Stylus System Qualification Procedures for Zeiss CMMs
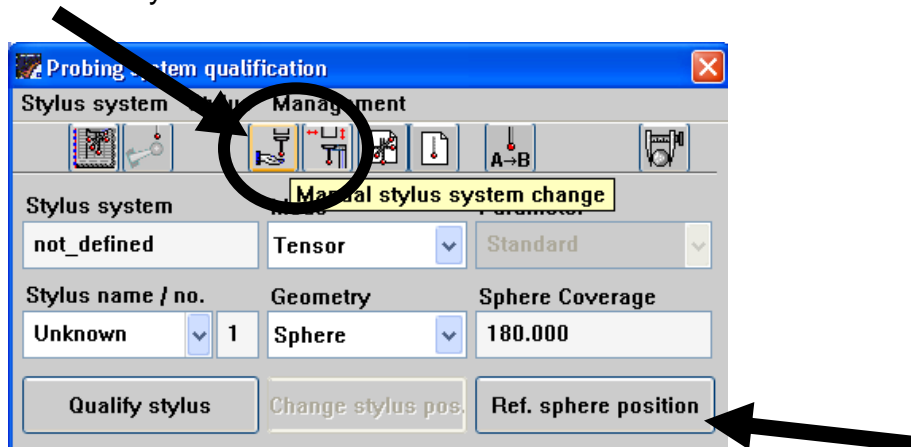
Section 1: Locating the Reference Sphere

This section shows how to locate the Reference Sphere. **THIS PROCEDURE MUST BE COMPLETED BEFORE ANY QUALIFICATION TAKES PLACE!**

1. Determine if the Reference Sphere needs to be located. Location is needed if any of the following conditions exist:
   a. The Reference Sphere has been moved since last location
   b. The CMM has been powered down since last location
   c. A significant amount of time has passed since last location
   d. You do not know if you should locate the sphere or not
2. If you need to set the location, follow the below steps. If not, begin your stylus qualification procedure.
3. In your prerequisite list, click the Stylus System button
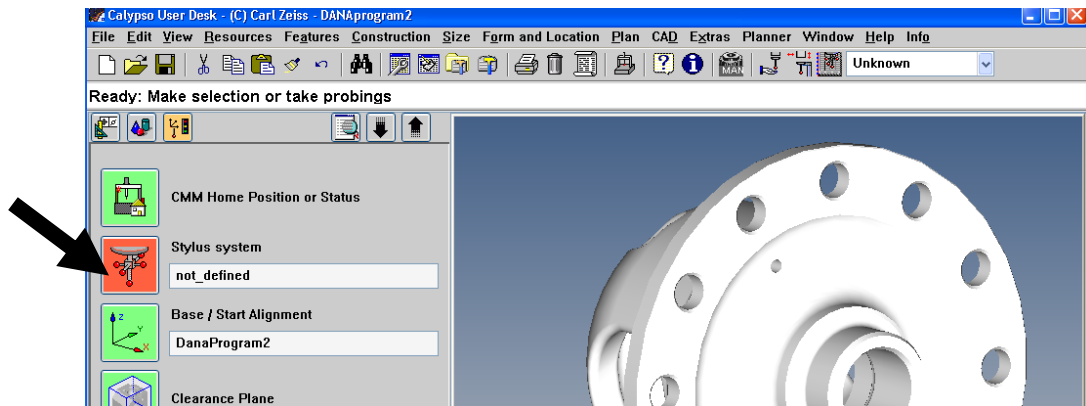
4. In the Stylus System screen, perform an AUTOMATIC or MANUAL PROBE STYLUS SYSTEM change and load the MASTERPROBE. Make sure Stylus Number 1 is active.


5. On the Stylus System screen, click the REF. SPHERE POSITION button.

6.	When the Orientation of Reference Sphere window appears, click the appropriate picture representing the reference sphere as it appears on your CMM when looking at the reference sphere from above.
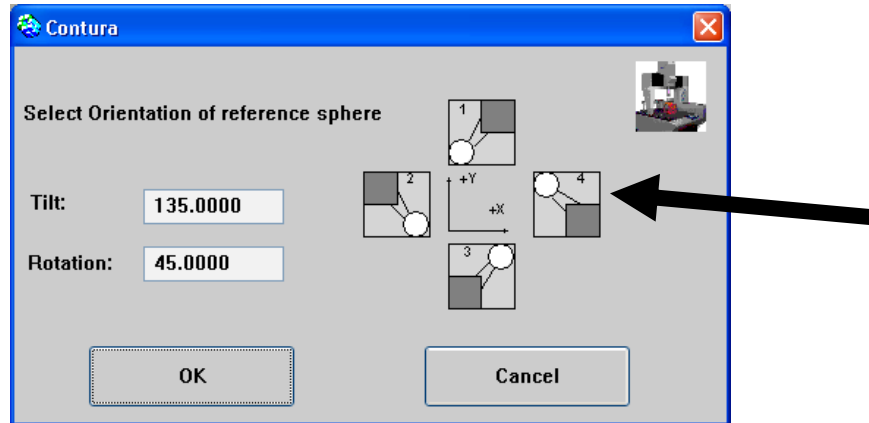
7.	Calypso will then prompt you to take a point on the reference sphere in the direction of the stylus shaft. At this time, drive the CMM to the reference sphere and take a point directly on top of the sphere.
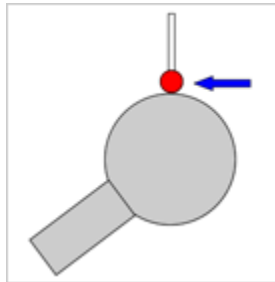

8.	Calypso will automatically locate the sphere by taking a series of points around the reference sphere.

Section 2: Creating and Qualifying New Stylus Systems

This section shows how to create a new stylus system and how to qualify all of the tips in your new system. You must assemble your stylus system before you begin this procedure. Touch-trigger users (RST, TP2, TP20 sensors) with rotating heads can try the LIST QUALIFICATION procedure (see notes on www.jhtools.com website). If that is successful, this section can be skipped.

1. In any open program, from the Prerequisite List, click the STYLUS SYSTEM button.
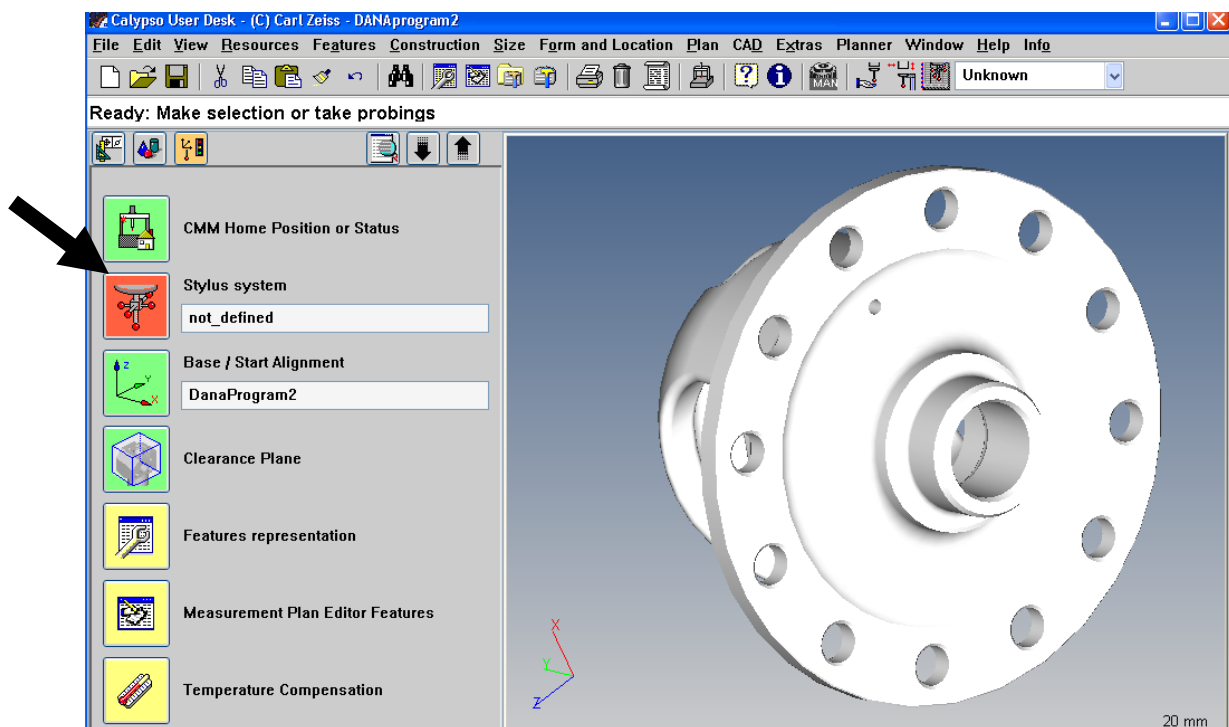
2. In the Stylus System screen, click the MANUAL STYLUS SYSTEM CHANGE button
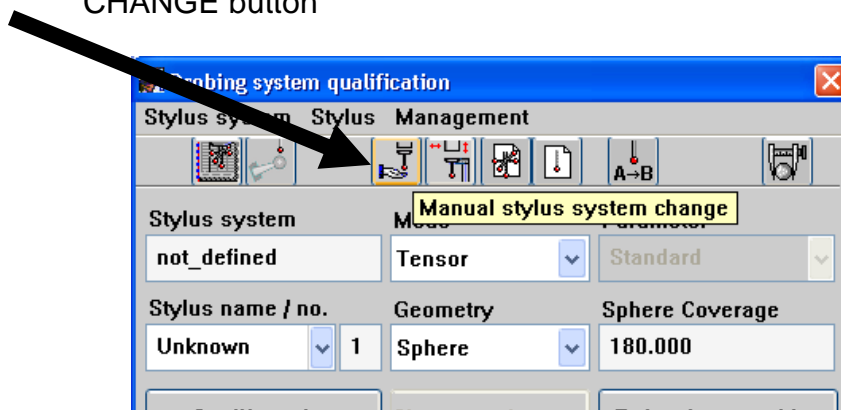
3.   In the Stylus System screen, click the MANUAL PROBE CHANGE button. Remove the attached stylus system if needed and attach the new stylus system by pressing the red arrows. Follow any direction Calypso gives you during the removal and attachment of stylus systems.


Click arrow to attach new stylus system
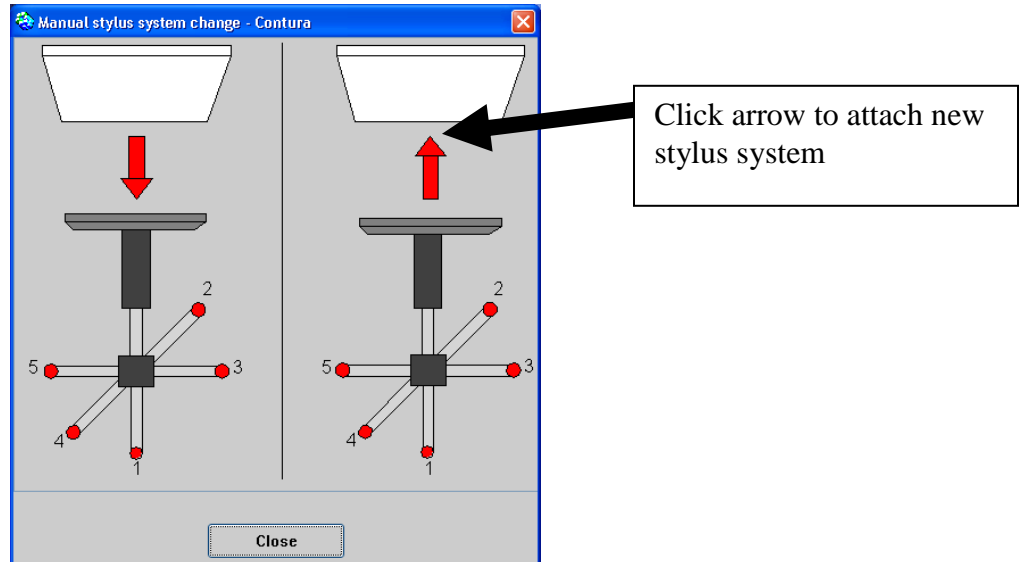
4.   When the SELECT STYLUS SYSTEM window appears after attaching the new stylus system, click the NEW button.
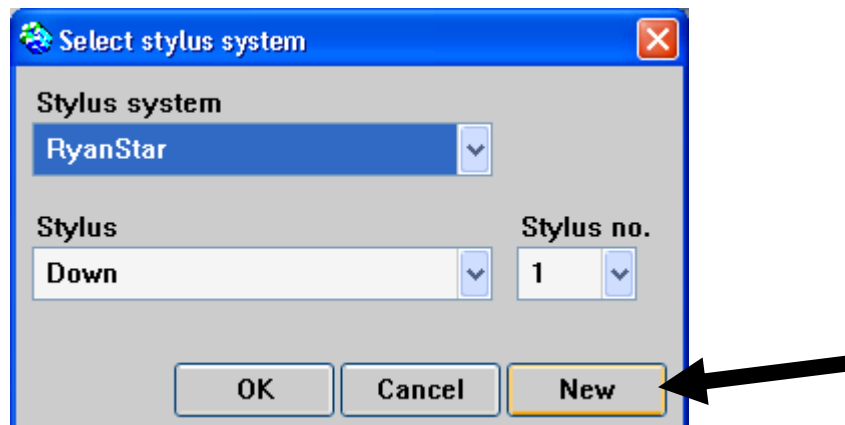
5.   When the CREATE NEW STYLUS SYSTEM window appears after clicking NEW, fill in the name of the new stylus system AND the name of the first stylus in the blanks provided. Also, choose an appropriate Stylus Number, following the convention below. Stylus name is your choice and does not have to follow a convention like number must.
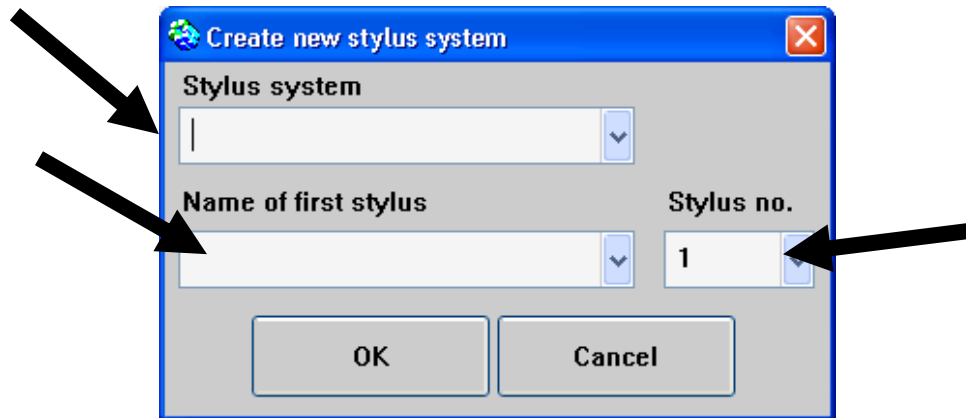

Stylus System Naming Convention
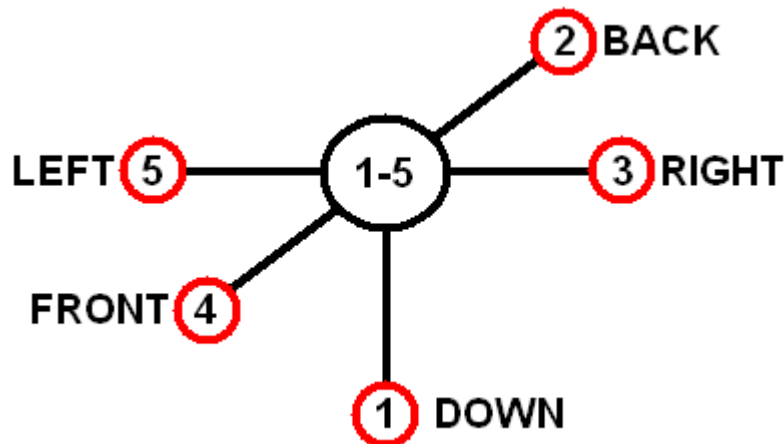
- Tip 1 is typically called "DOWN" or "–Z". On a rotating head, the angle is 0,0
- Tip 2 is typically called "BACK" or "+Y". On a rotating head, the angle is –90,90
- Tip 3 is typically called "RIGHT" or "+X". On a rotating head, the angle is 0,90
- Tip 4 is typically called "FRONT" or "-Y". On a rotating head, the angle is 90,90
- Tip 5 is typically called "LEFT" or "-X". On a rotating head, the angle is 0,-90
- More tips and angles can be added, but it is recommended that any non-axis direction tips have the number 6 or above.

6. **FIXED HEAD USERS (VAST, VAST XT, ST3) SKIP THIS STEP!**
   Once you have your stylus system name and first stylus name and number established, rotating head users must make sure to index the rotating head to the appropriate angle. Click the ROTATE STYLUS TO NEW POSITION button. Then, enter the desired angle and press EXECUTE.
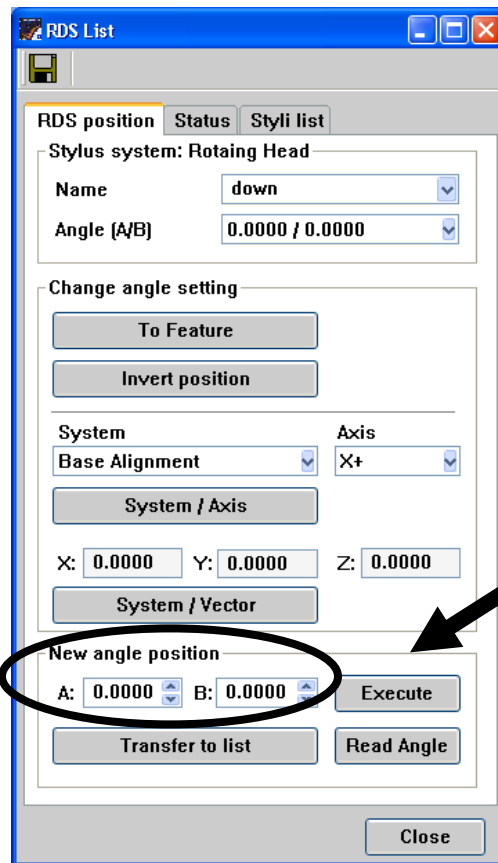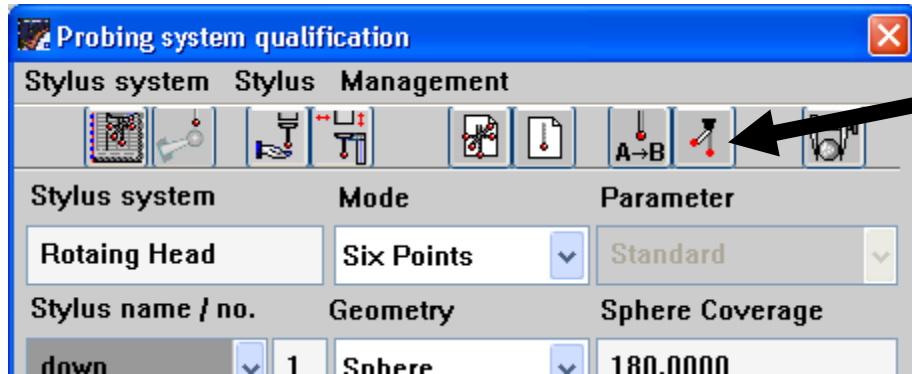
7. Press the STYLUS QUALIFICATION button. Follow the directions and take the probing point when prompted in the direction of the stylus shaft.
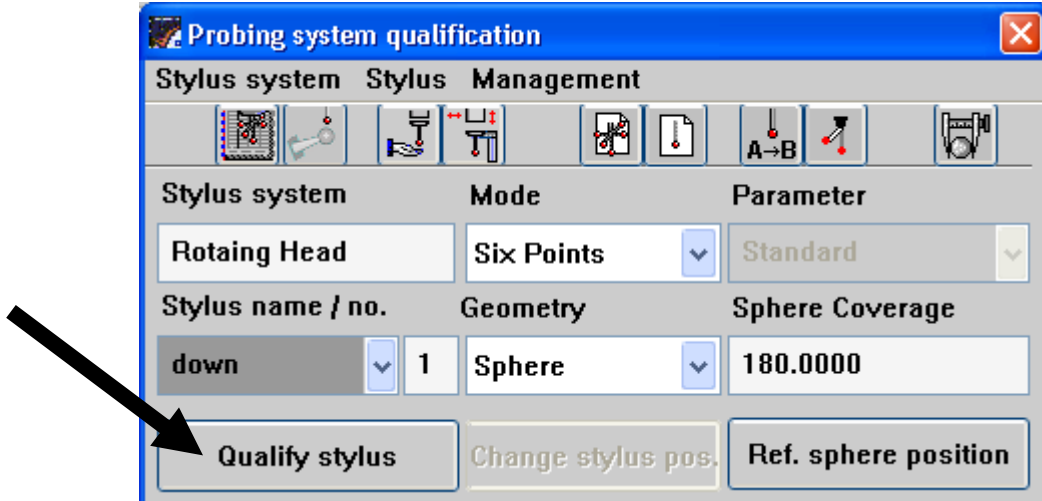
NOTE: The Qualification MODE should not be changed from Calypso's default setting in most cases when you are qualifying a stylus the first time. The optimum MODE depends on what type of sensor you are using. Below is a listing of common sensors and the appropriate Qualification MODE:

SENSOR	MODE
RST / TP2 / other Touch Trigger	Six Points
VAST, VAST XT	Tensor
VAST XXT	Qualify Passive Stylus
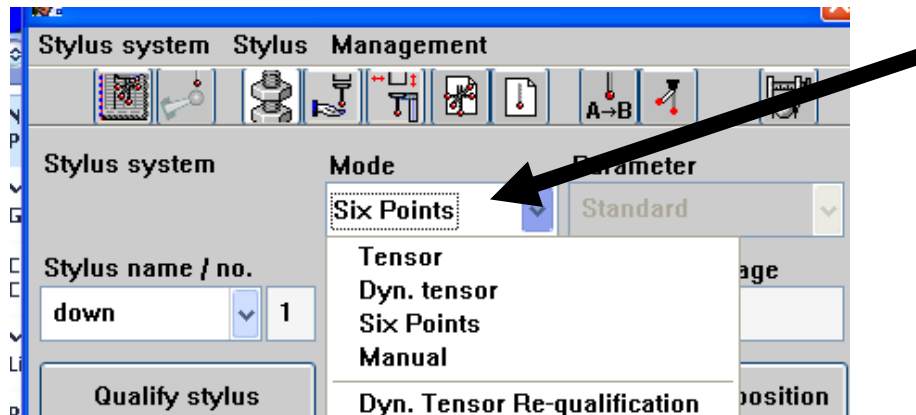
When following the directions to take the first point on the qualification sphere, if the probed point is not in an axis direction, Calypso will give you an opportunity to "clean up" the approach direction to the Reference Sphere. Type in the appropriate angles for the tip you are attempting to qualify. In the below example, if the tip was angled on 25 degrees in the +X direction from vertical, the below "CHANGE ANGLE FOR PROBING" window might appear. The actual angled of A1 X/Z of 25 and A2 of 0 should be edited into that window before clicking OK to finish the qualification.
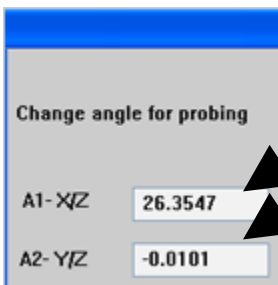
> If the tip you are trying to qualify is square with the CMM axes (tip numbers 1-5), this window should not appear! If it does, edit the A1 and A2 values to 0.

8. IF NEEDED, to qualify additional tips in this Stylus System, click the ADD STYLUS button and enter an appropriate tip name and number. Follow Steps 6-8 for all remaining tips until they are all qualified.
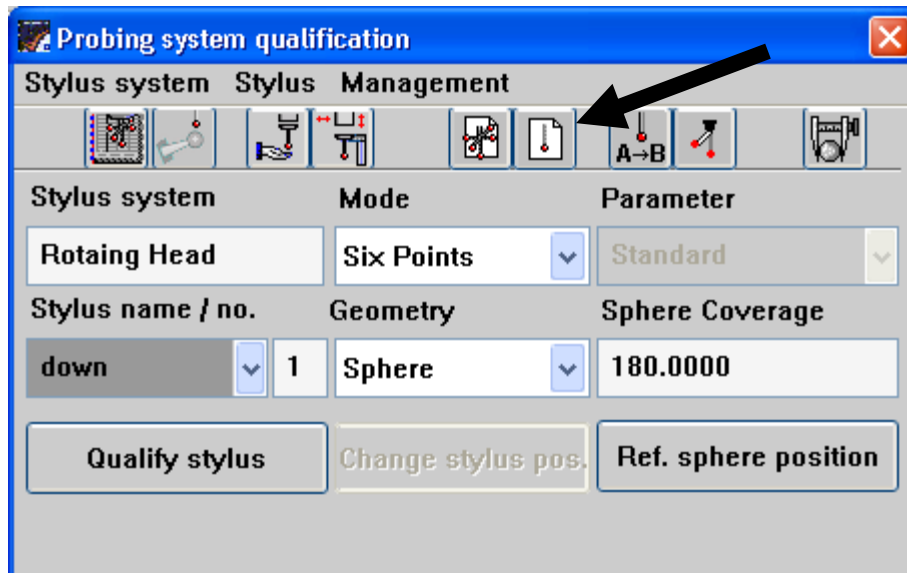
Section 3: Qualifying Existing Stylus Systems

This section shows how to requalify existing tips. **This procedure should not be used with NAVIGATOR or VAST XXT systems.** For Navigator and VAST XXT systems, a requalification program should be written, following the directions in Section 5.

1. In any open program, from the Prerequisite List, click the STYLUS SYSTEM button.
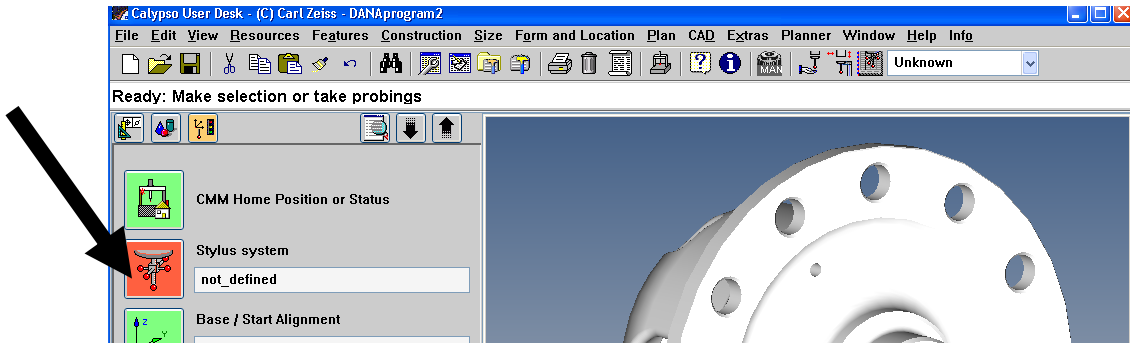
2. In the Stylus System screen, perform an AUTOMATIC or MANUAL PROBE STYLUS SYSTEM change to load the Stylus System to be qualified if needed.
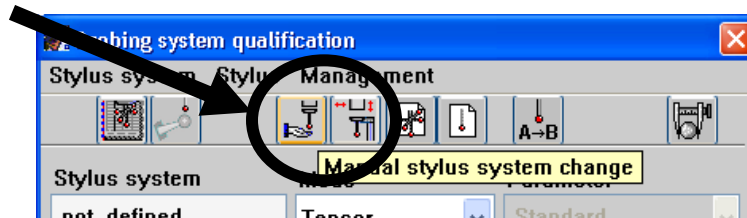
3. In the Stylus System screen, click the CNC PROBE SYSTEM QUALIFICATION button (the "Caliper" button) . When prompted, click RENEW QUALIFICATION. Calypso will automatically re-qualify ALL of the stylus tips on the current stylus system.
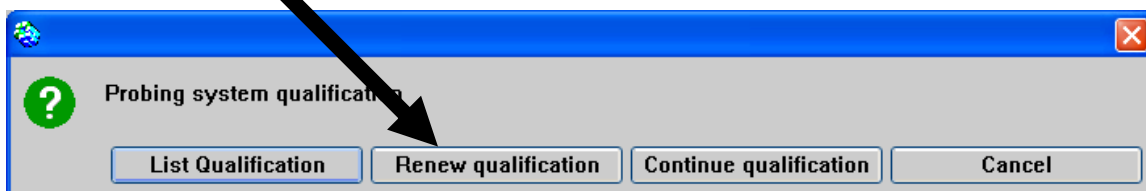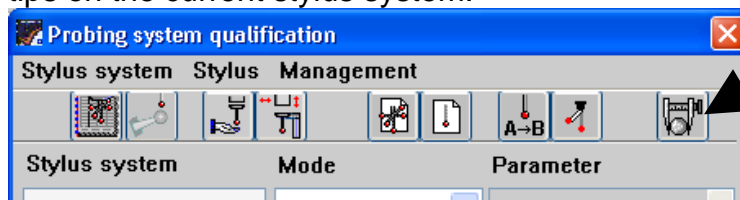
Section 4: Special Topics for XXT and Vast Navigator Users

This section shows explains some special considerations for Vast XXT and Vast Navigator users. This section does not apply to any other users.

VAST NAVIGATOR: There are three "types" of information that can be gathered when qualifying on a machine with VAST NAVIGATOR:
- Basic Position Information – using the "6-POINT" qualification mode
- Position and Static Bending – using the "TENSOR" mode
- Position, Static Bending, and Dynamic Bending – using "DYNAMIC TENSOR" mode

All tips should be qualified ONCE with the full "DYNAMIC TENSOR" qualification mode. Once this is completed, the Dynamic Bending information is stored on the system and is valid until the stylus is replaced. Note that completing a Dynamic Tensor qualification requires that the stylus scan around the qualification completely at the equator of the ball, relative to the tip. This means that for a traditional 5-pointed star, two positions cannot be qualified with Dynamic Tensor in the original reference sphere position. It is recommended that you rotate the reference sphere 180 degrees and re-locate the reference sphere following the procedure in Section 1, and then dynamically qualify the remaining tips.
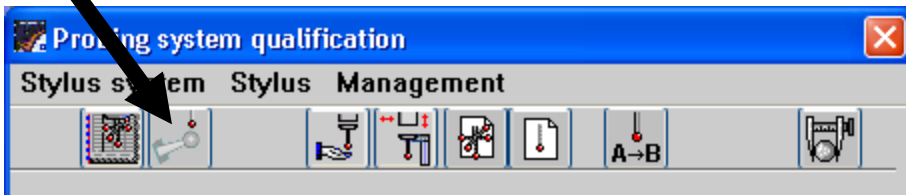
After full dynamic qualification of all tips on a stylus system, re-qualification is easiest done with a qualification program, as described in Section 5. Dynamic Qualification IS NOT NEEDED until any portion of the stylus system is replaced. If you re-qualify tips in the Stylus System Qualification screen, you may change the Qualification Mode to "TENSOR RE-QUAL". This will not change the Dynamic Bending parameters that you already established in the initial qualification. Tensor Re-Qualification does not take as long as full Dynamic qualification, and it does not require that the stem of the qualification sphere be out of the way.
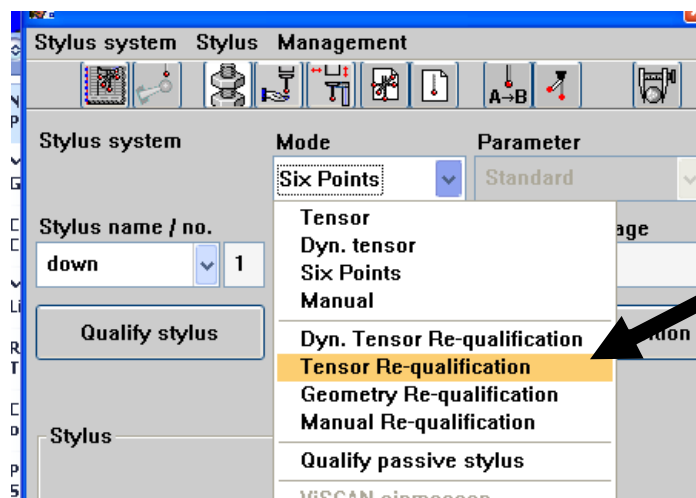
VAST XXT: The qualification of a passive scanning sensor like the VAST XXT is initially time-consuming. The passive scanning parameters must be determined by thoroughly scanning the qualification ball. If the stem of the qualification ball is in the way of scanning, you will get an error message. This means that for a traditional 5-angle configuration, two positions cannot be qualified in the original reference sphere position. It is recommended that you rotate the reference sphere 180 degrees and re-locate the reference sphere following the procedure in Section 1, and then qualify the remaining tips.

To minimize the zone of the sphere "blocked out" to the qualification path, you can reduce the size of the qualification sphere stem as known by Calypso. Note that this may allow for qualification of all your tip angles with one sphere setup. Also note that if this number is too small, you will collide with the qualification sphere stem during the qualification procedure. Please be careful and watch the scanning if you change the stem diameter. To change the stem diameter:

- Click the Qualification Sphere Administrator button

- Change the "SHAFT RADIUS" value.
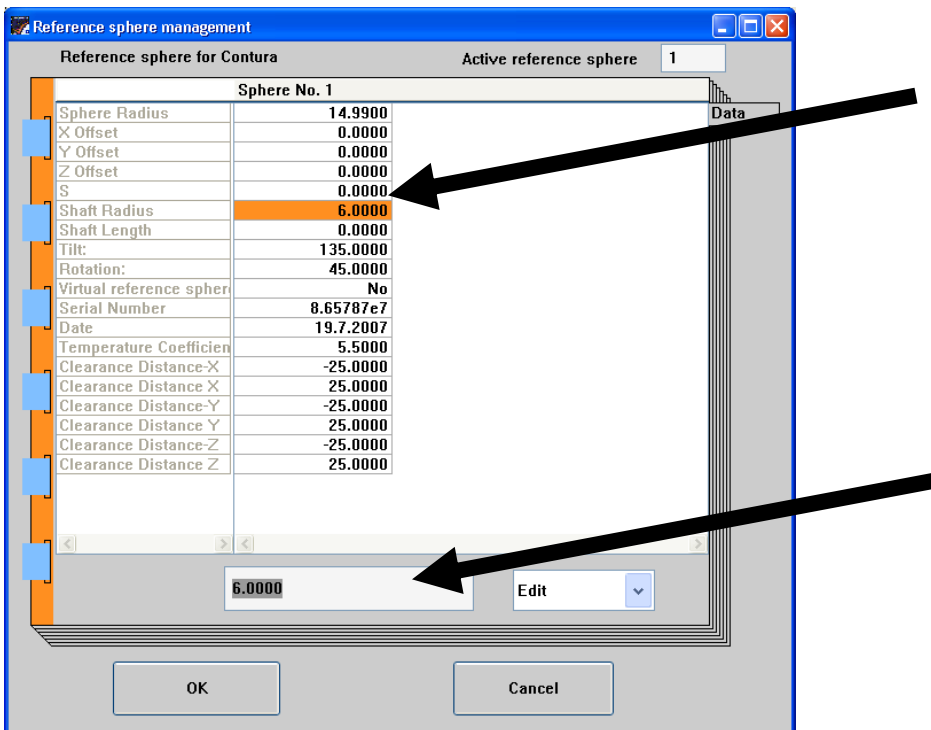
All tips should be qualified ONCE with the full "QUALIFY PASSIVE STYLUS" qualification mode. Once this is completed, the passive scanning information is stored on the system and is valid until the stylus is replaced. Full Passive Stylus Qualification IS NOT NEEDED until any portion of the stylus system is replaced or there is some other concern about the stylus system following a major collision.

After full Passive Scanning qualification of all tips on a stylus system, re-qualification is easiest done with a qualification program, as described in Section 5. If you re-qualify tips in the Stylus System Qualification screen, you may change the Qualification Mode to "GEOMETRY RE-QUAL". This will not change the Passive Scanning parameters that you already established in the initial qualification. Geometry Re-qualification does not take as long as full Passive Qualification and does not require the stem of the qualification sphere to be out of the way.
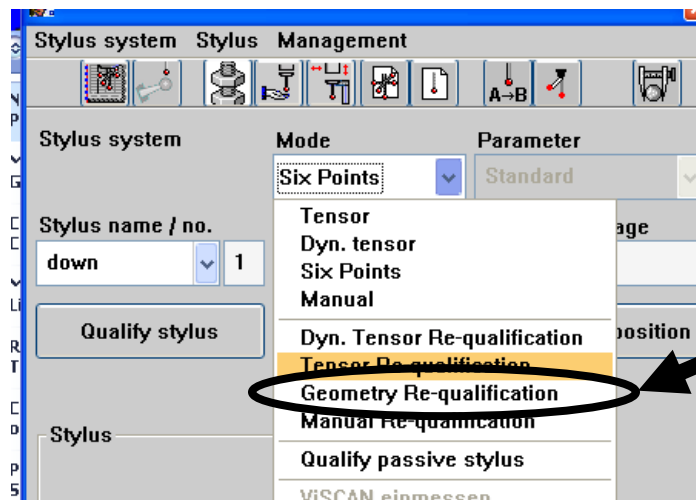
Section 5: Creating Stylus System Qualification Program

This section shows how to create a stylus system qualification program to qualify all of your stylus systems. This is very useful if you have a rack with many stylus systems on your CMM.

1.   Start a new program (File > New)
      An appropriate name for this program would be "Qualification"

2.   Drop in a "Probing System Qualification" characteristic into the program
      (Resources > Utilities > Probing System Qualification)
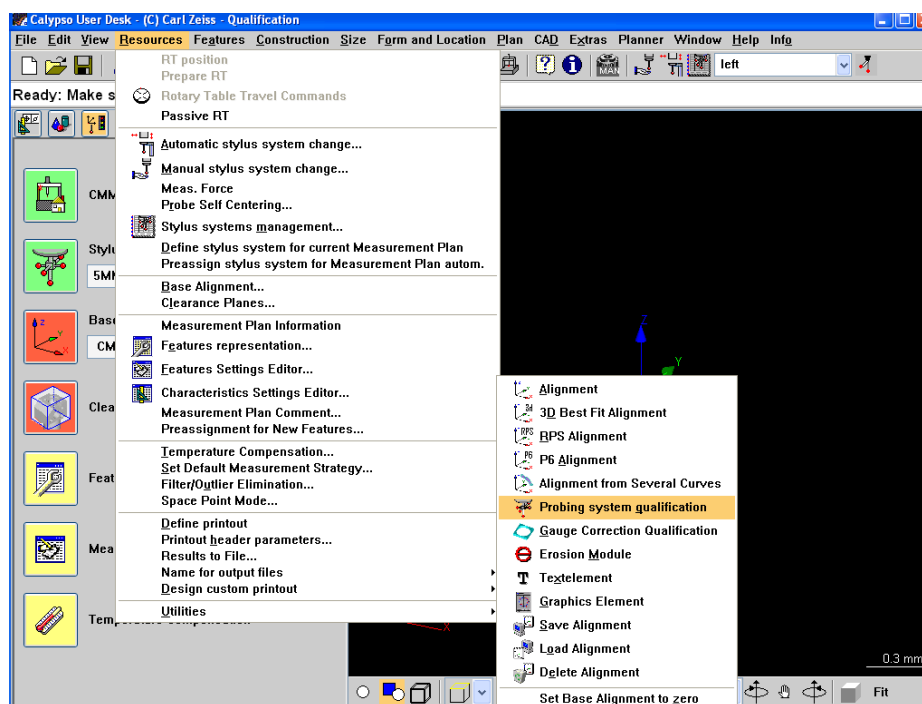
4.   Double-click the "Probing System Qualification" characteristic that
   drops into your Characteristics List.
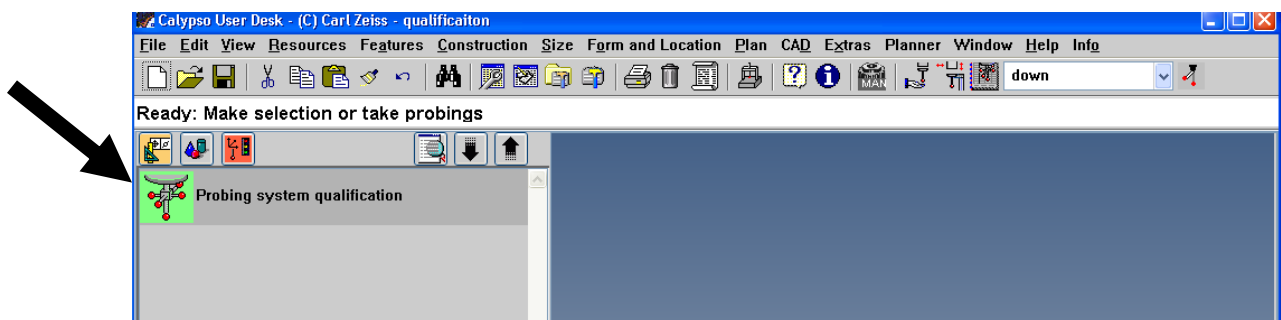
5.	Beside "Stylus System" there is a drop down box that allows the selection of which stylus system you would like to qualify. Choose the name of the first stylus system to be qualified. If the MasterProbe is in your Tool Rack, that should be the first "Stylus System" in this Qualification program. Specifying the MasterProbe first will update the position of the Reference Sphere on the table.
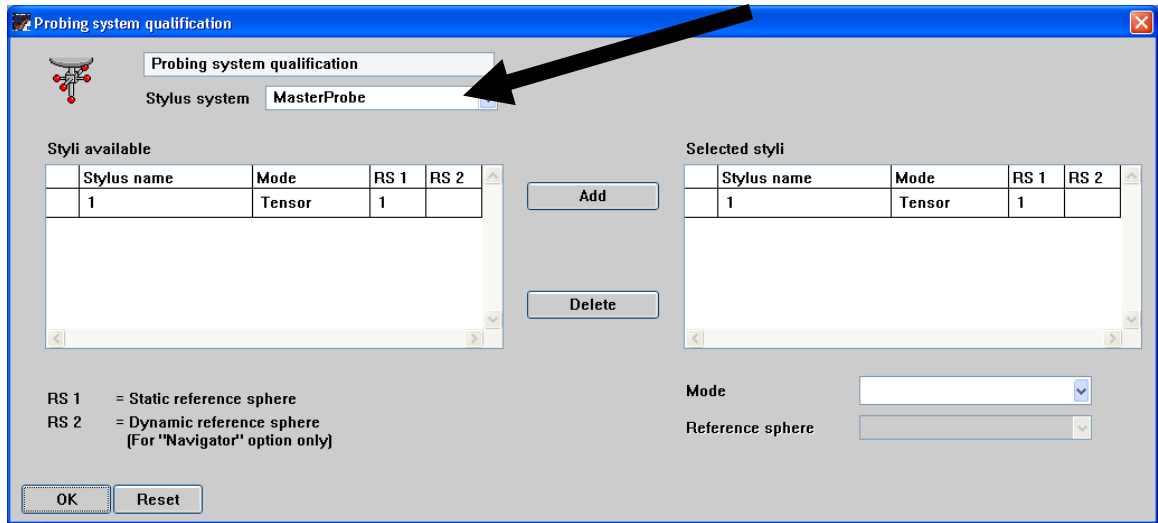
6.	Now we must set the mode of qualification for each selected tip. Select the first tip in the "Selected Styli" menu by clicking on the name. Then click the drop down menu beside "Mode". Choose the appropriate mode for your type of head:

		Touch-Trigger Heads: Choose "6 Points"
		VAST, VAST xt: Choose "Tensor"
		VAST xxt: Choose "Geometry Requal"

	Repeat this step for all of the tips in the "Selected Styli" menu.
	Once the correct mode is set for all tips in the "Selected Styli" menu, click the "OK" button at the bottom of the Probing System Qualification window.
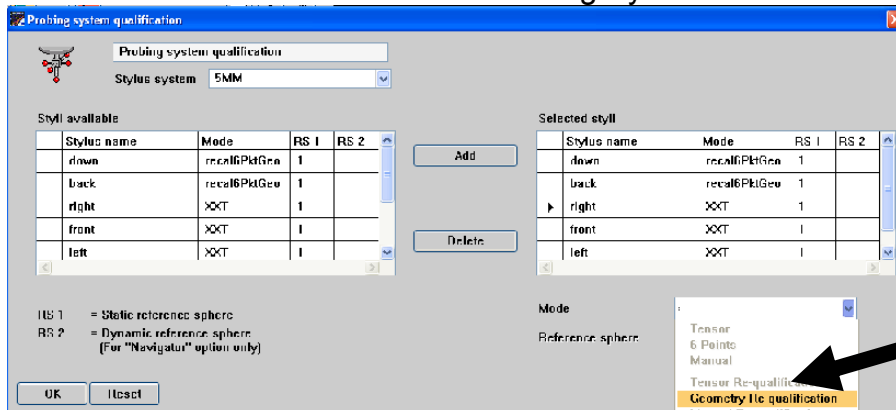
7.	If you would like to qualify two or more stylus systems in this same program, simply repeat steps 2 – 6 for each stylus system you would like to qualify. Each "Probing system qualification" characteristic should have a different stylus system selected under the "Stylus System" drop down menu.
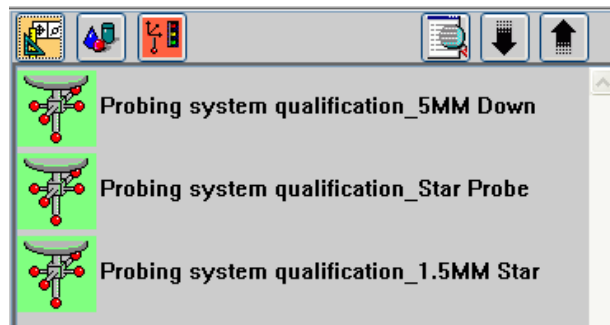

8.	Once you have all the "Probing system qualification" characteristics necessary, open the "Stylus System" window by clicking the stylus icon in the "Prerequisites List.
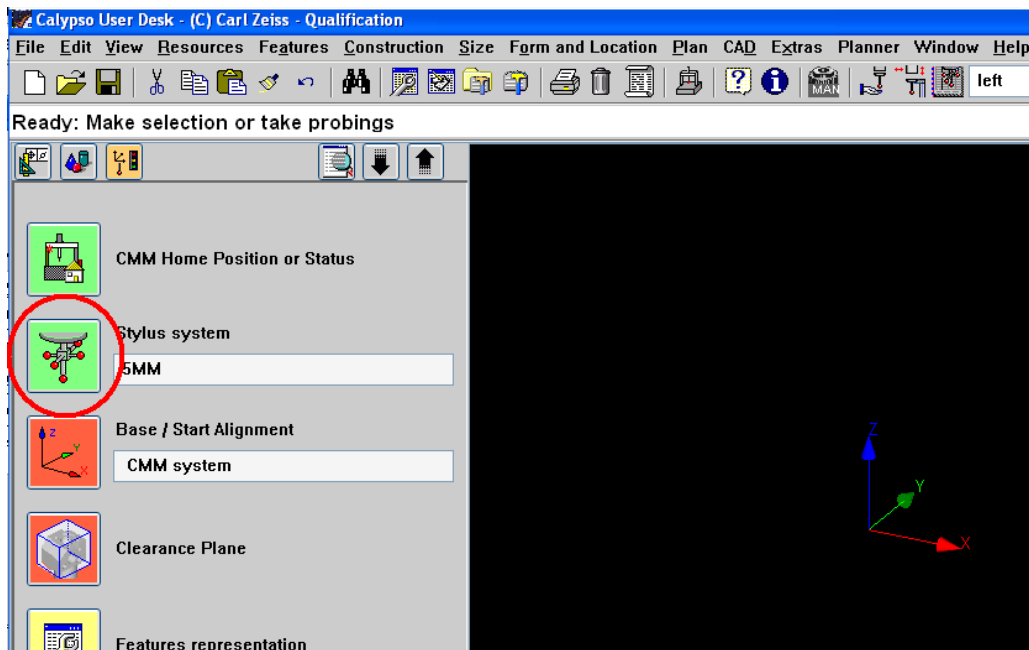
9.	Perform a CNC or Manual Stylus System Change to your Master Probe in order to locate your reference sphere, as detailed in SECTION 1.

10.	Once the reference sphere has been located, close the "Stylus System" window and run the program by clicking the "Run Measurement Plan" icon in the top toolbar.

Choose the options shown in the following picture in the "Start Measurement" window that appears. Most importantly, make sure "Current Alignment" and "Use Position Points Only" are selected.
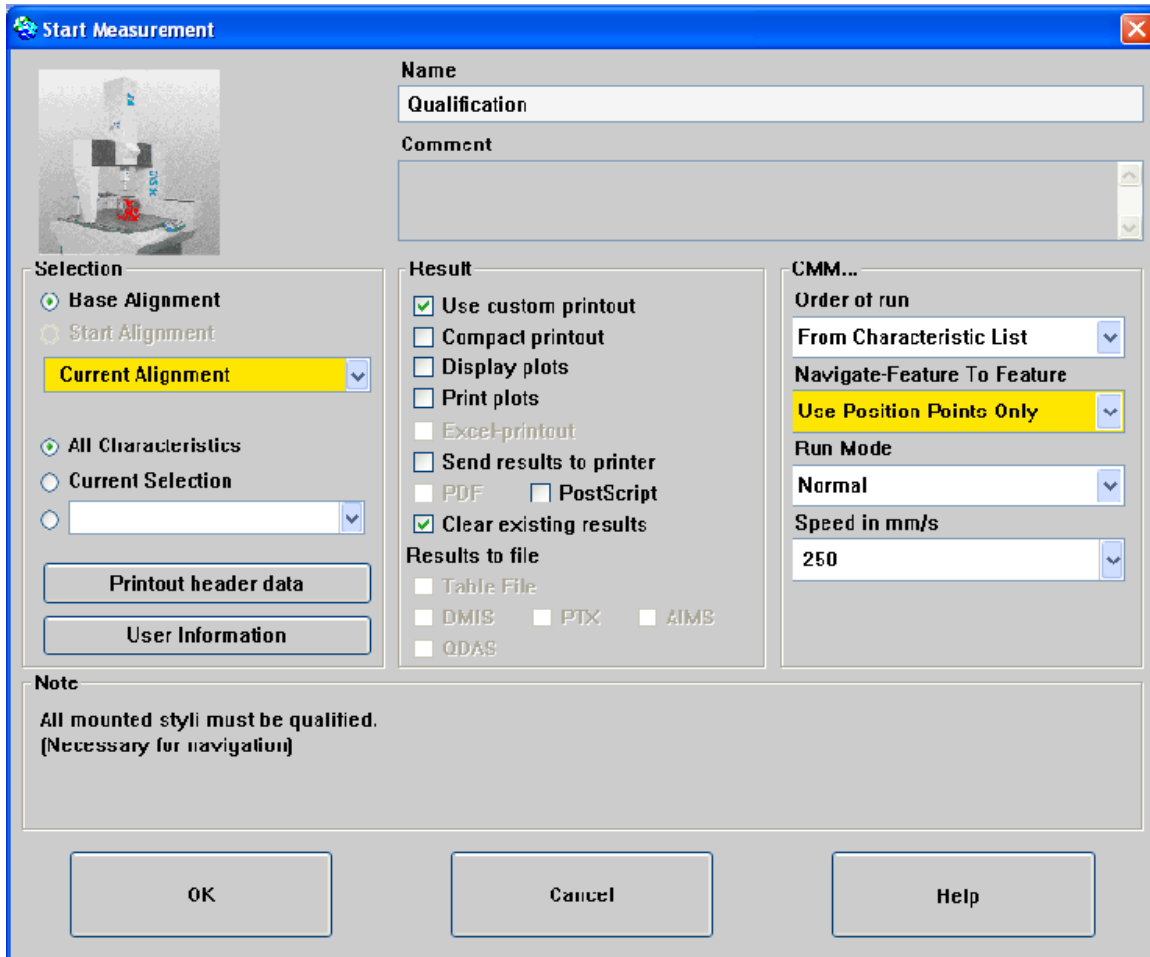
Click the "OK" button. Your first stylus system should load and begin qualifying. If you chose to qualify more than one stylus system, the second should load and begin qualifying once the first is finished.