Leica AT9x0

Prerequisites

- All Leica trackers are shipped with 192.168.0.1 as the IP address as default. The Leica AT960/930 also offer a wireless connection option.
- The current version of Tracker Pilot can be downloaded directly from the Laser Tracker Controller. To do so, open a web browser and type *http://192.168.0.1* in the search bar. This will open a link to the tools saved on the tracker controller. To learn more about configuring IP addresses, see the IP Address Basics section.

Compensation

The AT960/930 trackers and accessories can be compensated within Tracker Pilot (if you need the current Tracker Pilot you can browse directly to http://192.168.0.1 (or the trackers IP) and download Tracker Pilot from the controller).

- Compensation Password: Expert (Full and Intermediate, ADM, Reflector Definition, Camera Compensation, etc.)
- Server Settings Password: Administrator (TCP/IP address, Time/Date, etc.)

Starting the Interface

1. Select **Instrument > Add** and choose the respective Leica Tracker from the ***Add Instrument to SA*** dialog.

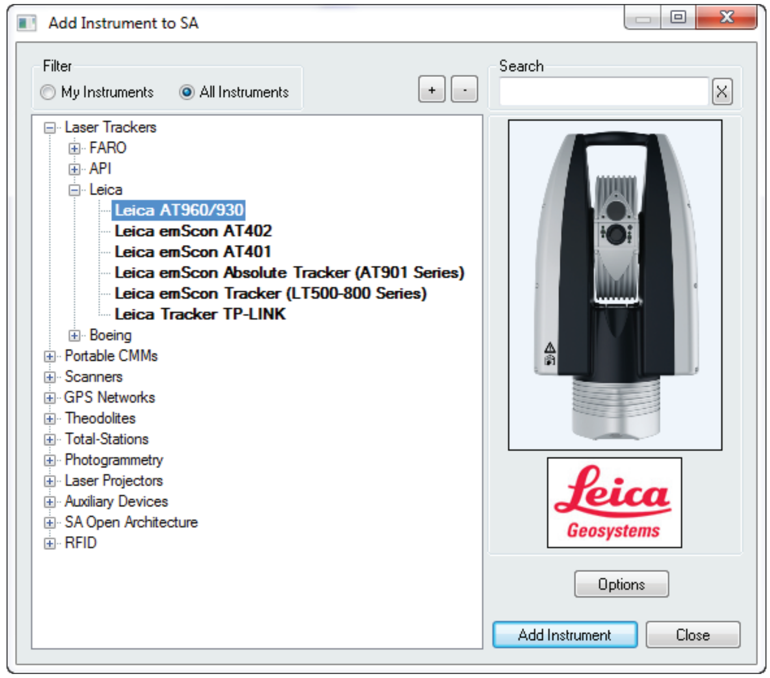

Figure 3-100. Adding a Leica AT960/930 tracker.

2. Now run the instrument interface module under **Connect (Instrument > Run Interface Module)** and choose **Laser Trackers**.

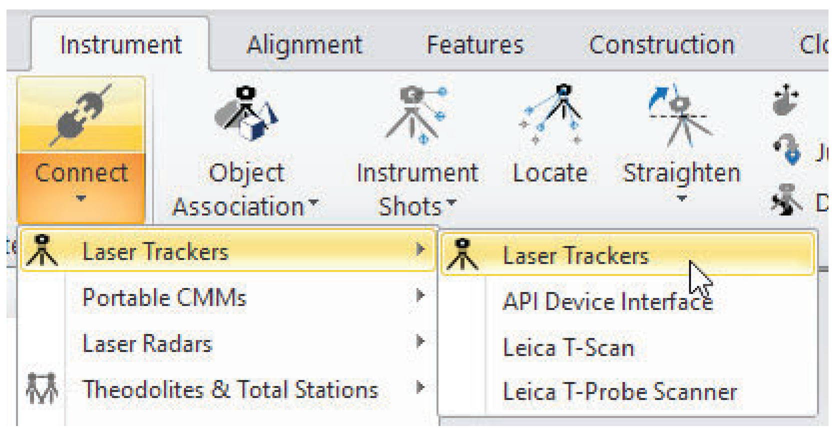

Figure 3-101. Selecting Laser Trakers from the Ribbon menu.

This will bring up a dialog with a list of available instrument models within SA to connect to. If you have a single instrument model adding in SA then on one will be shown within the Connect to SpatialAnalyzer dialog like this:

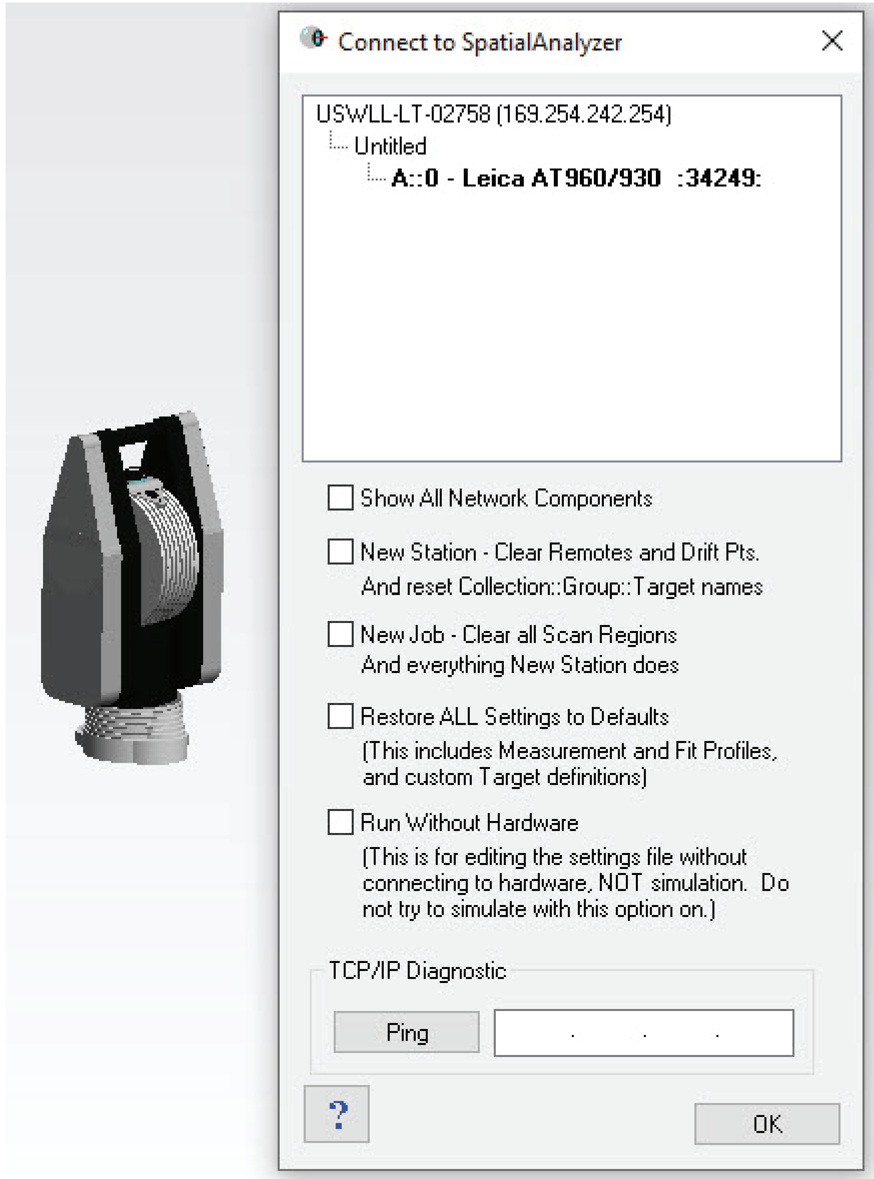

Figure 3-102. Connect to SA dialog where you pick the instrument model within SA to connect to.

3. Select the instrument model from the Connect to SpatialAnalyzer dialog and press OK to continue to the instrument connection.

4. Within the Leice LMF Connection window, enter the tracker's IP address and use the Ping button to test the connection if needed. The AT960/930 also offers an IP discover utility.

Once satisfied, press OK to connect. The next time the interface is started, you can simply click the Connect button (Run Interface and Connect icon). This will use the last saved settings and automati-

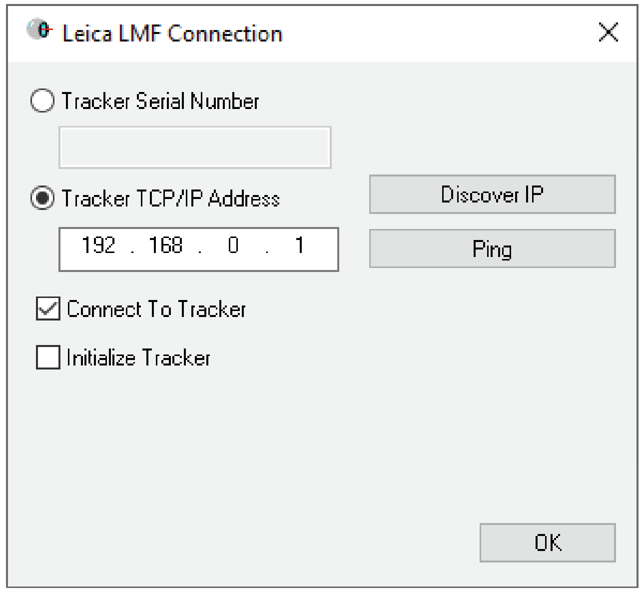

Figure 3-103. The Leica Tracker connection window.

cally connect the instrument. The interface is now connected and ready for use. Please refer to the Laser Tracker section for details on the laser tracker interface ("Laser Tracker Interface" on page 10).

Tracker Settings

To access the custom settings, use **Settings > Tracker > General Settings** or press the button. Then press the tracker specific button at the bottom.

6D Shank Measurements

With a calibrated shank tip attached to a T-probe (calibration is performed within Tracker Pilot), shank measurements can be taken for sheet metal applications, providing an edge measurement solution. *Shank Points* is a new Operation that can be used with any measurement acquisition mode(discrete, stable or scan). But two new measurement profiles have been added to support this application(Figure 3-104):

- **Discrete Shank Point.** This mode is the standard measurement of a point on an edge.
- **Discrete Bottom Shank Point.** This operation provides the same shank measurement option with the addition of a specified shift relative to the reference plane, designed to account for material thickness.

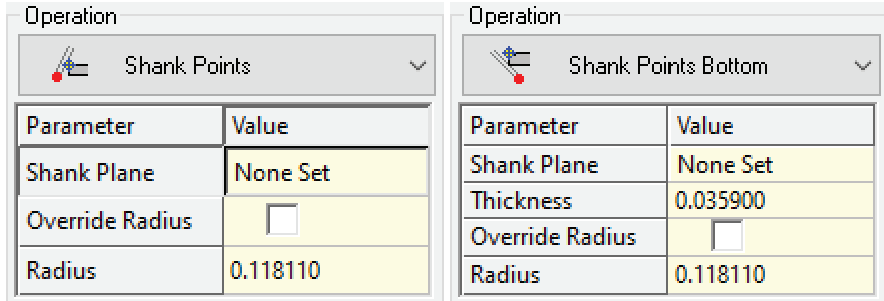

Figure 3-104. ShankMeasurement Profile Operations

Shank Plane - measurements require a projection plane to be defined and use this plane definition to define the intersection point of the shank axis and the plane. The tilt of the probe relative to the plane is used to determine the point's offset in combination with the probe diameter.

This means that the cleanest offset is obtained by holding the probe perpendicular to the edge. Tilting the probe is fine but leaning it such that it trails along the edge (into or out of the paper in (Figure 3-105) should be avoided and could cause an overestimate of the offset.

Override Radius- the radius of the shank probe should be set as part of the calibration process but its default value can be changed within the measurement profile if needed, using this control.

Shank Measurements in SpatialAnalyzer -

https://youtu.be/hXnoj4ov1GA

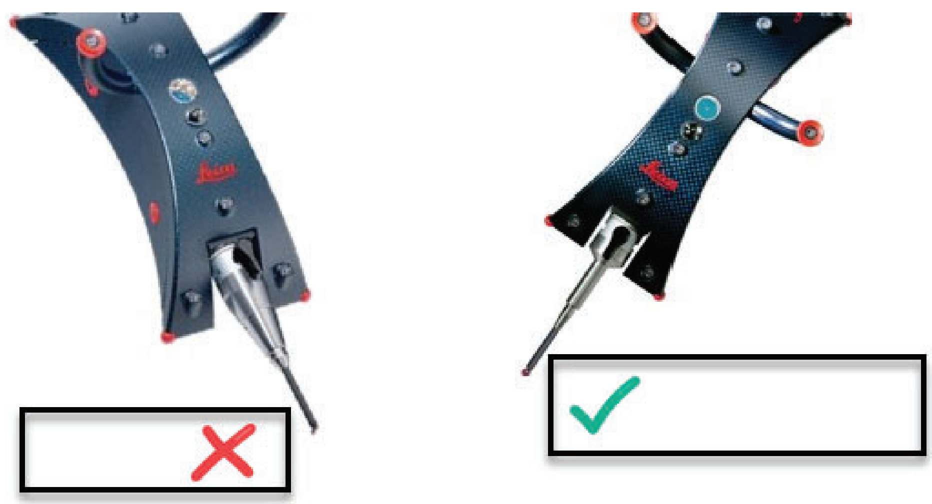

Figure 3-105. Properorientationof the probe for accurate shank measurements

Proximity Measurements with a Shank Probe

Shank measurements can also be used with proximity triggers. This makes edge measurements easy to perform by allowing you to trigger points along an edge as you slide a shank probe along it.

To do so perform the following steps:

1. Build a vector group to be used for the proximity trigger process. Each vector in this vector group will be used as a trigger such that as the probe's axis crosses the vector a point will be triggered for you.
2. Enable *Use Shank* option within the Auto-Proximity Scan profile operation. This tells SA to use the shank point not the tip of the probe in the proximity calculation.

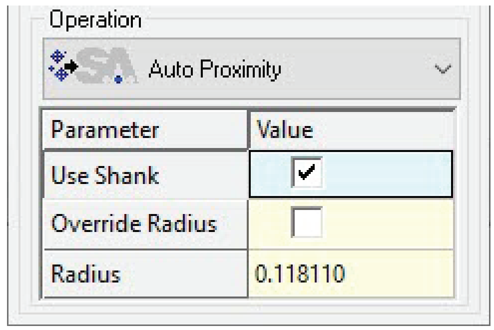

Figure 3-106. Auto Proximity Operation has an option to Use Shank which needs to be enabled.

3. Navigate to **Instrument>Automatic Measurement>Auto-Correspond with Proximity Triggers>Vectors**. Specify a tolerance zone to consider and a resulting group name and begin the operation.

Double check that the option to measure each point more than once within the proximity dialog is ***Enabled***. If you don't, it will simply take the first point that is within the proximity tolerance…on the approach and will not find the closest point to the vector intersection.

4. Slide the shank probe along the edge of the part to trigger measurements at each of the reference vector locations.

The point that is recorded is the closest point on the shank to the vector origin. Its important, therefore to have a good alignment. If the measure feature deviations significantly from the nominal the compensation can be affected.

Offset Frames for 6D Measurements

Its possible to define and utilize offset frames with a T-probe or T-mac. This allows you to take a 6D measurement, but record a frame that is spatially offset from its base position as the measurement. The offset frame utilizes a fixed transform relative to its position and orientation. Defining one is idea for scenarios where you are defining a tool tip on a robot for example.

There are two ways to define offset frames.

1. An offset frame can be defined and saved within a measurement profile. Additional details on this can be found in the section on measurement profiles here: "Measurement Profiles" on page 25.

2. An offset frame can also be defined as part of a target definition. This is important for multi-sided T-Mac's because it allows measurements from each face to return a common transform. It also provides an option to have the offset applied to all measurements from this target.

There are several steps to defining a common offset frame for a T-Mac which are as follows:

1. Rigidly mount the T-Mac as desired such that it is visible from your instruments location. Then record or construct the desired frame you wish to return from the measurement. This may means measuring the end effector for the robot for example. Ensure that the T-Mac and Robot do not move. Also measure common points in case additional instrument stations will be required and a tie in will be necessary.
2. Lock onto the T-Mac and set the measurement profile to a 6D Discrete Measurement profile (this will allow you to measure an offset transform for the target definition).
3. Open the Reflectors and Targets database and click on the manufacturer's definition to open the offset frame definitions (Figure 3-107).

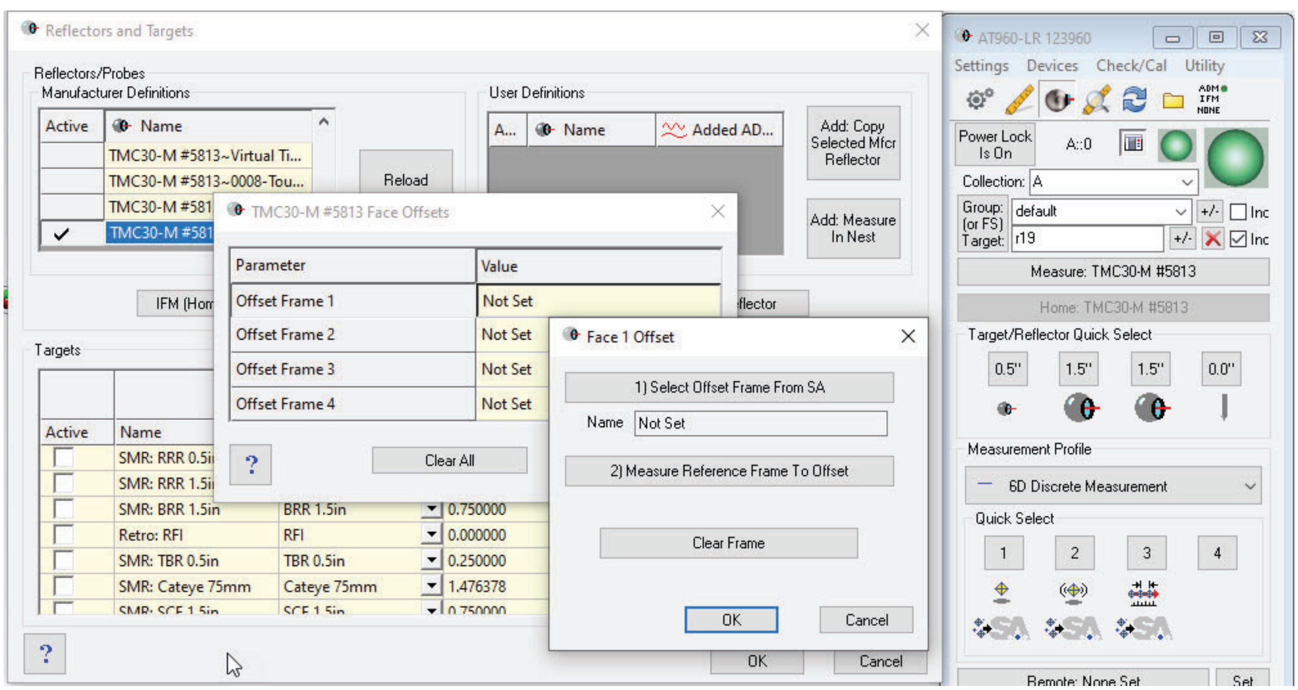

Figure 3-107. Setting an offset frame for Face 1 of a multi-sided T-Mac.

This dialog allows you to select from a list of offset frames (only a single offset frame will be visible when locked onto a regular T-Mac or T-Probe). Select the desired frame which corresponds to the desired face and a familiar offset frame measurement dialog will open. You can then select the offset frame and measure the current position to compute the offset definition.

4. Move the tracker without moving the robot to a new location and tie it in to the prior station. You can then add an additional offset frame for this T-Mac face. The process can be continued until each face of the T-Mac has been calibrated with offset frame definitions.

These offset frames will be persisted for each face of each reflector. You may clear a given offset frame by clicking its row in the grid and selecting (Clear Frame).

External Trigger Configuration

The external trigger settings are defined within a "Custom Triggers" measurement profile. These settings are shown conceptually in Figure 3-108 and as they appear in the measurement profile settings dialog in Figure 3-108.

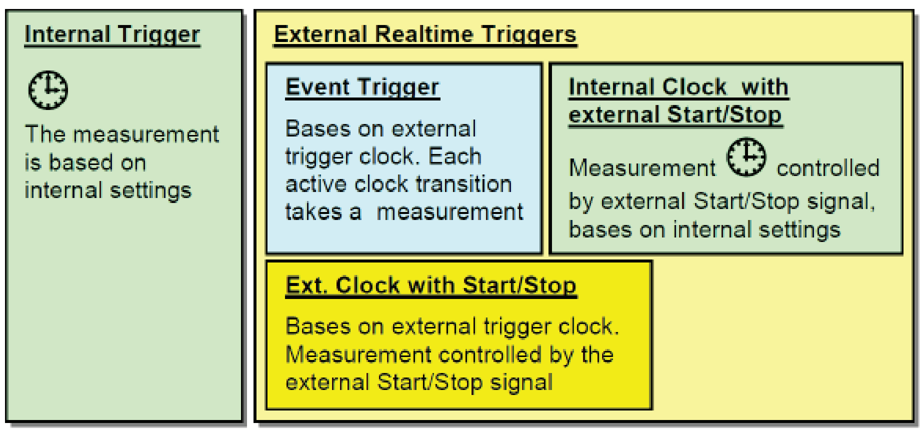

Figure 3-108. External Trigger Configuration

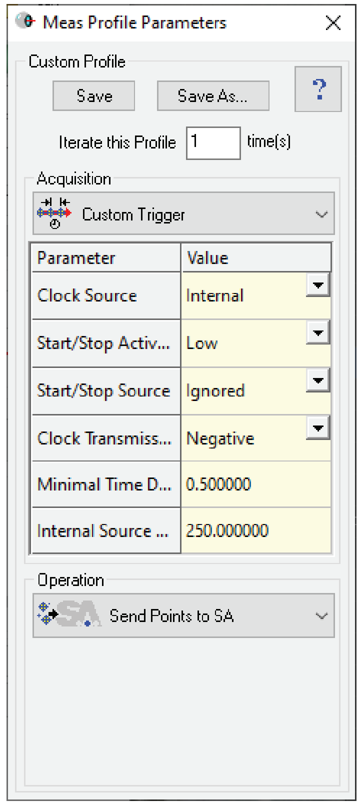

Figure 3-109. CustomProfileusedto Enable External Triggering

Measurement Profile Settings

External Trigger measurements can be performed using either of two basic methods:

1. Set the **Clock Source** to "Internal" and use the external trigger to control the start and stop of a scan at a give rate.
2. Set the **Clock Source** to "External" and trigger measurements exclusively with the external trigger.

Clock Source:

- **Internal (Internal Clock with External Start/Stop Signal).** Measurements will be triggered by the external start/stop signal on the trigger board. However, the measurement rate will be taken based on internal settings and is not synchronized to an external signal.
- **External (External Clock with Start/Stop Signal).** The measurement will be controlled by a start/stop signal on the trigger board. One transition of the clock signal (positive or negative depends on the configuration) triggers a measurement if the Start/Stop signal is active.

Start / Stop Active Level

- **Low/High.** The start/stop signal can be set either low or high active (for example, low active means that events are being generated as long as the start/stop signal remains low).

Start / Stop Source

- **Ignored/Active.** This setting controls the subsequent response to the external trigger after a measurement operation has started. If ignored, the measurement will continue regardless of other triggers until the profile is stopped, while if active, the following trigger changes will start / stop the measurement.

Clock Transmission

- **Negative/Positive.** This defines the change in clock signal used for the trigger (negative transition or positive transition).

Minimal Time Delay

- **Delay Value.** This defines the maximum rate at which measurements can be taken (minimal delay between two consecutive measurements). Additional trigger signals sent faster than this preset delay will be ignored.

Leica's Orient to Gravity (OTG) Operation.

An Orient to Gravity (OTG) Operation can be used to compensate a tracker's base frame with respect to gravity. Its important to realize that an OTG operation is a system calibration and will change the way in which measured points are recorded and sent to SA. Comparing measurements before and after a level compensation would be similar to comparing different instruments to each other.

This means that if you intend to perform an OTG there are two required conditions:

1. A level compensation (OTG) should be performed after each instrument station move - prior to any point measurements.
2. If measurements have already been taken at an instrument plant, a *jump instrument* operation must be performed prior to performing a level compensation (OTG) and taking additional measurements.

For more information about level measurements refer to the Instruments Chapter of the SA Users Manual.

Running the Tracker Interface Separately

One of the unique features about SA's architecture is that the instrument interface can be run separately from SA. This provides a means to run multiple trackers independently on different machines while connect to a single SA for data storage. Doing so also provides the ability to separate the persistence files for individual trackers, as the persistence file will be saved in the directory as where the tracker interface is launched, as opposed to the ***C:\Analyzer Data\Persistence*** folder.

In order to run the SA Laser Tracker process separately some additional support files are required. These include the following files (Figure 3-110):

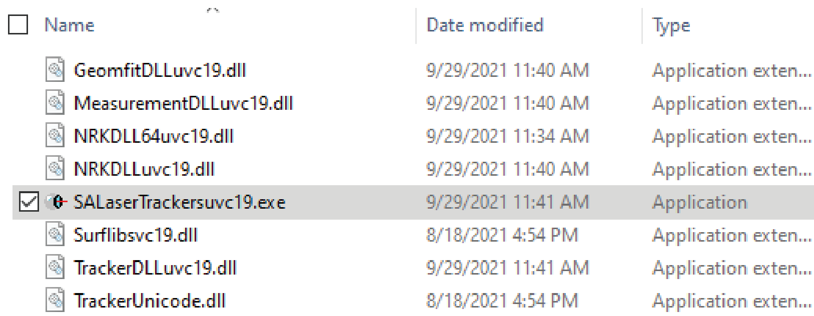

Figure 3-110. Required Files to run the SA Laser Tracker process independently from SA.

Additional Connections

The AT960 can be used with a number of peripheral devices. For more information refer to the following quickstart guides:

- “Hexagon AS1 and AS1 XL Scanners” on page 134
- “Leica Absolute Scanner (LAS) 20-8” on page 144
- “Leica T-Scan Interface” on page 147