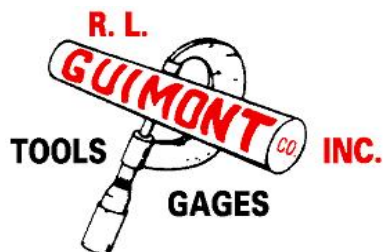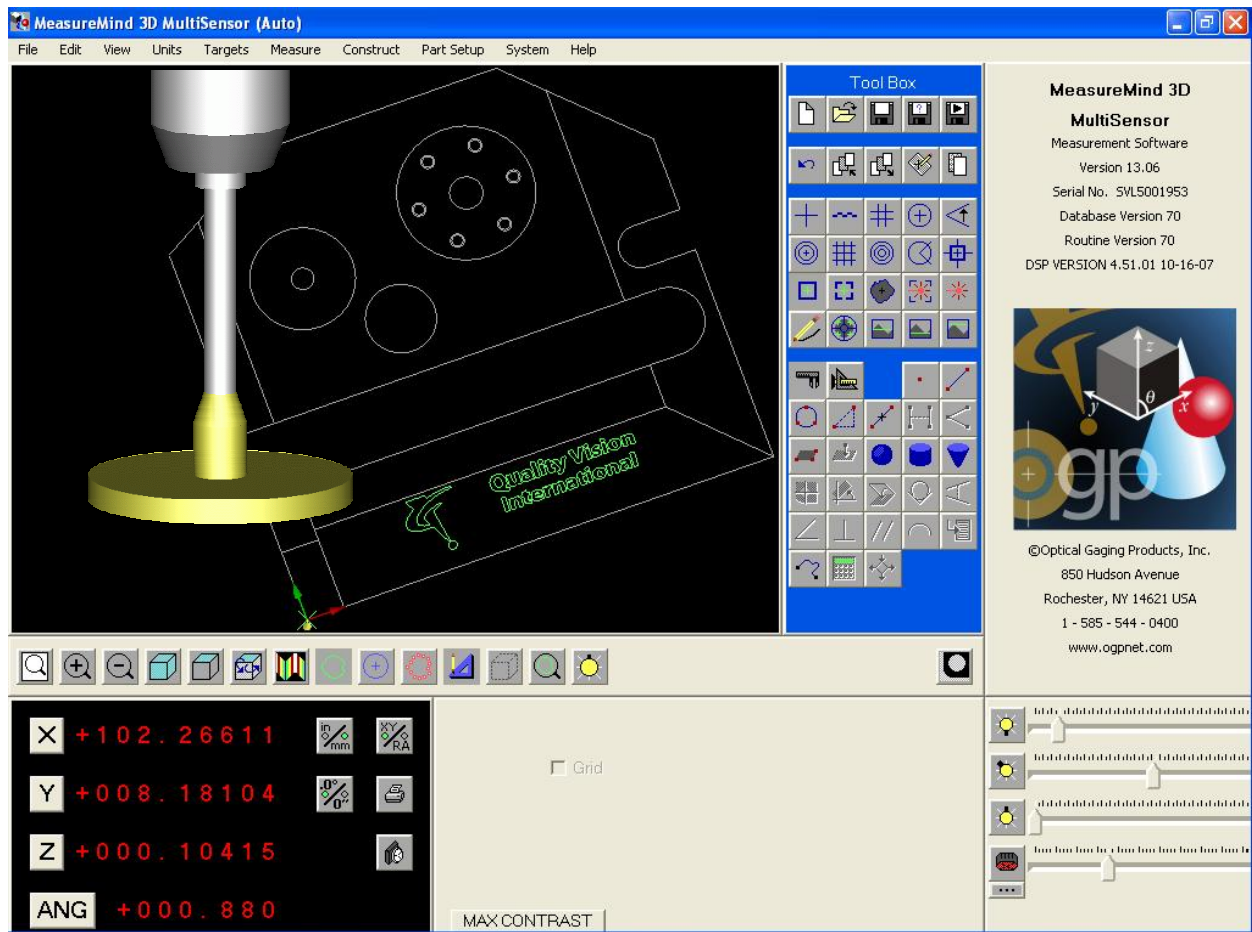# MeasureMind 3D MultiSensor Disc Probe Setup and Calibration Guide

R.L. Guimont Co., Inc.
9071 Technology Drive
Fishers, IN 46038
800.444.3237
sales@rlguimont.com
www.rlguimont.com

MeasureMind 3D Disc Probe Guide

1 Introduction

1.1 Overview

MeasureMind does not support Disc probes as a standard feature in the software. There is a work around that involves manually adjusting the values of the Disc stylus. This is done by measuring the reference sphere with the Primary tip and then measuring the reference sphere with the Disc stylus and editing the Disc data. This is repeated until the 2 probes measure the reference sphere the same. The *trick* is that we first have to configure and calibrate a 'dummy' probe that we will use to enter the Disc data. The *catches* are that MeasureMind 3D won't recognize the changes to the probe file until the software is restarted and we must work in Inches. These instructions assume that you are familiar with using MeasureMind 3D including use of the the touch probe.

1.2 Related Documents

- MeasureMind 3D MultiSensor Reference Guide (P/N 790321)
- Touch Probe Users Guide (P/N 790380)

1.3 Documentation Conventions

Type Style; Symbol	Used for	Examples
Arrow (→)	• Selections from a main menu and submenu(s)	• Select **System → Configuration → Probe Tips...**
Bold	• Commands to be typed • Keys to be pressed • Menu items to be selected • Buttons to be pressed or selected • Emphasized words	• type **DIA5-DIA3** • Click **OK** • do **not** check the box
italics	• Nominals and Reported values	• enter the *Diameter*, *X*, *Y*, *and Z* values
`Courier New`	• Parameter Names	• `Orientation1Tip1TipDiameter`
Blue text	• Program Steps	• (Program Step 5)

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2 Configure the 'dummy' probe
2.1 Select **System → Configuration → Probe Tips...**
2.2 Select **Create New Stylus**. Give the probe the name you want to have for the Disc probe.
2.3 Enter the same information as the Primary probe.

3 Calibrate the Probes

3.1 If necessary, perform a Probe to Optics calibration.

3.2 Select **System → Calibration → Auxiliary Tips** and follow the instructions.

    3.2.1 After the Primary probe has been calibrated, record the *X, Y, Z and Diameter* of the reference sphere.
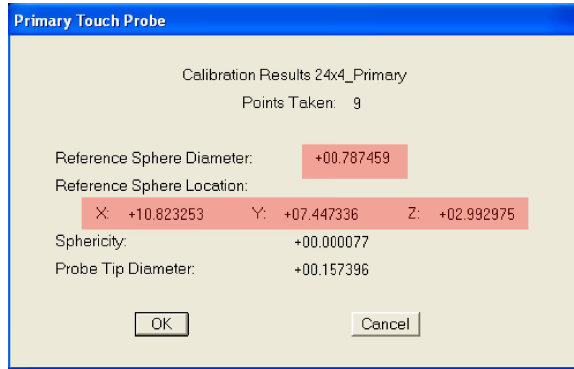
3.2.2 Click **OK**, then select the Disc probe to calibrate.

3.2.3 When prompted to remove the Primary and attach the Disc probe, **leave the Primary probe in the head** and just click **OK** to the messages.

3.2.4 Continue with the calibration.

3.2.5 When the calibration is complete, probe a point on top of a flat surface, then zero the **Z** readout in the DRO window.
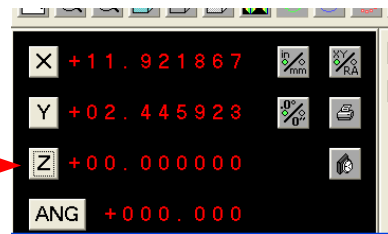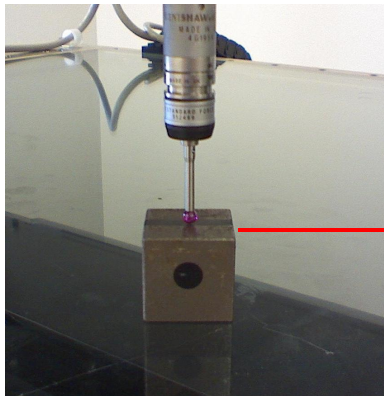
3.2.6 Manually remove the Primary probe from the TP-20 then insert the Disc probe.

3.2.7 Take a probing on the same block. Record the *Z-value* from the DRO window.
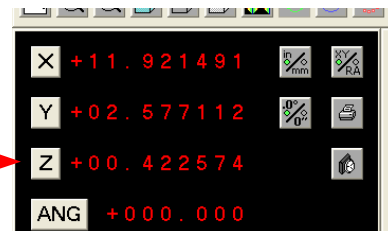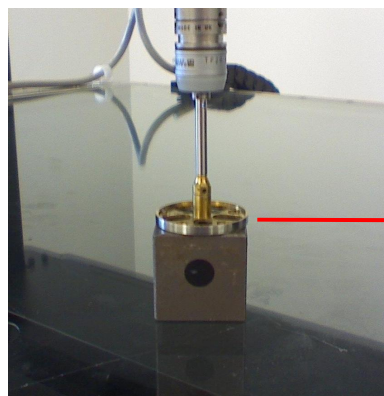
3.2.8 Measure and record the *Diameter* of the Disc with a set of calipers or a ruler.

3.2.9 Measure and record the *Thickness* of the Disc with a set of calipers or a ruler.

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4 Initial Disc Probe Edit
4.1 Exit MeasureMind.

4.2 Open the file C:\OGPMM\Config\styli.ini in Notepad.

4.3 Under the section with the name of your Disc probe, edit the following parameters (see Appendix B1):

4.3.1 `Orientation1Tip1XOffset=0.00000001`

4.3.2 `Orientation1Tip1YOffset=0.00000001`

4.3.3 `Orientation1Tip1ZOffset=` *Z-offset*

4.3.3.1 Divide the thickness of the Disc (step 3.2.9) by 2

4.3.3.2 Add the *Z-value* from the DRO window (step 3.2.7). This is the rough *Z-offset* between the two probes.

4.3.4 `Orientation1Tip1TipDiameter=` Diameter of Disc (step 3.2.8)

4.3.5 Save and close the file.

5 Create the Disc Probe Calibration Program (see Appendix A)
5.1 Start MeasureMind. Make sure the system is in Inches with 6 decimal places of resolution.

5.2 Load the Primary probe.

5.3 Construct a **Point** (Program Step 1). Under the **Nominals**, enter the *X, Y, and Z* values recorded in step 3.2.1.

5.4 Add a **Datum Origin** step and set the Point to the X,Y, and Z origin. (Program Step 2)

5.5 Measure the reference sphere as a **Sphere** (Program Step 3).

5.5.1 Under the **Nominals**, set the *X, Y, and Z* values to zero and enter the Diameter recorded in step 3.2.1.

5.5.2 Select **AutoPath** and under advanced make sure there are at least 9 points.

5.6 Add a **Datum Origin** step and set the sphere to the X,Y, and Z origin. (Program Step 4)

5.7 Measure a **Circle** at the equator of the reference sphere. (Program Step 5)

5.7.1 Under the **Nominals**, enter the *Diameter* of the reference sphere and set the *X, Y, and Z* nominals to zero.

5.7.2 Select **AutoPath** and under advanced make sure there are 8 points.

5.8 Add a **Datum Origin** step and set the circle to the X,Y, and Z origin. (Program Step 6)

5.9 Load the Disc probe.

5.10 Measure a **Circle** at the equator of the reference sphere. (Program Step 7)

5.10.1 Under the **Nominals**, enter the *Diameter* of the reference sphere and set the *X, Y, and Z* nominals to zero.

5.10.2 Select **AutoPath** and under advanced make sure there are 8 points.

5.10.3 Print the *X, Y, and Z values.*

5.11 Add a **Math** step to the program. (Program Step 8)

5.11.1 In the expression box type **DIA5-DIA3**. This will give you the deviation of the the measured diameters between the 2 probes.

5.11.2 Print the *result.*

5.12 Save the program (i.e. Disc_probe_calibration.rtn)

6 Run the program and print or save the results

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7   Edit the Disc Probe Data
   7.1   Exit MeasureMind
   7.2   Open the file C:\OGPMM\Config\styli.ini in Notepad.
   7.3   Under the section with the name of your Disc probe edit the following:
       7.3.1   `Orientation1Tip1XOffset`: Subtract the X-value reported in the program from the value listed.
       7.3.2   `Orientation1Tip1YOffset`: Subtract the Y-value reported in the program from the value listed.
       7.3.3   `Orientation1Tip1TipDiameter`:   Add the math step result reported in the program to the value listed.
       7.3.4   Save and close the file.

8   Verify the Disc Probe
   8.1   Re-start MeasureMind.
   8.2   **Open** and **Run** the program.
   8.3   Repeat steps 6 and 7 until the values are as close to zero as possible.

   Note: Once the values are within ±0.0001″ you will eventually hit a point when the deviations reported are machine noise. Over time you will figure out just how close you can get to zero with your particular machine.

9   Future Re-calibration
   To run the program in the future, all you will have to do is edit the X,Y, and Z nominal in step 1 to match the coordinates of the reference sphere if it has been moved to a different location on the stage.

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Appendix A: Sample Program Listing

```
Disc_probe_calibration.RTN
===============================================================================
Header:
-------------------------------------------------------------------------------
Setup:
Run from machine home
Edit the XYZ nominals in step #1 to match the location of the reference sphere
    on the stage relative to machine home
===============================================================================
Step:  1          Inch       Cart      Decimal Degree     Construct
Comment:
Constructed point @ Reference Sphere Location
 Point                      Actual      Nominal     Upper Tol.  Lower Tol.
        X Location        +13.552537   +13.552537   +0.000000   +0.000000
        Y Location        +08.378174   +08.378174   +0.000000   +0.000000
        Z Location        +03.492066   +03.492066   +0.000000   +0.000000
        True Position     +00.000000                +0.000000    RFS
 Hide Step: No     Skip Step: No
-------------------------------------------------------------------------------
Step:  2          Inch       Cart      Decimal Degree     Construct
 Datum Origin               Actual      Nominal     Upper Tol.  Lower Tol.
        Zero X Axis
        Zero Y Axis
        Zero Z Axis
        At Actual
Features:     1
Reference Feature(s):       1
Data Stream: No
 Hide Step: No     Skip Step: No
-------------------------------------------------------------------------------
Step:  3          Inch       Cart      Decimal Degree     Measure
 Sphere                     Actual      Nominal     Upper Tol.  Lower Tol.
        Sphere Diameter   +00.787403   +00.787459   +0.000000   +0.000000
        X Location        +00.000486   +00.000000   +0.000000   +0.000000
        Y Location        +00.000312   +00.000000   +0.000000   +0.000000
        Z Location        -00.000009   +00.000000   +0.000000   +0.000000
        Sphericity        +00.000080                +0.000000
        True Position     +00.001156                +0.000000    RFS
 Hide Step: No     Skip Step: No
 Touch Probe      DSM : 24x4_Primary  Tip # 1
Points:    42     Data Stream: No
-------------------------------------------------------------------------------
Step:  4          Inch       Cart      Decimal Degree     Construct
 Datum Origin               Actual      Nominal     Upper Tol.  Lower Tol.
        Zero X Axis
        Zero Y Axis
        Zero Z Axis
        At Actual
Features:     1
Reference Feature(s):       3
Data Stream: No
 Hide Step: No     Skip Step: No
-------------------------------------------------------------------------------
Step:  5          Inch       Cart      Decimal Degree     Measure
 Circle                     Actual      Nominal     Upper Tol.  Lower Tol.
        Diameter          +00.787475   +00.787476   +0.000000   +0.000000
        X Location        +00.000000   +00.000000   +0.000000   +0.000000
        Y Location        +00.000036   +00.000000   +0.000000   +0.000000
        Z Location        -00.000000   +00.000000   +0.000000   +0.000000
        XY Angle          -008.19947   +000.00000   +00.00000   +00.00000
        Elevation         +089.99460   +090.00000   +00.00000   +00.00000
        3D Circularity    +00.000103                +0.000000
        True Position     +00.000072                +0.000000    RFS
 Hide Step: No     Skip Step: No
 Touch Probe      DSM : 24x4_Primary  Tip # 1
Points:    25     Data Stream: No
-------------------------------------------------------------------------------
```

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```
--------------------------------------------------------------------------------
Step:  6           Inch       Cart      Decimal Degree    Construct
 Datum Origin                 Actual     Nominal     Upper Tol.  Lower Tol.
      Zero X Axis
      Zero Y Axis

Features:     1
Reference Feature(s):        5
Data Stream: No
 Hide Step: No     Skip Step: No
--------------------------------------------------------------------------------
Step:  7           Inch       Cart      Decimal Degree     Measure
 Circle                       Actual     Nominal     Upper Tol.  Lower Tol.
      Diameter          +00.787670   +00.787476   +0.000000   +0.000000
 p    X Location        -00.003187   +00.000000   +0.000000   +0.000000
 p    Y Location        -00.000457   +00.000000   +0.000000   +0.000000
      Z Location        +00.000005   +00.000000   +0.000000   +0.000000
      XY Angle          +022.43502   +000.00000   +00.00000   +00.00000
      Elevation         +089.99775   +090.00000   +00.00000   +00.00000
      3D Circularity    +00.000150                +0.000000
      True Position     +00.006438                +0.000000    RFS
 Hide Step: No     Skip Step: No
 Touch Probe       DSM : 25mm_Disc  Tip # 1
Points:    32     Data Stream: No
--------------------------------------------------------------------------------
Step:  8           Inch       Cart      Decimal Degree    Construct
 Math                         Actual     Nominal     Upper Tol.  Lower Tol.
 p    Result            +00.000195   +00.000000   +0.000000   +0.000000
Expression:
DIA7-DIA5
 Hide Step: No     Skip Step: No
--------------------------------------------------------------------------------
```

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Appendix B1: Sample styli.ini file after initial edit

```
###############################################################################################
#STYLUS CONFIGURATION PARAMETERS
#
# Type
#                   0 - TP_2, 1 - TP_6, 2 - TP_20, 3 - TP_200, 4 - SH25_1, 5 - SH25_2, 6 - SH25_3, 7 - FPS
#
# DockWithModule
#                   0 - never dock with module, 1 - may dock with module
#        ApproachVelocity
#                   The velocity in In / Sec that the system should use during approach moves.
#
#        ApproachAcceleration
#                   The velocity in In / Sec that the system should use during approach moves.
#
###############################################################################################
[24x4_Primary]
Type=2
 NumTips=1
DockWithModule=0
ApproachVelocity=0.31496063
ApproachAcceleration=1.57480315
Tip1WorkingLength=0.94488189
Tip1TipDiameter=0.15081324
Tip1ApproachDistance=0.10000000
Tip1Azimuth=0.00000000
Tip1Elevation=-90.00000000
Tip1ScanSpeed=0.39370000
Tip1InnerDeflection=0.00787400
Tip1OuterDeflection=0.01968500
NumOrientations=1
Orientation1Azimuth=0.0
Orientation1Elevation=-90.0
Orientation1Tip1XOffset=0.00000002
Orientation1Tip1YOffset=0.00000001
Orientation1Tip1ZOffset=0.00000000
Orientation1Tip1TipDiameter=0.15081324
[25mm_Disc]   ←
Type=2
NumTips=1
DockWithModule=0
ApproachVelocity=0.31496063
ApproachAcceleration=1.57480315
Tip1WorkingLength=0.94488189
Tip1TipDiameter=0.15081530
Tip1ApproachDistance=0.10000000
Tip1Azimuth=0.00000000
Tip1Elevation=-90.00000000
Tip1ScanSpeed=0.39370000
Tip1InnerDeflection=0.00787400
Tip1OuterDeflection=0.01968500
NumOrientations=1
Orientation1Azimuth=0.0
Orientation1Elevation=-90.0
Orientation1Tip1XOffset=0.00000001      ⎫
Orientation1Tip1YOffset=0.00000001      ⎬  Lines to edit
Orientation1Tip1ZOffset=-0.47574000     ⎪
Orientation1Tip1TipDiameter=0.98250000  ⎭
CURRENTLY_DEPLOYED=1
ACTIVE_TIP=1
```

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Appendix B2: Sample styli.ini file after completed calibration

```
##################################################################################################
#STYLUS CONFIGURATION PARAMETERS
#
# Type
#                    0 - TP_2, 1 - TP_6, 2 - TP_20, 3 - TP_200, 4 - SH25_1, 5 - SH25_2, 6 - SH25_3, 7 - FPS
#
# DockWithModule
#                    0 - never dock with module, 1 - may dock with module
#        ApproachVelocity
#                    The velocity in In / Sec that the system should use during approach moves.
#
#        ApproachAcceleration
#                    The velocity in In / Sec that the system should use during approach moves.
#
##################################################################################################
[24x4_Primary]
Type=2
NumTips=1
DockWithModule=0
ApproachVelocity=0.31496063
ApproachAcceleration=1.57480315
Tip1WorkingLength=0.94488189
Tip1TipDiameter=0.15738132
Tip1ApproachDistance=0.10000000
Tip1Azimuth=0.00000000
Tip1Elevation=-90.00000000
Tip1ScanSpeed=0.39370000
Tip1InnerDeflection=0.00787400
Tip1OuterDeflection=0.01968500
NumOrientations=1
Orientation1Azimuth=0.0
Orientation1Elevation=-90.0
Orientation1Tip1XOffset=0.00000001
Orientation1Tip1YOffset=0.00000000
Orientation1Tip1ZOffset=0.00000000
Orientation1Tip1TipDiameter=0.15738132
[25mm_Disc]
Type=2
NumTips=1
DockWithModule=0
ApproachVelocity=0.31496063
ApproachAcceleration=1.57480315
Tip1WorkingLength=0.94488189
Tip1TipDiameter=0.15739973
Tip1ApproachDistance=0.10000000
Tip1Azimuth=0.00000000
Tip1Elevation=-90.00000000
Tip1ScanSpeed=0.39370000
Tip1InnerDeflection=0.00787400
Tip1OuterDeflection=0.01968500
NumOrientations=1
Orientation1Azimuth=0.0
Orientation1Elevation=-90.0
Orientation1Tip1XOffset=-0.01924200
Orientation1Tip1YOffset=-0.00657100
Orientation1Tip1ZOffset=-0.47574000
Orientation1Tip1TipDiameter=0.98417400
```

Lines to edit