Surphaser

Prerequisites

Before adding and running a Surphaser Scanner in SA, the appropriate USB drivers must first be installed.

Download the operating system-specific Surphaser drivers from ftp://ftp.kinematics.com/pub/SA/Install/Driver%20Downloads/Scanners/Surphaser/. (*note the "USB Driver" is for Windows 10).

1. Unzip the drivers into a known location. Example: `C:\DrvWinUsb`
2. Plug in the Surphaser USB cable to the PC. Windows should recognize the USB device and automatically locate the drivers and install them. If this is performed correctly, the Surphaser scanner will be presented in your Device list (Figure 7-3).

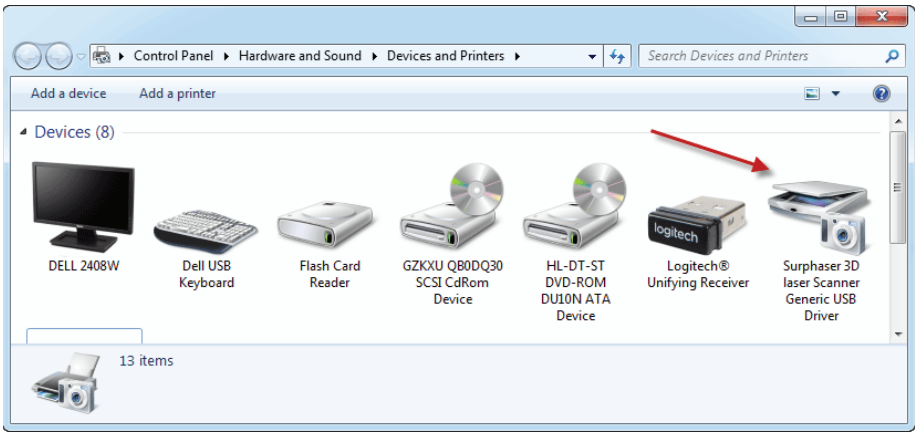

Figure 7-3. The Device list.

If windows does not automatically acquire the driver then go to **Control Panel//System//Device Manager** locate the unknown USB device and

(under Human Interface Devices) and right-click on it. Select Update Driver and direct the search to the folder in which you placed the USB drivers.

You will also need to locate the Rpr file for your particular scanner which is the parameter file and should be supplied with the instrument.

Running the Surphaser

1. Add a Surphaser to SA via **Instrument>Add** or using the icon. Select the Surphaser Scanner or Surphaser 10 Scanner and press Add Instrument (Figure 7-4).

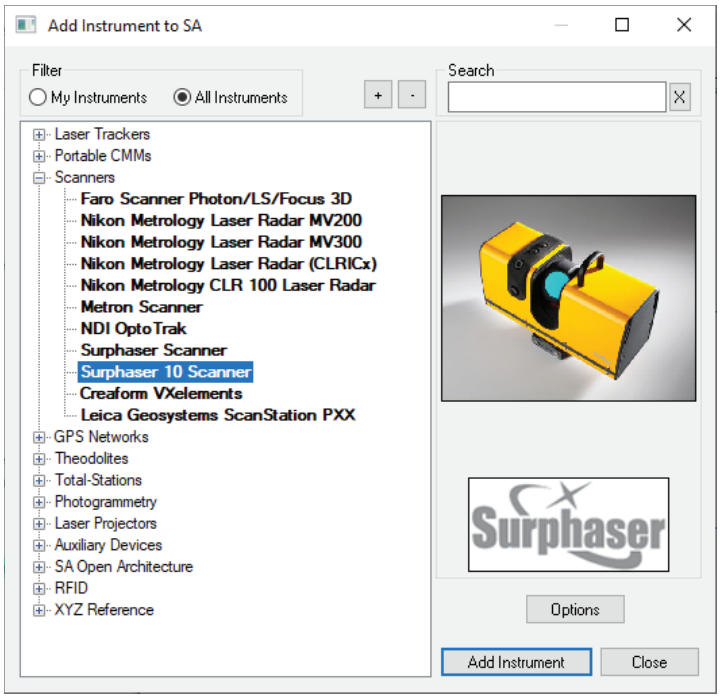

Figure 7-4. Adding the Surphaser to SA.

2. Run the instrument interface module under **Instrument>Run Interface Module** and choose *Surphaser.*

3. When the instrument interface opens for the first time you will need to browse to the Options tab and update the path to the Rpr file (Figure 7-5).

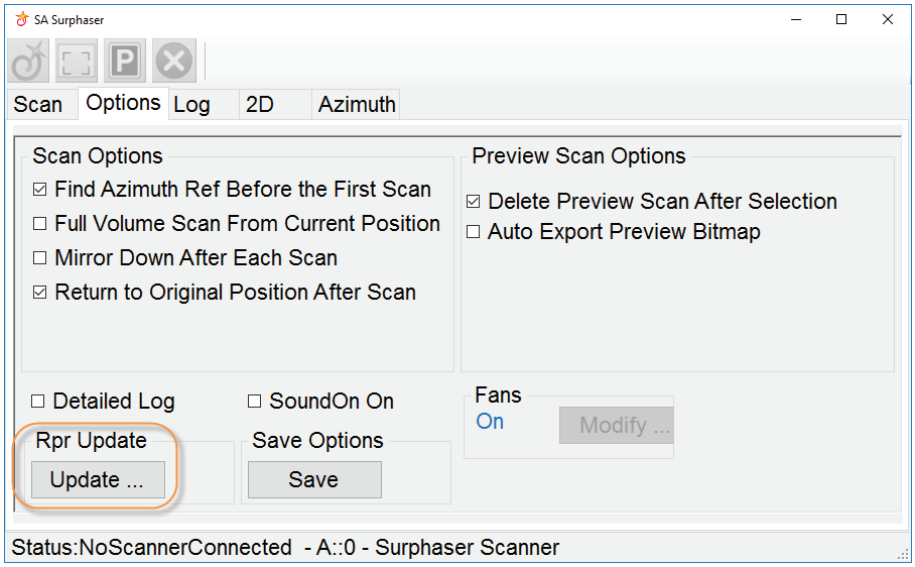

Figure 7-5. Options Tab of the Surphaser Interface

The Rpr file needs to be in the following directory: C:\Users\[user]\AppData\Roaming\NRK\SA Surphaser 3.12. Each scanner has it's own Rpr file so it is possible to have multiple files in this same directory. You will need to set this path by selecting Open once for each file. This will register the Rpr file with the Scanner's internal list (in an XML file also in this directory). From then on any of the registered scanners can be plugged in and used and the correct Rpr file will be found for it automatically.

After the first connection a user should be able to simply plug in the scanner, add a new instrument model and press the Running Man icon  to connect.

Scanning with the Surphaser

The SA Surphaser Interface provides a lot of options but a basic scan can be performed as follows:

1. Verify the Scan Density and Processing Option settings are set at reasonable levels.
2. Check the ouput file name (Collection & Cloud Name) for the cloud is set how you would like it to appear in SA and check that the *Send to SA When Done Scanning* check box is enabled.
3. Adjust your scan region as desired or set it to a *Full Volume* scan
4. When satisfied press the scan button 

Instrument Specifics

The instrument interface provides a detailed panel style control for driving the scanner. It is composed of a set of master control buttons and 5 tabs to easily set up and process a scan (Figure 7-6).

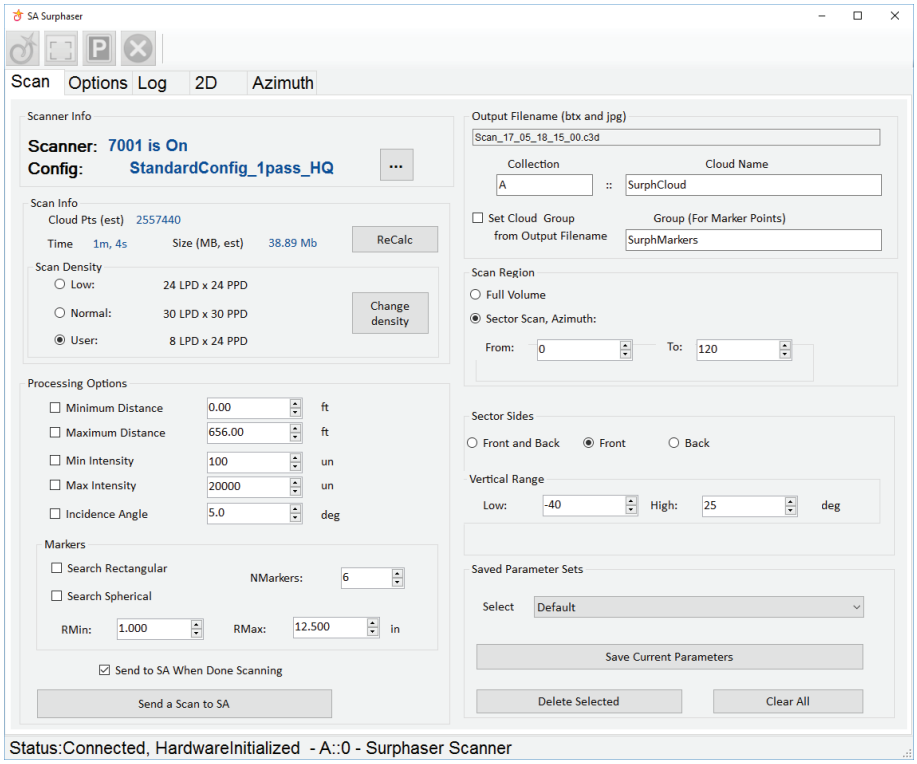

Figure 7-6. SA Surphaser Interface

- **Scan Tab.** Which provides direct configuration of the scan to be performed.
- **Options Tab.** Which provide a set of controls and preferences for scanning and scan previews that shouldn't need to be edited on a regular basis (Figure 7-5).
- **Log Tab.** This page provides a running record of the scanner activity and the associated file names and directories used
- **2D Tab.** This page provides a preview image of the scan and allows for region selection and re-scan control.
- **Azimuth Tab.** Provides move control and Azimuth zero point rest control.

Scan Controls

The *Scan* tab provides the primary scan controls:

Scanner & Scan Info

The scanner section provides identification information and configuration control (Figure 7-7).

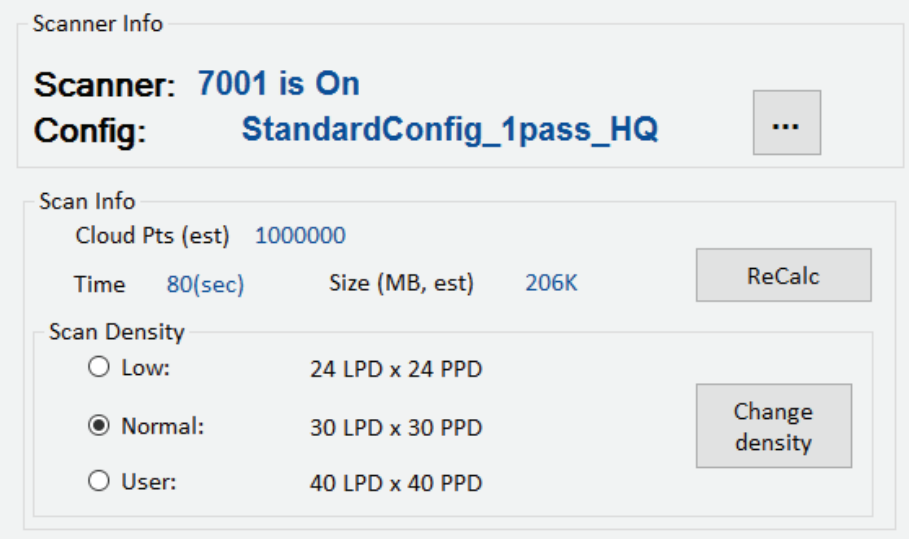

Figure 7-7. Surphaser Interface showing the tabs and scanner information sections

This section provides a preview of the scan that would be generated with the current settings. This can be very helpful because it provides advance knowledge of the number of points being requested, the time required to generate the scan and the resulting file size that would be generated.

Scan Density

The scan density can be defined either using **Low** or **Normal** density as well as using a **Custom** value set through the Change density button. The **Lines Per Degree (LPD)** and **Points Per Degree (PPD)** defines a grid density that can be set at a prescribed distance, and doing so will present an estimate for the Scan Time and Scan File Size.

To set the density at a given range, enter the **Point Spacing** you would like to have at a give distance and press the Set button. This will recompute the user defined density setting for you (Figure 7-8).

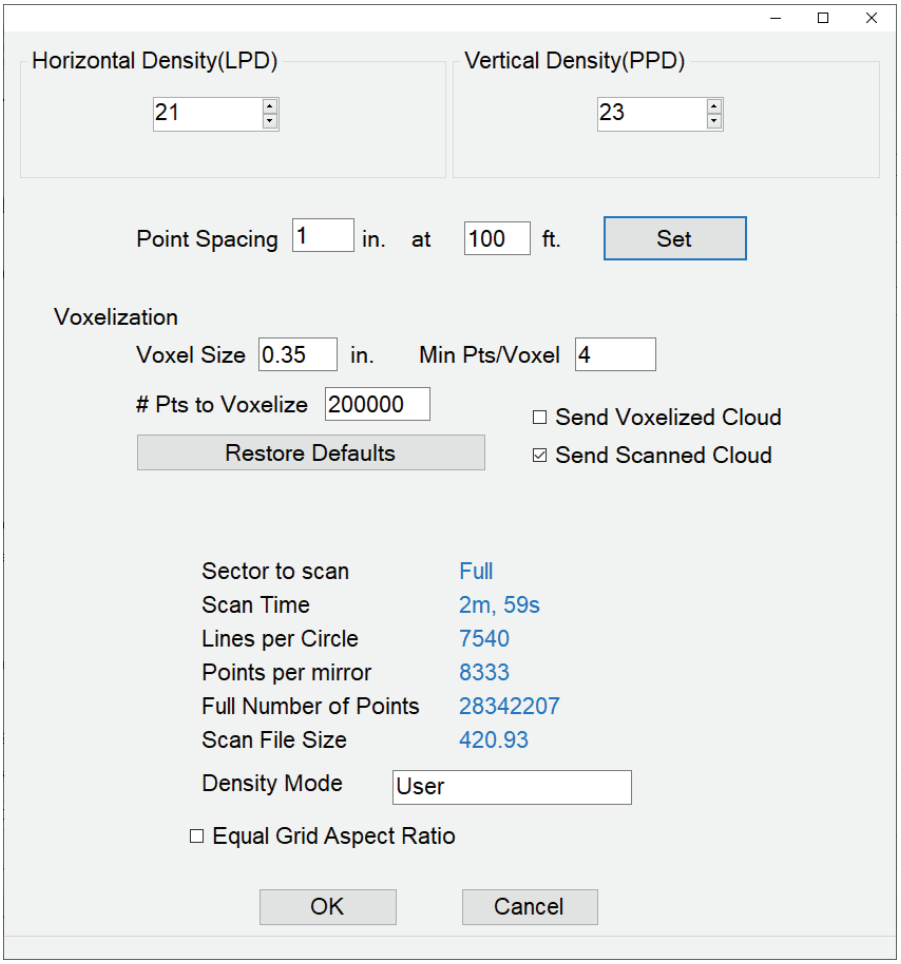

Figure 7-8. Change density controls dialog.

Voxelization

Scans can be sent to SA at full resolution and/or using a voxelized sub-sampling approach. Simply check the options as to which data foramt to import into SA. Much like voxelizing a cloud directly within SA, the **Voxel Size** determines the volume of data processed to produce a single point, the **Min Pts/Voxel** determines the required number of points per voxel for a point to retained, providing an outlier rejection option. The **# Pts to Voxelize** determines the batch processing size.

Cloud Name Controls

The cloud name control section is used to define the base name of the point cloud saved within the SA job file (Figure 7-9). It will also be used to name the voxel cloud, by appending "_vox" to the entered cloud and using it for the target point group if needed.

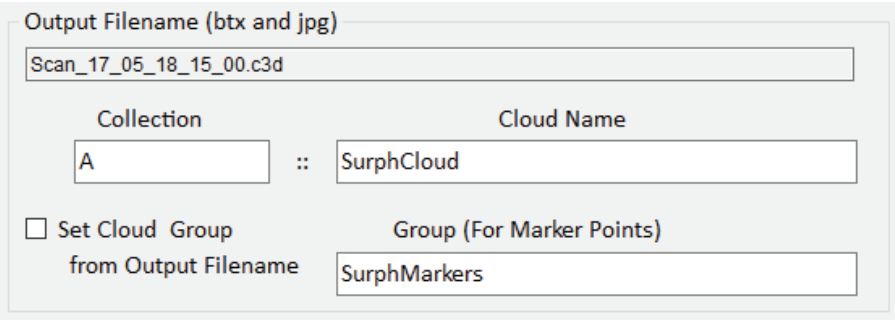

Figure 7-9. Cloud Name Control

The collection and cloud name can be entered here as well as the group name for the target markers. The *Set Cloud Group from Output Filename* checkbox can be used to ensure that the saved scan files or imported scan file names are used and synchronized with the cloud names within SA.

Processing Options

Processing filters are applied as a post processing operation following the scan and prior to passing the scan data to SA (Figure 7-10).

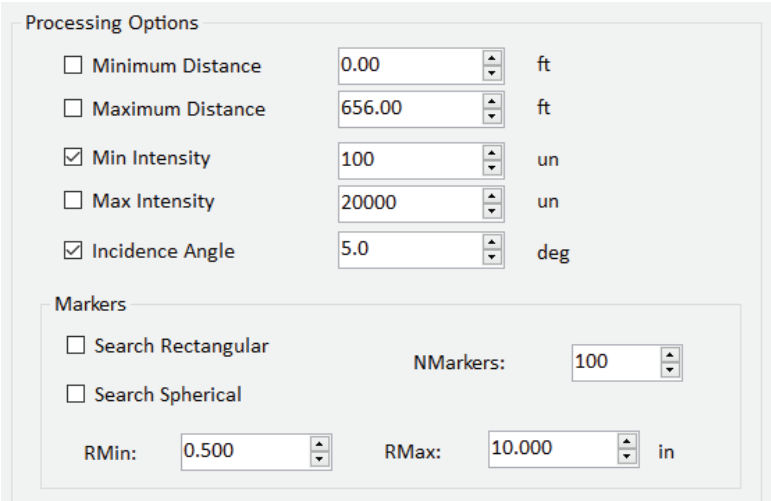

Figure 7-10. Scan Processing Options

- **Distance filter.** Minimum and Maximum Distance setting can be enabled to remove points from the scan that are beyond these thresholds.
- **Intensity filter.** Minimum and Maximum Intensity setting can be enabled to remove points from the scan that are beyond these thresholds.
- **Incidence Angle.** Defines an acceptance threshold for scan angle which describes the minimum incidence angle accepted.
- **Markers.** Both rectangular (checkerboard) and spherical markers can be detected from the scan automatically as part of the post scan processing. The NMarkers numeric field provides a convenient way to identify how many markers should exist in and be extracted from the scan. Only the best specified num-

ber of targets in the data set will then be returned. The RMin and RMax controls can be used to restrict target detection to with a size range (for both target types).

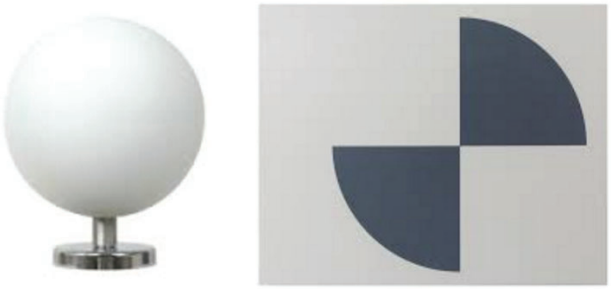

Figure 7-11. Example Scanner Targets

Output Filename

When a scan is generated it is generated both as a btx file and jpg in the Surphaser Directory and passed to SA using a Collection::Object Name. The files are saved in the same directory as the Rpr file (C:/Users/[User]/AppData/Roaming/NRK/Surphaser3.12/Scan). The Set from FileName button makes it easy to set the correct collection object name in SA to match the Scanner output file name.

Scan Region

Scanning can be restricted both in Azimuth and Vertical Range. To perform a full 360 degree scan use the *Full Volume* setting (Figure 7-12).

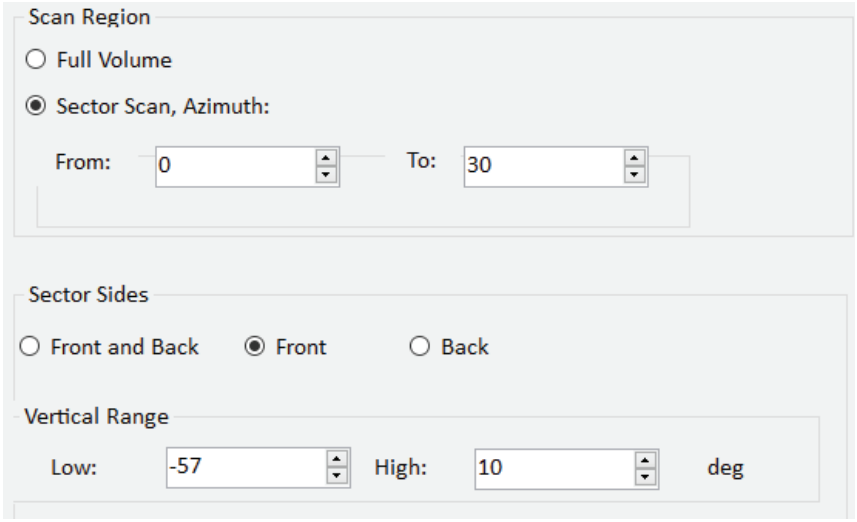

Figure 7-12. Scan Region Controls

- **Sector Scan, Azimuth.** This control defines the horizontal rotation of the scanner from start to finish in degrees from the currently set zero point. Scans are performed from right to left, counterclockwise as viewed from the top of the scanner.
- **Sector Sides.** The scan can be restricted to only use the front or back face of the scanner as well as both. With Front and Back checked the scan includes a full path from low over the vertical to the back low point in a full arc.

- **Vertical Range.** When either front or Back are set the vertical range controls become enabled and set the upper and lower limits of the scan.

These values can also be easily populated by doing a quick overview scan and then selecting the region you would like to scan graphically from the image on the *2D* Tab (Figure 7-13). A prompt will provide an easy way to update the existing Azimuth and Vertical Range settings from the selected region. This region can then be save as part of a Parameter Set. More than one region will remain selected for reference but only a single scan region can be used at one time.

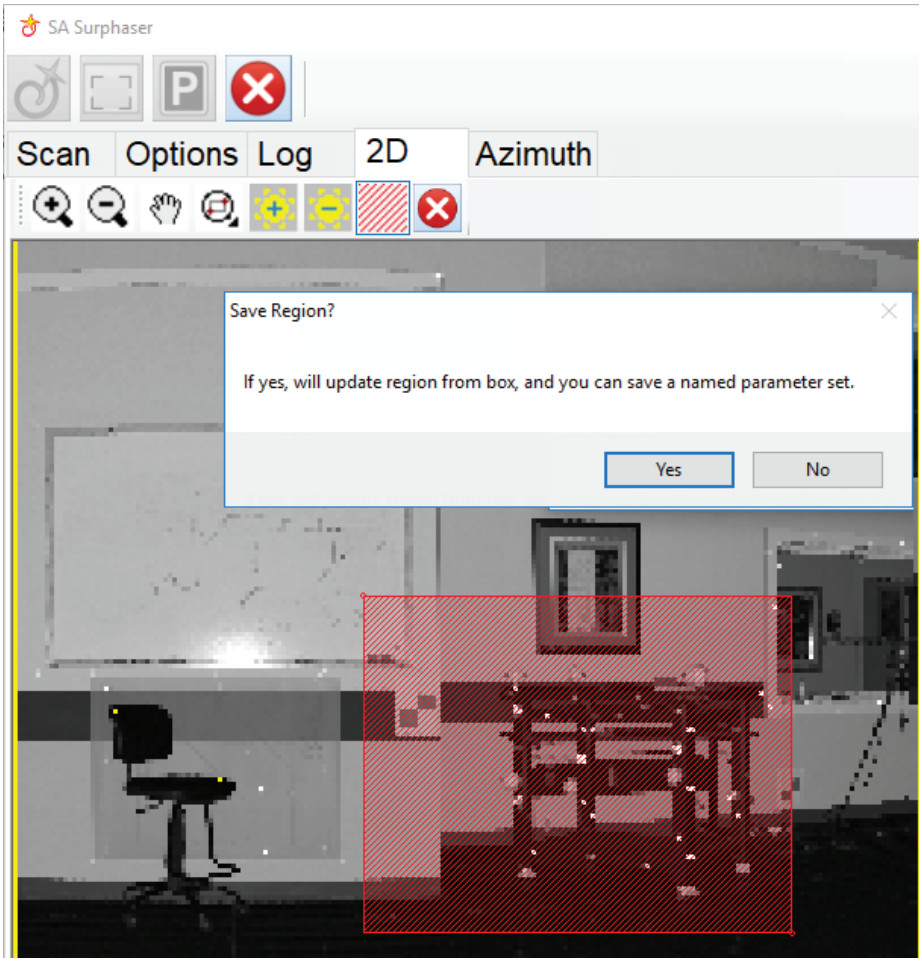

Figure 7-13. Region selection from the 2D Tab.

Parameter Sets

Configuration settings for a scan can be named and saved as part of a *Parameter Set*. These include the following parameters:

- Name
- Scan Density, LPD (Lines per Degree), and PPD (Points per Degree)
- Distance, Intensity and Incidence Angle Filters with options to turn either on or off.

- Markers, Search Rectangular (true or false), Search Spherical (true or false), *NMarkers* (number of markers), *RMin* (minimum marker size), *RMax* (max marker size)
- Full Volume or Sector Scan. Sector Scan is the same as before, with settings for the vertical and horizontal ranges. Full Volume is a full 360 deg. scan.
- Sector Scan Range, Azimuth From, To (degrees), and Elevation Low, High (degrees).
- Front, Back, Front and Back. Previous versions of the Surphaser interface only allowed either the front face or both. Now, a Sector Scan can include only the back face as well.

Parameter sets are saved in the persistence file. To update a saved parameter set (rather than create a new one with a small change), press Save Current Parameters and give it the same name as the existing parameter set you wish to update. This will overwrite the existing parameter set and update it.

Importing Saved Scan Files

At the bottom of the Scan tab is a Send a Scan to SA button. This button provides direct access to importing pre-existing scan files of *.btx, and *.ptx formats (Figure 7-14).

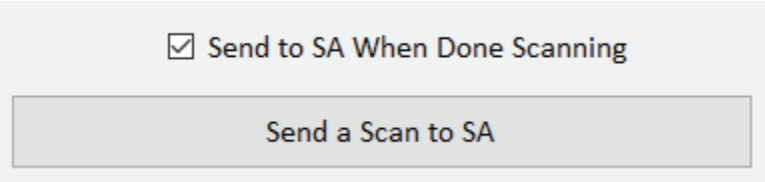

Figure 7-14. Controls for Importing Scans

The *Send to SA When Done Scanning* option is used to trigger an import as soon as a scan completes. Scan files (.c3d, .btx) as well as preview images (.jpg) and text files of the marker coordinates (.txt) are saved in the **C:\Users\[User]\AppData\Roaming\NRK\SA Surphaser 3.12\Scan** directory as part of the scanning process. These file may need to be periodically purged to keep the size down.

Working Offline

In addition to importing existing saved san files using the Send a Scan to SA button, **Parameter Sets** can be created offline through the simulation interface. To start the Surphaser interface in simulation (without hardware) do the following:

1. Select **Instrument>Run Interface Module**
2. Then select the **Surphaser** interface from the list of interfaces
3. In the Surphaser Connection dialog first pick the instrument model then un-check the Connect Scanner check box, and press OK.

Parameter sets are saved in the persistence file located in **C:\Analyzer Data\Persistence**. The *SASurphaserSettings.bin* file contains the saved Parameter Sets and can be distributed to different machines.

Azimuth Designation

The Surphaser currently does not have an absolute zero location for the Azimuth (horizontal angle). This means that starting a scan from a designated azimuth value will not necessarily return the same results if you turn off the scanner and then reconnect later. It can also drift or be rest during a connection. For this reason, the Azimuth tab offers the users the ability to reset the zero location or move the instrument to a preset value (Figure 7-15).

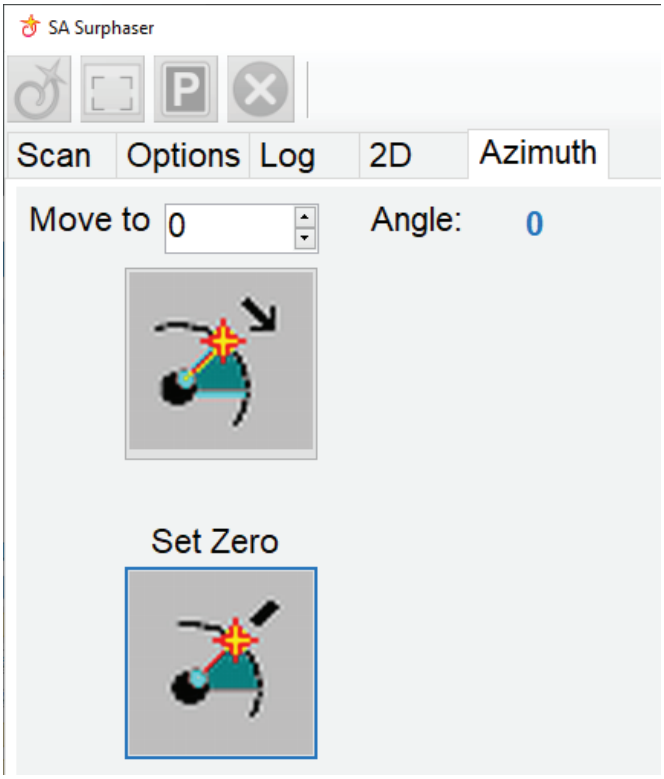

Figure 7-15. Azimuth Tab of the Surphaser Interface

If the azimuth changes for any reason it is advisable to add an additional instrument station to SA. This can be done by right-clicking on the instrument and selecting **Jump Instrument to New Location**. This will make it easier to align the scans.

At this point, the best practice is to scan common markers in order to precisely locate the new station to the old. If the Azimuth control is used, then a test scan will reveal how well the reset azimuth matches the old. Be sure the newly added station is in the same position as the old in this case.

Measurement Plan (MP) support

SA provides comprehensive support for automation purposes. You can define regions from measurements within SA, designation pe-

rimeters and scan them as needed using predefined Parameter Sets called by name. However, the azimuth zero position can and will change so that needs to be accounted for.

- **Set Instrument Group and Target.** The "Point Name" argument will set the Collection and Cloud names, as well as the group name for found targets, and the voxel cloud name (if set to send).
- **Configure and Measure.** The "Point Name" argument will set the Collection and Cloud names, as well as the group name for found targets, and the voxel cloud name (if set to send). The "Measurement Mode" argument specifies the Saved Parameter Set (measurement profile). If the profile is not found, the command will fail if the User Interaction Mode is set to Silent. Otherwise, you'll be asked if you want to use the current settings. If "Measure Immediately" is false, the command will simply set the profile selected if it is found. The "Timeout in Seconds" is ignored, since scan time can vary quite a lot, depending on scan paramters.
- **Scan within perimeter.** Ensure that the azimuth has not drifted on the scanner since the definition of the "Scan perimeter name". You can use the [Azimuth] tab in the interface to control the zero location, or simply use scanned [Markers] to locate the instrument. The "Parameter set name" specifies the Saved Parameter Set (measurement profile). If the profile is not found, this command will proceed with current settings if the User Interaction Mode is set to Silent. Otherwise, you'll be asked if you want to use the current settings.
- **Instrument Operational Check.** Instrument Operational Check "*Send Scan to SA [path]*". Supports importing of both *.ptx and binary *.btx files. Also the command "*Find Zero*" is available to return as closely as possible to the Azimuth zero point.