

CS8800 WALKING PROFILER

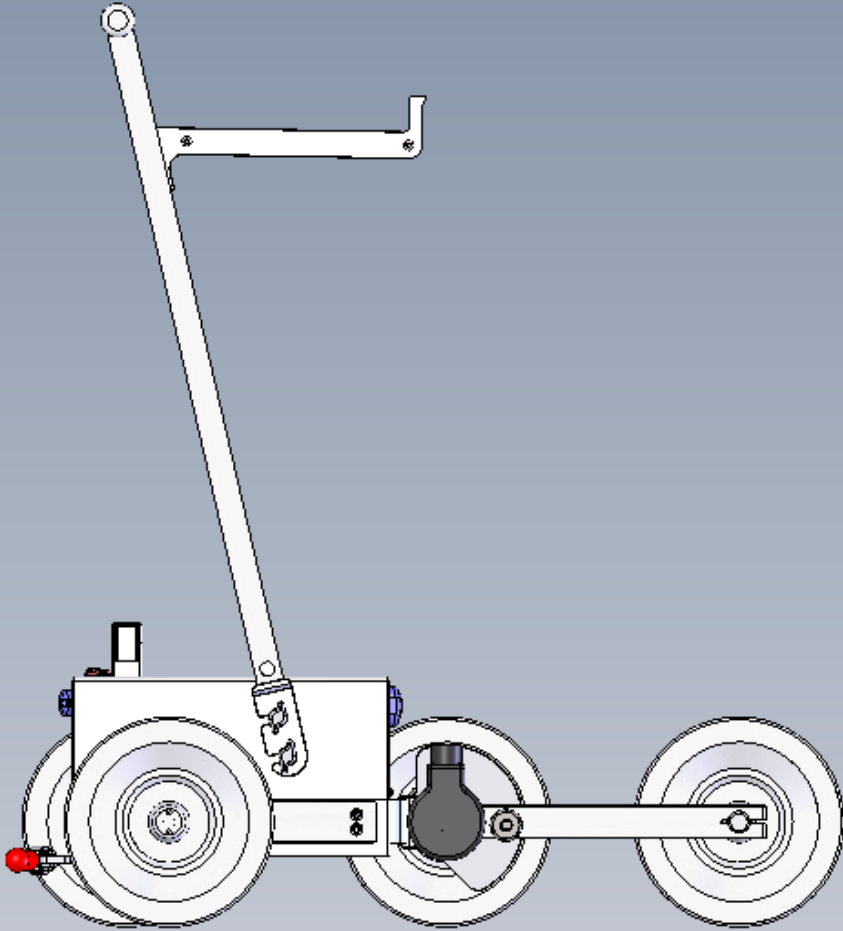


Overview

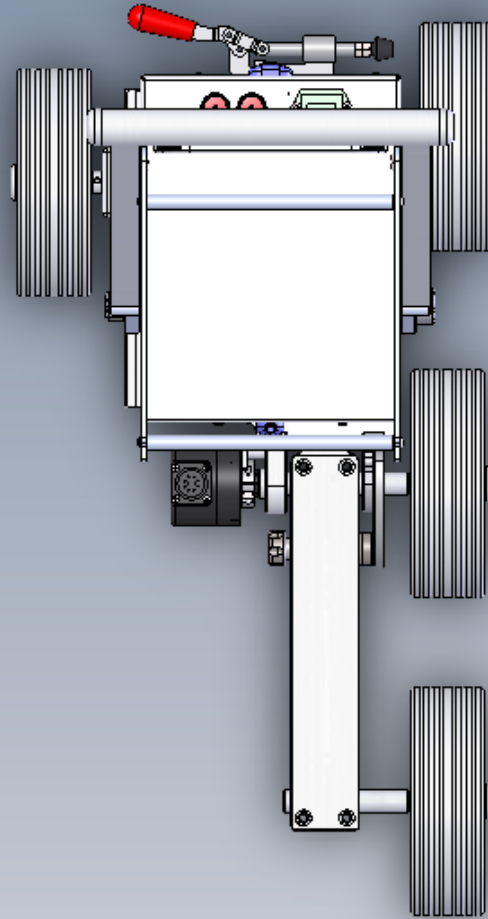


- CS8800 Design and Measurement Method
- Operational Procedures
- Recent and Pending Enhancements
- Base Price & Options
- Comments on October 2009 FHWA Collections

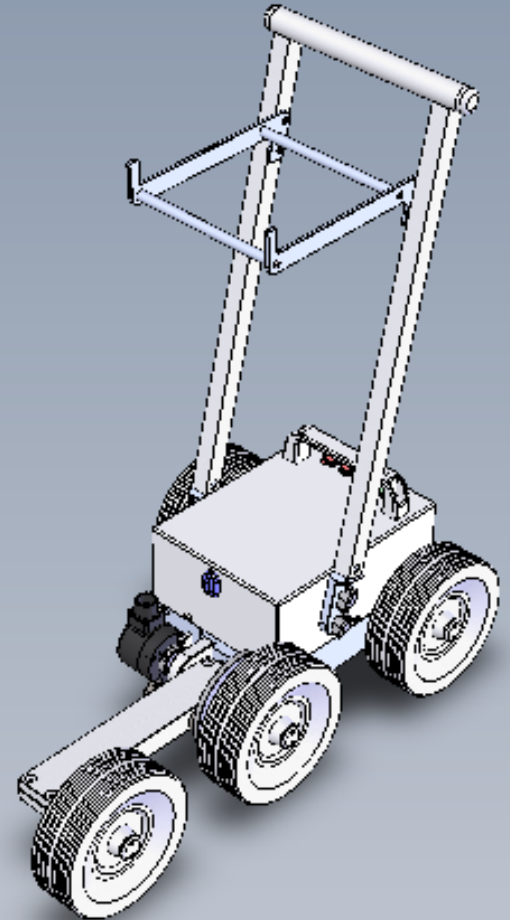
CS8800 DESIGN



▲ Side ▲



▲ Top ▲



▲ Isometric ▲

CS8800 Design Specification

Attribute	SSI CS8800
Warm Up Time	10 minutes
Working Surfaces	Firm and relatively free of stones and debris. Can be wet and dusty. Mud skim/soupy OK if firm below
Operating Speed	~2.5 kph / 1.5 mph; slower on rough or textured surfaces
Sampling Interval	25.4 mm (1.0 inches)
Output Parameters	IRI, MRI, HRI, PRI, RQI, CA Bridge, Variable localized roughness template. PDF, Excel, ERD/PPF and raw strip trace formats.
Localized Roughness	Adjustable template for calculating dimensions of defect areas
Operator Computer	Panasonic Toughbook 19 with Touchscreen. Windows XP/Vista/7
Application Software	Microsoft Windows user interface software.

CS8800 Design Specification

Attribute	CS8800
Height Precision*	±0.0025mm (±0001 inch) per 254 mm (12 inch) wheel-base
Profile Accuracy*	±0.381 mm (±0.015 inch) per 45.7 meters (50 yards)
IRI Accuracy*	±0 .05 m/km (± 3.0 inches/mile)
Correlation with Rod/Level IRI*	±.01 m/km (1 in/mi); 0.985 repeatability on 10 runs (dense AC).
Wavelength Limits	~0.45 meters (1.5 feet) to undetermined upper limit (beyond any relevant or useful wavelength).
Maximum Grade	1 in 4.7 or 12 degrees
Minimum Curvature	No worse than 15 meters (16 yard) radius
*Subject to variation depending on degree of texture and roughness of measured surface	

CS8800 Operation

SSI Profiler v2.3

Open File Analyze Data Collect Data Exit

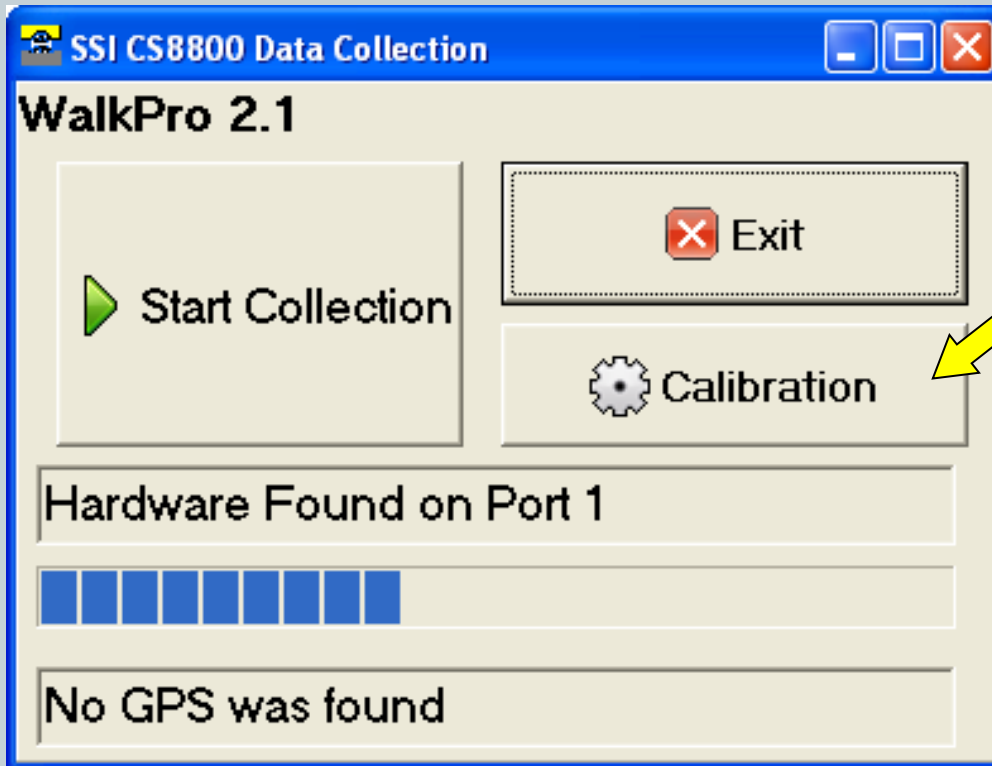
Active File: C:\DataFiles\RHD\Collector\Dual\SSI RD_I-580_90529_Test 09.rhd

☒ Match T1/T2 Data Print Report Print Selected Trace View Trace in Google Earth View Trace in Map Point

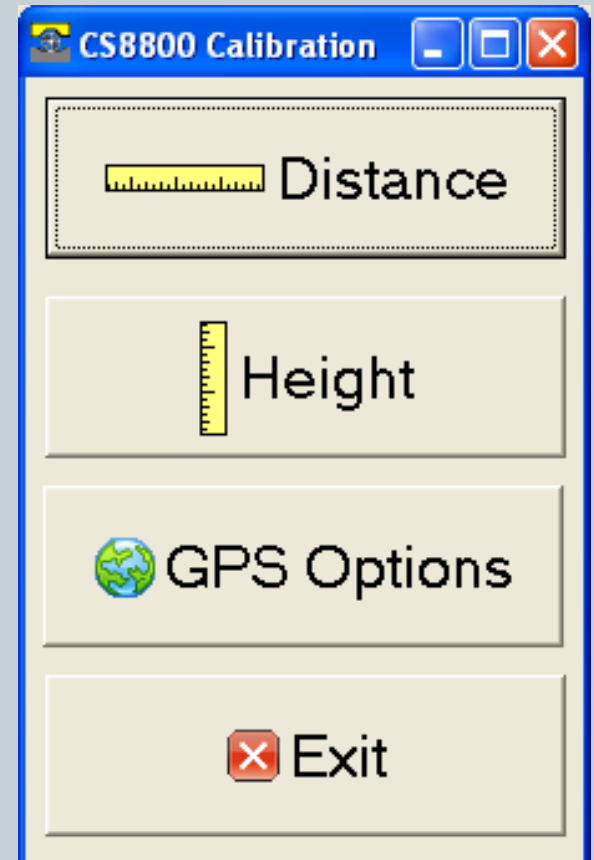
Segment	Station		IRI			Defects		Notes
#	Start	End	Track 1	Track 2	Average	Track 1	Track 2	
Summary	0+00.0	531+36.4	123.7	118.7	121.2	168	189	
Speed (Ave, Max, Min) = 54.2, 67.7, 7.5								
1	0+00.0	5+28.0	80.0	63.3	71.6	1	1	0 0' 0.00" S 0 0' 0.00" W
2	5+28.0	10+56.0	157.6	134.5	146.0	4	3	0 0' 0.00" S 0 0' 0.00" W
3	10+56.0	15+84.0	120.6	130.0	125.3	5	6	0 0' 0.00" S 0 0' 0.00" W
4	15+84.0	21+12.0	150.6	116.7	133.6	2	2	0 0' 0.00" S 0 0' 0.00" W
5	21+12.0	26+40.0	163.8	115.0	139.4	3	1	37 50' 16.55" N 122 17' 47.17" W
6	26+40.0	31+68.0	126.8	106.4	116.6	1	0	37 50' 21.04" N 122 17' 48.11" W
7	31+68.0	36+96.0	85.3	86.4	85.8	0	0	37 50' 26.60" N 122 17' 49.12" W
8	36+96.0	42+24.0	94.1	68.9	81.5	1	0	37 50' 31.94" N 122 17' 50.27" W
9	42+24.0	47+52.0	69.2	63.2	66.2	0	0	37 50' 36.94" N 122 17' 51.42" W
10	47+52.0	52+80.0	84.9	64.2	74.5	1	0	37 50' 41.89" N 122 17' 52.51" W
11	52+80.0	58+08.0	103.9	105.7	104.8	1	2	37 50' 47.19" N 122 17' 53.66" W
12	58+08.0	63+36.0	127.7	105.2	116.4	2	1	37 50' 52.03" N 122 17' 54.79" W
13	63+36.0	68+64.0	132.0	94.3	113.2	3	1	37 50' 57.66" N 122 17' 56.03" W
14	68+64.0	73+92.0	131.8	123.9	127.9	5	7	37 51' 2.76" N 122 17' 57.29" W
15	73+92.0	79+20.0	114.5	113.9	114.2	5	2	37 51' 7.61" N 122 17' 58.52" W
16	79+20.0	84+48.0	110.3	99.8	105.0	1	1	37 51' 12.83" N 122 17' 59.93" W
17	84+48.0	89+76.0	102.9	104.7	103.8	2	1	37 51' 18.32" N 122 18' 1.47" W
18	89+76.0	95+04.0	124.8	107.9	116.4	4	3	37 51' 24.47" N 122 18' 3.19" W
19	95+04.0	100+32.0	97.0	81.6	89.3	1	2	37 51' 29.43" N 122 18' 4.56" W
20	100+32.0	105+60.0	93.4	82.0	90.7	4	0	37 51' 35.74" N 122 18' 6.32" W
21	105+60.0	110+88.0	96.0	92.8	94.4	2	2	37 51' 40.52" N 122 18' 7.66" W
22	110+88.0	116+16.0	105.3	100.4	102.8	2	3	37 51' 48.13" N 122 18' 9.78" W
23	116+16.0	121+44.0	87.9	82.8	85.3	1	0	37 51' 51.59" N 122 18' 10.75" W
24	121+44.0	126+72.0	146.5	130.2	138.4	1	2	37 51' 58.43" N 122 18' 12.70" W
25	126+72.0	132+00.0	74.5	83.1	78.8	0	0	37 52' 3.04" N 122 18' 14.15" W
26	132+00.0	137+28.0	77.6	87.7	82.6	0	1	37 52' 9.76" N 122 18' 16.03" W
27	137+28.0	142+56.0	94.8	77.1	85.9	1	0	37 52' 15.62" N 122 18' 17.66" W
28	142+56.0	147+84.0	92.3	83.8	88.1	1	1	37 52' 21.71" N 122 18' 19.56" W
29	147+84.0	153+12.0	82.3	73.0	77.6	0	0	0 0' 0.00" S 0 0' 0.00" W
30	153+12.0	158+40.0	124.6	125.4	125.0	2	2	37 52' 33.85" N 122 18' 23.33" W

C:\DataFiles\RHD\Collector\Dual\SSI R&D_I-580_90529_Test 09.rhd

Calibration

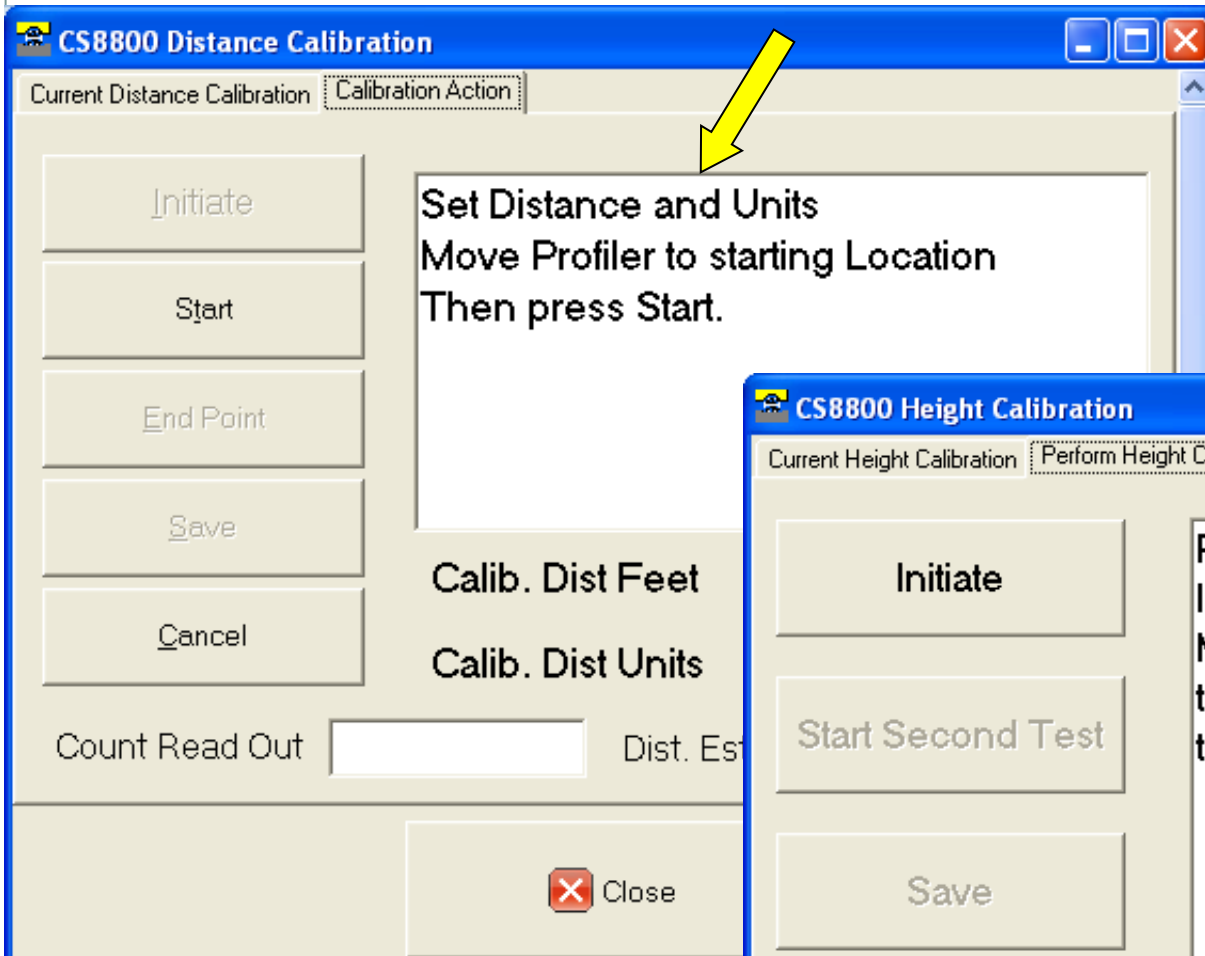


▲ Hardware Detection/Diagnostics ▲



▲ Calibration Options ▲

Calibration



CS8800 Distance Calibration

Current Distance Calibration | Calibration Action

Initiate

Start

End Point


Save

Cancel

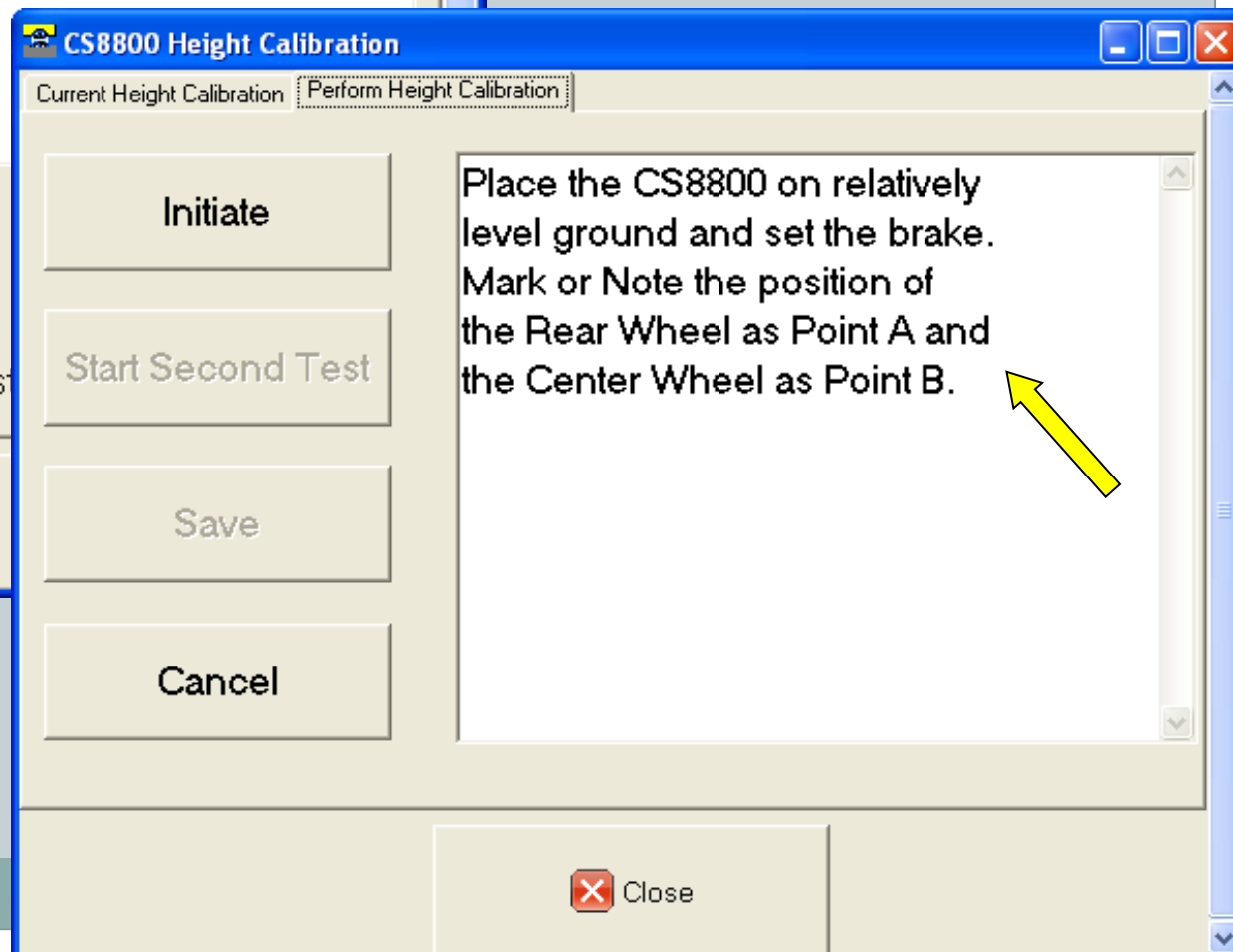
Calib. Dist Feet

Calib. Dist Units

Count Read Out Dist. Est

 Close

A yellow arrow points to the 'Initiate' button.



CS8800 Height Calibration

Current Height Calibration | Perform Height Calibration


Initiate

Start Second Test

Save

Cancel

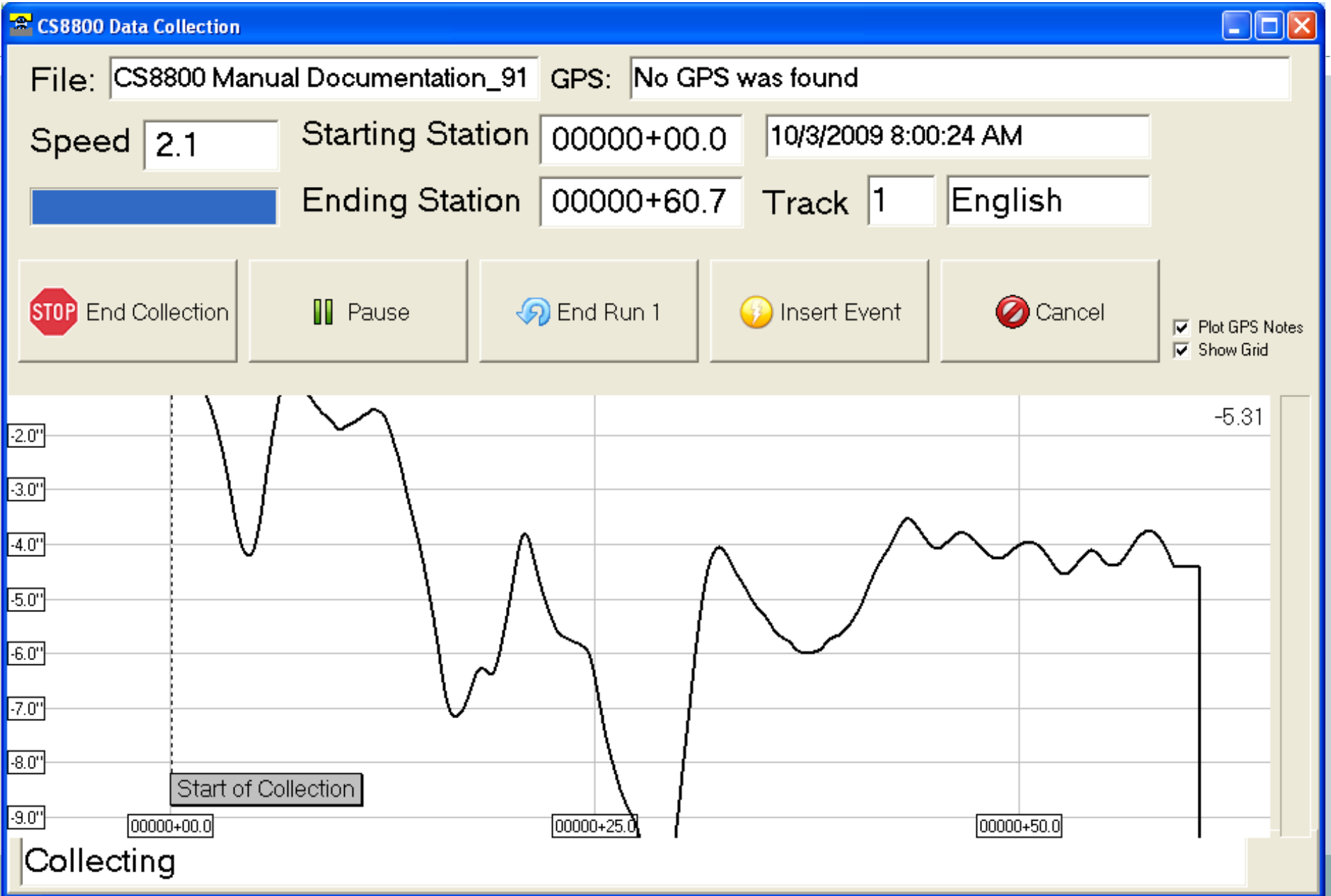
Place the CS8800 on relatively level ground and set the brake. Mark or Note the position of the Rear Wheel as Point A and the Center Wheel as Point B.

 Close

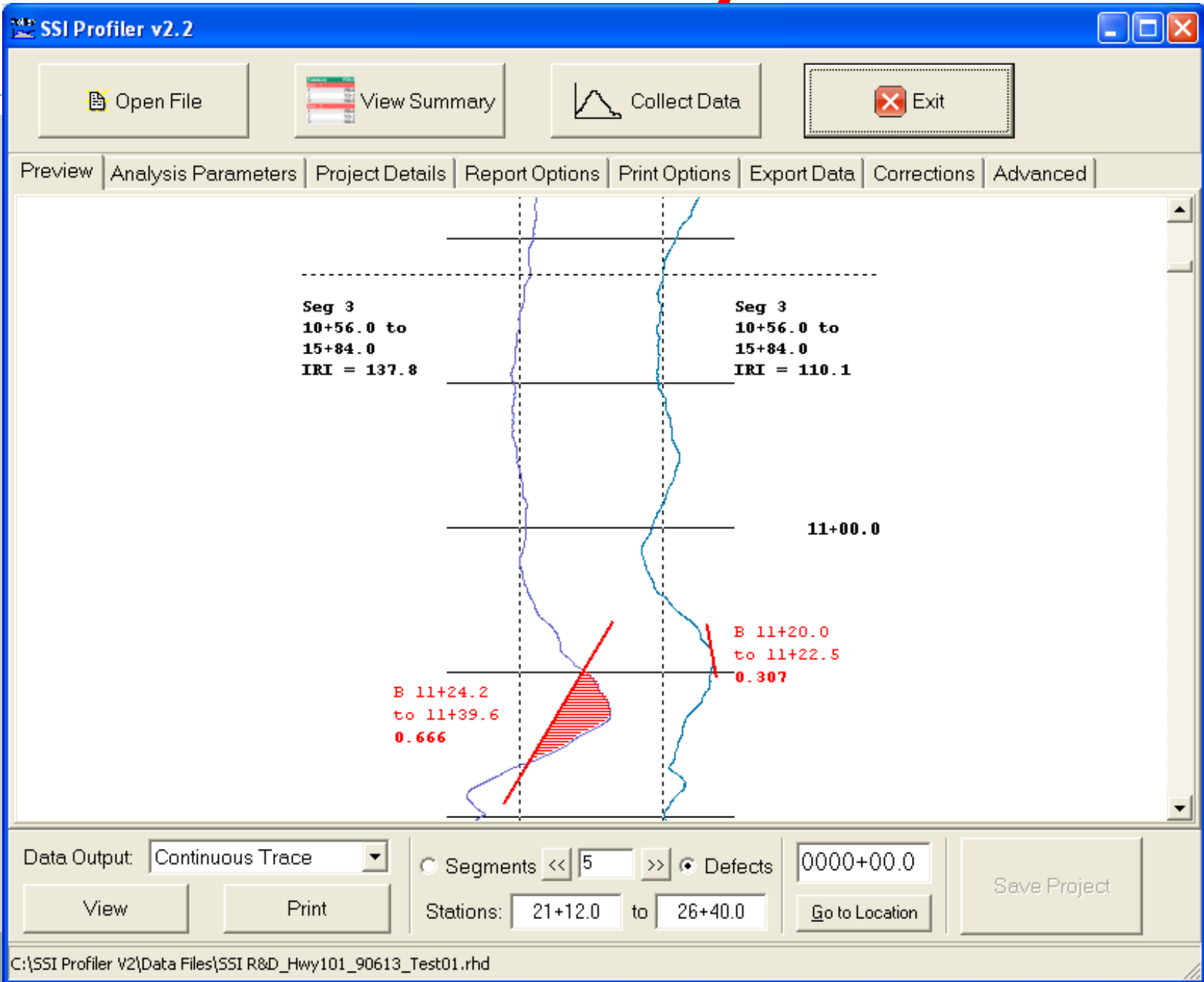
A yellow arrow points to the instruction text.

▲ On-Screen instructions ▲

Data Collection



Data Analysis



Data Analysis

SSI Profiler v2.3

Open File View Summary Collect Data Exit

Preview Analysis Parameters Project Details Report Options Print Options Export Data Corrections Advanced

Project Parameters

Job Report Memo User Defined

Parameter	Value

Add Parameter Remove Parameter

Data Output: Single Trace

Segments << 27 >> Defects

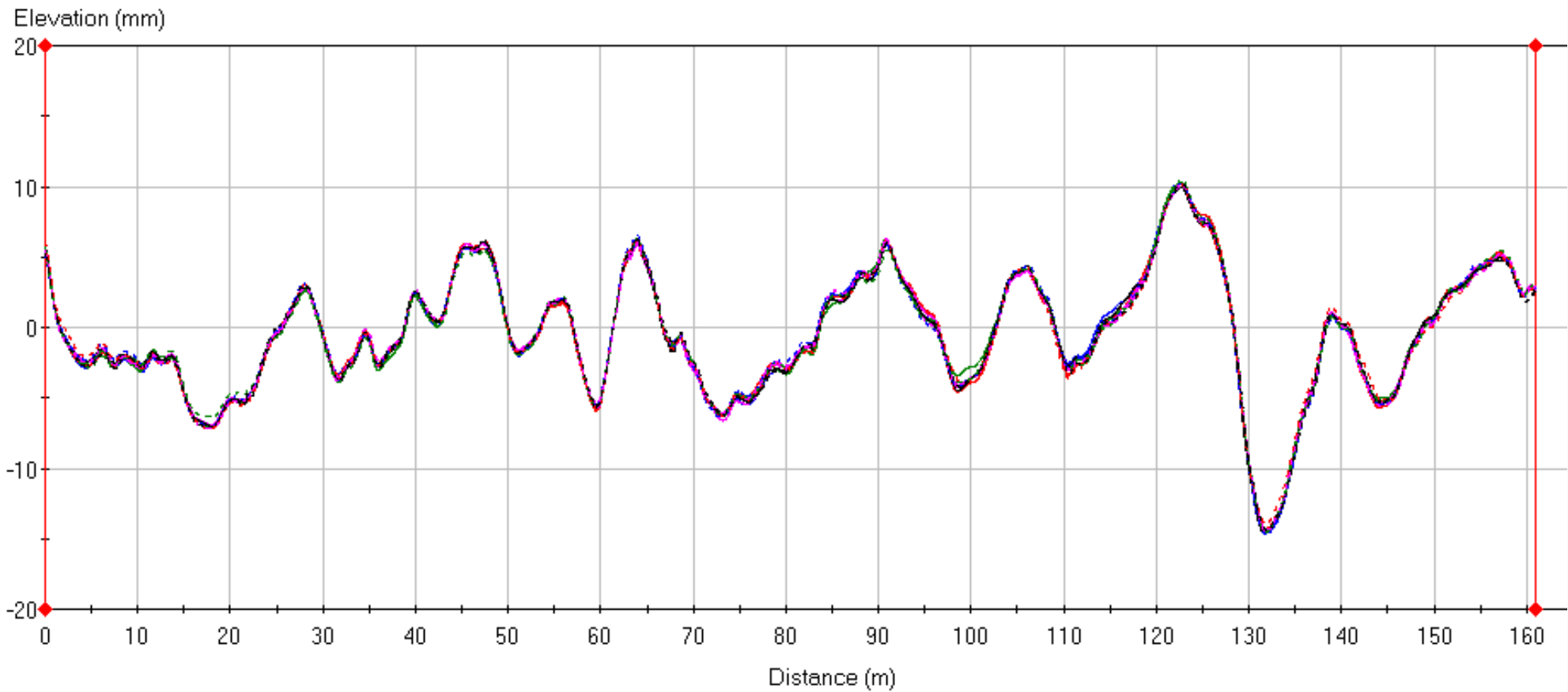
Stations: 137+28.0 to 142+56.0

0142+56.0

View Print Go to Location Save Project

C:\DataFiles\RHD\Collector\Dual\SSI R&D_I-580_90529_Test 09.rhd*

CS8800 Performance



**▲ August 2008: Passed .985 IRI Profile Repeatability Threshold
for FHWA Reference Profiling Device Qualification ▲**

FHWA Data Collections (10/2009)



Asphalt (Dense Grade)



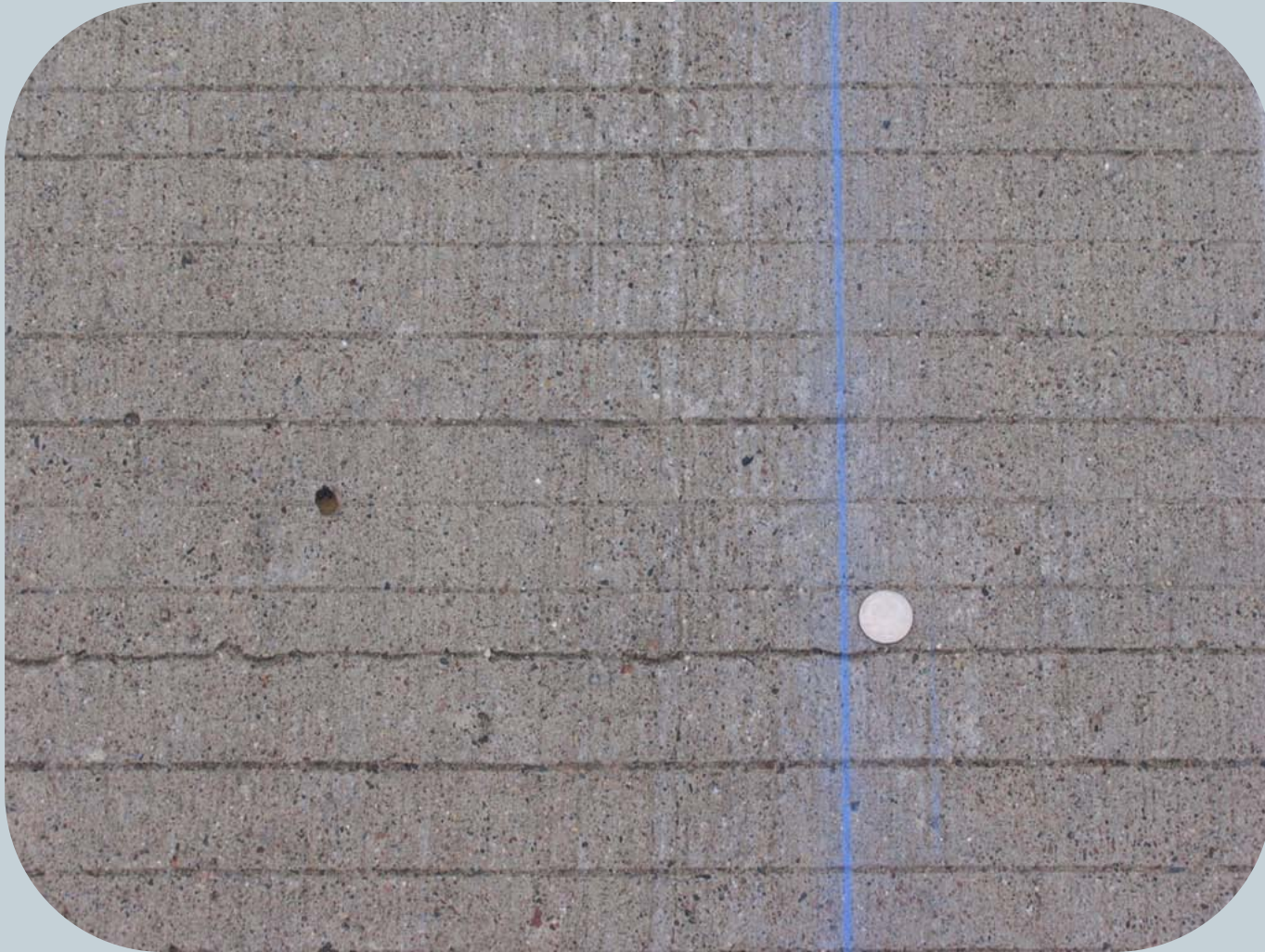
Chip Seal



Asphalt (Pervious/Open Graded)



Transverse Tined



Longitudinal Tined



Diamond Grind (Longitudinal)



Conventional Grind at Night



FHWA Testing--Observations



▶ Short Wavelength Features

- Improve preservation of short wave content by optimizing data from CS8800 contacting height measurement apparatus

▶ Volume of Collections

- Five or Six is Enough??

▶ Unwanted Variables Among Device Collections

- Significant differences in timing of collections. Varying temperature, moisture/humidity, lighting, etc.

▶ Where Should the Bar be Set?

- 98/98/98/94% Waveband Thresholds Appropriate for All Surface Types?

FHWA Testing--Observations



▶ Validation of Durability

- Long testing hours and heavy rain demonstrate robustness of device

▶ All Surfaces Representative of “Real World” Surfaces

- Chip seal surface degradation
- Unopened longitudinal tined surface.

▶ Second Data Collection Will be Valuable

- Refinements based on first test should improve results on second.
- Staggered collections by Benchmarking Device vs. continuous by candidate devices



CS8800—Enhancements

- ▶ Redesign of Core Electronics**
- ▶ Engineered Wheels & Tires
(75 mm/2.75" footprint)**
- ▶ Optimization of Front-Arm Data**
- ▶ Lithium Ion Battery / Power Meter**
- ▶ Comprehensive Software Upgrades**



CS8800 Options

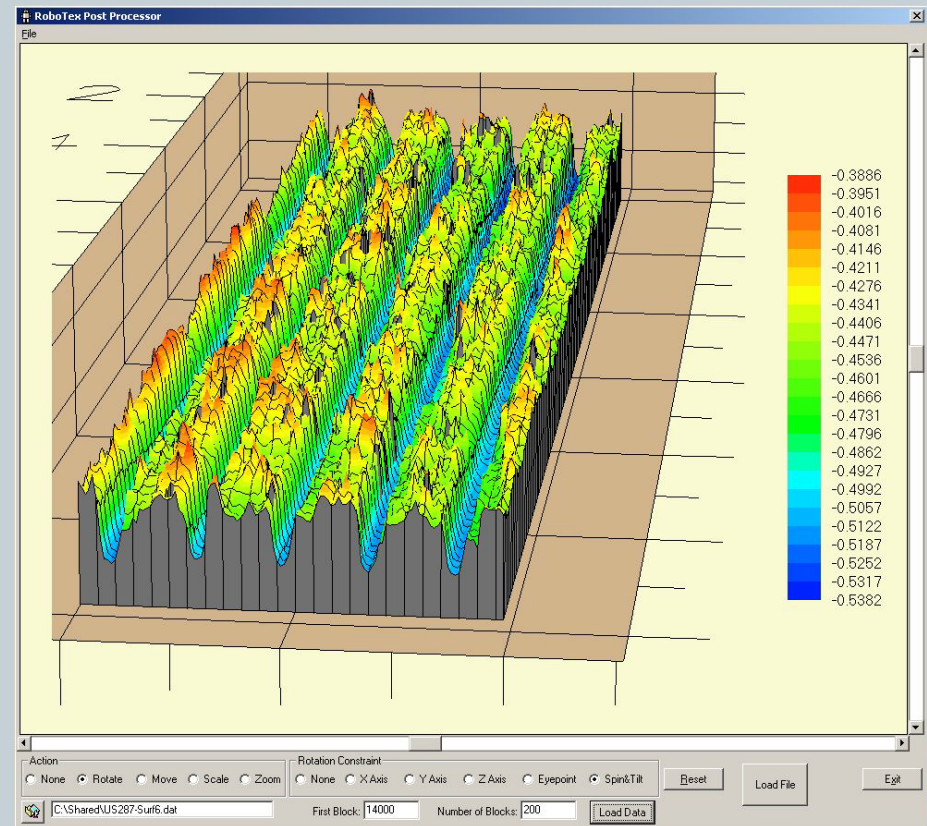
- ▶ **CS8800 with Texture Sensor**
- ▶ **CS8800 with Ground Penetrating Radar Sensor**
- ▶ **Floor Flatness / Floor Levelness (ASTM E-1155)**
- ▶ **Pairing Surface Profiling with Survey Instruments for Topography Mapping and Machine Control Applications**

CS8800 With Texture Measurement



▲ Line Scanning LMI RoLine or Bytewise RoadMap) for 3-Dimensional Texture Data ▲

Simultaneous Collection of Surface Profile Data and Texture Content



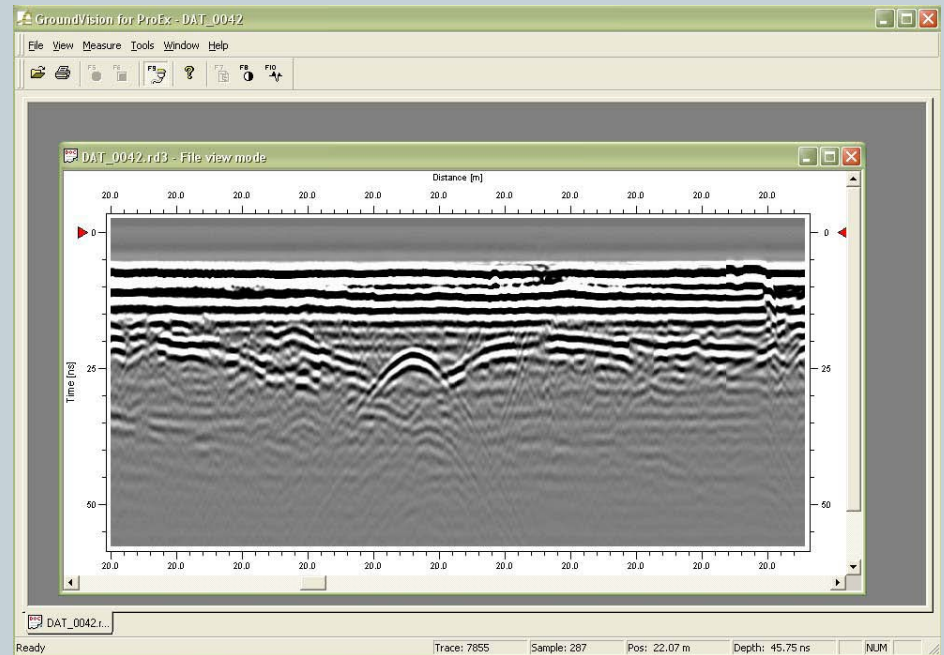
▲ 3-D Texture Imagery ▲

CS8800 With Ground Penetrating Radar



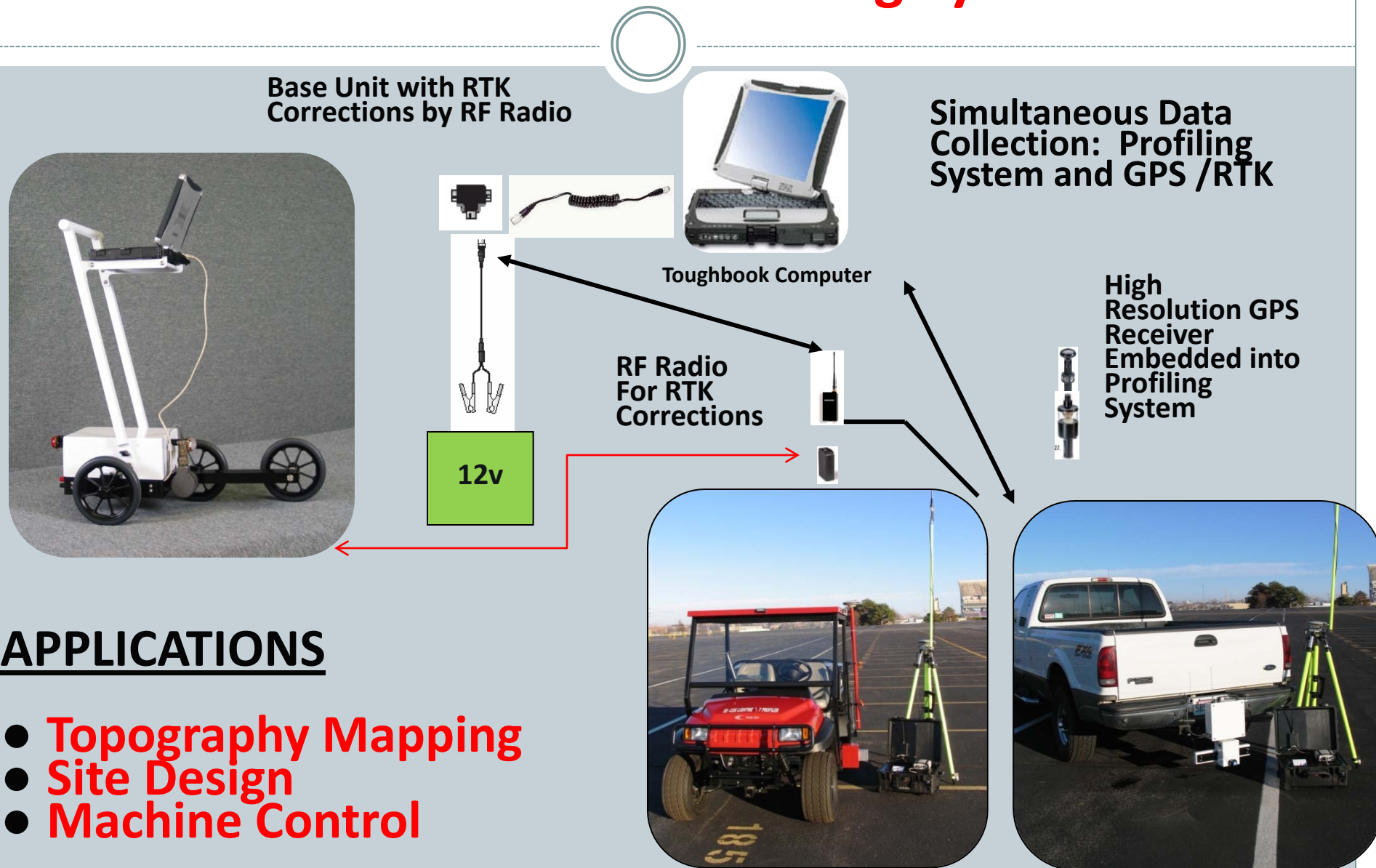
Simultaneous Collection of Surface Profile Data and GPR Content

**Variable Frequency GPR
Antennas Attach to CS8800 for
Different GPR Applications**



▲ **GPR Imagery on Toughbook with Windows Software** ▲

Survey Systems (Corrected GPS or Total Stations) PAIRED With Surface Profiling Systems



The End



- Dennis Scott
- SSI (Surface Systems & Instruments, LLC)
- (800) 662-5656
- dscott@smoothroad.com