

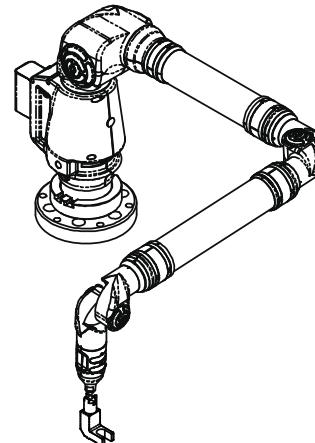
Probe Compensation Overview

Probe compensation is a localized process by which a measurement device is optimized to perform measurements accurately.

To understand probe compensation, you must first understand the FaroArm's reference system. The FaroArm is factory compensated from the base to the last joint or axis, and the position of this joint is defined by the coordinate system which originates at the base of the FaroArm. The last axis of the FaroArm has its own coordinate system, and the location of the center of the ball probe is reported in the probe's coordinate system. After the probe's coordinates are established, these are translated into FaroArm coordinates and you are ready to start taking measurements.

Measurement accuracy relies on probe compensation under optimal conditions. If the probe compensation passes, measurements will be accurate. If the probe compensation fails, measurements will not be as accurate. Proper mounting and technique are critical compensation factors.

To optimize compensation and minimize stress-induced errors during this critical procedure, place the FaroArm in a single position in which the elbow joint remains relatively stationary without any obstructions or restrictions in movement while the compensation is performed. Do not let the elbow joint fall during compensation. Only exercise the last joint of the FaroArm for the software to accurately compensate the probe tip. Minimizing elbow joint movement and focusing on the probe and last arm joint during compensation maximizes measurement accuracy.



Compensate Probe

When changing the style or dimension of the probe at the end of the FaroArm, you must compensate it for the FaroArm to measure and function accurately. Probe compensation is an optimization procedure that requires you to digitize points. The two methods of compensation are:

- Hole 
- Sphere 

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Click either button to compensate the current probe. The Hole Compensation method differs depending on whether the GUIDANCE check box is selected or cleared. See “Edit Probe” on page 86.

- See “Hole Method - Guidance” on page 88.
- See “Hole Method” on page 92.
- See “Sphere Method” on page 94.



Hole Method - Guidance

Perform the Hole compensation using the FARO probe compensation cone. If the GUIDANCE check box is selected for the current probe, use the following steps. See “Edit Probe” on page 86.

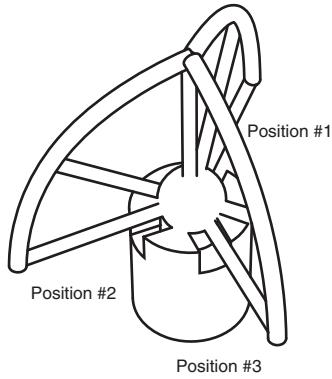
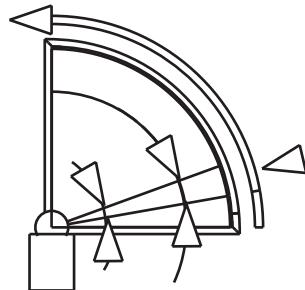


Figure 4-5 Hole Method

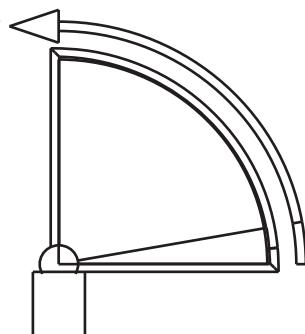
Collect all of the points in this method by holding down the FRONT button. The FaroArm will collect points as fast as possible (“scanning”) until you release the

FRONT button. Digitize at least 200 points in each of the three different positions.

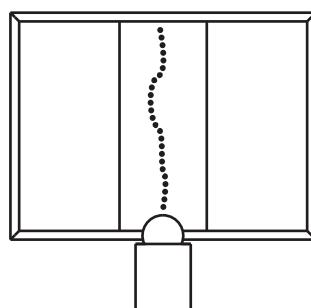
1 Place the ball probe in the cone.



2 Seat the probe in the cone, move the handle down until the shaft of the probe is parallel with the top of the cone.



- Look at the dialog box and move the handle until you reach the starting position.



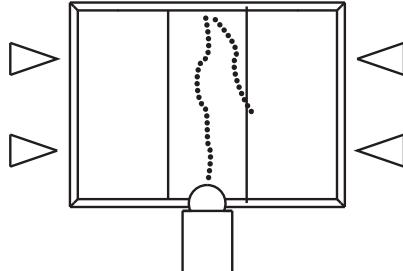
3 Press and hold the FRONT button. Sweep the handle up to the vertical position, making sure to move in a straight line. Be sure that the ball probe remains seated in the hole.

- Release the FRONT button to pause.

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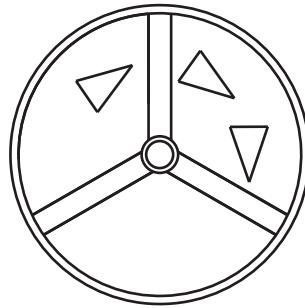
- Look at the dialog box to help you stay within the zone.

- 4 Sweep again until all 200 points are digitized. Look at the dialog box to help you digitize all of the points.



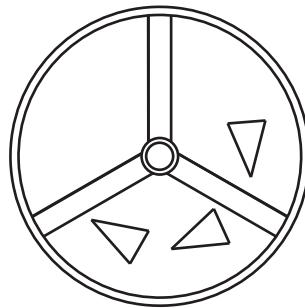
- 5 Rotate the Probe to the next position. Look at the dialog box and move the handle until you reach the start of the next position.

- Repeat steps 1 through 4 and digitize 200 more points in this position.



- 6 Rotate the Probe to the last position. Look at the dialog box and move the handle until you reach the start of the next position.

- Repeat steps 1 through 4 and digitize 200 more points in this position.



NOTE: Seven-axis FaroArms have an additional position. Rotate the handle.

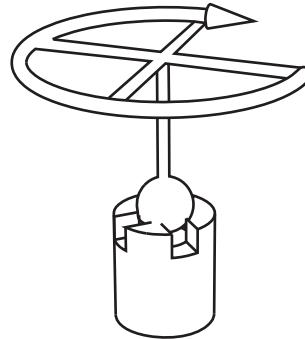
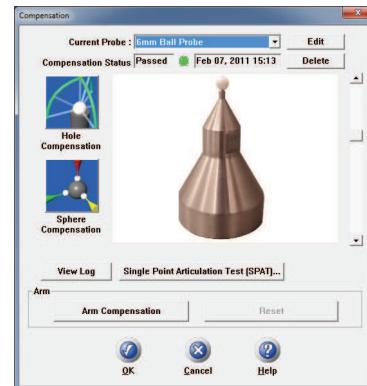


Figure 4-6 Additional Position for Seven-axis FaroArms

CAUTION: The probe *must* be well-seated in the hole when digitizing all compensation points. Even one or two poorly digitized points significantly affects the optimization process, which then has an effect on the accuracy of the FaroArm.

The digitized compensation points then calculate and the COMPENSATION STATUS updates. If the probe passes, the current date and time is added to the probe information.

You can view the details for all of the compensations of a probe by clicking the VIEW LOG button. See “View Log” on page 98.

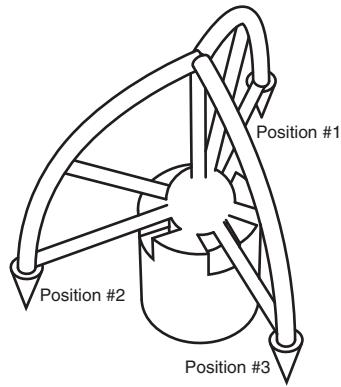




Hole Method

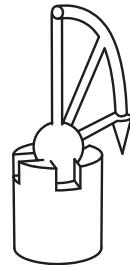
Perform the Hole compensation using the FARO probe compensation cone or a 5mm diameter machine drilled hole. The hole does not have to be exactly 5mm, but it must be smaller than the probe's diameter with a smooth seat. If the GUIDANCE check box is clear for the current probe, use the following steps. See “Edit Probe” on page 86.

Collect all of the points in this method by holding down the FRONT button. The FaroArm will collect points as fast as possible (“scanning”) until you release the FRONT button.

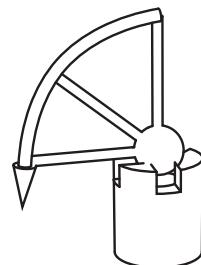


- 1 Place the ball probe in the hole. Start in a vertical position.
- 2 Press and hold the FRONT button. Sweep the handle down to one of the horizontal positions. Be sure that the ball probe remains seated in the hole.
- 3 Release the FRONT button and repeat for each position.

- Digitize points in the hole and sweep to position #1.



- Digitize points in the hole and sweep to position #2.



- Digitize points in the hole and sweep to position #3.



Figure 4-7 Hole Method - Guidance

NOTE: Seven-axis FaroArms have an additional position. Rotate the handle.

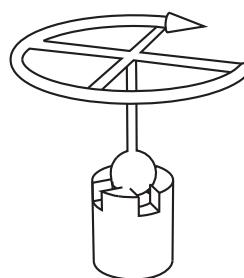


Figure 4-8 Additional Position for Seven-axis FaroArms

CAUTION: The probe *must* be well-seated in the hole when digitizing all compensation points. Even one or two poorly digitized points significantly

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affects the optimization process, which then has an effect on the accuracy of the FaroArm.

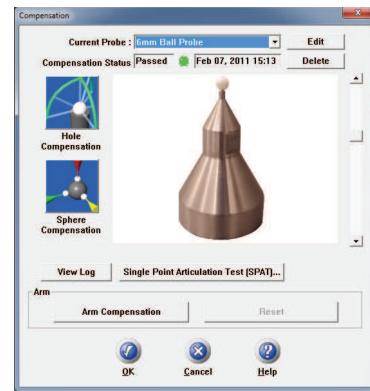
The digitized compensation points then calculate and the COMPENSATION STATUS updates. If the probe passes, the current date and time is added to the probe information.

You can view the details for all of the compensations of a probe by clicking the View Log button. See “View Log” on page 98.



Sphere Method

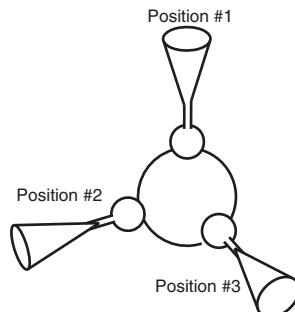
Perform the Sphere compensation using any size precision sphere or tooling ball. The sphere should be at least 10mm (3/8") diameter or larger. The Sphere compensation method differs slightly for Six-Axis FaroArms or Seven-Axis FaroArms. See “Six-Axis FaroArm” on page 94 or “Seven-Axis FaroArm” on page 96.



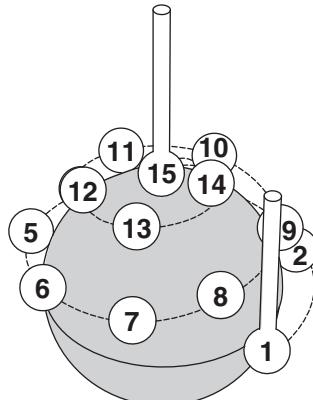
Six-Axis FaroArm

You will digitize 45 individual points in specific locations around the sphere by pressing the FRONT button for each.

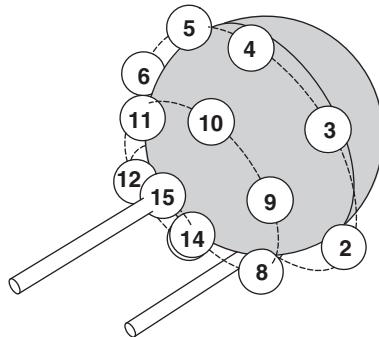
CAUTION: The ball probe *must* remain in contact with the sphere while digitizing points. Even one or two poorly digitized points significantly affects the optimization process, which then has an effect on the accuracy of the FaroArm.



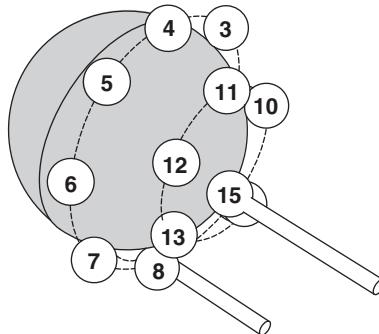
- Digitize 15 points around the top hemisphere of the sphere with the probe pointing in position #1.



- Digitize 15 points around the front hemisphere of the sphere with the probe pointing in position #2.



- Digitize 15 points around the side hemisphere of the sphere with the probe pointing in position #3.



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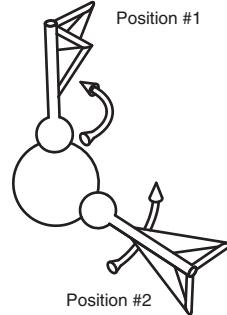
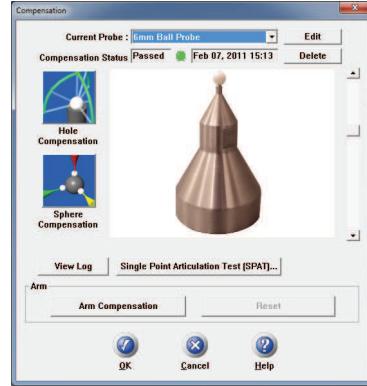
The digitized compensation points then calculate and the COMPENSATION STATUS updates. If the probe passes, the current date and time is added to the probe information.

You can view the details for all of the compensations of a probe by clicking the View Log button. See “View Log” on page 98.

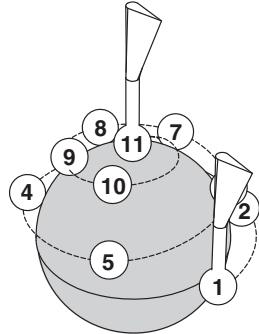
Seven-Axis FaroArm

You will digitize 44 individual points in specific locations around the sphere by pressing the FRONT button for each.

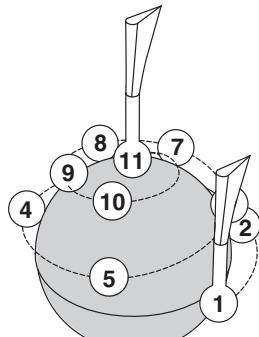
CAUTION: The ball probe *must* remain in contact with the sphere while digitizing points. Even one or two poorly digitized points significantly affects the optimization process, which then has an effect on the accuracy of the FaroArm.



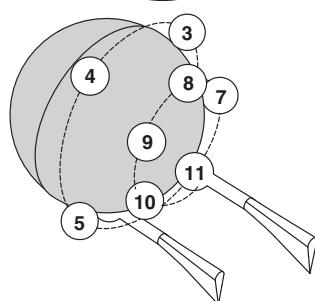
- Digitize 11 points around the top hemisphere of the sphere with the probe pointing in position #1. Hold the handle in the same direction and orientation for every point.



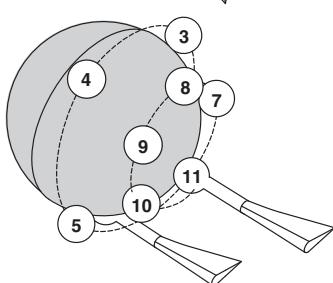
- Rotate the handle 90 degrees. Digitize 11 points around the top hemisphere of the sphere with the probe pointing in position #1. Hold the handle in the same direction and orientation for every point.



- Digitize 11 points around the front hemisphere of the sphere with the probe pointing in position #2. Hold the handle in the same direction and orientation for every point.



- Rotate probe 90 degrees. Digitize 11 points around the front hemisphere of the sphere with the probe pointing in position #2. Hold the handle in the same direction and orientation for every point.



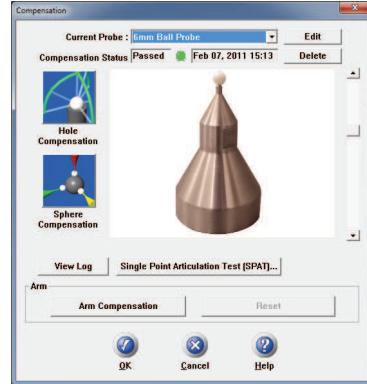
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The digitized compensation points then calculate and the COMPENSATION STATUS updates. If the probe passes, the current date and time is added to the probe information.

You can view the details for all of the compensations of a probe by clicking the View Log button. See “View Log” on page 98.

View Log

The COMPENSATION LOG dialog box displays the compensation history of the current probe. You can set to active or delete any previous compensation. You can also select the compensation values and copy them to the windows clipboard.



Name	X	Y	Z	2 Sigma	Max Error	Date	Serial Number	Method	Points	Guid...
6mm Ball Probe	-0.0025...	0.0018...	0.0010...	0.0012...	0.0012...	Feb 21, 2011 15:10	E09-05-11-08727	Hole	277	Off
6mm Ball Probe	-0.0024...	-0.0019...	9.4933...	0.0014...	0.00178...	Feb 21, 2011 13:16	E09-05-11-08727	Hole	277	Off
6mm Ball Probe	-0.0022...	-0.0014...	9.4915...	0.0010...	0.00135...	Feb 21, 2011 13:11	E09-05-11-08727	Hole	505	Off

Figure 4-9 Compensation Log dialog box

- The X, Y, Z values are the location of the center of the ball probe in the last joint coordinate system.
- The 2 Sigma value is the deviation of all the points taken during the compensation.
- The Max. Error column displays the displacement of the point with the largest displacement. In order to pass compensation, this value has to be less than the single point accuracy specification of the arm. See “FaroArm Calibration” on page 46.