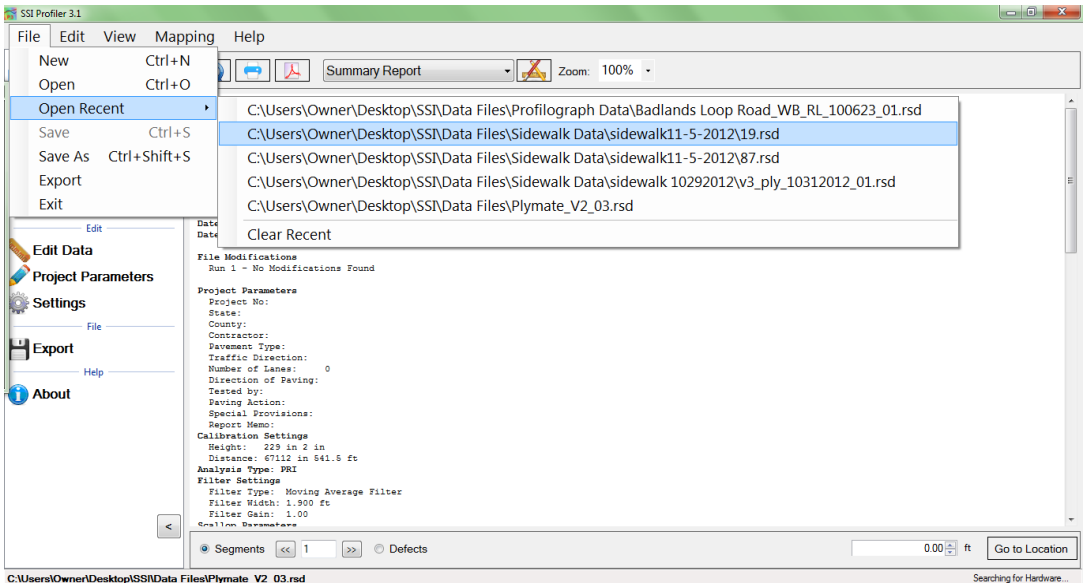


Figure 56: The Open Recent feature

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.

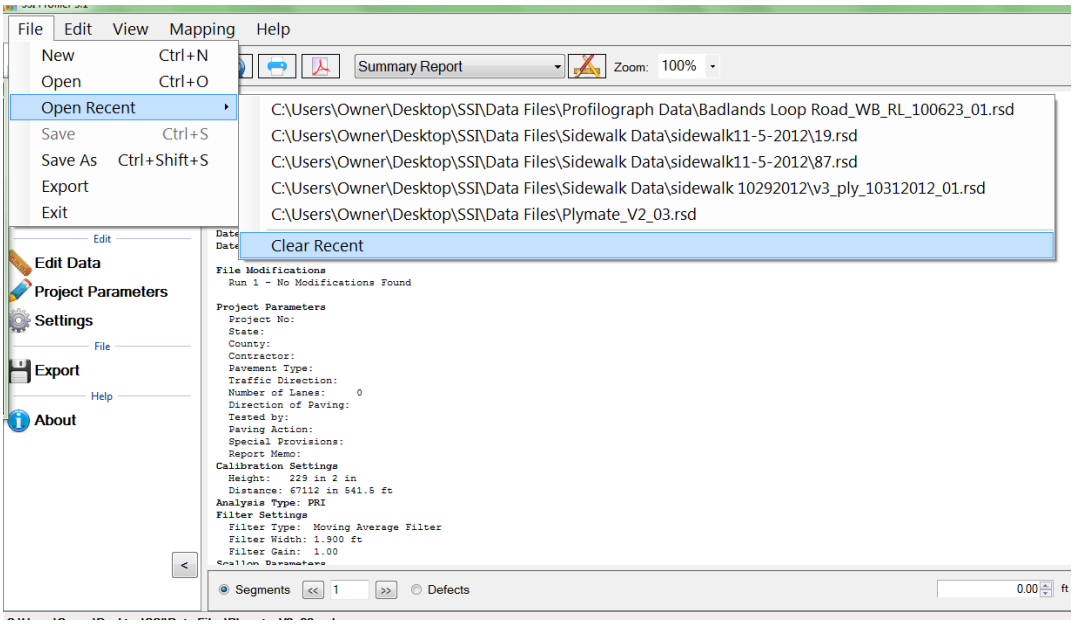


Figure 57: The clear recent feature

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.

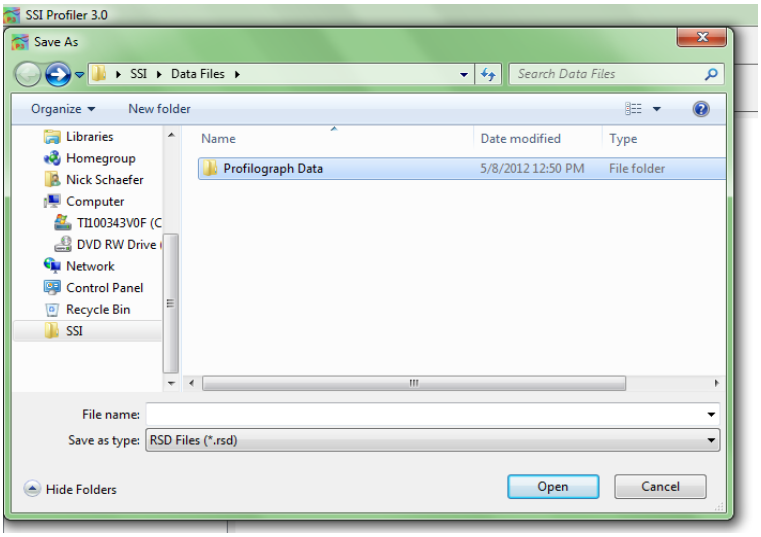


Figure 58: Saving a file through Save As in RSD format

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.

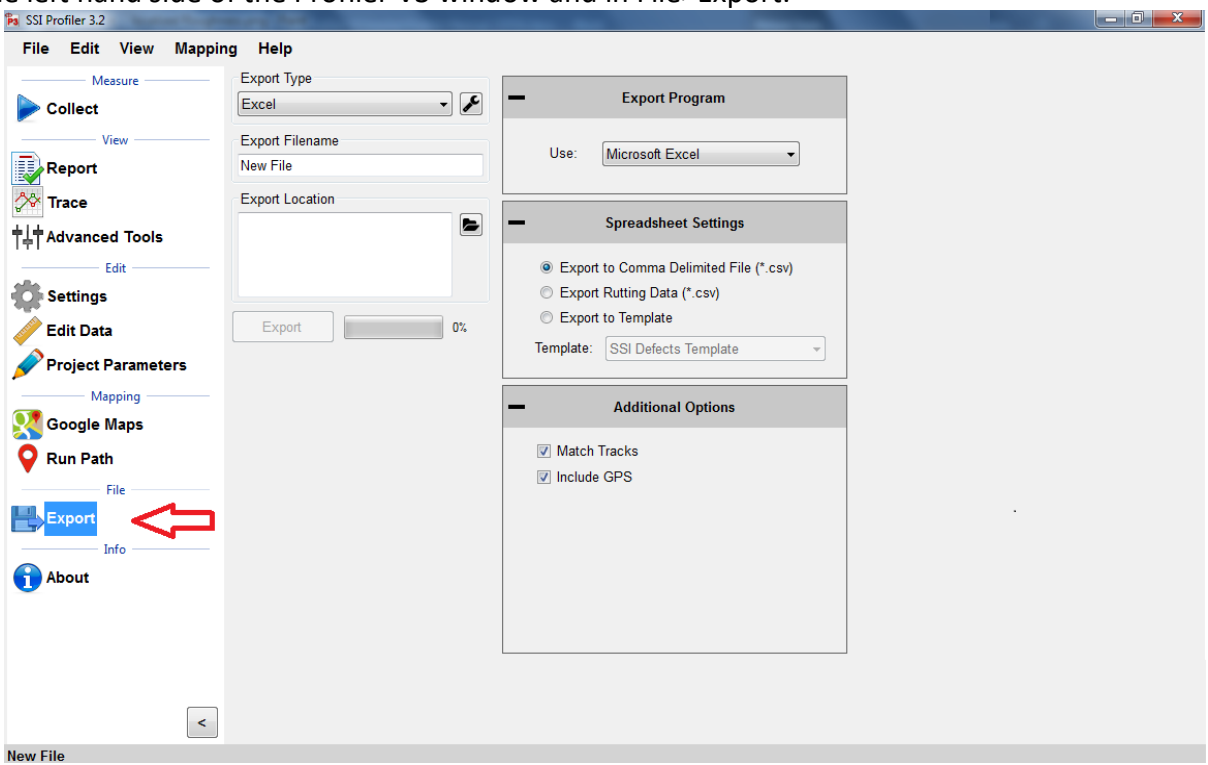


Figure 59: Window for exporting the data into Excel format

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.

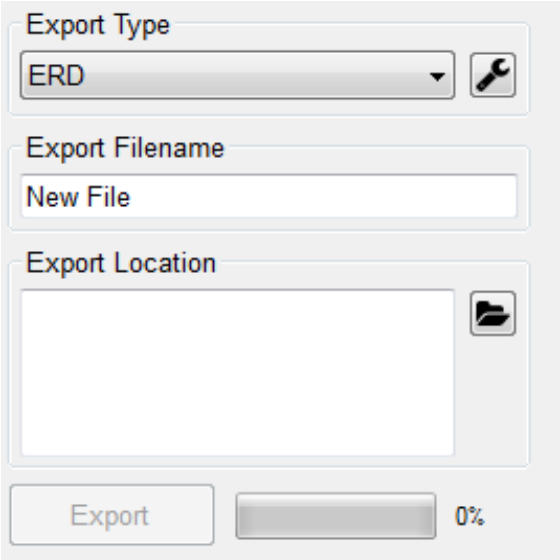


Figure 60: Select location to save the exported file

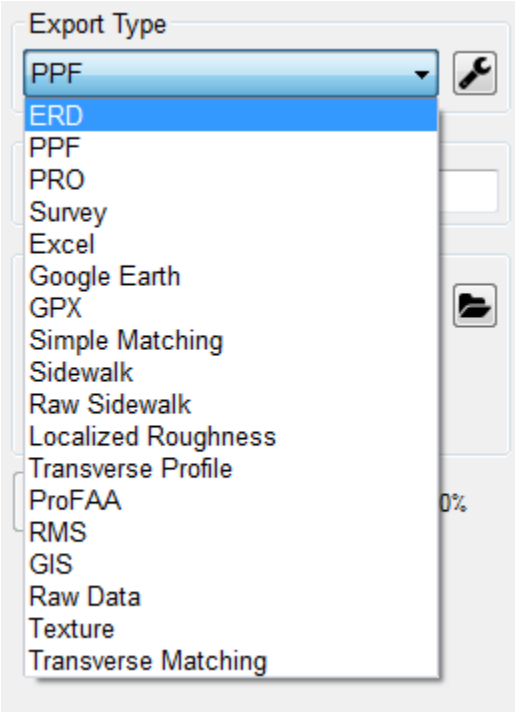


Figure 61: The export type drop down menu

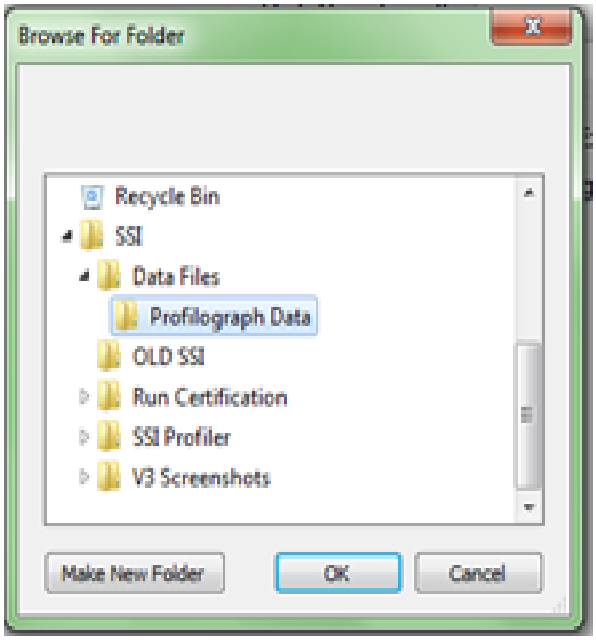


Figure 62: The export folder location selection

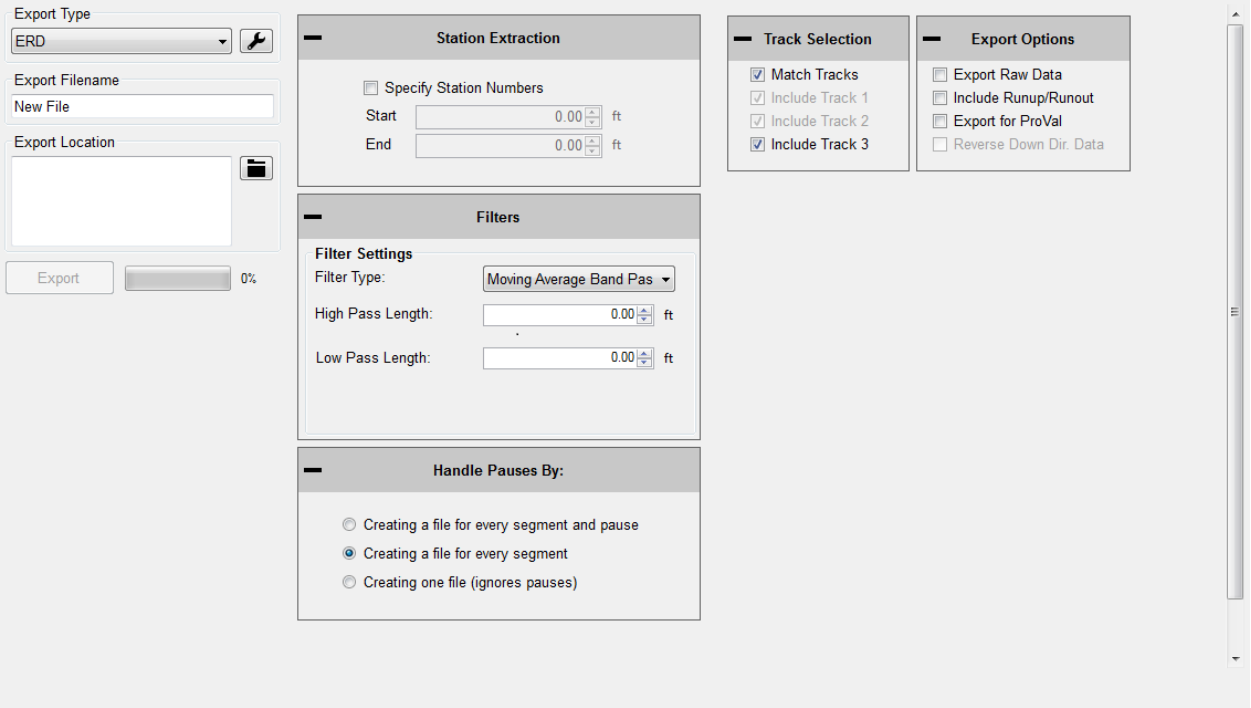


Figure 63: The ERD format export window with match tracks selected

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.

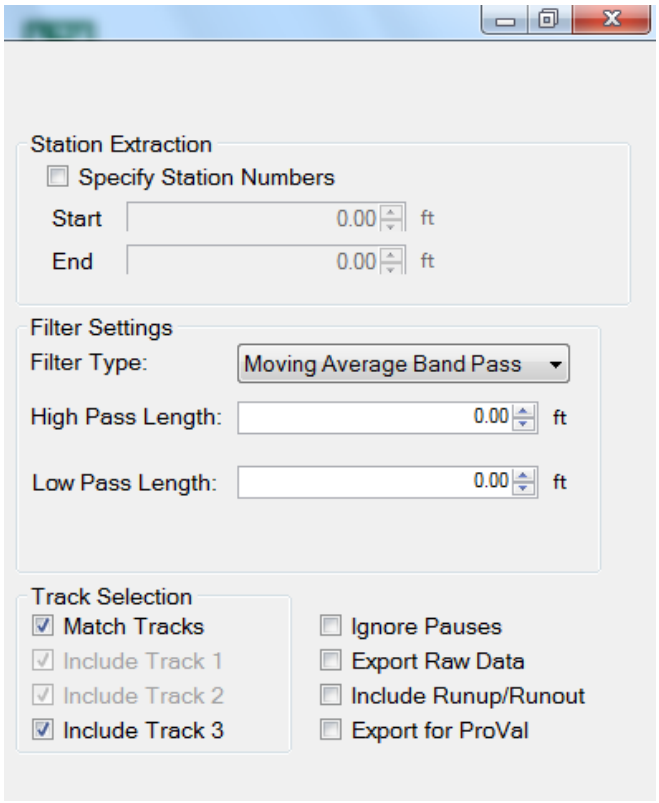


Figure 64: The ERD export window settings

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.

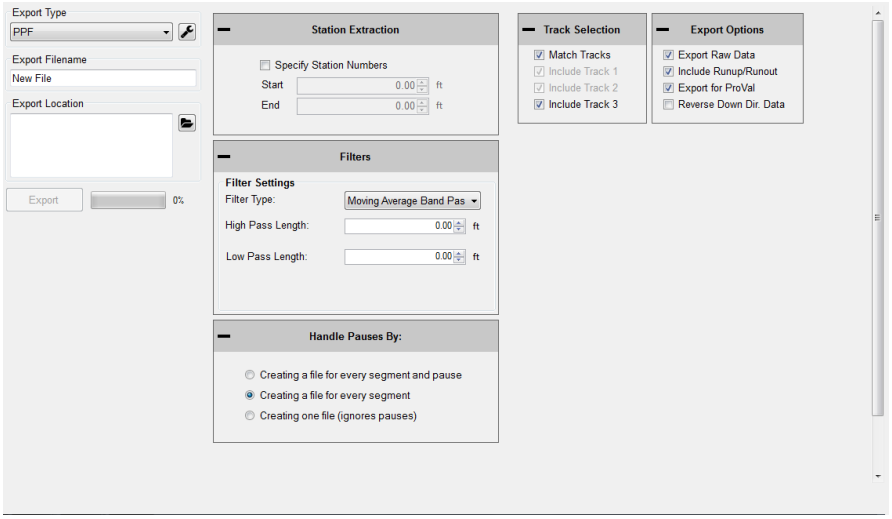


Figure 65: The PPF export window

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.***

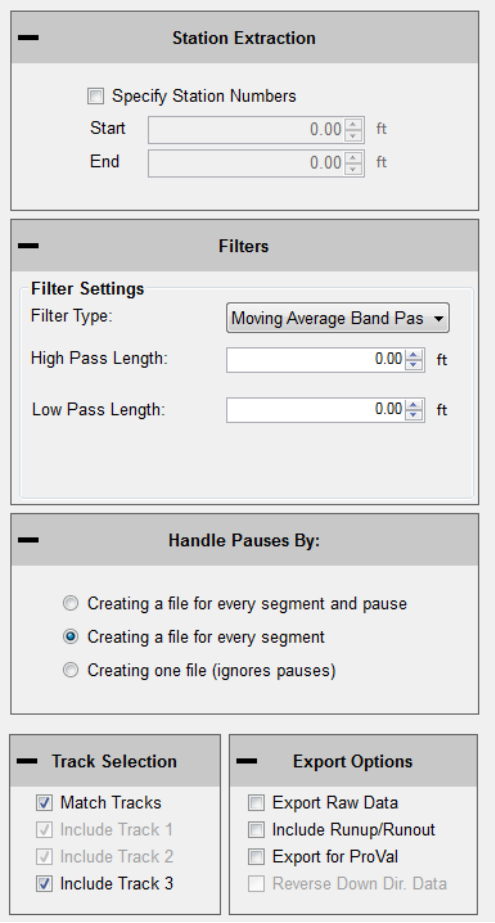


Figure 66: Optional settings when exporting in PPF format

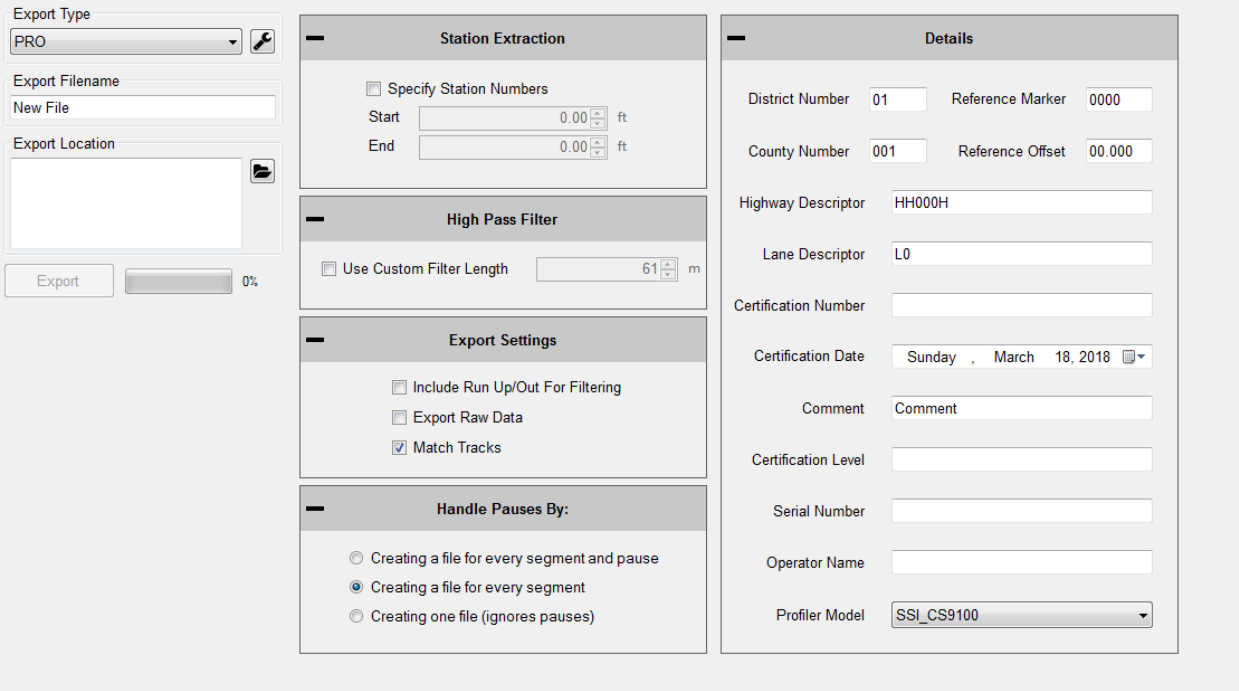


Figure 67: The PRO format window

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.

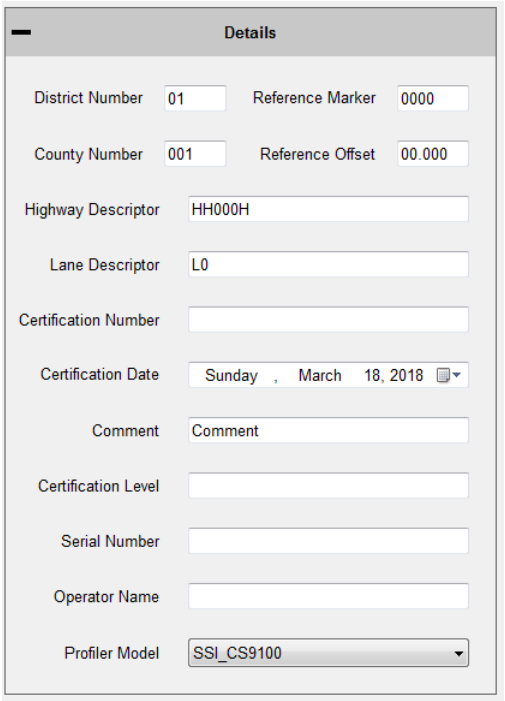


Figure 68: The Details tab contains information about the project

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.

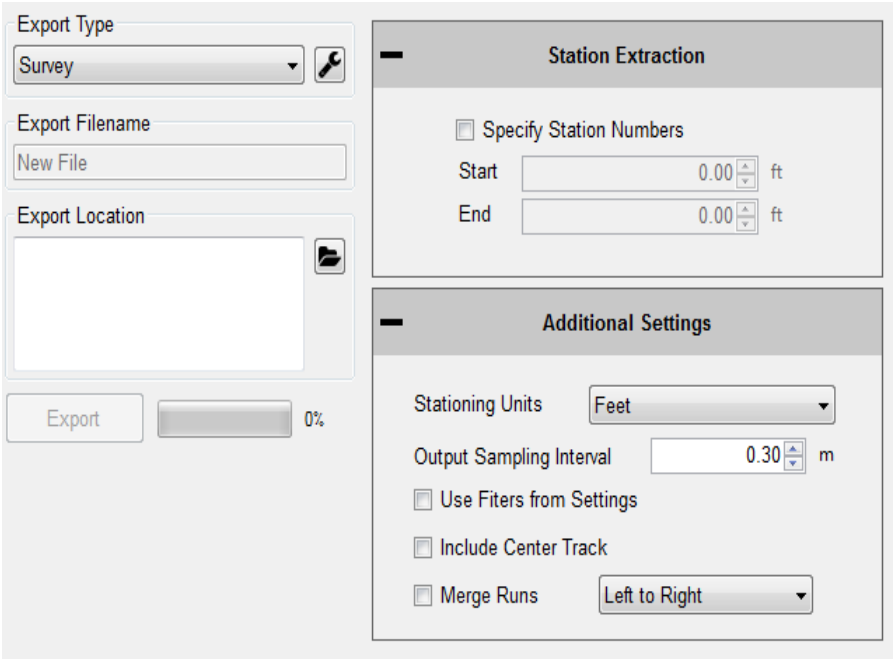


Figure 69: The window for exporting in Survey format

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.

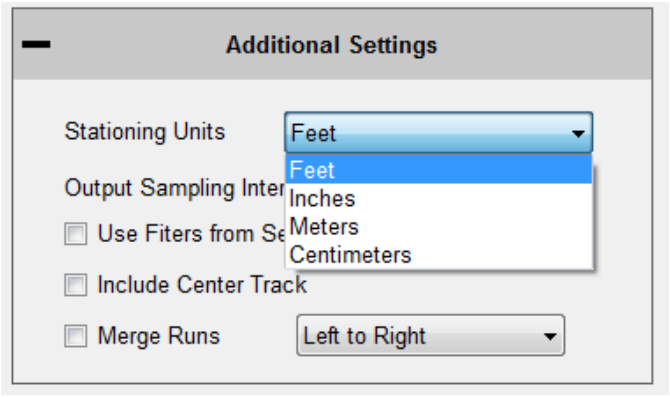


Figure 70: Stationing units dropdown menu and options

Exporting to Excel Format

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

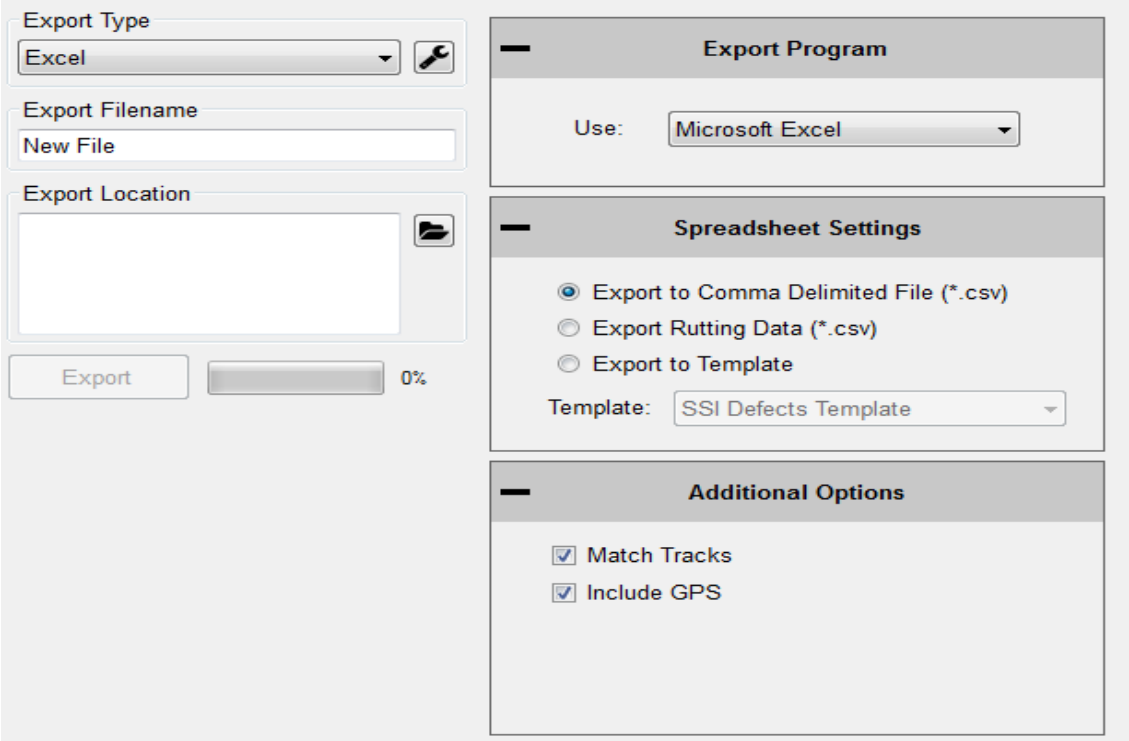


Figure 71: Exporting the data into Microsoft Excel format

Export to Template

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.

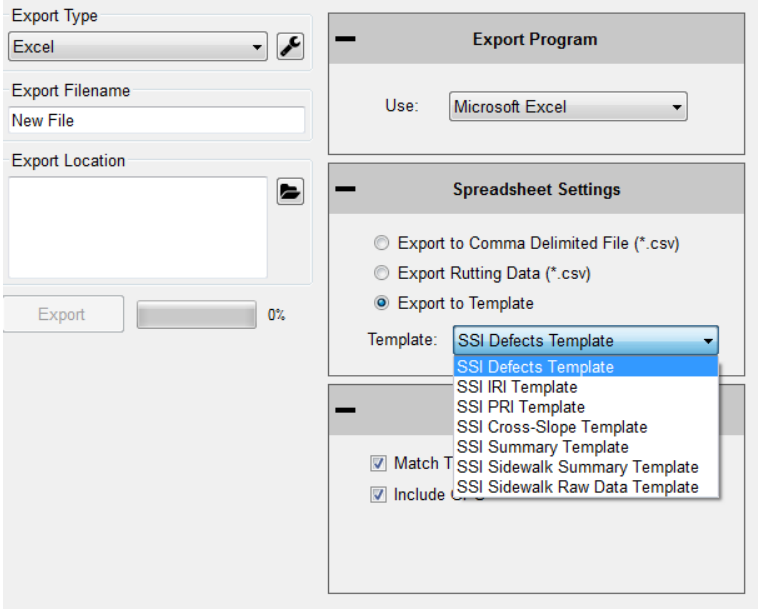


Figure 72: The types of excel formats are listed

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

Exporting to Google Earth

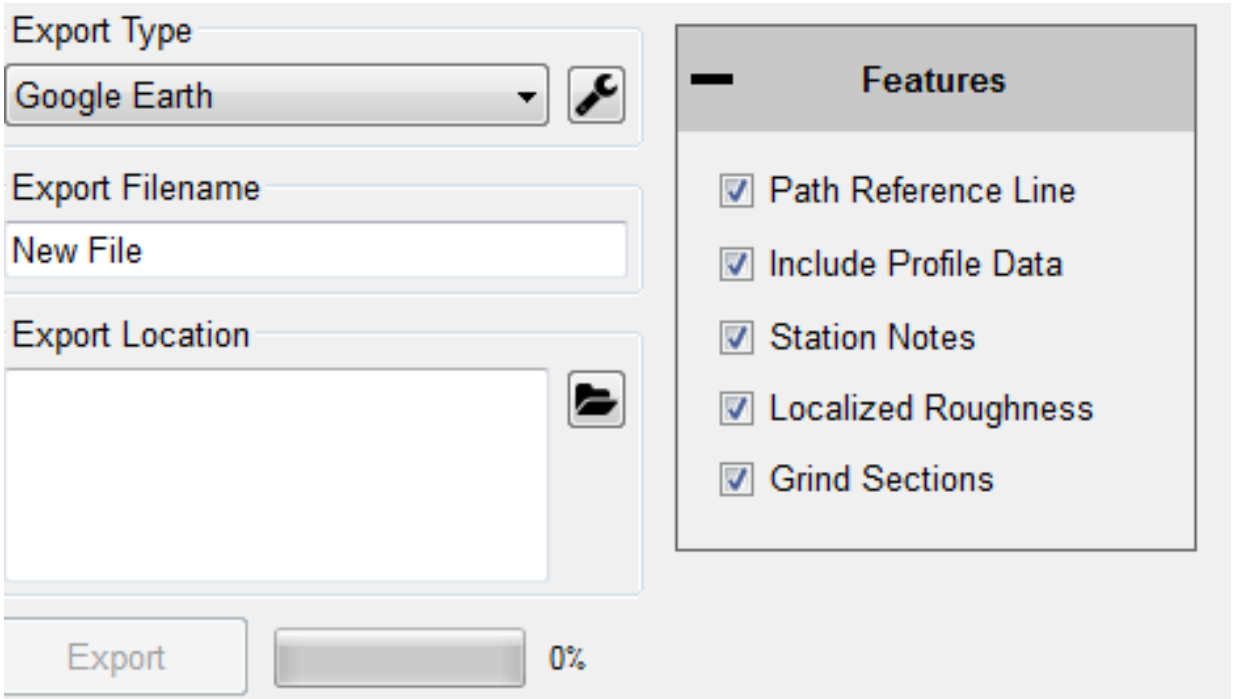


Figure 73: Google Earth export settings

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.

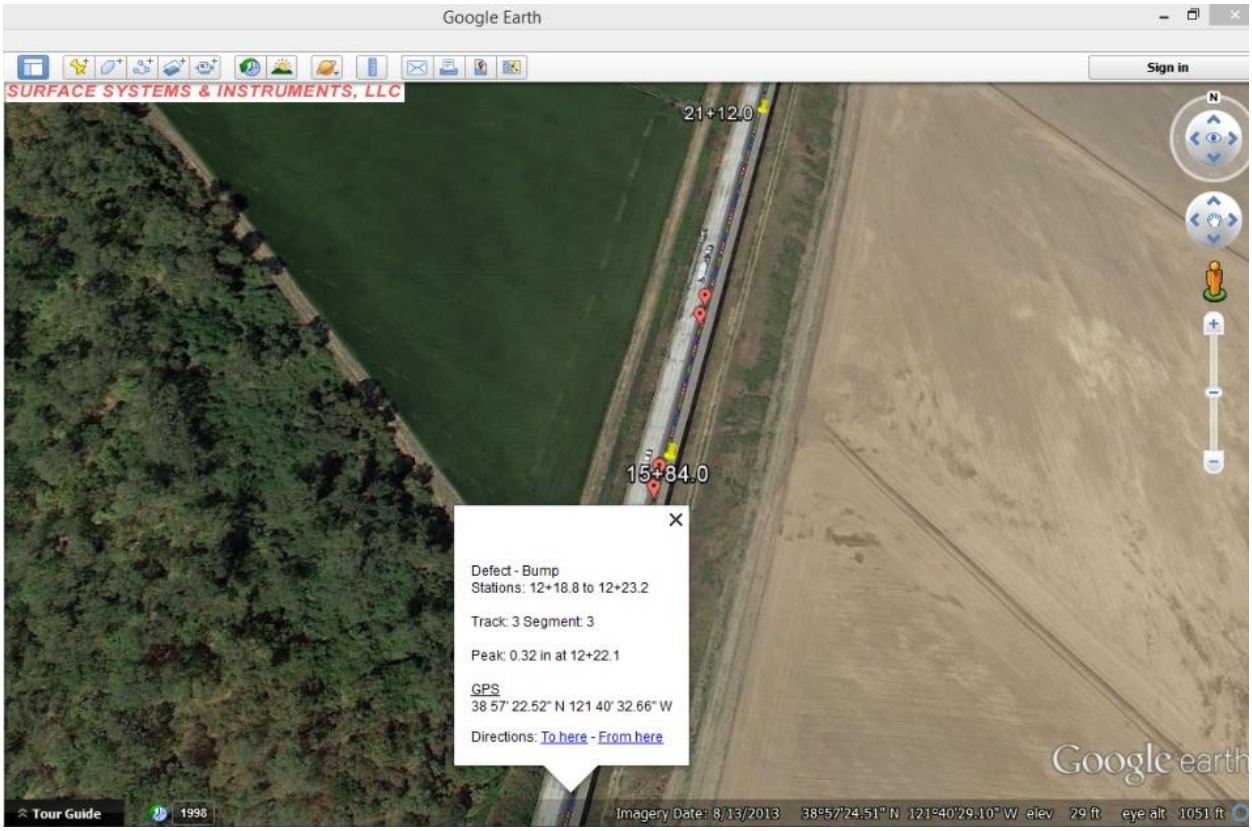


Figure 74: Google Earth view on laptop

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.

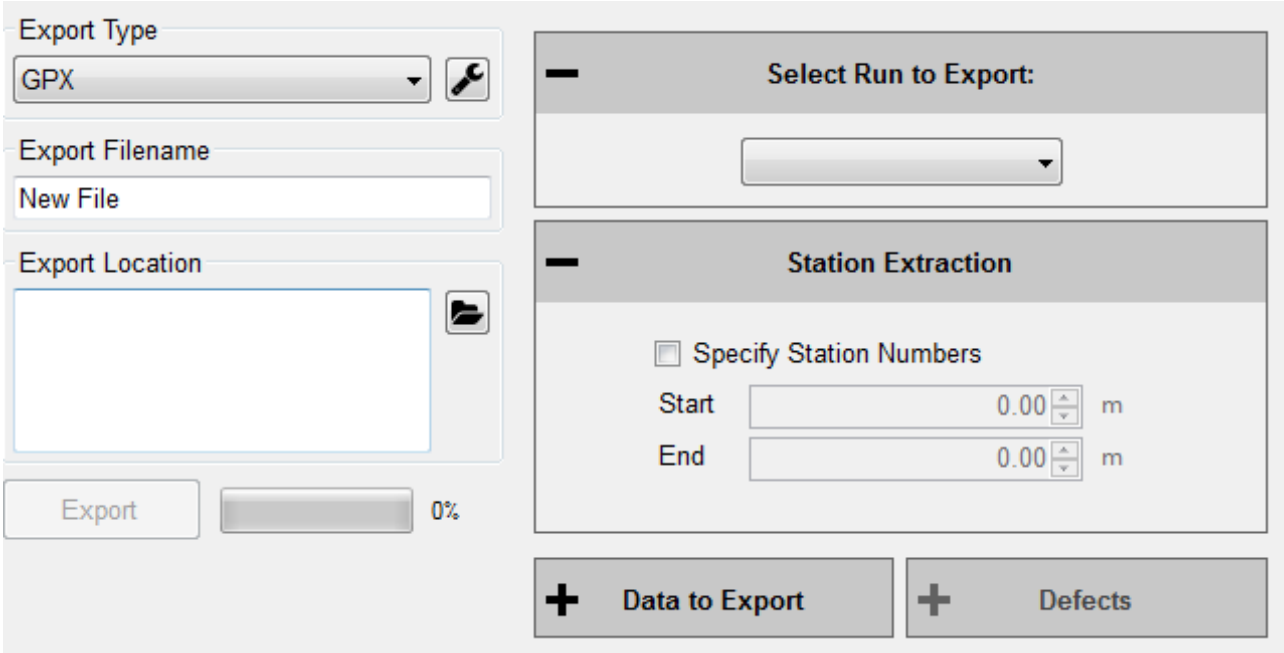


Figure 75: The export window for GPX format

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 files 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.

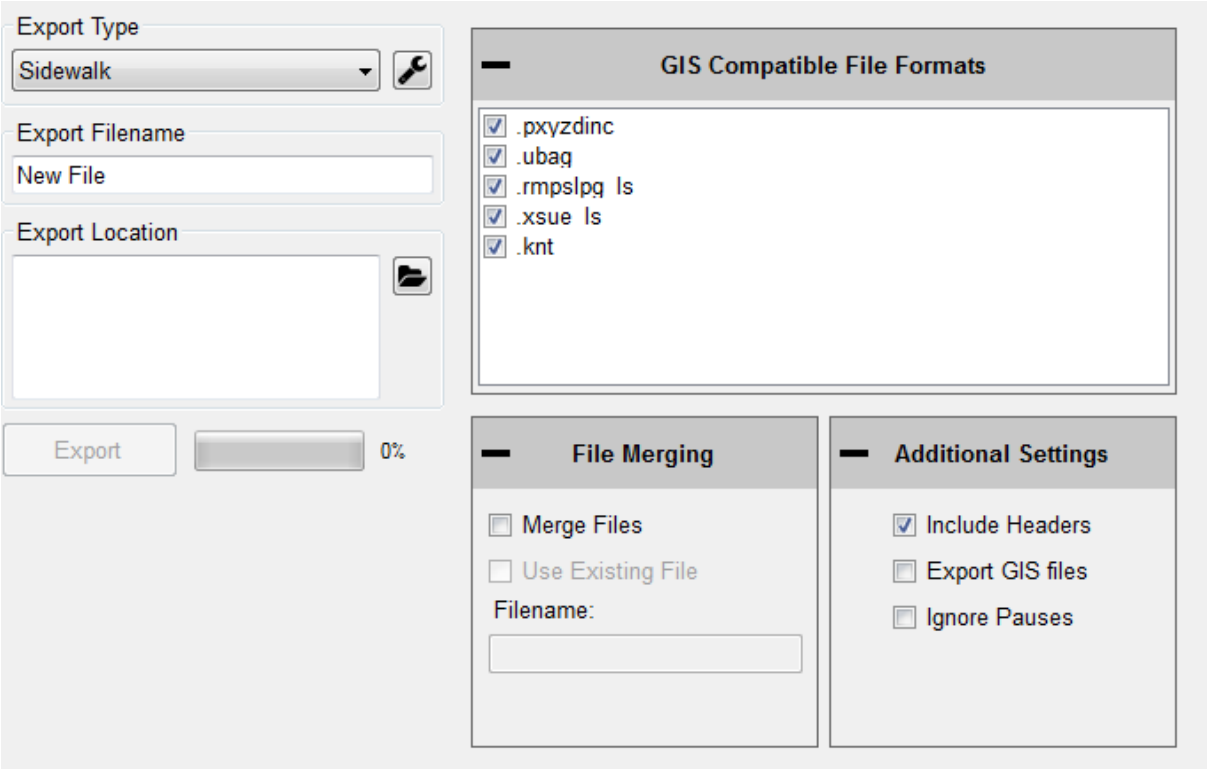


Figure 76: Export to Sidewalk window

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.

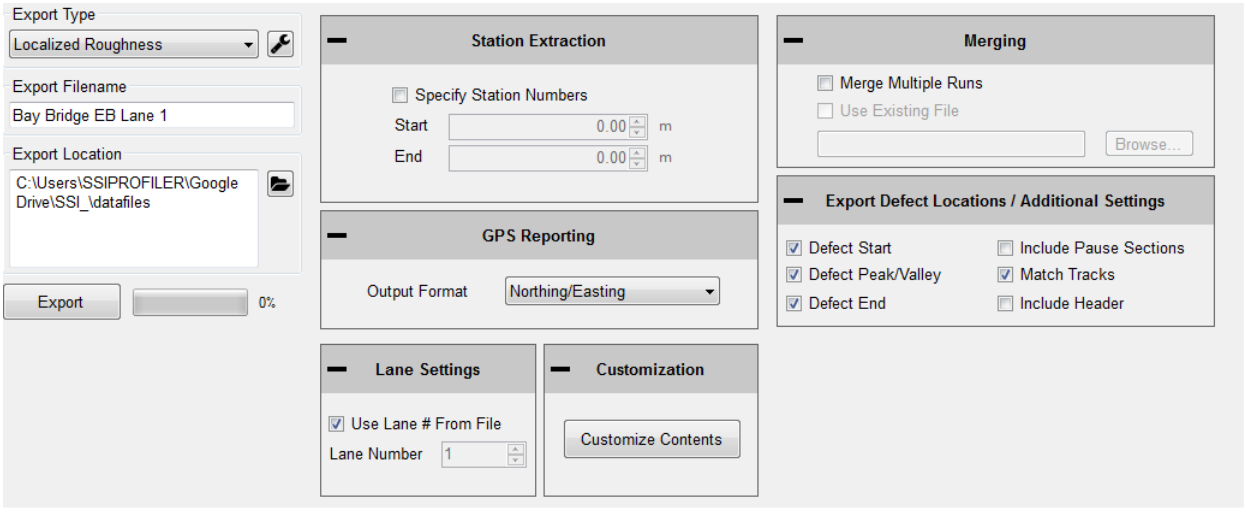


Figure 77: The Localized Roughness export options window

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.

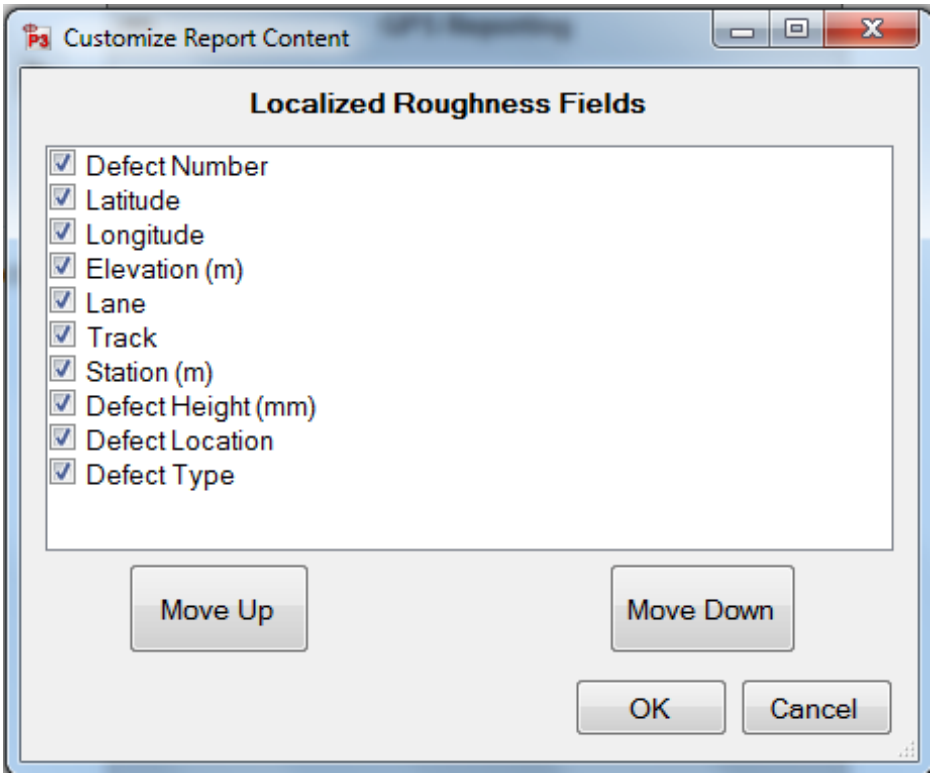


Figure 78: The Customize Window

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.

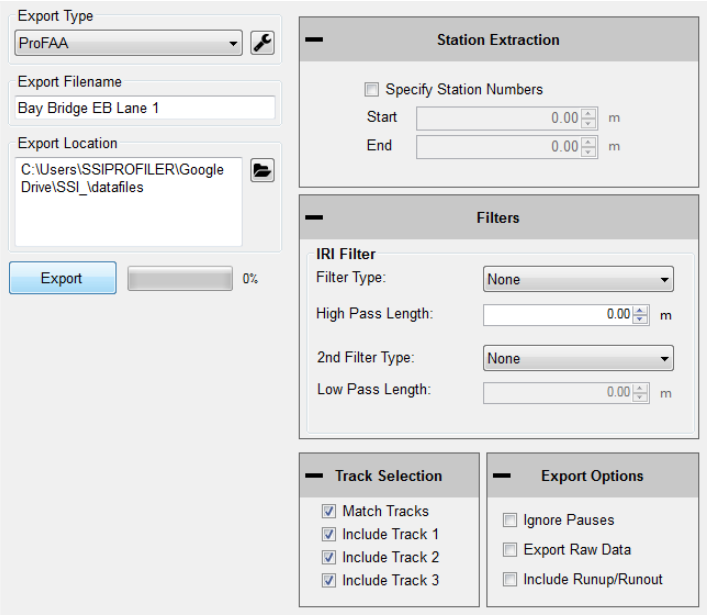


Figure 79: ProFAA window

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.

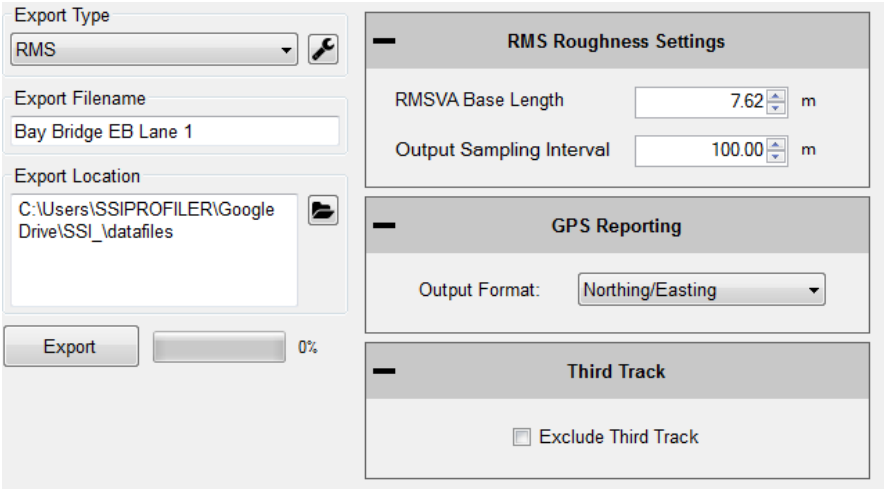


Figure 80: RMS export settings

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

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.

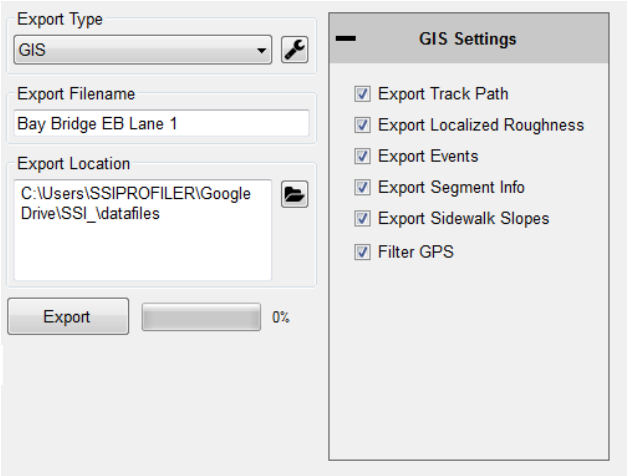


Figure 81: GIS export settings

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.

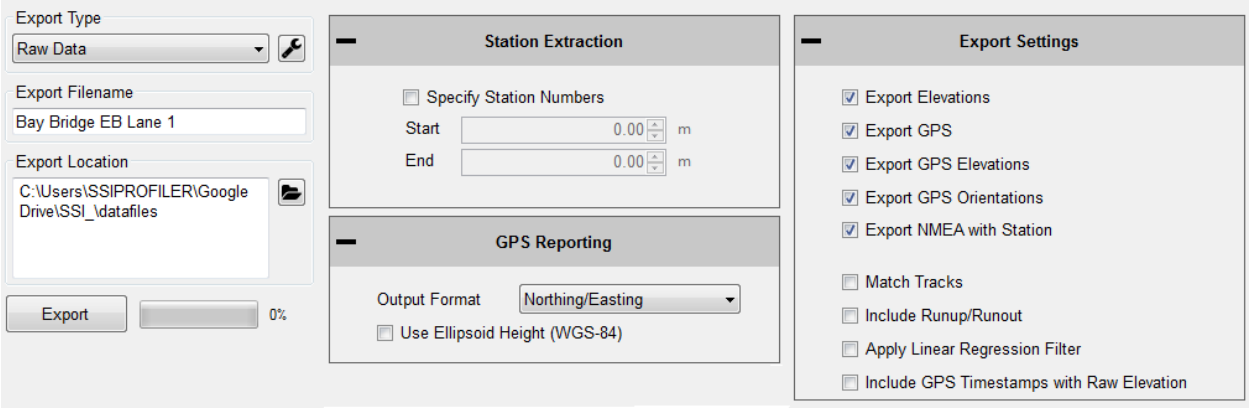


Figure 82: Exporting Raw Data Settings

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

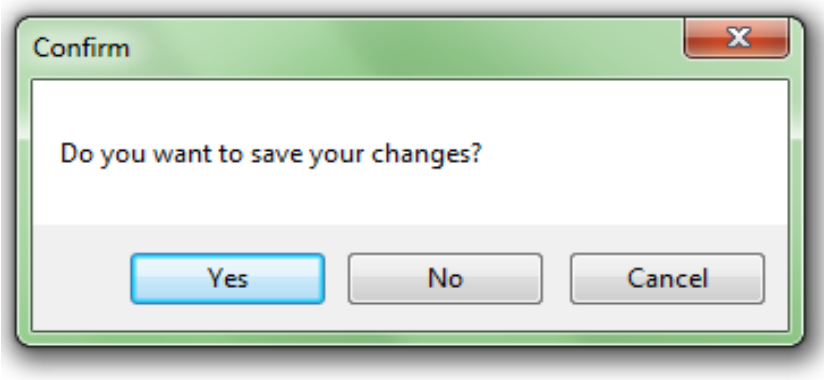
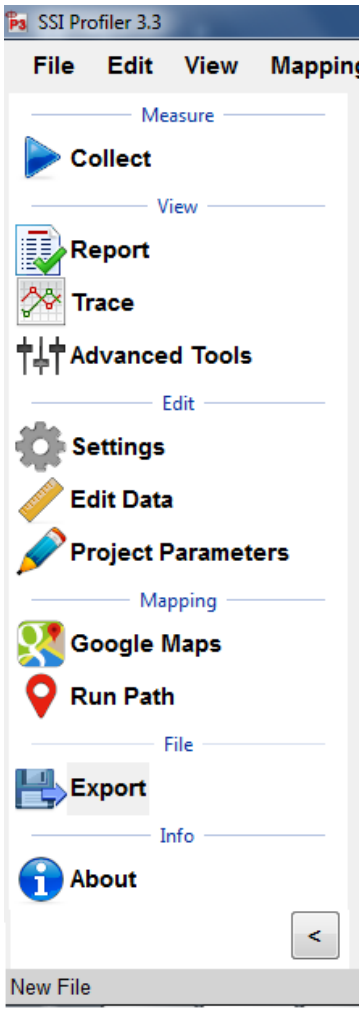


Figure 83: Exiting the program- Saving

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 84. Shortcut bar with all the frequently used

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.

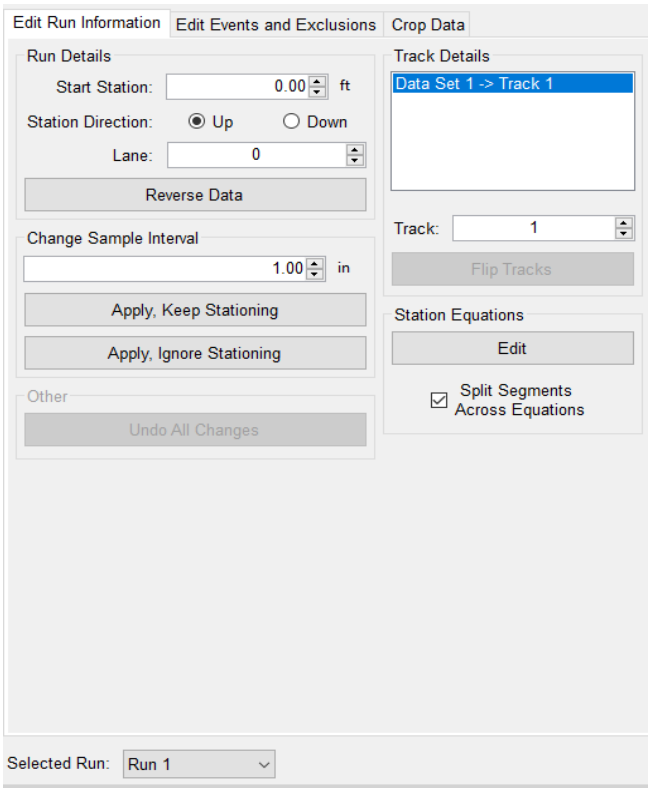


Figure 85. Edit run information tab

Edit Run

Open the Edit Data feature in the shortcut bar (Look for the ruler icon). Under Edit Run Information Tab, the user can adjust starting station, Lane, Track, and Station Equations.

If the data was collected in the wrong station direction, the operator can change to Station Direction to Up or Down or use the 'Reverse Data' button.

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, but can be changed under the 'Change Sample Interval'. Do not change the sample interval unless strictly necessary.

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.

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."

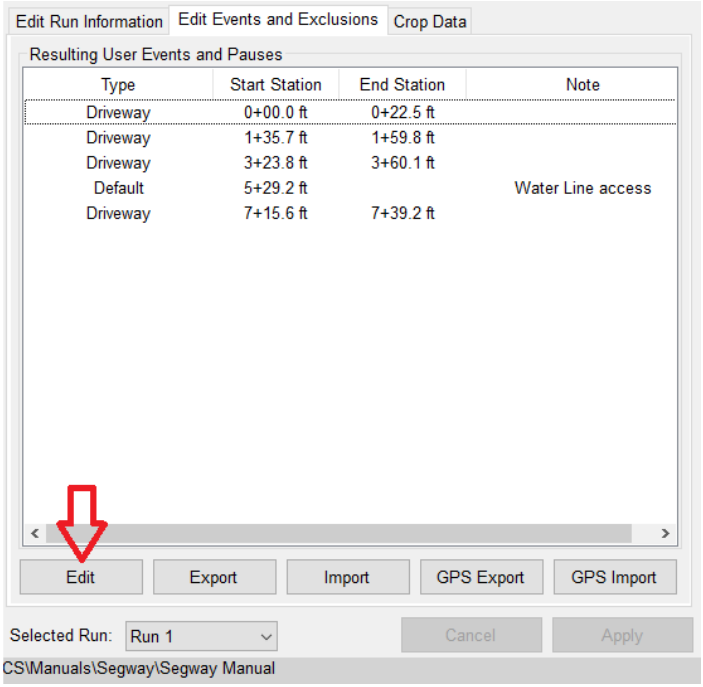


Figure 86. Adding or removing pauses from the collection

Edit a Pause/Event

1. Select the pause or event to be edited in the left column list. It is selected when the blue bar is highlighted the Pause/Event title. See figure 86.
2. On the right side of the window, Select the run number to add the pause to from the drop-down menu.
3. Change the Type of Pause/Event
4. Change the Start and End Station.
5. Add a Note to the Pause/Event
6. Change Buffer settings.
7. Select the Apply button

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

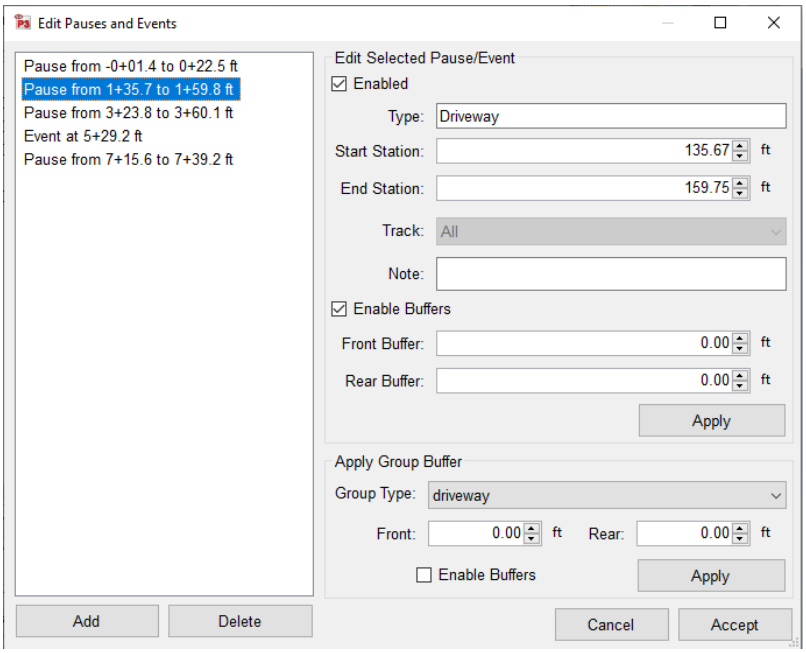


Figure 87. Edit pause and events window

Add a Pause/Event

1. Select the 'Add' button under the Pause/Default list in figure 86 above.
2. Select Pause or Event
3. Enable Pause/Event information
4. Chose Type, Start Station and End Station
5. Add notes and/or buffers
6. Select the 'Add' button

Pause Definition

When the collection system is paused, height data is omitted but 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.

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.

Pause Notes

To explain the reason for the pause/event or the location, enter the information in the pause notes. This information will appear in the track notes of the trace reports. See figure 87.

Pause/Event Buffers

Choose the Pause/Event Front and Rear Buffers. The units can be changed by simply clicking on the unit icon to the right of the buffer and a dropdown list will appear. Select Add when finished.

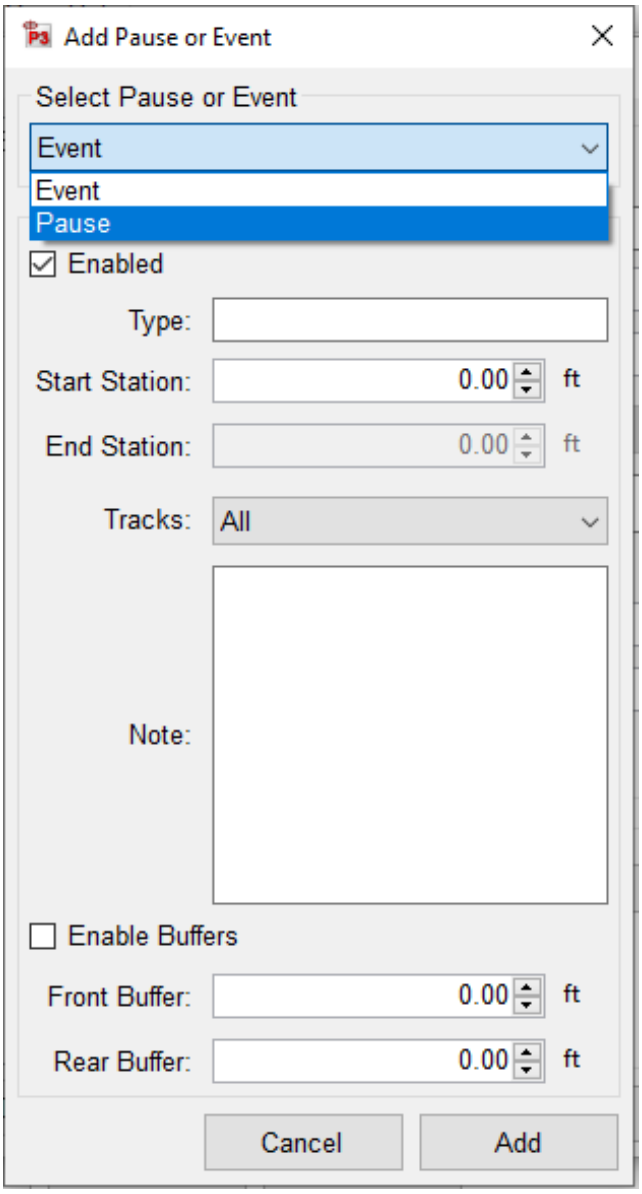


Figure 88. Add Pause/Event window

Crop Data

The Crop Data tool (See figure 88 below) 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**.

Change the distance units and height units of the graph by clicking on the units icon and selecting from the drop down menu. The graph can also be seen in the Pan or Zoom mode with an option to apply on either the x axis, y axis or both.

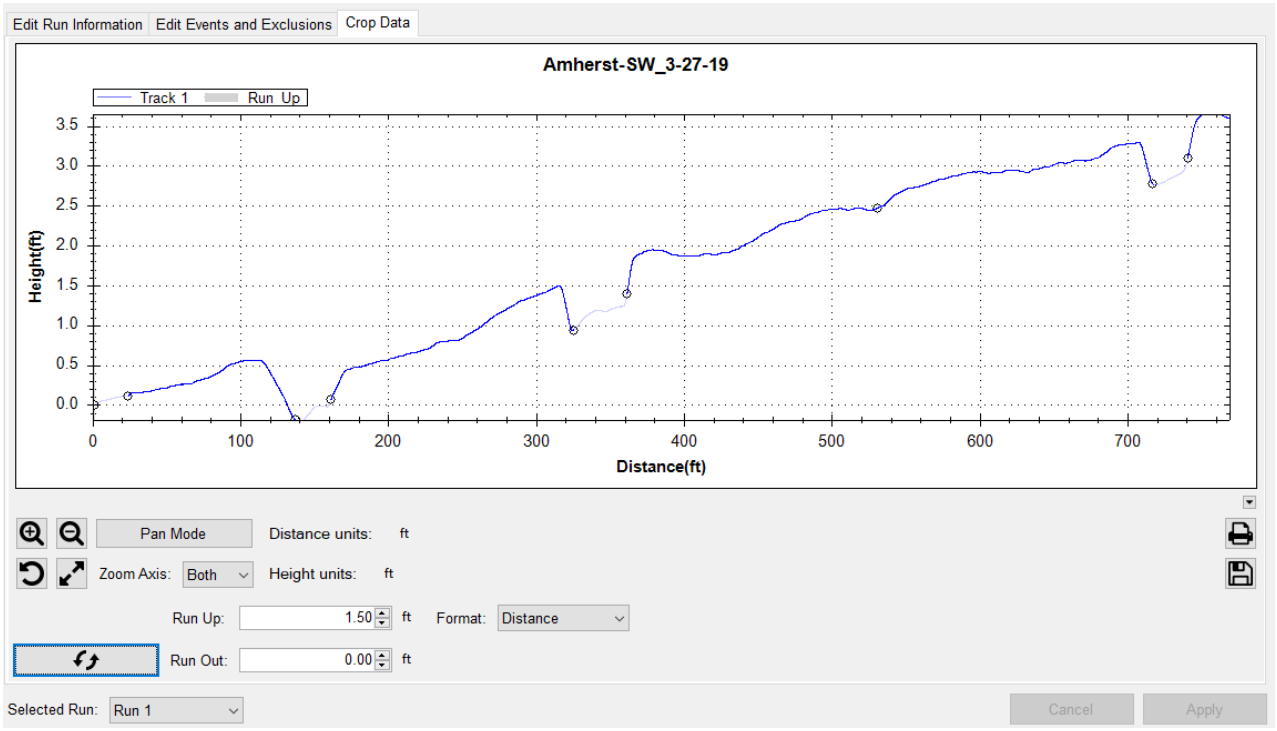


Figure 89. Crop Data Tool

Project Parameters

The Project Parameters section is the location where the job information is entered. 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.

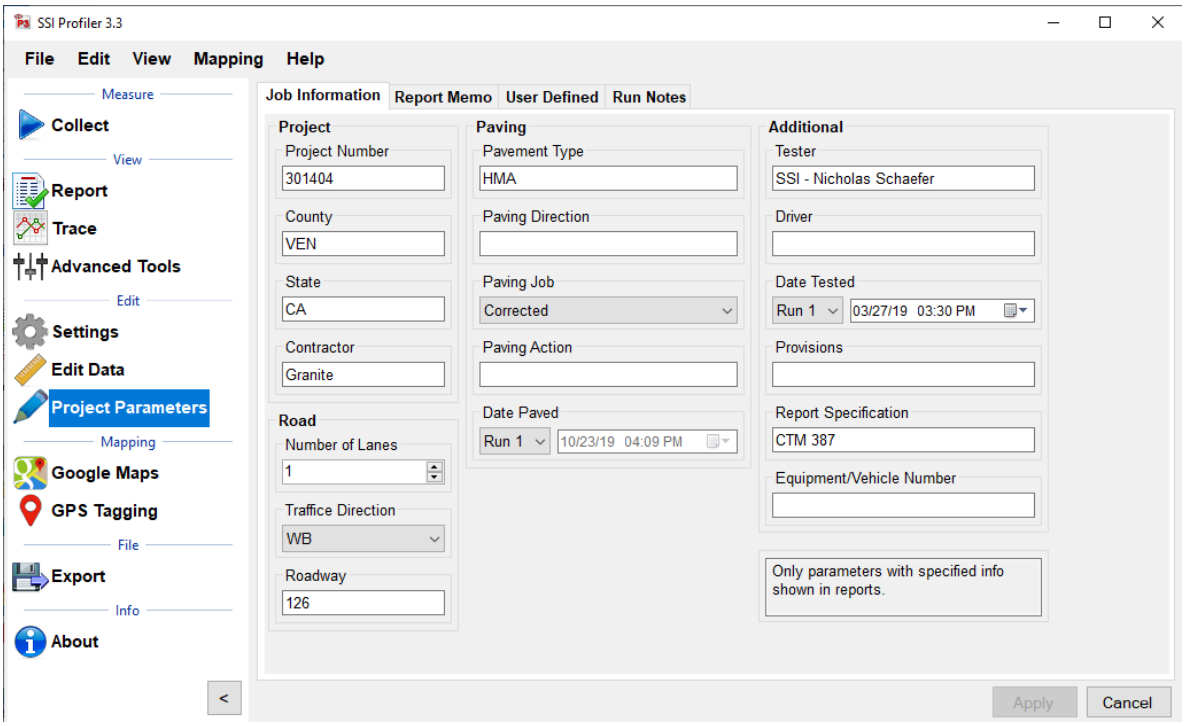


Figure 90. Project Parameters on the Job Information tab

Job Information

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

Project

Project Number

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

County

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

State

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

Contractor

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

Road

Traffic Direction

The traffic direction of the lane to be profiled.

Number of Lanes

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

Paving

Pavement Type

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

Paving Direction

Enter the direction of the paver when placing the pavement.

Paving Job

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

Paving Action

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

Additional

Tester

The individual operating the profiling equipment over the pavement surface.

Provisions/Weather

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

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.

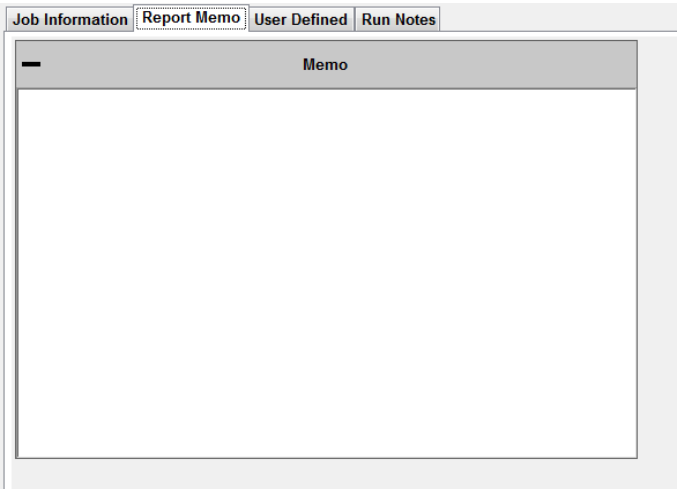


Figure 91: Report Memo window

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.

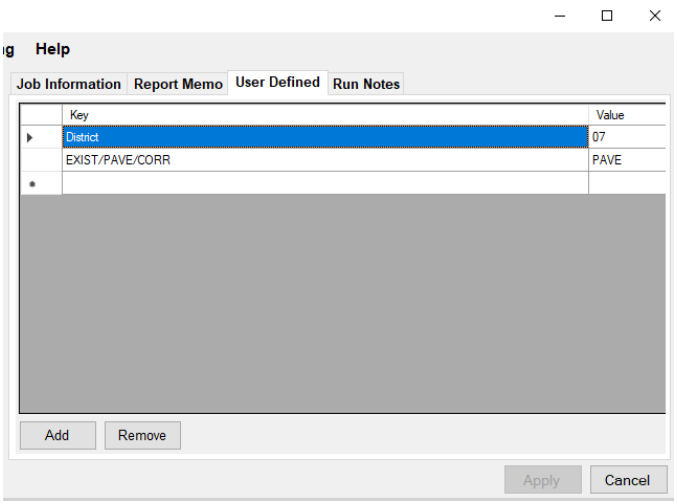


Figure 92. The user defined window

Run Notes

The Run Notes lets the user add specific notes to the run indicating whatever useful knowledge the operator wishes to associate and save with the file and run. This can include road and weather conditions. Press 'Apply' to save the changes.

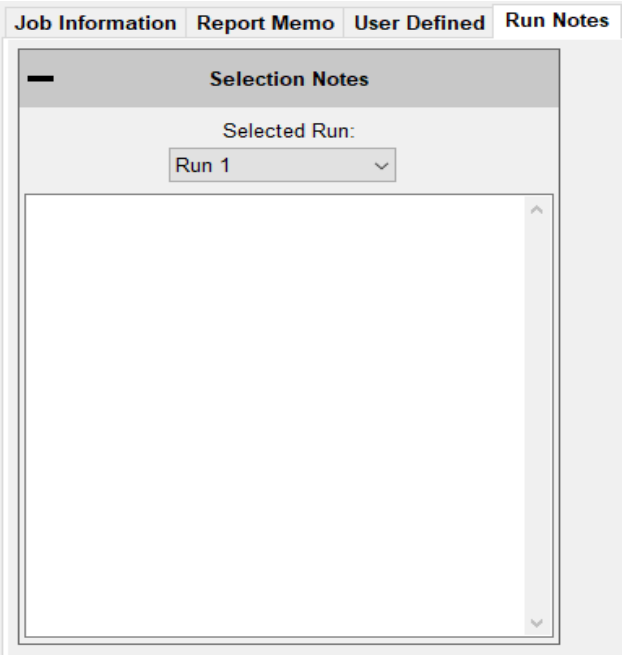


Figure 93. The Run Notes window.

Settings

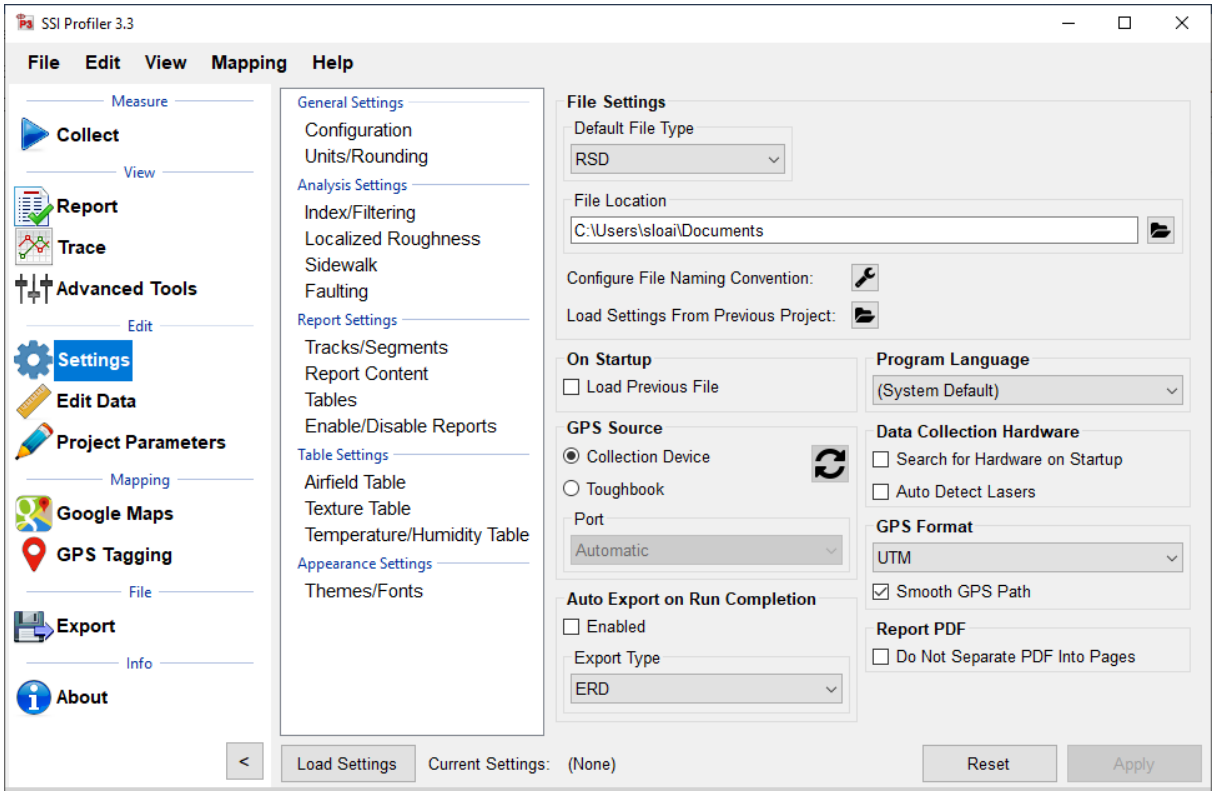


Figure 94: Report options window

Report Content

Chose which parameters to show in the Summary Report by clicking on the checkbox next to the following options: Show Defects Table, Show Rutting Table, Show Event Notes Table, Show Only Failing Segments. Below, the operator can choose whether to show Individual track 1 and track 2 Values or an Average for track 1 and track 2 values.

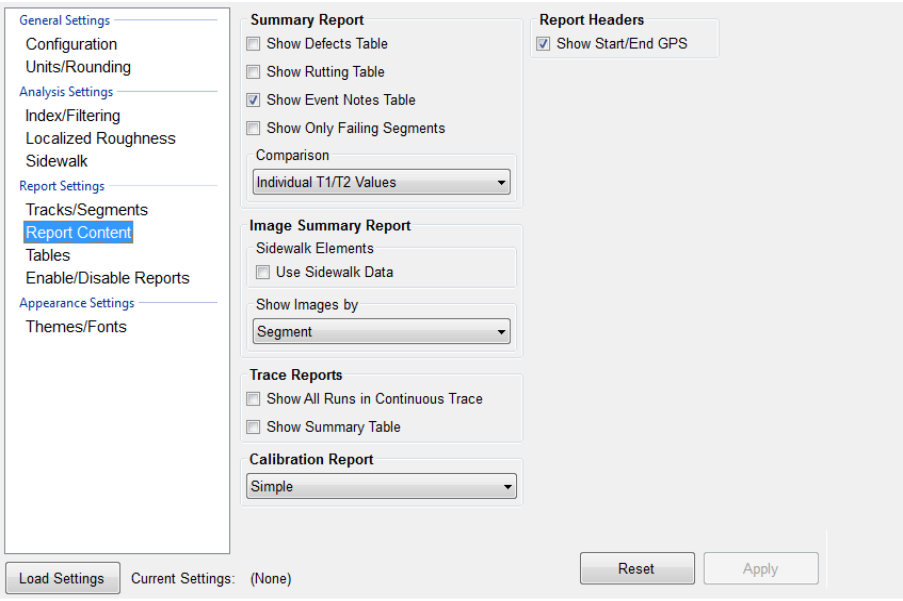


Figure 95. Report Content window

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. To configure for sidewalk data, check the "Use Sidewalk Data" box.

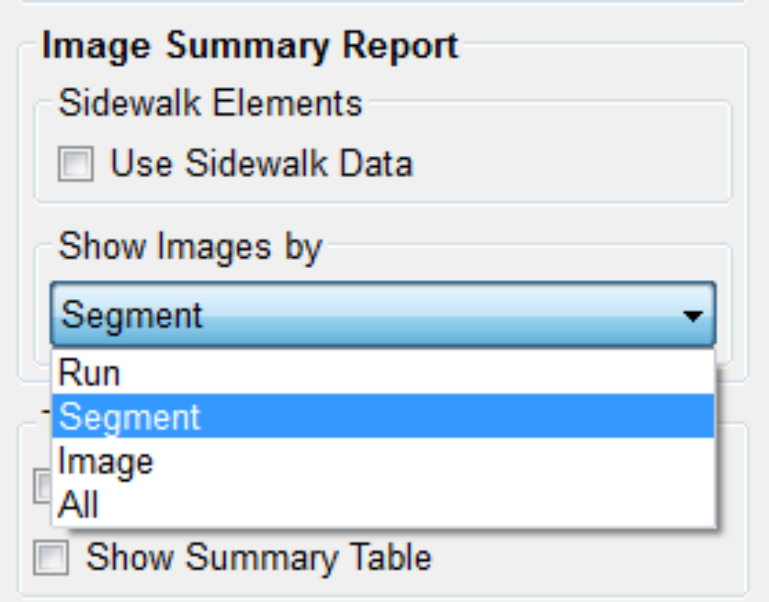


Figure 96: Image Summary Report options under Report Content.

Trace Reports

Chose to Show All Runs in a Continuous Trace and/or show the summary table by clicking on the checkboxes next to each option.

Calibration Reports

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.

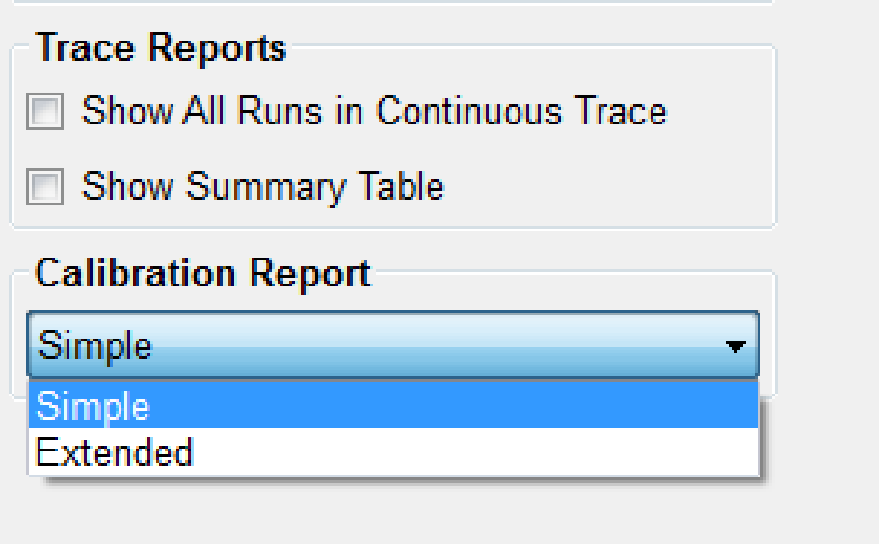


Figure 97. Calibration Report

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

Select content desired to be reported in the Summary Table, the Rutting Table, The Trace Notes Table, the Slope Table and the Events Table. These will appear as additional columns. *Note: The Rutting table only applies to laser systems with more than three lasers. The Slope table only applies to systems with IMUs including some laser systems and the CS8600 system*.

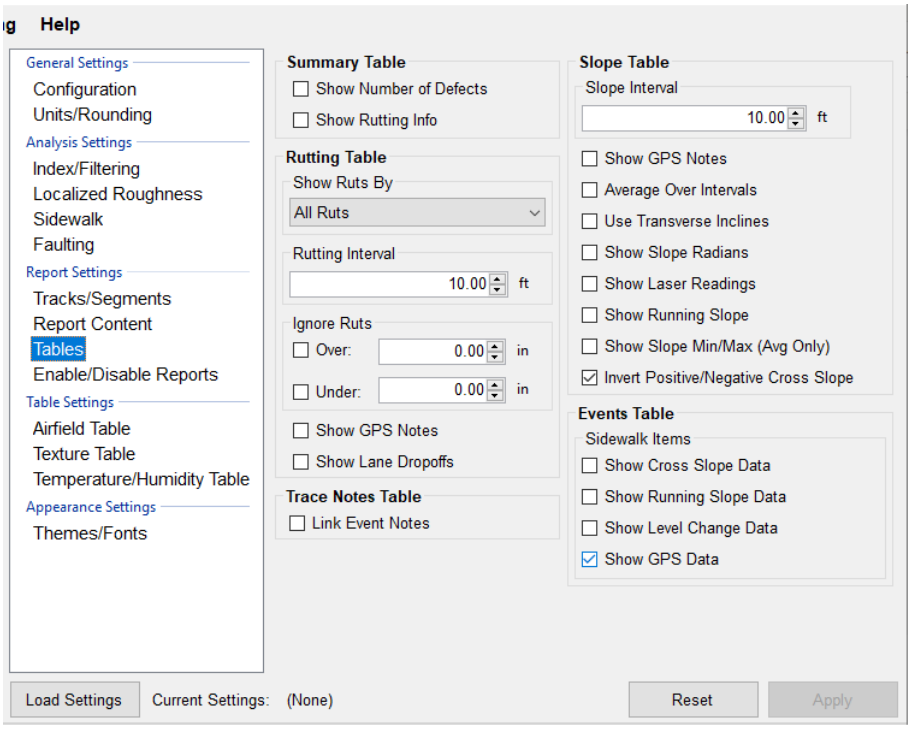


Figure 98. The Table options in Report Settings.

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 figure 104.

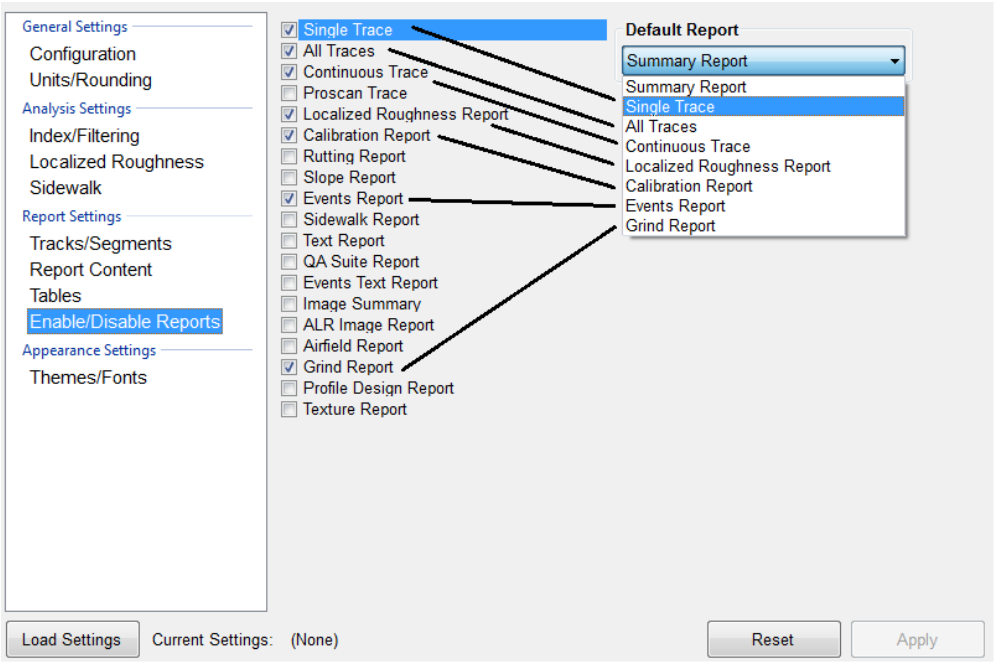


Figure 99. Enable/Disable Reports window

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.

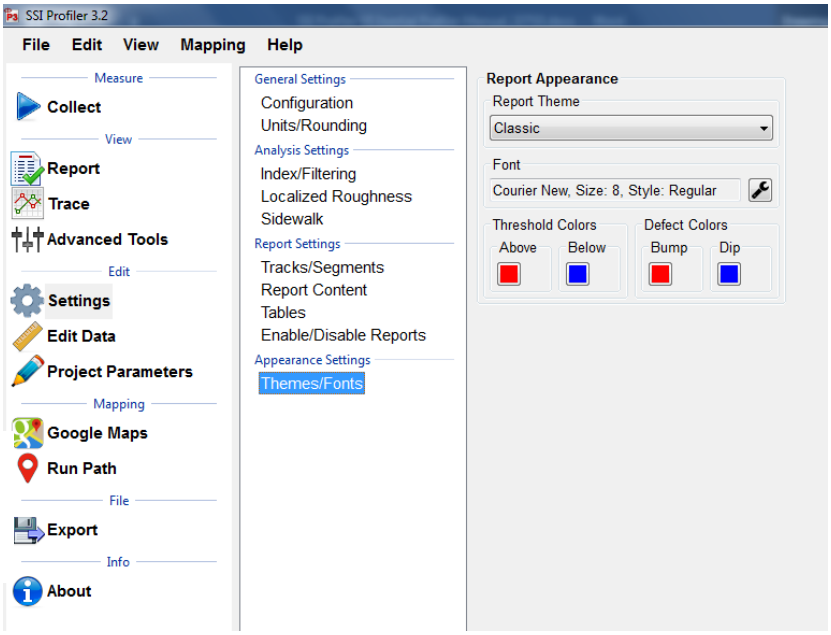


Figure 100. Themes and Fonts option under Appearance settings.

View

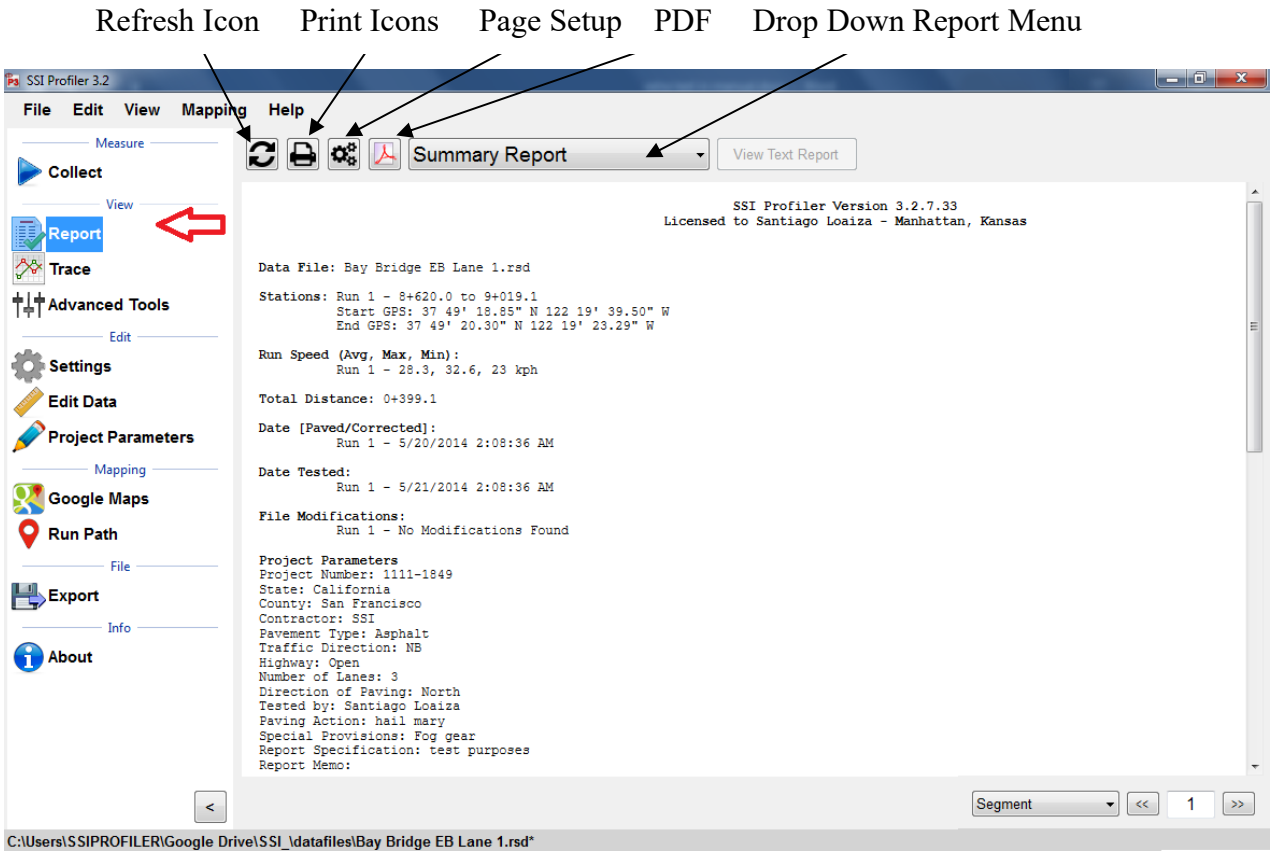


Figure 101. Summary header for single trace report

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. Automatically Refresh may be selected in Tracks/Segments settings window. With this selected, reports will automatically refresh when changes are made.

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.

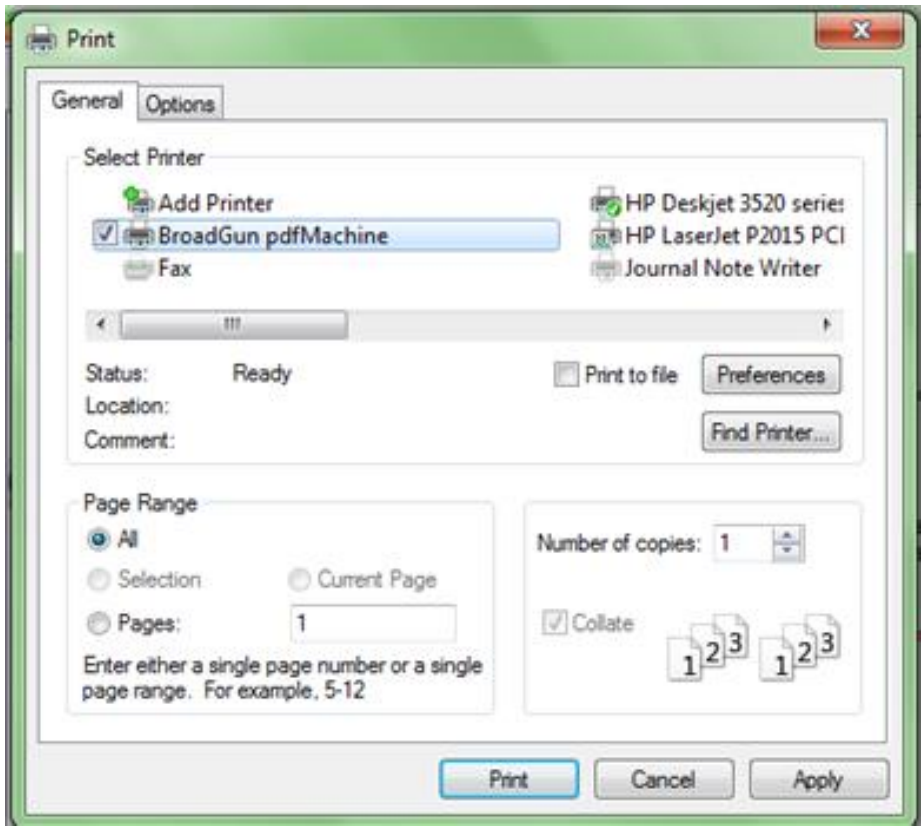


Figure 102. Printing Options Window

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.

To PDF

The Adobe Symbol between the Printer symbol and the report type will print the current report to PDF format if a PDF printer is installed. Contact SSI support if 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.

Reports containing Sidewalk data are “Sidewalk Report”, “Image Summary Report”, and “Texture Report”.

Figure 103. Drop-down menu for the report options

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

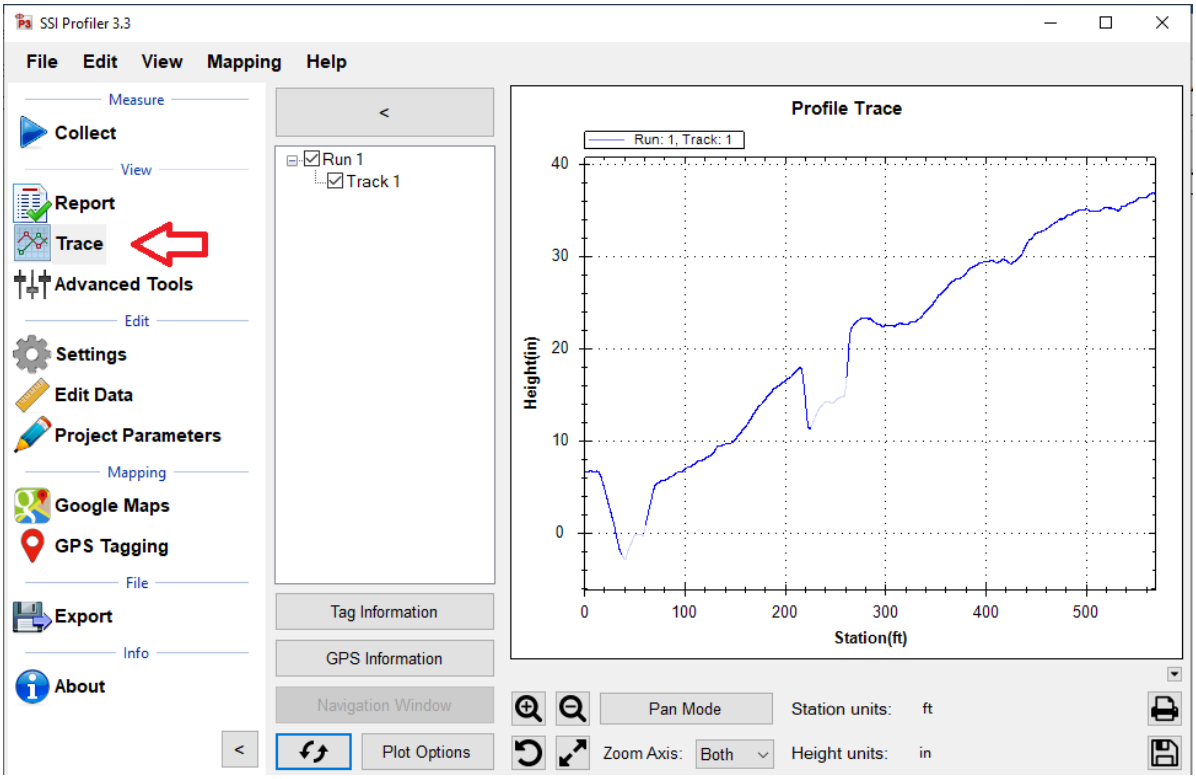


Figure 104: An example of the profile

Choosing Tracks for Plotting

To choose tracks for plotting in the trace window, select the check box next to the desired tracks. Once all 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 changes will not be shown.* Review the legend to verify that all 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

Plotter Data Type

Select between Profile, Continuous IRI, MRI and HRI, Median Profile, Segmented Bar IRI, Brids Eye View, Continuous IRI vs Speed, and Rolling Straight Edge.

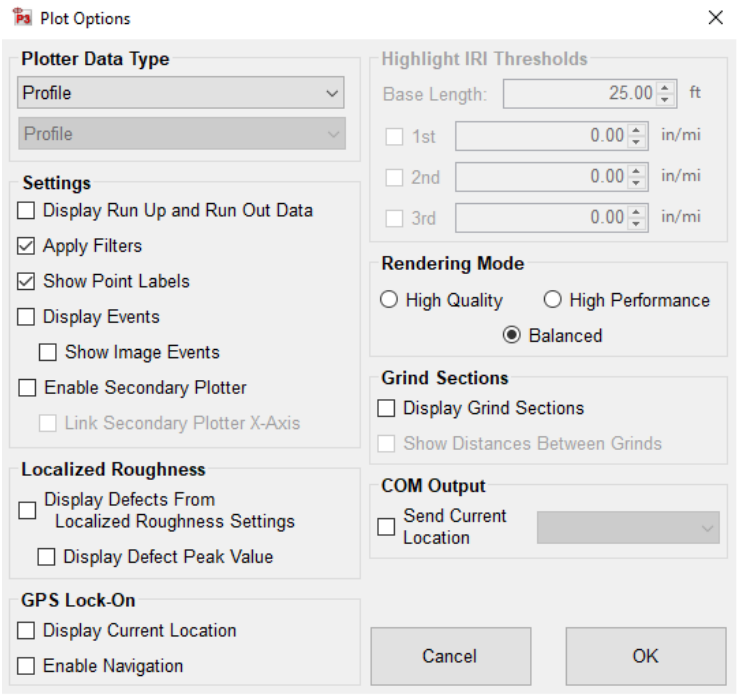


Figure 105. The plotter options window.

Apply filters

To apply 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.

Enable Secondary Plotter

Select the ‘Enable Secondary Plotter ’ to add another graph to the window making for easier analysis when comparing profiles.

Localized Roughness

Select the ‘Display Defects’ checkbox to show Bumps and/or Dips according to the previously chosen Localized Roughness Settings. Select the ‘Display Defect Peak Value’ to show the max height of the bumps/dips.

GPS Lock-On

Select the 'Display Current Location' checkbox to indicate GPS position. Select the 'Enable Navigation' checkbox 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.

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.

Grind Sections

Select the 'Display Grind Section' and then select 'Show Distance Between Grinds' for complete grind information.

COM Output

Select the 'Send Current Location' to output GPS location data to another device

Tag Information

The tag feature allows the user to add pauses, events and station markers to previously collected data. The system must be connected to GPS for it to work. With GPS Location displaying position choose 'Set Station Marker', 'Event Location', 'Start Pause Location', 'End Pause Location', 'Start Grind Location', 'End Grind Location'.

Use the 'Undo' and 'Undu All' buttons to eliminate any changes.

The 'Set Static Location' button will popup the Static Location window allowing the input of a GPS location. The window will also allow the user to select the Location Type. Choose between 'Set Station', 'Start Pause', 'Event', and 'End Pause'.

The 'Import Locations' button will allow the user to import and use previously defined GPS Locations.

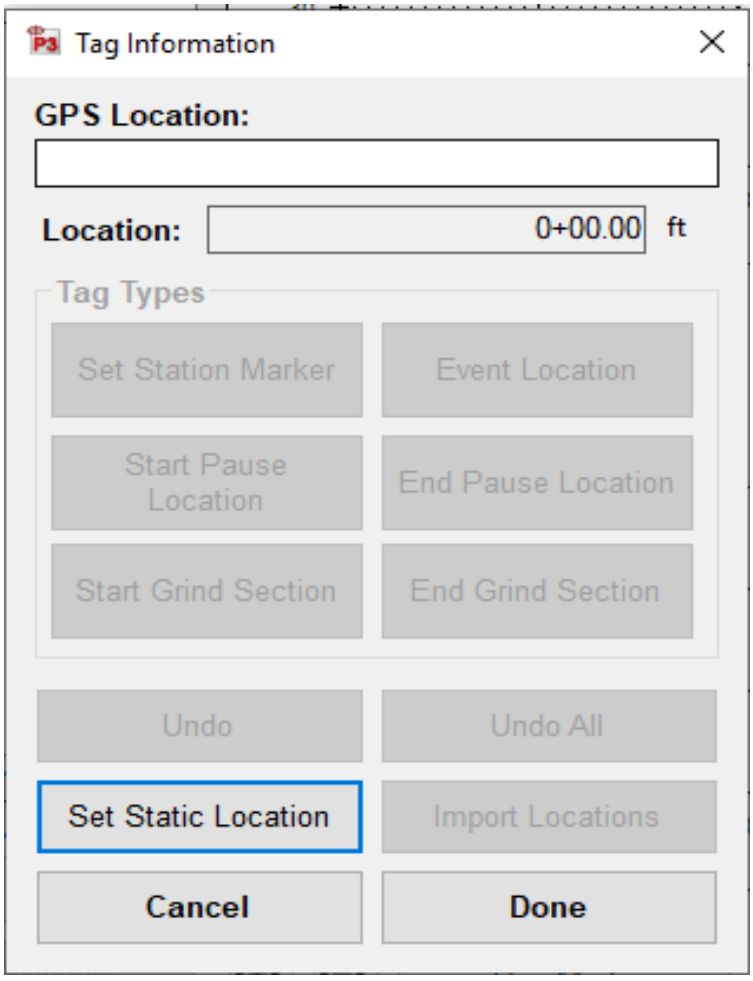


Figure 106: Static Tagging Feature

Print

To print the trace, select the Print Icon in the lower right-hand corner of 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.

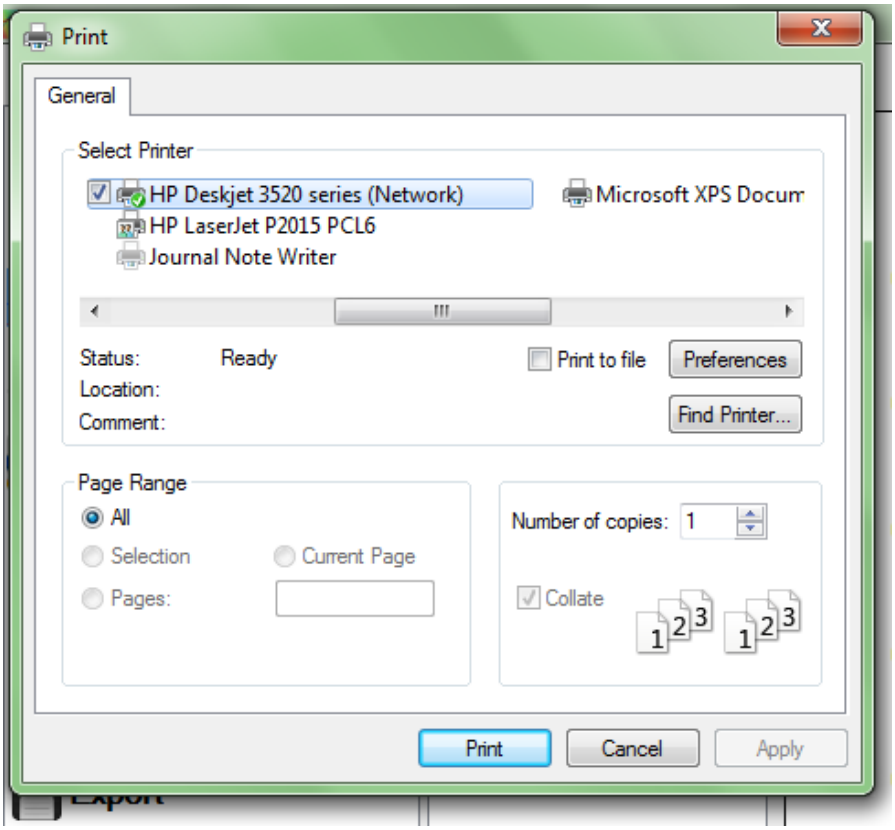


Figure 107. Print window after the print icon is selected

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.

Save

Click on the Save icon in the lower right-hand corner of the trace window. 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.

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

Images Window

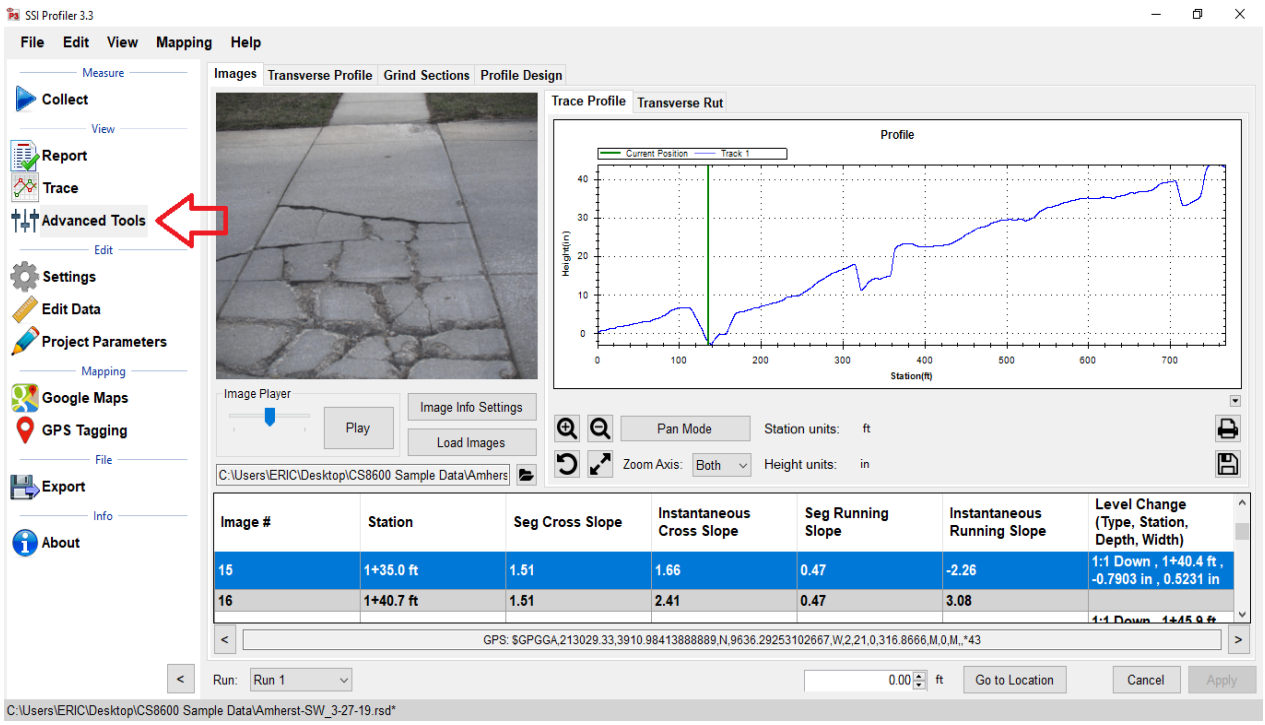


Figure 108. Advanced Tools Images window with an image loaded

Once the ´Load Images´ button is selected, the software will load the images found in the directory listed below the button. The default address is where they are initially saved after collection. If the

directory where they were initially saved to is changed and software closed, the next time Profiler 3 is opened the address box will say ´Image directory not found´. **Displayed content can be modified by right clicking on the header row.**

For CS8600 systems Image #, Station, Seg Cross Slope, Instantaneous Cross Slope, Seg Running Slope, Instantaneous Running Slope, and Level Change can be viewed. Seg Cross/Running Slope computes the average slope over the "Segment Length" which can be configured in Settings>Index/Filtering. Instantaneous Cross/Running Slope displays the slope reading at the station the image was taken plus/minus image offset.
The arrow keys on the 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.

Mapping

Google Maps

Google Maps allows visualization of data within SSI Profiler 3 software. The data depicted in Google Maps will be the same as exported Sidewalk GIS files.
An internet connection is required for use of Google Maps

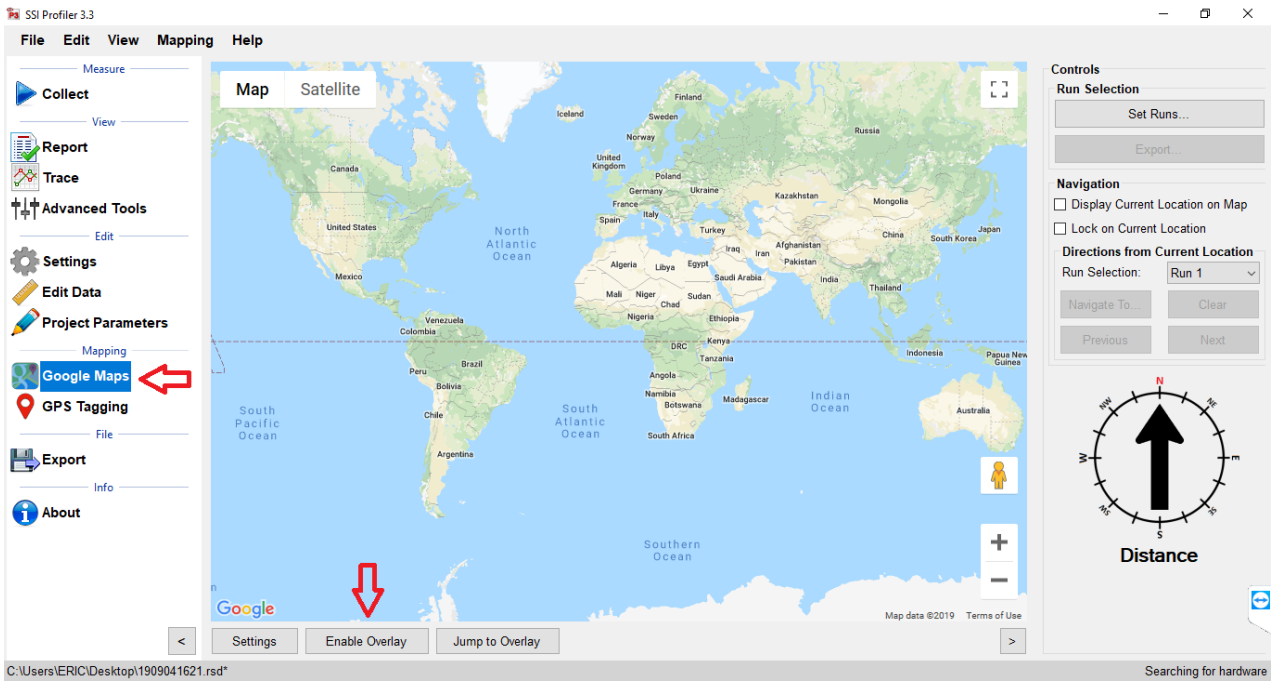


Figure 109. Google Maps Initial Screen

With a file loaded, press "Enable Overlay" to superimpose data on the map. "Jump to Overlay" zooms in on the loaded dataset.

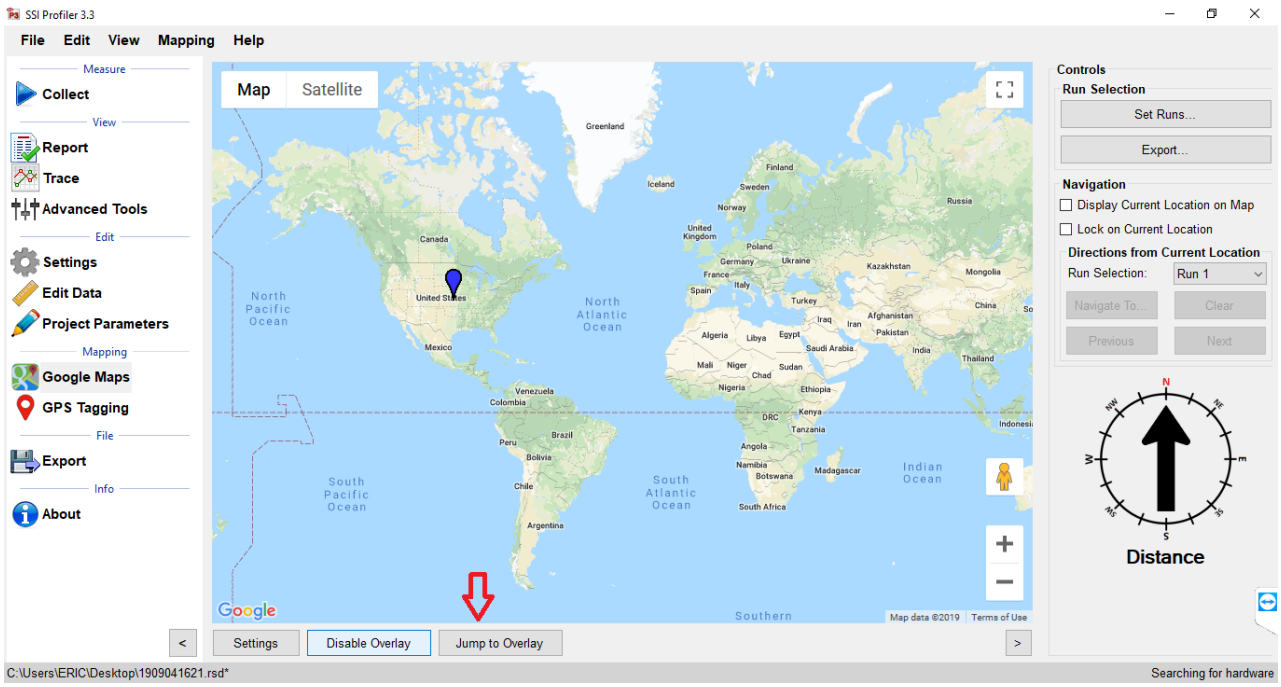


Figure 110. Google Maps Jump to Overlay

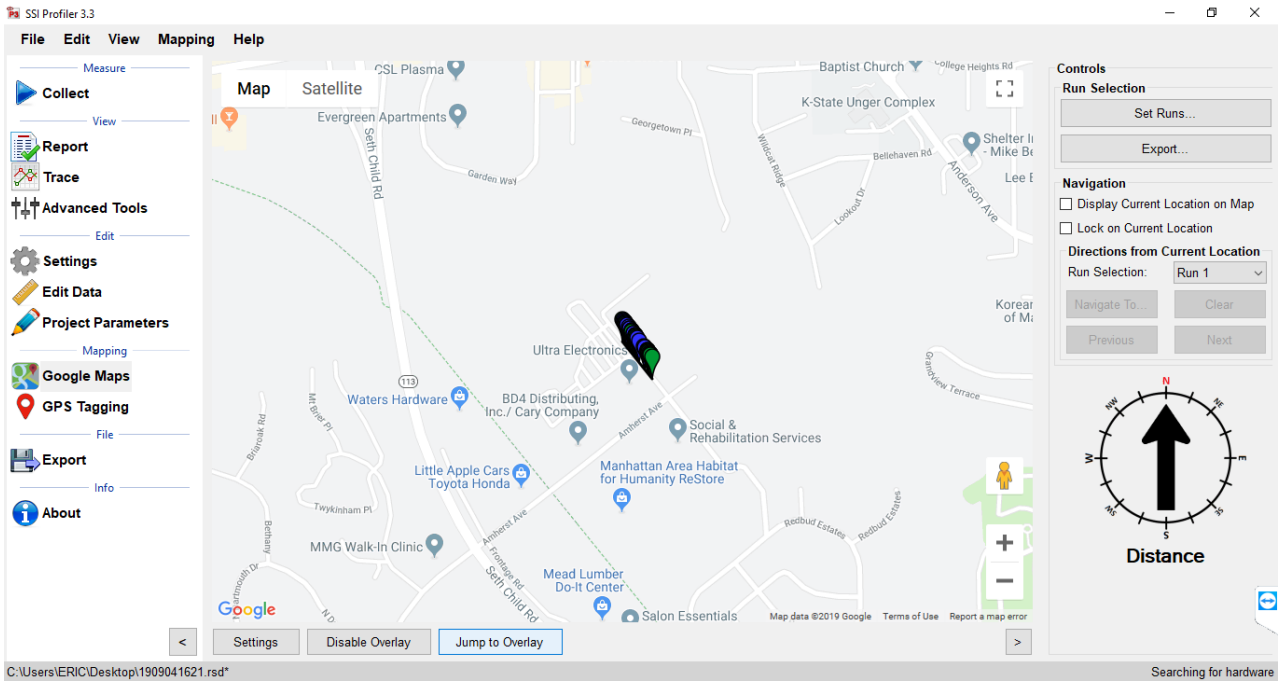


Figure 111. Google Maps after Jump to Overlay

The pins displayed in Google Maps represent sidewalk features. When selected, each pin displays its relevant data.

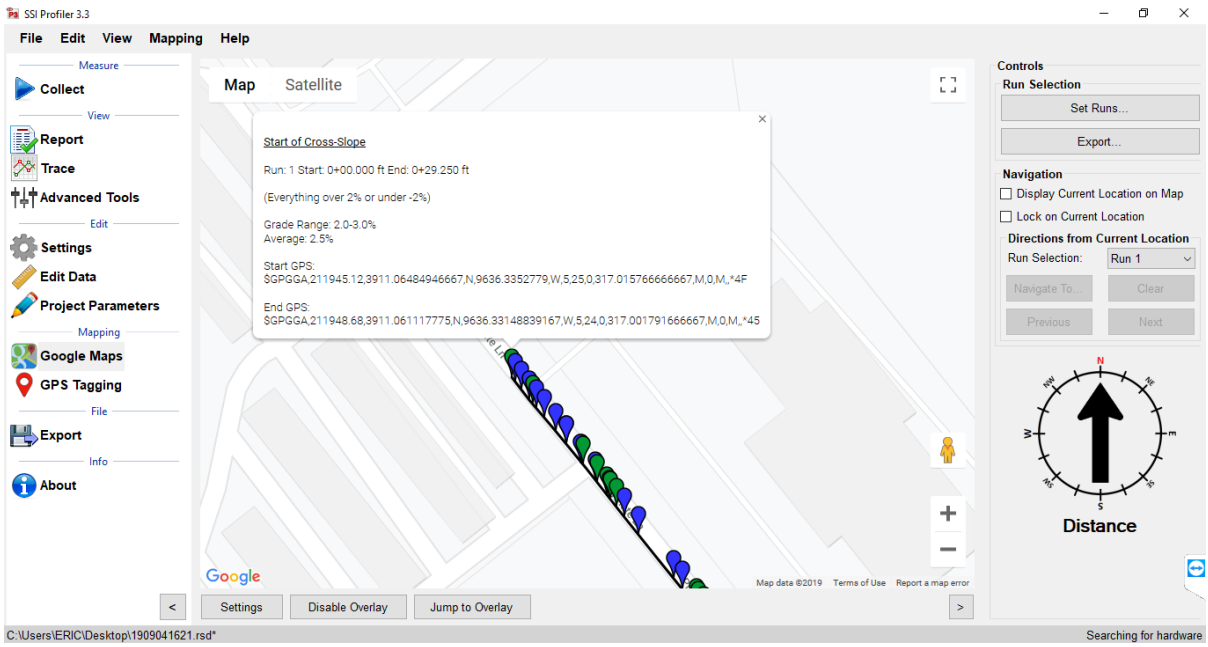


Figure 112. Google Maps Overlay zoomed in with pin clicked for information

"Settings" allows configuration of which features are displayed in Google Maps under Display Options. Path Display Type changes how the traveled path is depicted. Pin colors can be edited as desired through Map Pins>Edit Pins.

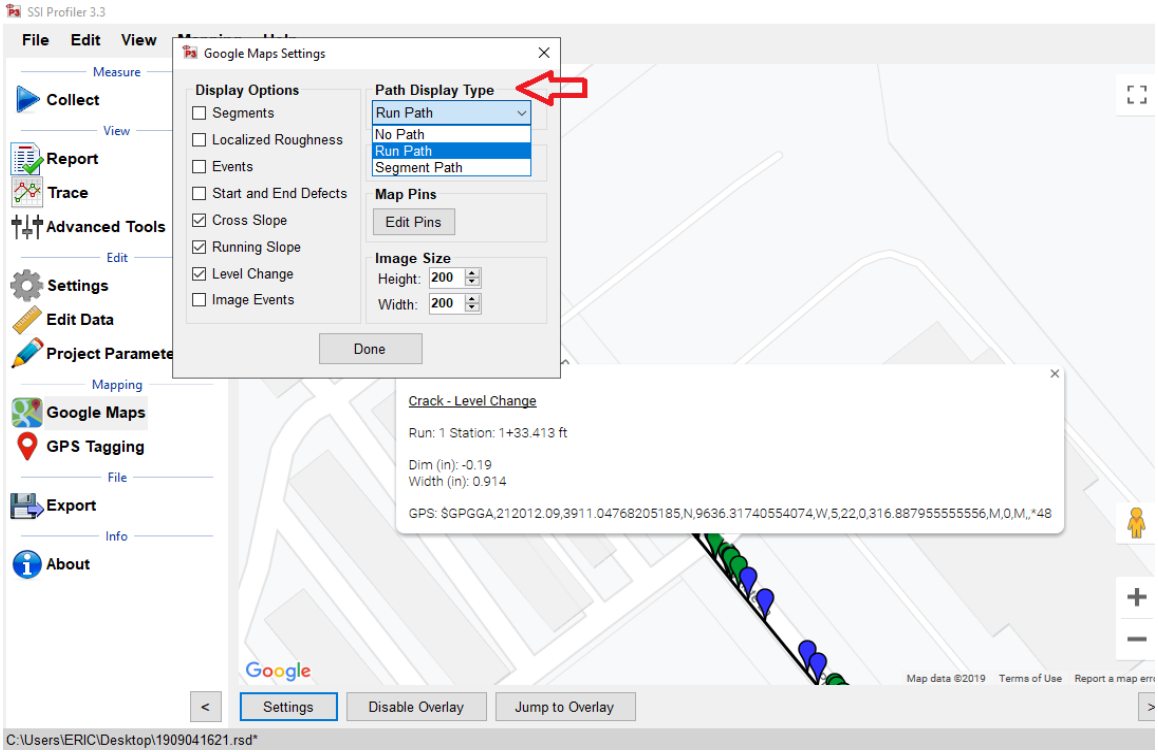


Figure 113. Google Maps Settings: Path Display Type

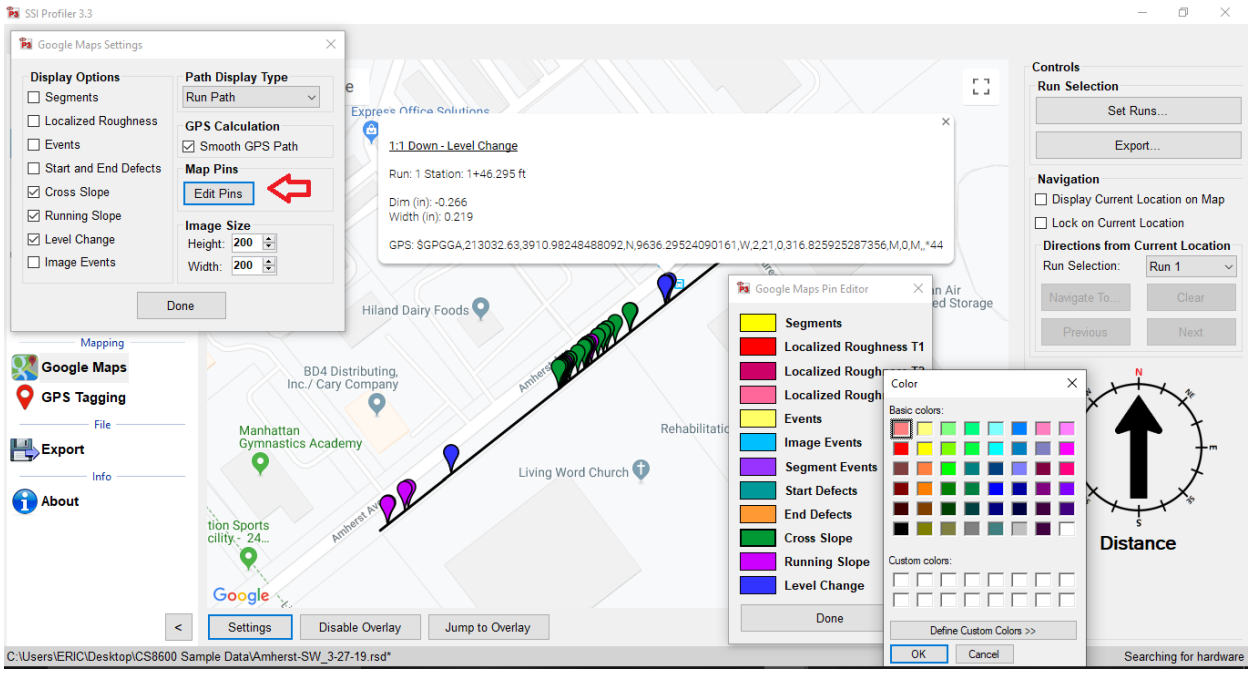


Figure 114. Google Maps Settings: Edit Pins

Data can be exported to .kml format through the Google Maps window by clicking “Export” under Run Selection. KML files can be viewed in most GIS software, for example, ESRI ArcGIS Earth and Google Earth.

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. Must be connected to system with GPS to use this feature.

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. The map will move with the GPS system in real time. Must be connected to system with GPS to use this feature.

Directions from Current Location

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

To navigate to an Event, Pause, Segment, Image, GPS Coordinate, or Station, 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 Navigation feature.

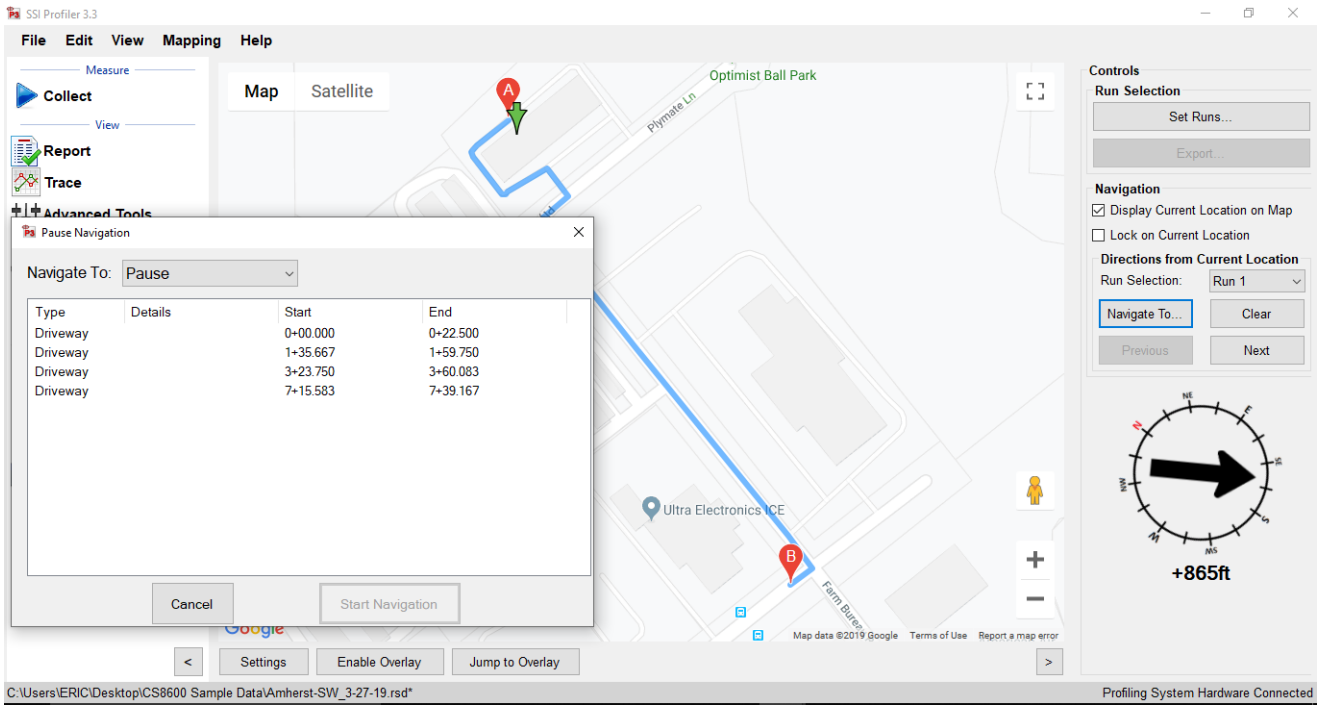


Figure 115. Google Maps Navigation

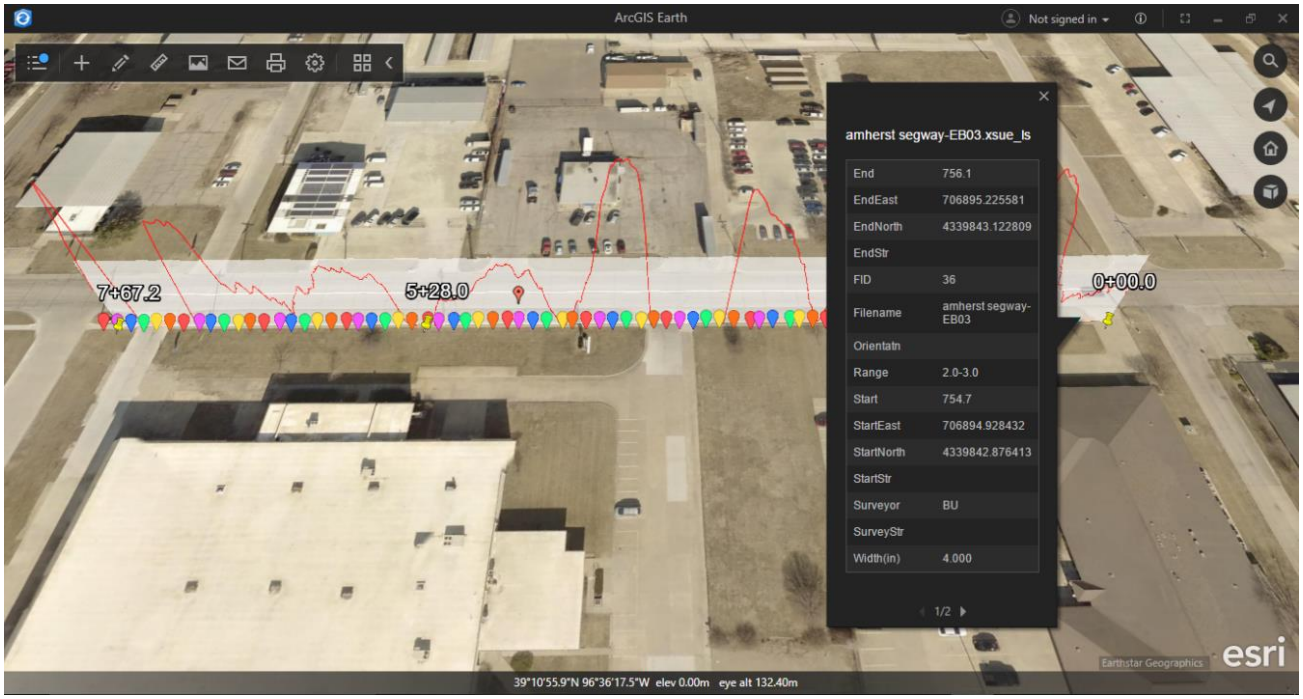


Figure 116. KML export in ArcGIS Earth

About

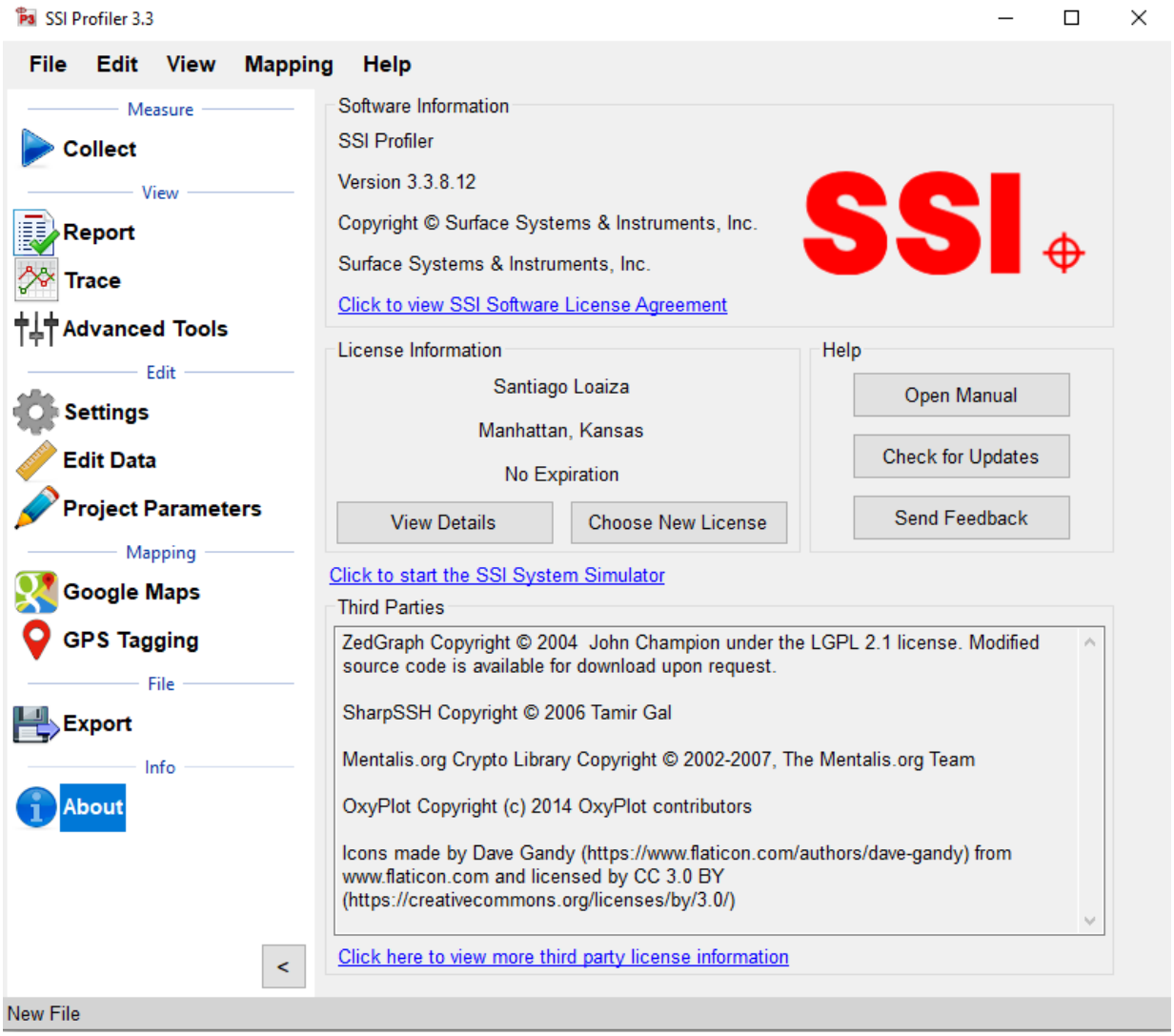


Figure 117: About Window

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. Contact Support@smoothroad.com for any manual requests.

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.

Exiting Program

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

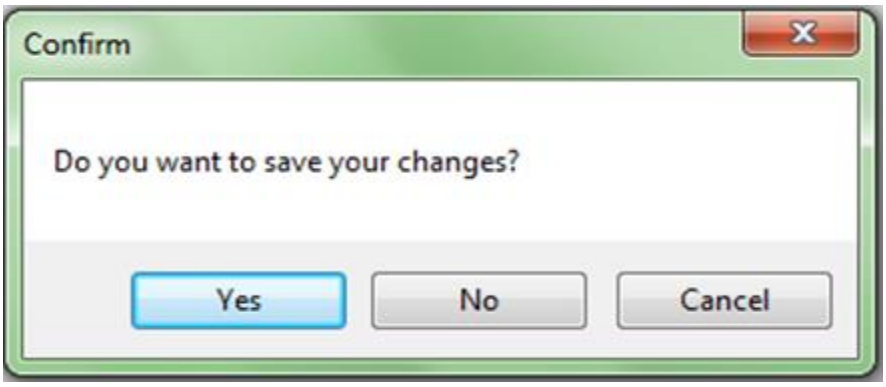


Figure 118. Exiting Program window, chose 'Yes' to save changes, 'No' or 'Cancel'

Recommended Tools

Create a personal default file name convention for your project

Under General Settings the operator may select “Configure File Naming” to create a new file name convention.

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 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.

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 CS8600 software contact SSI. 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.

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

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 Gocator 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?

Lasers Not Firing

Main Cause: No/ insufficient power reaching the lasers

- Is the blue light flashing on the 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?

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?

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

Profiler Hardware Not Found

Check the serial port connection from the profiler to the computer. Check that the profiler has power and is charged. If software disconnects from hardware, close SSI Profiler and reopen the program with the profiler powered on. If problem persists, close the program and shut the power off to the profiler. Wait five seconds then turn the power to the profiler on. Then open the SSI Profiler program. If the issue is not solved, contact SSI customer support.

Do Not Replace the Device Components with Store Bought Items

Surface Systems and Instruments designs and manufactures their custom-built profilers in house. Replacing damaged parts that are inadequate will adversely affect the ability to collect accurate profiles. Please contact SSI for replacement parts.

Updating the Software

If your SSI Profiler license has expired, you will not be able to update. Contact SSI to renew your license and receive new software updates.