

## Aicon Move Inspect



This quick-start guide can be used for initial configuration, connection and basic operation of the AICON Move Inspect Photogrammetry system within SA. For more details on instrument operation and configuration, please contact AICON directly.

### Hardware Setup

Set up the AICON MoveInspect system following the Manufacturer's directions. This will depend on the camera configuration and system type. Ensure you have the appropriate camera mounts, tripods, and cabling to power the unit.

- Communication with SA is done through TCP/IP Ethernet connection so an appropriate network connection is necessary. Use the IP Configuration program within the MoveInspect directory to configure the IP's of the cameras which are typically on the 192.168.0.x network.
- Control over the dynamic reference system from SA was added in 2017 and requires MoveInspect v7.01.06 or later.

### Software Setup

SA does not interface with the cameras directly but rather with the host application, AICON MoveInspect. Therefore, MoveInspect must be installed, calibrated, and running on the local machine prior to any attempt to connect to SA.

- Please contact AICON directly to obtain the correct version of MoveInspect for your camera system and install it following the manufacturer recommendations. (<http://aicon3d.com>)
- You can verify SA's current version compatibility by looking in

the SA readme file available under the Help menu within SA. Probe, Adapter and panel setup and calibration must also be performed within MoveInspect. Target recognition and interpretation is also performed within MoveInspect. Once correctly configured SA can acquire any of 3 data types from AICON these include:

- Point measurements from coded / noncoded targets, probes and adapters.
- A constellation of points from coded targets and panels
- 6D Frames from adapters

### Basic MoveInspect Connection

Start MoveInspect software before attempting to connect to the instrument in SA.

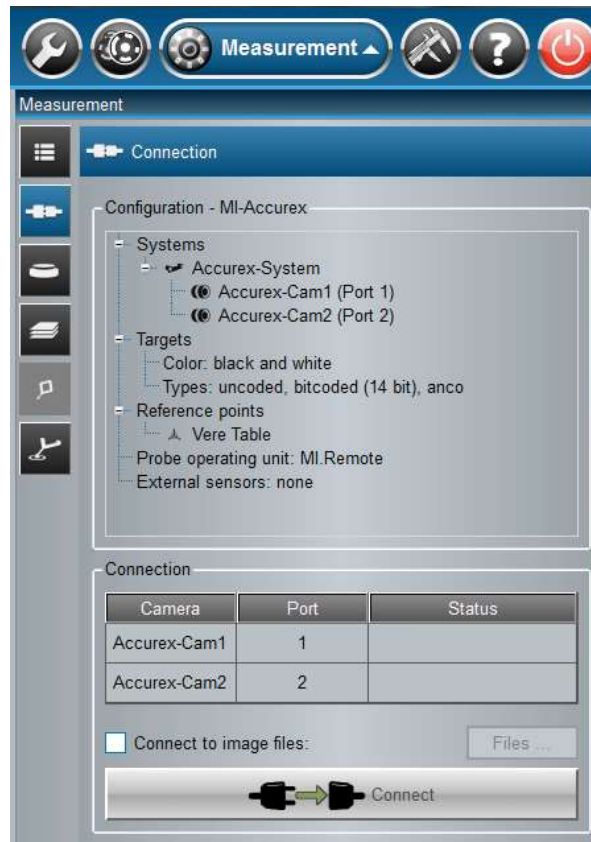
3. Select a "Configuration" from the "Administration" Menu (Figure 17-8). A configuration defines the measurement environment and the configuration of the camera system. This includes both the probe definition and any adapters. These must be configured in order to be used within SA.



**Figure 17-8.** Configuration Selection from the Administration page.

4. To begin measuring, go to the Measurement menu and from the Connection page select **Connect** (Figure 17-9), this may be done automatically in newer versions of MoveInspect.

**Figure 17-9.** Connecting within MoveInspect.

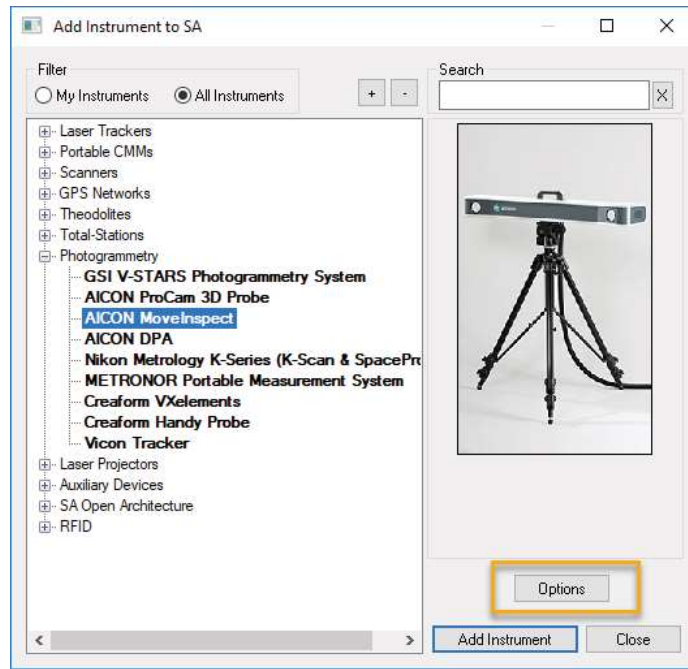


5. Once connected you can switch to the Measurements page in MoveInspect. All subsequent measurement control can be performed within SA.

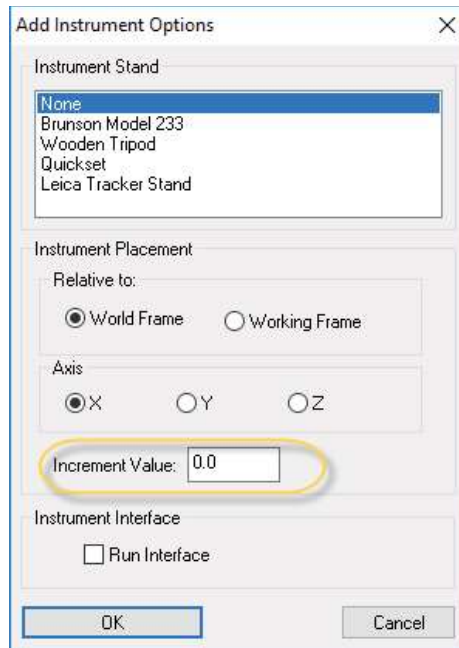
### Starting the SA Interface

1. Within SA select **Instrument > Add** and choose the AICON MoveInspect System from the Instrument List (Figure 17-10). Press the **Options** button and ensure that the Increment Value is set to 0 (Figure 17-11). This only needs to be done the first time you connect. Press the **Add Instrument** button to add the instrument to SA.

**Figure 17-10.** Adding the Icon  
move Inspect System



**Figure 17-11.** Add Instrument  
Placement Control




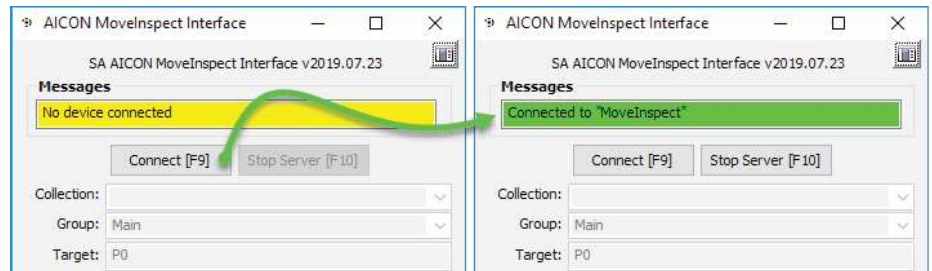
2. Start the instrument interface using **Instrument > Run Interface Module and Connect** or .
3. When the interface opens, press the **Connect** [F9] button to establish a connection with Aicon MoveInspect (Figure 17-12).

Figure 17-12. Starting the Server

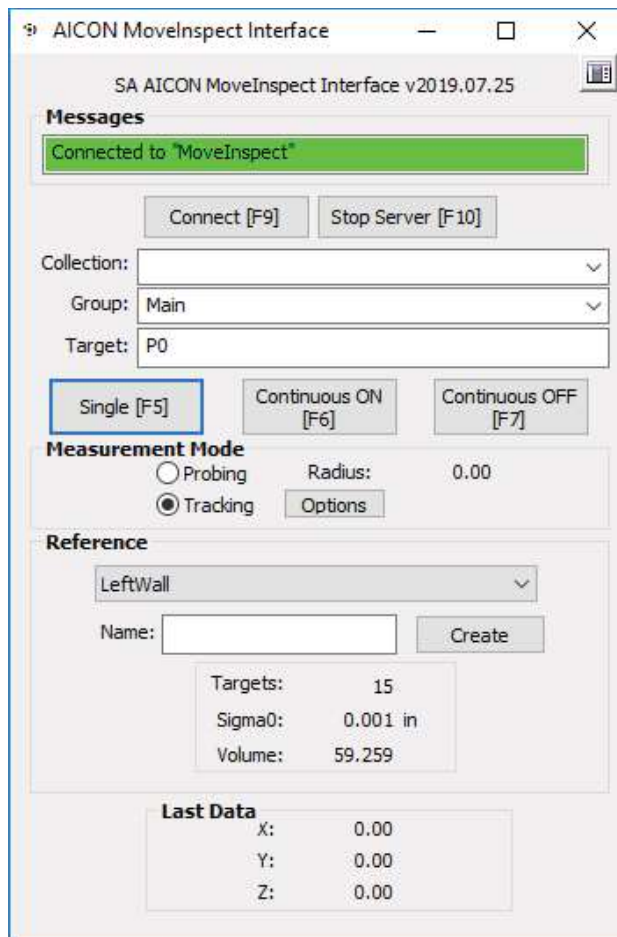


### Instrument Specific Operations

The primary controls within the AICON MoveInspect Instrument Interface are as follows (Figure 17-13):

- **Measurement Mode.** User to switch between Probing and Tracking. Probing uses the MI probe and defined tips, while Tracking mode is needed for coded/uncoded target measurement as well as all adapter operations.
- **Reference.** The dynamic reference set within MoveInspect can be both controlled from within SA by name and new references can be defined and enabled.

Figure 17-13. Aicon Measurement Control and the SA Interface

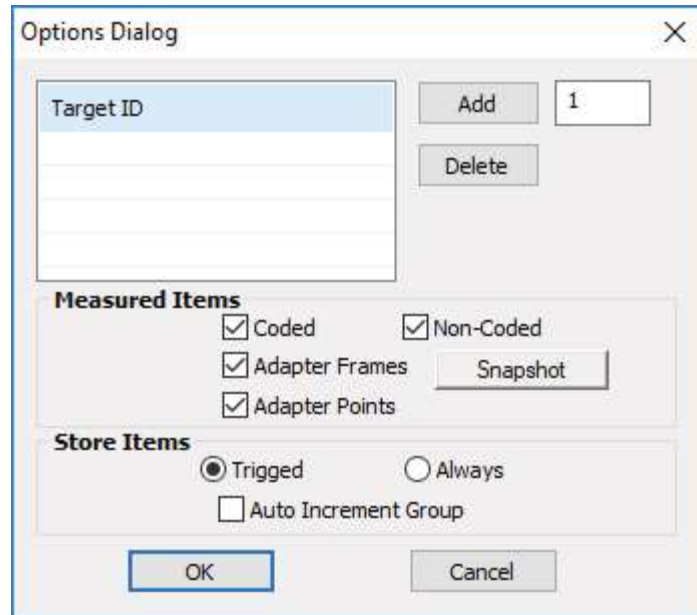


## Probing

In **Probing** mode, full control over Collection, Group, and Target designations are set from the designated fields and the displayed probe radius will be saved with each point taken.

## Tracking

In **Tracking** mode the **Options** button should be used to ensure that the desired measurements filters are in place (Figure 17-14).



**Figure 17-14.** Options controls for tracking mode acquisition

The **Target ID** list can be used to identify and measure only specific named targets (coded or non-coded) by number. It operates in either of two modes. If the list is empty then all visible targets will be measured. Alternatively, if specific numbers are added then only those specific targets will be recorded.

The **Measured Items** selection presets master controls to turn on or off targets of different types. When a measurement is taken the targets that are enabled in this section will be recorded within SA.

**Adapters.** All of the visible adapters in the current MoveInspect configuration will be recorded to SA when in Tracking mode and the adapter options are enabled in the **Measured Items** section. A single adapter can be defined such that it returns a frame or set of frames as well as a set of return points. Point naming is based upon the designated adapter naming, not the dialog target name.

- **Probing Frames.** Frame measurements recorded from an adapter will use the Frame names defined within the adapter. This means that if a measurement has already been taken in SA and the adapter frames already exist, then no additional frames will be created. Instead, each measurement will update the transform of the existing frames within SA. This can be very

helpful in updating a frame to frame relationship and can directly be used in trans-track operations. In order to record static 6D measurements and record these frame measurements as separate frames, the **Snapshot** button must be enabled. The adapter frame name and a timestamp will be then returned with each measurement.

- **Adapter points.** Adapter point measurements will also use the point names designated in the adapter definition along with the Group name specified in the Aicon Interface. Each measurement will be recorded as a separate observation on the existing points unless the **Auto Increment Group** option is enabled in the **Store Items** section.

**Store Items.** The Store Items section controls how and when measurements are stored in Tracking mode.

- **Triggered.** With triggered enabled measurements will be taken when the MI probe button is triggered only.
- **Always.** With this option enabled all the visible items will be recorded when the **Single** measurement button is pressed or sequentially as long as a **Continuous** measurement is active.
- **Auto Increment Group.** Is used to separate each sequential measurement in separate groups as apposed to recording additional observations on existing points.

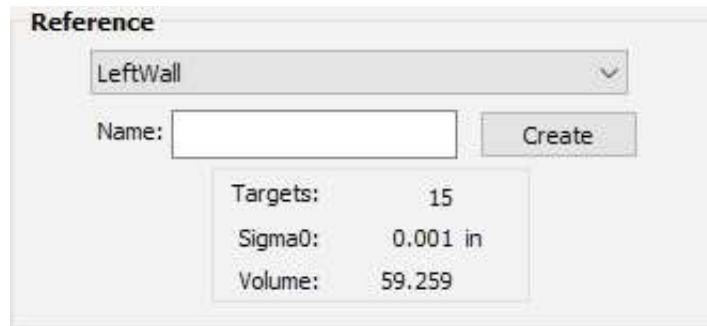
**Dynamic Reference.** This section is used to set and define the dynamic reference within MoveInspect. The drop down list will be populated with the reference systems currently defined within MoveInspect automatically when you connect.

To define a new Dynamic Reference do the following:

1. Take a single Measurement of all visible reference points. Optionally, construct a frame relevant to these points (by probing features or fitting CAD to the points, etc.) and make this the working frame.
2. In the SA Interface for MoveInspect, type in a name for the Dynamic Reference and select **Create** (Figure 17-15). Once active, the MoveInspect software should reflect the new Dynamic Reference in the "Measurement" menu.

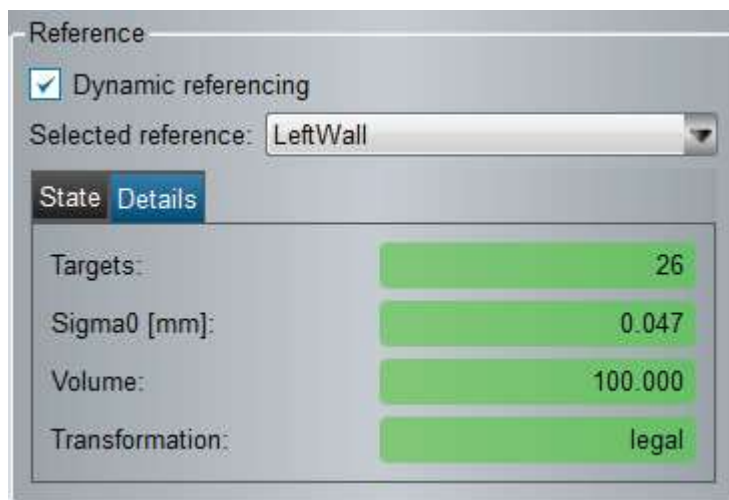


**Figure 17-15.** Defining a new Dynamic Reference



Once the reference is active, the points involved in the reference are no longer measured into the SA file, but they are being used to update the instrument position relative to the points (Figure 17-16).

**Figure 17-16.** Activated Dynamic Reference in Movelnspect



- To disable the active dynamic reference system select the “None” field from the first row from the drop down list.

The status of the Dynamic Reference is determined by the thresholds set for the reference. This is done as part of Administration in Movelnspect and include the following parameters:

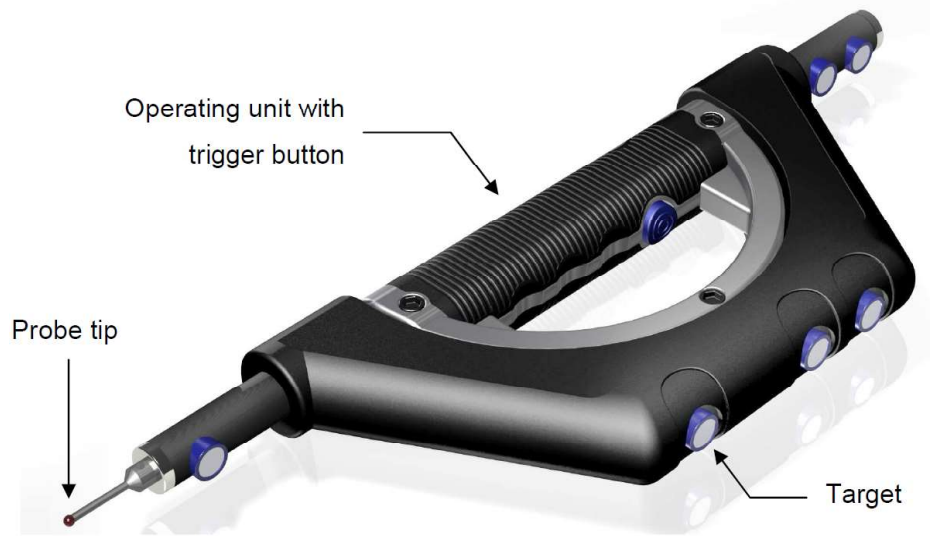
- **Min Target Count.** How many reference points must be visible.
- **Max Sigma.** The upper uncertainty threshold for the transform.
- **Min Volume (%).** The minimum volume covered by the visible points as a percentage of the full volume if all points were visible.

**Notes on the Probe:**

The MI Probe interacts through a Bluetooth connection directly with the AICON Movelnspect software (Figure 17-17). Connection and probe definition control is available in the Administration tab:



**Figure 17-17.** Probe Button Functions



In probing mode the probe tip and probing vector is saved in SA. The probe measurement button can also be used to trigger measurements in Tracking mode and can be set as the trigger for measurements of the selected targets, through the *Store Items* radio buttons.

**Notes on MP Script Controls:**

In addition to general instrument operations there are a set of specific *Instrument Operational Check* commands available as part of a Measurement Plan (MP) script for AICON:

| AICON MoveInspect   |  |
|---------------------|--|
| Connect             | Connects to the server and connects SA to MoveInspect.   |
| Stop Server         | Disconnects the communication between the interface and the MoveInspect software   |
| Set Measure Mode [] | Set the mode to: "Probing" or "Tracking" in place of [].   |
| Set Filter []       | Sets the measurement action to: "Coded", "NonCoded", "Adapter-Frames", "AdapterPoints" followed by "True" or "False" in place of []. For example: "Set Filter AdapterFrames True". |
| Snapshot            | Toggles the current Adapter frame setting from updating an existing frames transform to recording separate frames with each measurement.   |
| Set StoreMode []    | Controls the Store Items radio button selection. Use "Set Store-Mode Triggered" or "Set StoreMode Always".   |
| Measure             | Initiates a Single Measurement.  |
| Measure Continuous  | Initiates a Continuous Measurement.  |
| Stop                | Stops the current measurement.   |
| Set Reference []    | Where [] is the Name of the desired existing dynamic reference system. No name specified deactivates reference.  |

**Creating an Adapter**

Adapters are a rigid constellation of target points that are used to define or represent an object. From this set of targets a set of return targets or frames can be defined such that a measurement of the coded targets returns a set of helpful and often hidden reference points. 6D frames can also be defined in relationship to this target constellation such that a single measurement of this constellation will compute

and return a set of adapter return point or 6D frames.

Adapters are defined in the MoveInspect software under Administration, much like a probe, and are added as part of a Configuration.

To define a new adapter the point name and position of the set of target points needs to be collected either from within MoveInspect or within SA and used to define a new adapter. An example of this process is as follows:

Within SA capture the point names and coordinates that define the new adapter's position in space:

1. Activate a DR (optional to hide any target points that would otherwise be recorded), set the Measure Mode to Tracking and open the Options dialog making sure that the coded or noncoded targets you want to use for the adapter will be recorded.
2. Place the adapter in the view of the camera's and take a Single (tracking) measurement to create a new point group from the adapter targets.
3. Construct a frame that is relevant to the points that compose the adapter. Construct additional frames or location points as desired in relationship to the target points.

Next, within MoveInspect do the following:

4. Create a new Adapter  from the "Administration" menu in MoveInspect and select the appropriate target type(s) (Figure 17-18)



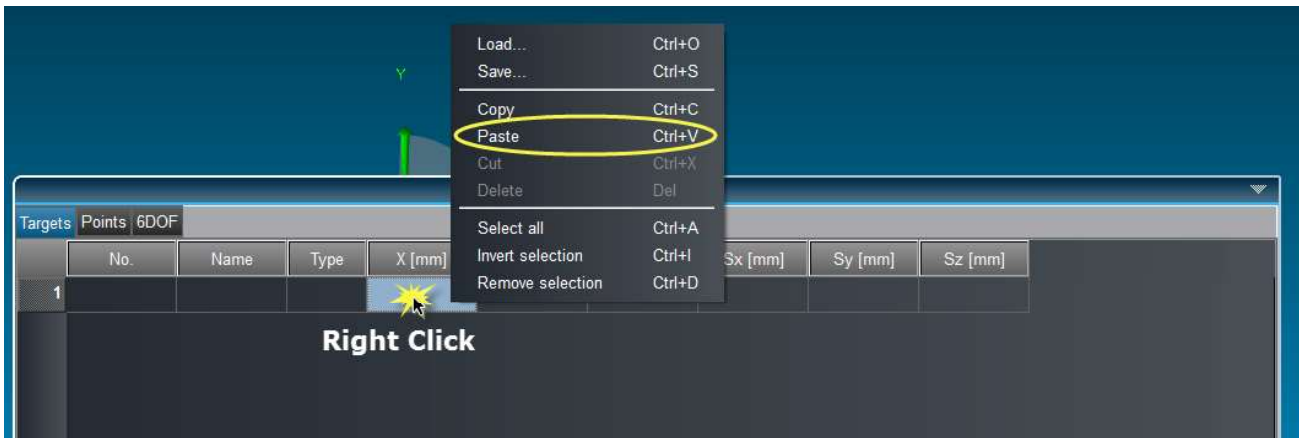
**Figure 17-18.** Adapter Configuration

5. Copy both the Point Names and point coordinates of the measured adapter points from SA (Figure 17-19) and paste them into MoveInspect "Targets" (Figure 17-20). Leave "No." column 0 unless it's a coded target.

Report Bar ( WCF: A::Table )

| Point Group<br>A::NRK Part |           |           |           |  |
|----------------------------|-----------|-----------|-----------|--|
| Point Name                 | X<br>(mm) | Y<br>(mm) | Z<br>(mm) |  |
| 10070                      | 224.5117  | 161.9242  | 56.8592   |  |
| 10071                      | 376.8927  | 167.3619  | 51.2104   |  |
| 10072                      | 629.3046  | 163.6717  | 73.1564   |  |
| 10073                      | 649.7889  | 152.9382  | 49.3817   |  |
| 10074                      | 585.3760  | 27.9690   | 37.0474   |  |
| 10075                      | 598.9814  | 25.2562   | 34.9748   |  |
| 10076                      | 687.7202  | 145.5306  | 52.1351   |  |
| 10077                      | 654.1589  | 14.2511   | 39.5005   |  |
| 10078                      | 665.7375  | 11.9103   | 34.4161   |  |
| 10094                      | 1043.3729 | 7.1512    | -262.4686 |  |

**Figure 17-19.** Copy Adapter Points from SA



**Figure 17-20.** Pasting Adapter Points into MoveInspect

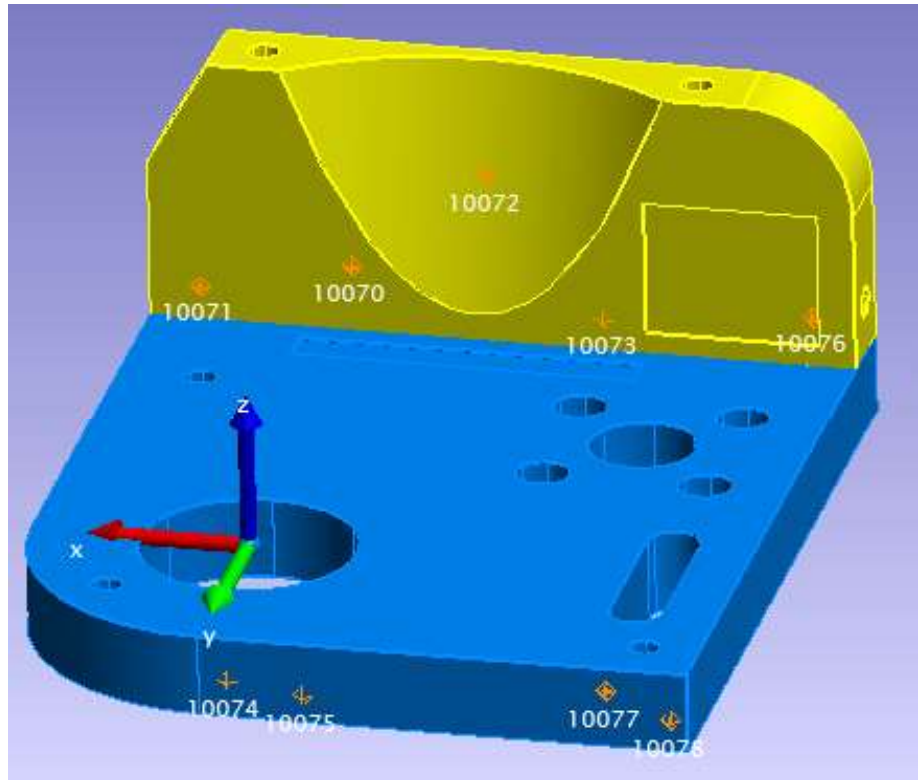
6. Copy the transform of the adapter frame into the “6dof” tab. Don’t change working frames between copying the Targets and 6dof!

The names can be pasted into their column from SA or the Targets can be given new names. An Adapter is defined by 3 tabs...

- **Targets.** are the measured targets used to define the adapter
- **Points.** are the computed adapter points that can be returned as part of a measurement.,
- **6Dof.** are the names and transforms of computed frames that also can be returned as a measurement.

A resulting adapter frame or set of return points should be defined. This makes it possible that when the adapter points are measured the resulting frame(s) transform is returned.

**Figure 17-21.** Adapter points and related frame built on an NRK part



The coordinate and name of each return frame needs to be pasted or type into the 6DOF tab of the adapter definition. This frame could be defined anywhere but should be meaningful relative to the adapter targets, such as is shown in (Figure 17-21). In this example the NRK part has been defined as an adapter and the center of the large hole has been defined as a return frame. When a measurement is taken the targets are recorded in MoveInspect, the frames transform computed, and passed on as the frame measurement.



| Targets Points 6DOF |                 |         |        |        |          |          |          |            |         |         |         |
|---------------------|-----------------|---------|--------|--------|----------|----------|----------|------------|---------|---------|---------|
|                     | Name            | X [mm]  | Y [mm] | Z [mm] | RotX [°] | RotY [°] | RotZ [°] | Rot. order | Sx [mm] | Sy [mm] | Sz [mm] |
| 1                   | Demo Block Hole | 588.328 | 68.210 | 45.020 | 0.401    | -1.151   | 168.733  | CAP        | 0.000   | 0.000   |         |
| 2                   |                 |         |        |        |          |          |          |            |         |         |         |

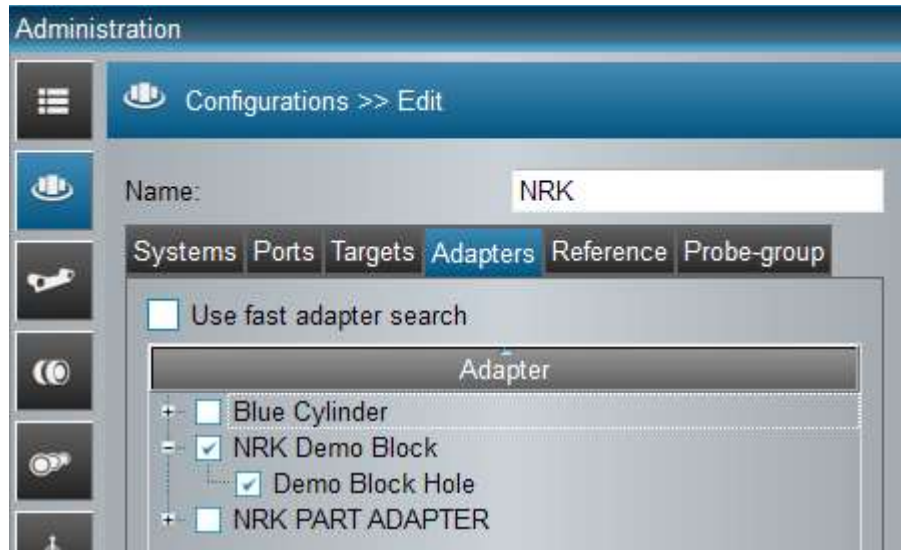
| Frame                 |           |           |          |
|-----------------------|-----------|-----------|----------|
| A:NRK Part Hole Frame |           |           |          |
|                       | X         | Y         | Z        |
| Translation (mm)      | 588.3280  | 68.2096   | 45.0205  |
| Rotation (deg)        | 0.4010    | -1.1513   | 168.7332 |
| X Axis                | -0.980530 | 0.195339  | 0.020093 |
| Y Axis                | -0.195236 | -0.980731 | 0.006997 |
| Z Axis                | 0.021072  | 0.002938  | 0.999774 |

**Figure 17-22.** Applying Adapter base frame transform

The working frame should not change between copying the target coordinates and the adapter frame transform.

7. Save the adapter changes , then return to the Configurations tab  of the "Administration" menu and edit the configuration to include the new adapter and save the configuration (Figure 17-23).

**Figure 17-23.** Adding Adapter to the Configuration



Now measuring Targeting/ Continuous/ Frames to SA will constantly update the position of a frame matching the adapter's 6DOF name ( i.e. "Demo Block Hole") in the active collection.

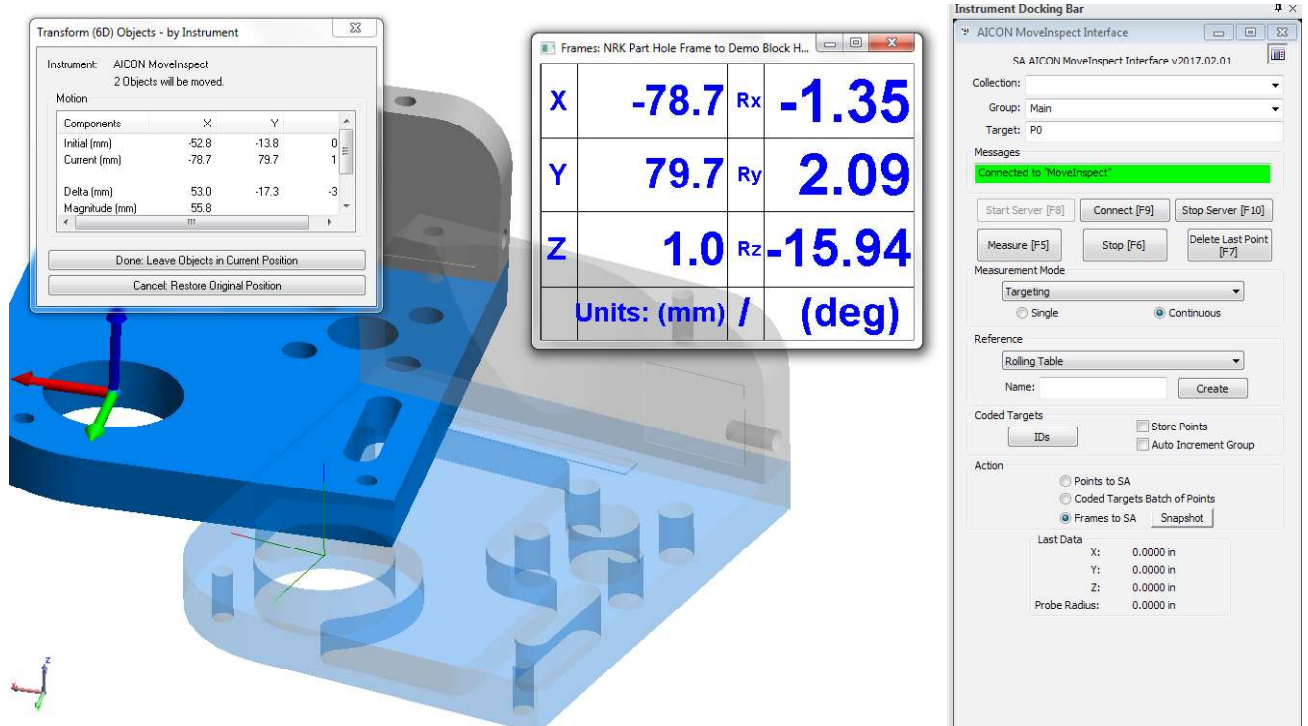
### Using an Adapter for Alignment

Once a dynamic reference and at least one adapter are defined, SA can be used to do some alignment or layout work. If the adapter is set up to come in as a frame, then a goal frame can be constructed in SA with respect to the points used as a dynamic reference. The frame representing the adapter comes from measuring the pattern of points on an object. A single measurement or snapshot with Frames to SA as the action will populate the SA TreeBar with the adapter frame(s). For real-time 6 degree of freedom feedback during the alignment process, first create a frame to frame relationship between the goal frame and the adapter. With a watch window on the relationship, the user can see the current position of the part with respect to the goal position.

For some added clarity to the user, CAD or SA Objects can be moved with the adapter frame in real time using the trans-track feature of SpatialAnalyzer. If this is desired, first move the objects to the adapter frame in its starting position. The starting position can be measured with a snapshot. Generally this can be accomplished with



a frame to frame transform (since the adapter frame is likely known with respect to the CAD), but it can also be accomplished with points to objects relationship fitting, for example. Once the objects are in the appropriate starting position, trans track can begin. **Edit > Move Objects > Transform in 6D using Instrument Updates**. With the measurement set as Targeting/Continuous/Frames to SA, the watch window on the Frame to Frame relationship will show the current 6dof deviation from the goal frame, and the trans-track will update the location of the CAD or SA Objects to match the current position of the adapter frame (Figure 17-24).



**Figure 17-24.** Using an Adapter with live updates in SA