VMS

FAST START GUIDE

This document was produced by the Marketing Communications Department of Quality Vision International, Inc. 850 Hudson Ave., Rochester, New York 14621-4896 USA. Telephone: 585-544-0450. FAX: 585-544-0131. E-mail: webmaster@qvii.com.

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Section 1

Introduction

This *Fast Start Guide* explains how to create and use VMS measurement programs. It explains:

- User interface design and available software tools
- How to get started using the VMS software, how to set up a part, how to measure and construct features, how to create and run a program, and how to output measurements

This guide is meant to be a quick overview. It is not a substitute for more detailed documentation such as the *VMS Reference Guide* (P/N 790411) and the *VMS on-line Help*, or for VMS training.

Related QVI Documentation

- *VMS Reference Guide* (P/N 790411)

If You Need Help

For help, contact your local authorized Sales or Service Representative.

Documentation Conventions

This guide uses consistent visual cues and standard text formats to help you locate, interpret, enter, or select information easily.

Type Style or Symbol	Used for	Examples and Explanations
Bold or *italic*	• Emphasized words	• Do **not** repeat this step • Select the *highest* magnification
Bold	• Commands to be typed • Keys to be pressed • Buttons to be pressed • Menu item to be selected	• Type **Exit** • Press **Enter** • Press **OK** • Select **Copy**
/	• Selections from a menu	• Select **Setup / Options / Measurement**
Initial caps	• Proper nouns • Product names • Sections; Figures	• Use the Measure function • Windows™ • See Section 3
ALL CAPS	• Acronyms • File names	• ACSCII; QVI; VMS • Save the program as FASTSTART.VOY

Section 2

More information in VMS Reference Guide, Section 2

User Interface

Joystick

To Move...	Do this...
Along the X axis	Move the joystick lever right (positive X) and left (negative X)
Along the Y axis	Move the joystick lever forward (positive Y) and backward (negative Y)
Along the Z axis	Rotate the knob on top of the joystick CCW to raise (positive Z) the optics and CW to lower (negative Z) the optics

Keyboard

- Press F1 to view the on-line Help.
- Press Tab to move from field-to-field within a dialog box or window.

Note: See Section 2 in the *VMS Reference Guide* (P/N 790411) for a detailed description of the VMS software shortcut keys.

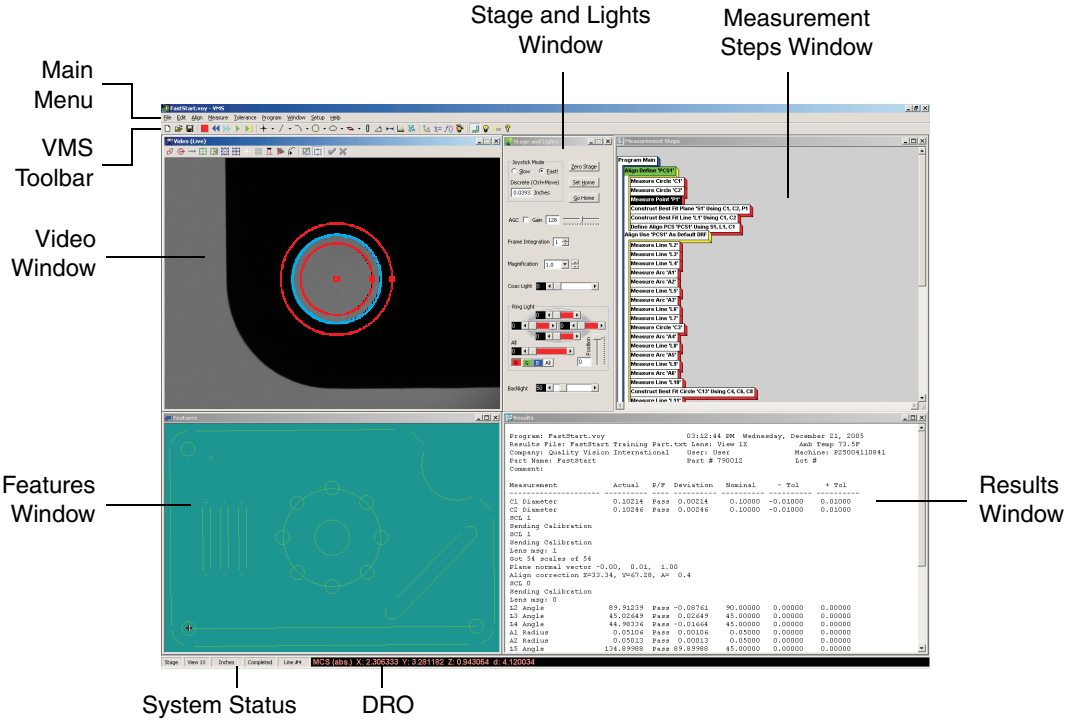
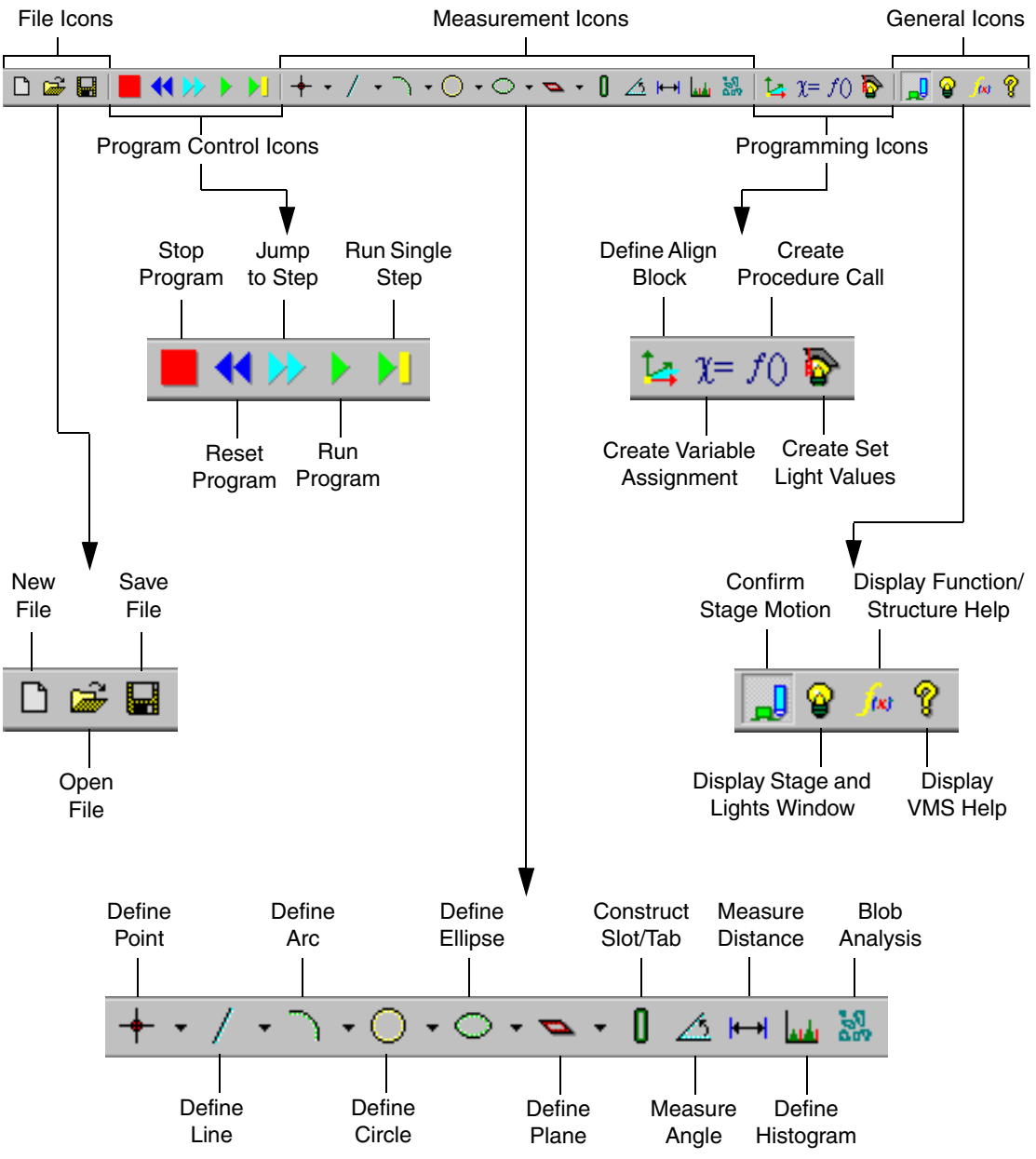


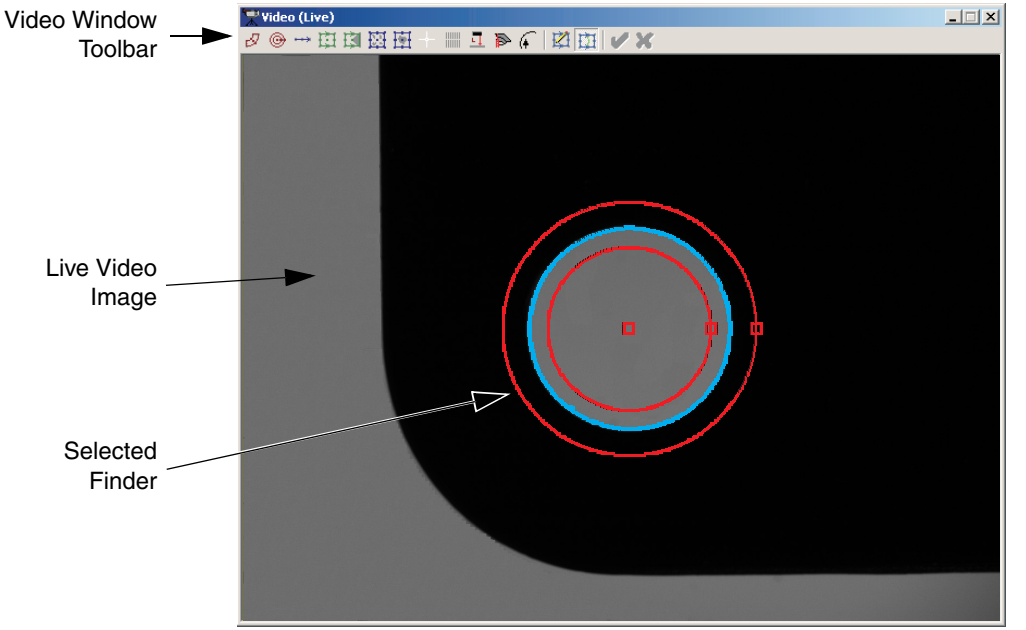
Figure 2-1: Default VMS Screen Layout

VMS Toolbar

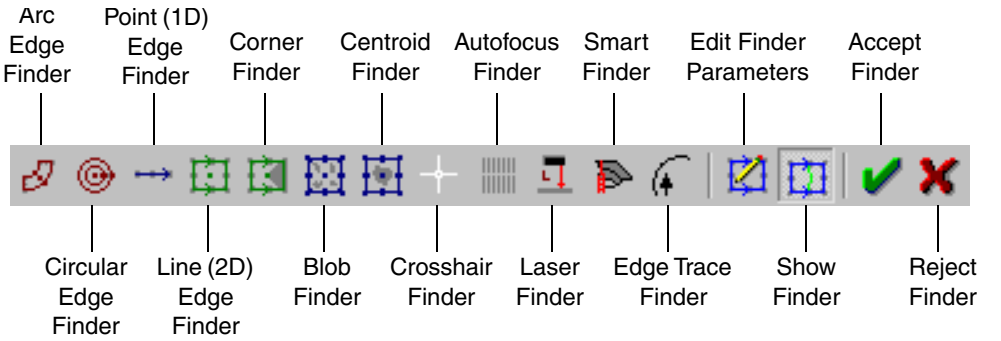

File Icons
Measurement Icons
General Icons
Program Control Icons
Programming Icons
Stop Program
Jump to Step
Run Single Step
Reset Program
Run Program
Define Align Block
Create Procedure Call
Create Variable Assignment
Create Set Light Values
New File
Save File
Open File
Confirm Stage Motion
Display Function/ Structure Help
Display Stage and Lights Window
Display VMS Help
Define Point
Define Arc
Define Ellipse
Construct Slot/Tab
Measure Distance
Blob Analysis
Define Line
Define Circle
Define Plane
Measure Angle
Define Histogram

Video Window

The Video window shows the live video image.



Video Window Toolbar



Features Window

The Features window shows all the measured and constructed features.

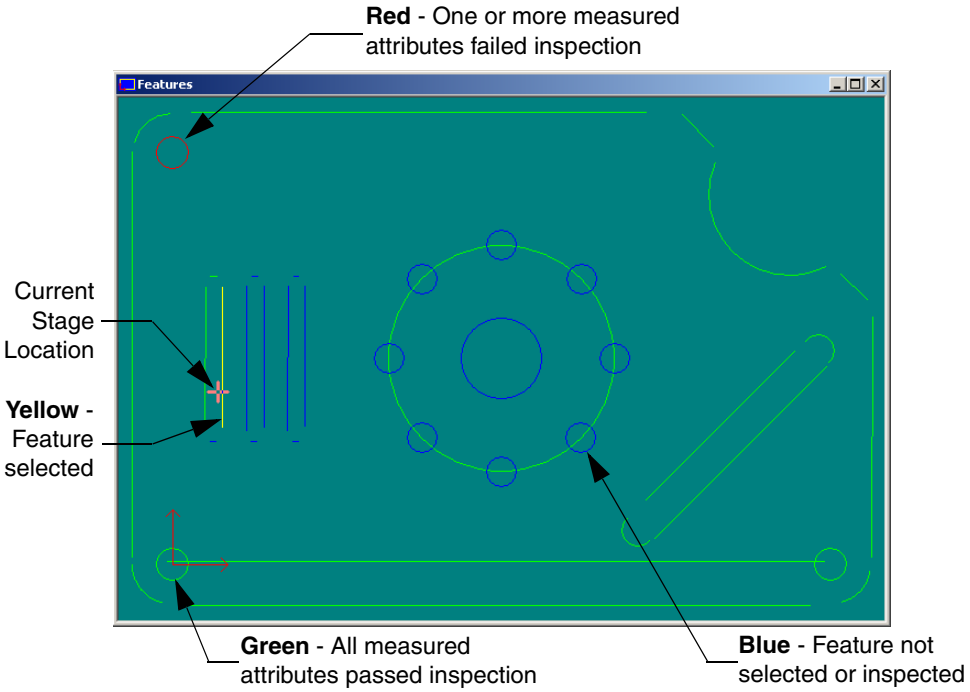


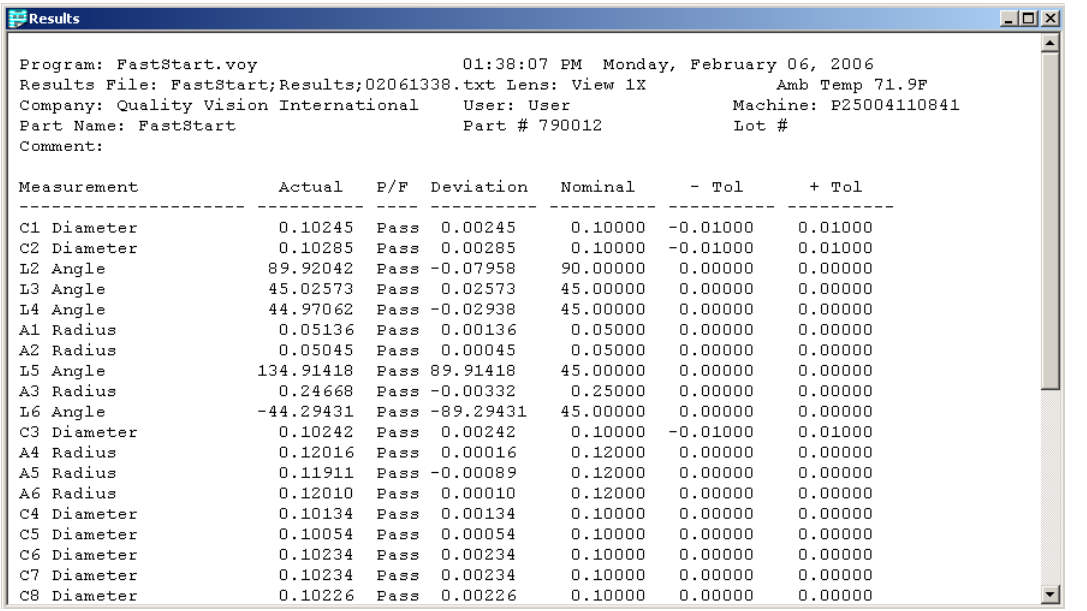
Figure 2-2: Color Conventions in the Features Window

Right-click in the Features window to display a context menu and select:

- **Stage View** to display a graphical representation of the stage
- **Part View** (shown above) to display a graphical representation of the part being measured
- **Set Zoom Factor** to specify the magnification factor
- **Set Mouse Z** to set the Z coordinate that is used when you move the stage using the mouse in the Features window
- **Inverse Zoom** to change the appearance of the zoom box
- **Select All Features** to select all of the features displayed in the Features window
- **Delete Selected Features** to delete all of the selected features
- **Print Part** to print a drawing of the Features window in Part View
- **Auto-build steps for Features** to insert a measurement step into the measurement program for each selected feature

Results Window

The Results window displays measurement results and other related messages, such as information from general output steps in the program.



Right-click in the Results window to display a context menu and select:

- **Copy** to copy the selected text
- **Clear** to delete all of the displayed text
- **Select All** to select all of the displayed text

Measurement Steps Window

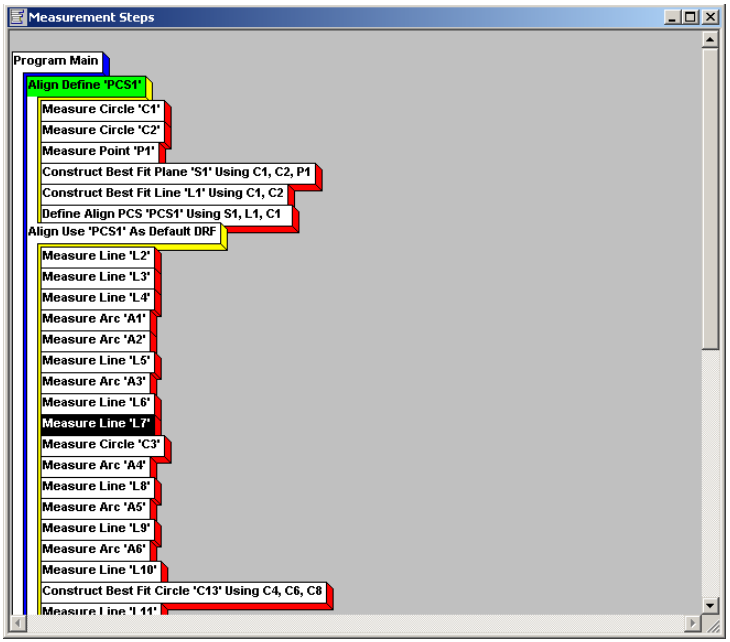
The Measurement Steps window shows all of the steps in the program in the order in which the system will perform the steps to measure a part.

The steps can be displayed as text, as 3D blocks, or in a tree-view—to change the view, right-click in the window and select the desired view from the context menu.

When displayed as 3D blocks (as shown below), the steps have the following characteristics:

- Steps appear stacked
- Colors and stacking appearance show different levels in the program, indicating which steps of the program are contained in or controlled by other steps of the program
- Each block includes a brief description of the step
- The colors on the top surface of the blocks change to indicate special conditions:
  - **Black with White text**—indicates that the step is selected
  - **Bright Green**—indicates the next step in the program when the program is paused
  - **Dark Green**—indicates that the selected step is the next step in the program
  - **Red with Black text**—indicates that the selected step is being edited

First step is the Main Program



DRO Window

Select **Window / View / Digital Readout** from the main menu to display the Digital Readout (DRO) window—displays the XYZ coordinates and the direct distance from zero (square root of the sum of squares of X, Y, and Z) of the center of the field-of-view.

Note: When you close the DRO window, the digital readout appears at the bottom of the screen (see Figure 2-1 on page 2-2).

The title bar of the DRO window displays the coordinate mode:

- **MCS (abs.)**—the coordinates are displayed in relation to the stage using the Machine Coordinate System (MCS) and in relation to an absolute coordinate system (abs.)
- **MCS (rel.)**—the coordinates are displayed in relation to the stage using the Machine Coordinate System (MCS) and in a coordinate system that is relative to a chosen point on the stage or part (rel.)
- **PCS (abs.)**—the coordinates are displayed in relation to the part using the Part Coordinate System (PCS) and in relation to an absolute coordinate system (abs.)
- **PCS (rel.)**—the coordinates are displayed in relation to the part using the Part Coordinate System (PCS) and in a coordinate system that is relative to a chosen point on the stage or part (rel.)

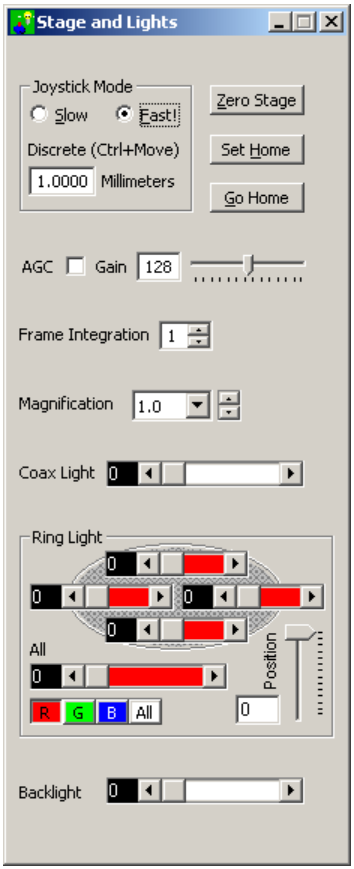
Right-click in the DRO window to display a context menu and select:

- **Zero DRO** to zero the digital readouts
- **Show MCS** to display the coordinates using the Machine Coordinate System (MCS)
- **Show PCS** to display the coordinates using the Part Coordinate System (PCS)

Stage and Lights Window

Click  in the VMS toolbar to display the Stage and Lights window. Controls include:

- **Zero Stage** to zero the stages
- **Slow** and **Fast!** radio buttons to set stage response to joystick deflection
- **Discrete** distance stage will move when holding down the **Ctrl** key while moving the joystick
- **Set Home** to set the home position
- **Go Home** to go to the home position
- **AGC** to turn on automatic gain control
- **Gain** to set programmable gain
- **Magnification** to change the magnification



To control illumination sources:

- **Coax Light** slider adjusts the intensity of the Coax Light (direct illumination)
- **Ring Light** sliders adjust the intensity of light in four quadrants
  - **All** slider adjusts all four quadrants equally
  - **R**, **G**, **B**, and **All** buttons produce Red, Green, Blue, and White light, respectively
  - **Position** slider adjusts the Z position of the PRL
- **Backlight** slider adjusts the intensity of the LED backlight

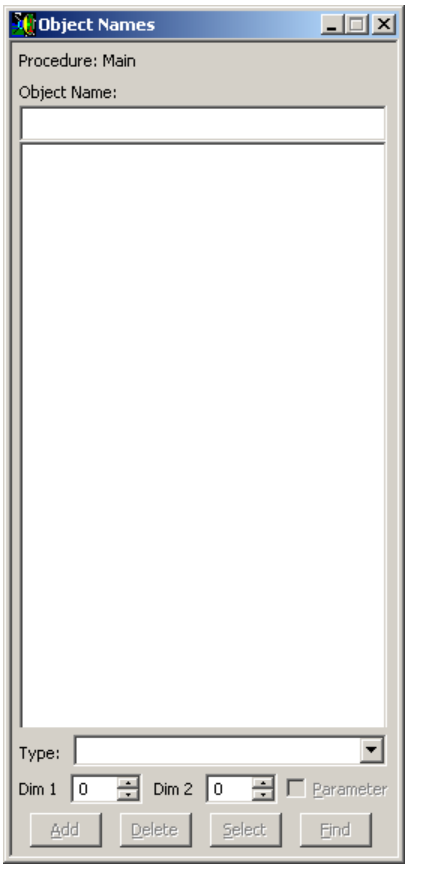
Note: The optimum light level varies depending on the part and the type of lighting used. When measuring features, try using different light levels.

Object Names Window

Select **Window / View / Object Names** from the main menu to display the Object Names window—display a list of all the features that have been measured or constructed.

Use the Object Names window to add features to a step by selecting the feature from the list and clicking **Select**.

Note: The Object Names window automatically appears when you select a construct function.



Section 3

Getting Started

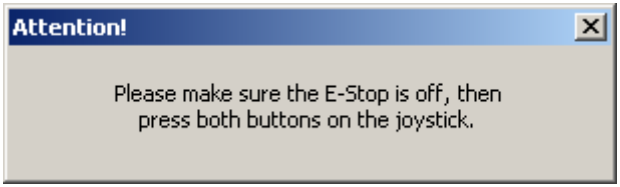
This section describes how to:

- Launch the software
- Zero the stage
- Select the units of measurement
- Stage a part
- Set the lower Z travel limit
- Access and use on-line Help

Launching the Software

1. Double-click  on the Windows Desktop.

   The following prompt appears:



2. Verify that the system is not in E-Stop mode and press both buttons on the joystick simultaneously.

Zeroing the Stage

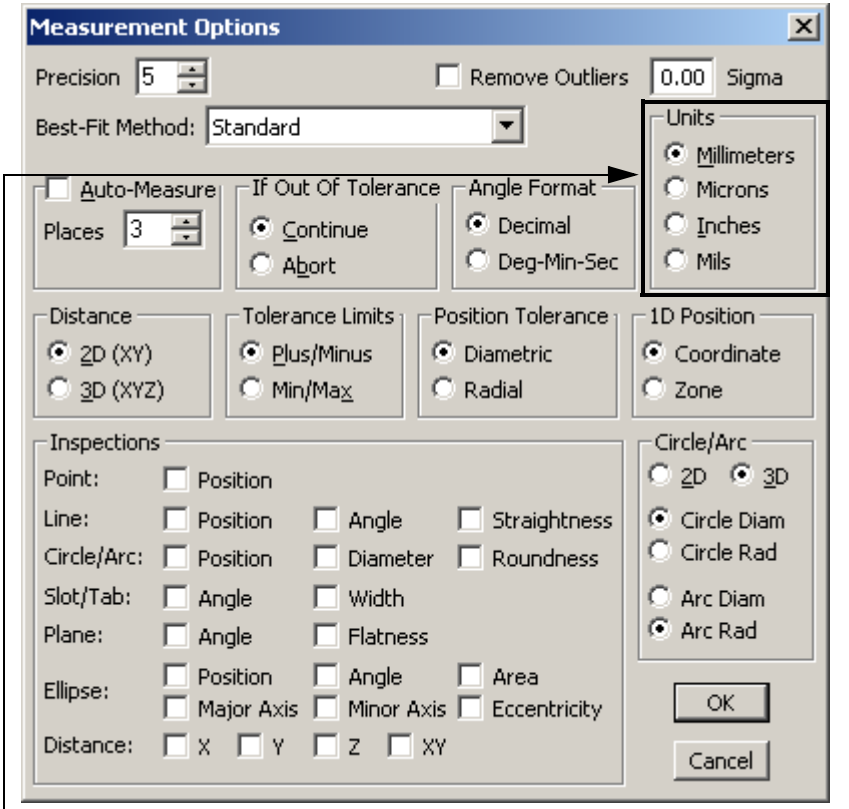
1. Verify that nothing is in the stage path.
2. In the Stage and Lights window, click **Zero Stage** to zero the stages.

   The system drives the X, Y, and Z axis stages to the home position.

Selecting the Units of Measurement

1. Select **Setup / Options / Measurement** from the main menu.

   The following dialog box appears:



2. In the **Units** section, select the desired units of measurement by clicking the appropriate radio button.

3. Click **OK** to save the changes and close the dialog box.

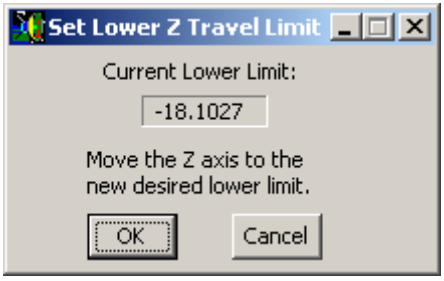
Staging a Part

1. Clean the stage glass.
2. Clear the stage of any obstructions.
3. Place the part on the stage so it is level (see warnings about stage load capacity and stage glass in the system hardware documentation).
4. Secure the part to the stage so it will not move when the stage moves.
5. Switch to Low Magnification to make it easier to locate features.
6. Turn on the appropriate light source in the Stage and Lights window (see *Stage and Lights Window* on page 2-9):
   - To view an edge, use backlight illumination
   - To view a surface, use coaxial light illumination
7. Use the joystick to move the stage so the desired edge or surface appears in the Video window.
8. Adjust the illumination as required.
9. Raise or lower the Z axis to focus the image.

Setting the Lower Z Travel Limit

1. Select **Setup / Z Limit** from the main menu.

   The following dialog box appears:



2. Use the joystick to raise or lower the Z axis to the desired lower limit position.
3. Click **OK** to set the lower limit and prevent Z from moving below the current point until the limit is changed.

Accessing and Using the Software On-Line Help

The VMS software on-line Help includes topics that describe the software functions, its use, and information for specific dialog boxes and windows.

To access the software on-line Help:

- Click  in the VMS toolbar
- Select **Help / Index** or **Help / Contents** (as applicable) from the main menu
- Press **F1** on the keyboard

Note: VMS follows the standard help design used in most Windows products.

To display a topic from the Contents List:

1. Click the **Contents** tab.

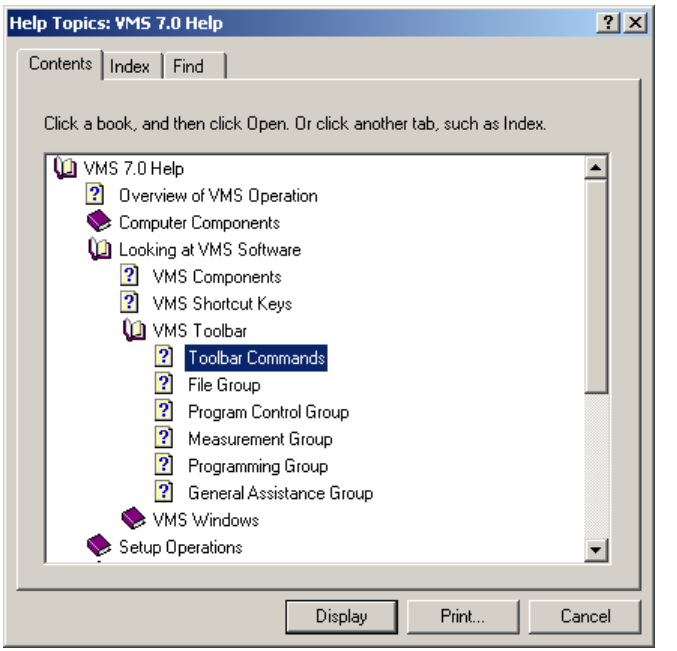
2. Double-click on the **VMS 7.0 Help** book to display a list of topic books.

3. Double-click on a topic book and repeat for other “books” until you see the desired book (for example, VMS Toolbar).

   The topic book opens and its subtopics are displayed.

4. Double-click on a topic (for example, Toolbar Commands) or select the topic and click **Display**.

   The topic is displayed as shown on the next page.



To display a topic from the Index List:

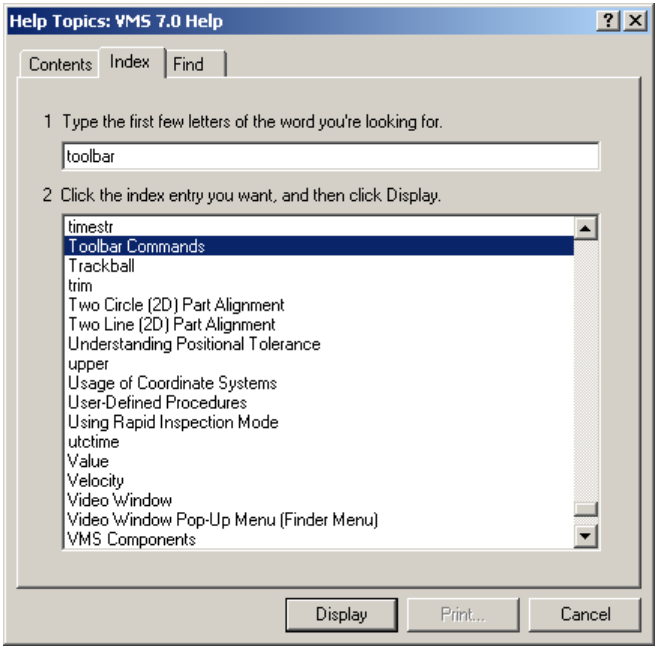
1. Click the **Index** tab.

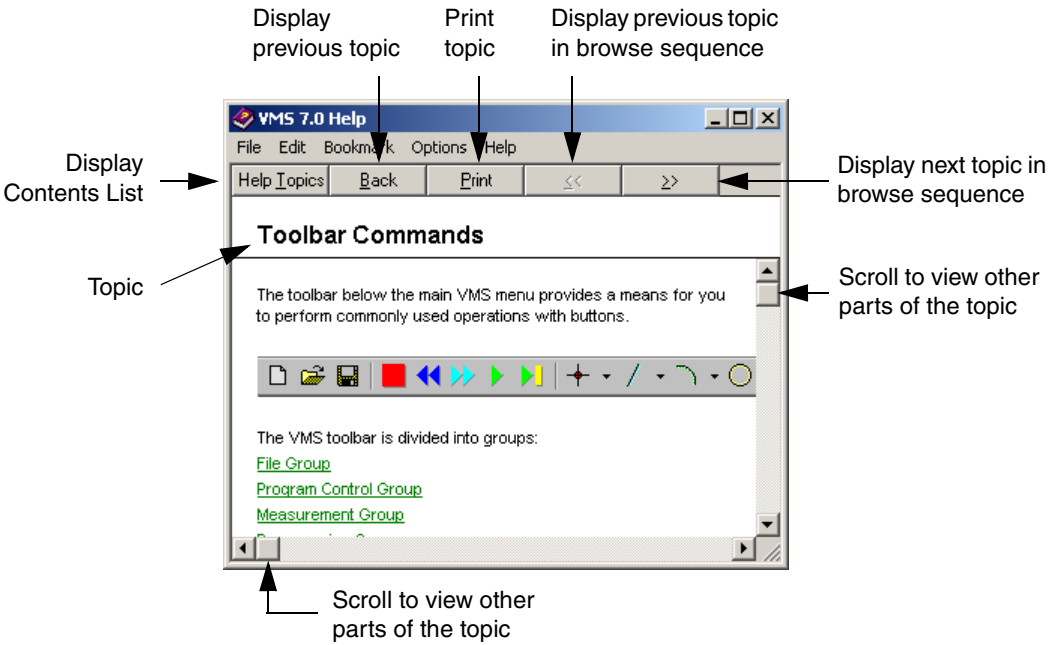
2. Type a search term (for example, “toolbar”).

   The software displays the topics that match the text.

3. Double-click on a topic (for example, Toolbar Commands) or select the topic and click **Display**.

   The topic is displayed as shown below.





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Section 4

More information in VMS Reference Guide, Section 7

Using Finders

This section describes the most-commonly used VMS finders—on-screen tools that collect data for measuring features on parts. You can rotate, resize, and move finders to define each specific feature.

Note: See Sections 6 and 7 for information about using finders to measure features.

Note: Only the most commonly used finders are described in this section. For additional information, see the *VMS Reference Guide* (P/N 790411) or the VMS on-line Help.

Types of Finders

Video window toolbar icon	Displays this Finder...	Description
	Arc Edge Finder	Defines all points on a radius
	Circular Edge Finder	Defines all points on a circle
	Point (1D) Edge Finder	Defines a single point
	Line (2D) Edge Finder	Defines points along a straight or slightly curved edge
	Crosshair Finder	Defines a single point on an edge
	Autofocus Finder	Finds the optimal focus point
	Smart Finder	Automatically selects the appropriate finder when you click on the edge of a feature

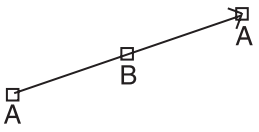
If a Finder Fails...

Cause	What to do
Stage glass is dirty	Clean the stage glass before staging a part
Part moved during a stage move	Secure the part to the stage so it will not move when the stage moves
Improper illumination	Increase or decrease the light level as required
Feature is out of focus	Focus the feature before running the finder
Finder does not match the feature	Manipulate the finder so it matches the curve and orientation of the feature— especially important when using the Arc Edge Finder
Finder is too close to the edge of the field-of-view	Reposition the feature and finder near the center of the Video window
Incorrect finder parameters	Change finder parameters as required

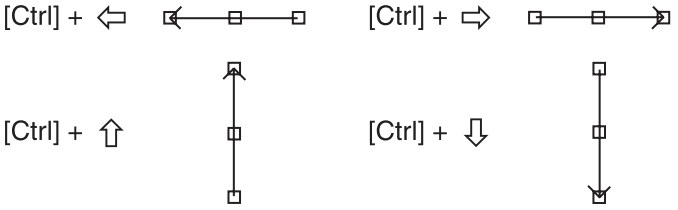
Using the Point (1D) Edge Finder

1. Position an edge in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  in the Video window toolbar.
4. Resize, rotate, and/or reposition the finder over the feature so the center handle is on the edge and the arrow points from light to dark.

To...	Do this....
Rotate the finder	Right-click on either outside handle (A) while dragging the mouse
Resize the finder	Click on either outside handle (A) while dragging the mouse
Move the finder	Click on center handle (B) while dragging the mouse



Tip: Use the [Ctrl] and arrow keys to quickly rotate the finder as shown:

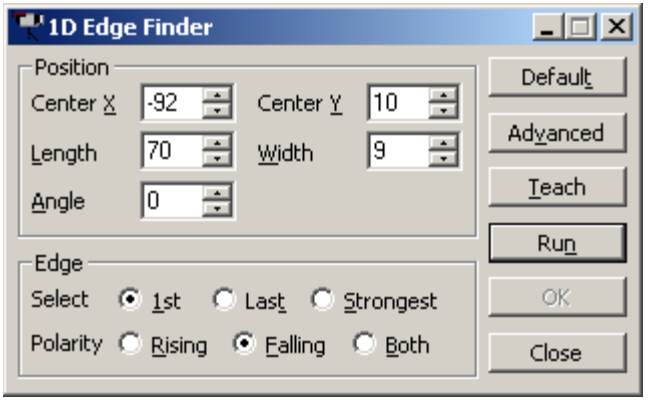


5. If necessary, change the desired Point (1D) Edge Finder parameters (described on the next page).
6. Double-click in the Video window to run the Point (1D) Edge Finder.

Point (1D) Edge Finder Parameters

Click  in the Video window toolbar to display parameters for the selected finder. If necessary, click the **Basic** button in the Point (1D) Edge Finder dialog box to display the following basic parameters:

- Position parameters:
  - **Center X** and **Center Y**—specifies the X and Y locations of the center handle in the finder
  - **Length**—specifies the size of the finder, perpendicular to the edge
  - **Width**—specifies the size of the finder, parallel to the edge
  - **Angle**—specifies the angle (in degrees) of rotation of the finder
- Edge parameters:
  - **Edge Select**—specifies what edge will be used during edge detection: the **1st** edge, the **Last** edge, or the **Strongest** edge
  - **Edge Polarity**—specifies the polarity of the edge used during edge detection: a **Rising** edge (dark-to-light), a **Falling** edge (light-to-dark), or **Both**

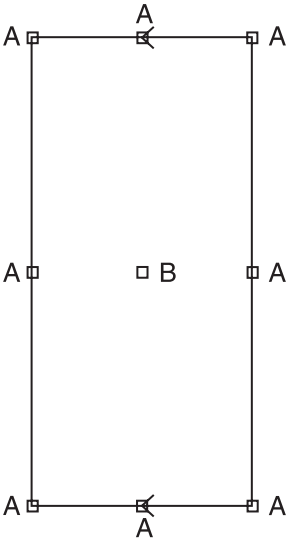


Note: Click the **Advanced** button to view additional Point (1D) Edge Finder parameters.

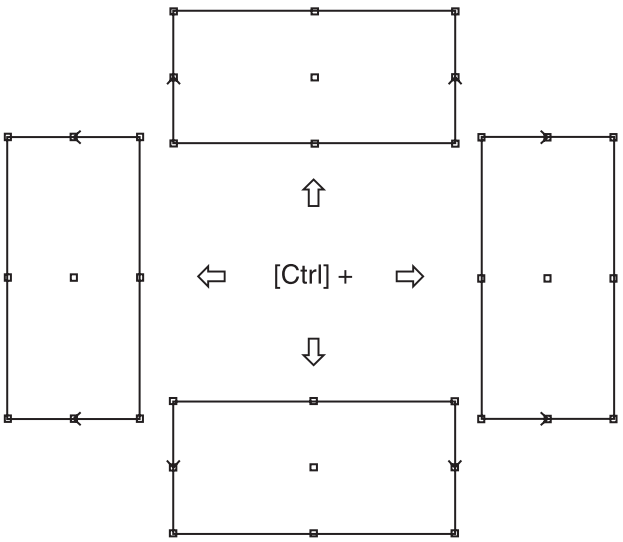
Using the Line (2D) Edge Finder

1. Position an edge in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  in the Video window toolbar.
4. Resize, rotate, and/or reposition the finder over the feature so the center handle is on the edge and the arrows point from light to dark.

To...	Do this....
Rotate the finder	Right-click on any outside handle (A) while dragging the mouse
Resize of the finder	Click on any outside handle (A) while dragging the mouse
Move the finder	Click on center handle (B) while dragging the mouse



Tip: Use the [Ctrl] and arrow keys to quickly rotate the finder as shown:

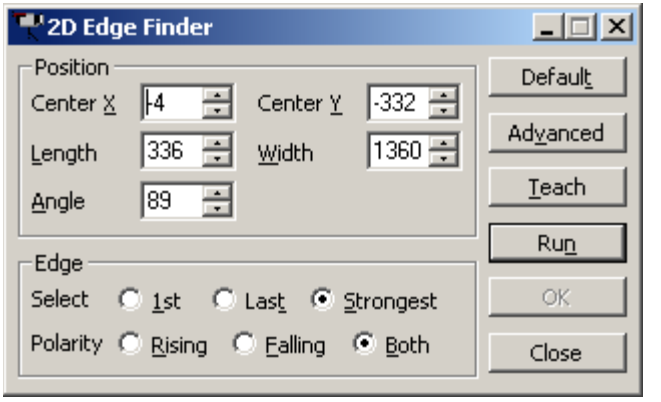


5. If necessary, change the desired Line (2D) Edge Finder parameters (described on the next page).
6. Double-click in the Video window to run the Line (2D) Edge Finder.

Line (2D) Edge Finder Parameters

Click  in the Video window toolbar to display parameters for the selected finder. If necessary, click the **Basic** button in the Line (2D) Edge Finder dialog box to display the following basic parameters:

- Position parameters:
  - **Center X** and **Center Y**—specifies the X and Y locations of the center handle in the finder
  - **Length**—specifies the size of the finder, perpendicular to the edge
  - **Width**—specifies the size of the finder, parallel to the edge
  - **Angle**—specifies the angle (in degrees) of rotation of the finder
- Edge parameters:
  - **Edge Select**—specifies what edge will be used during edge detection: the **1st** edge, the **Last** edge, or the **Strongest** edge
  - **Edge Polarity**—specifies the polarity of the edge used during edge detection: a **Rising** edge (dark-to-light), a **Falling** edge (light-to-dark), or **Both**

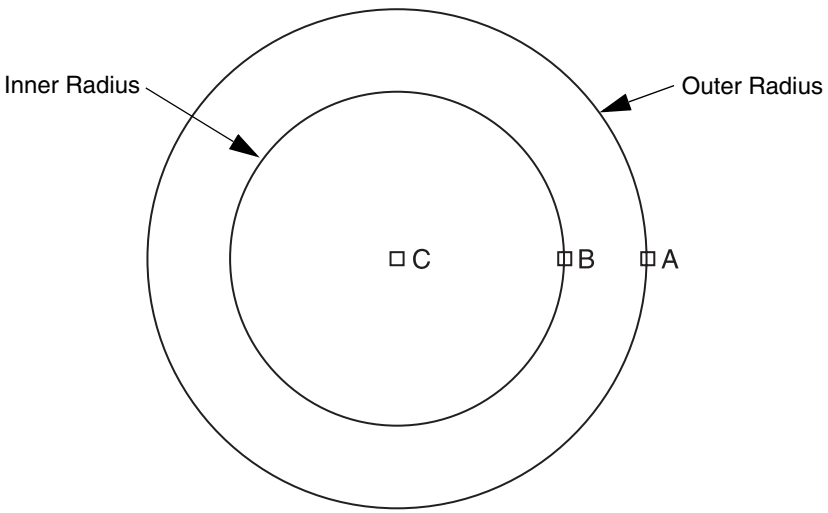


Note: Click the **Advanced** button to view additional Line (2D) Edge Finder parameters.

Using the Circular Edge Finder

1. Position a circular feature in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  in the Video window toolbar.
4. Position the inner circle of the finder inside the feature and the outer circle outside the feature; resize the finder if necessary.

To...	Do this....
Adjust radius of outer circle	Click on outer circle handle (A) while dragging the mouse
Adjust radius of inner circle	Click on inner circle handle (B) while dragging the mouse
Move the finder	Click on center handle (C) while dragging the mouse

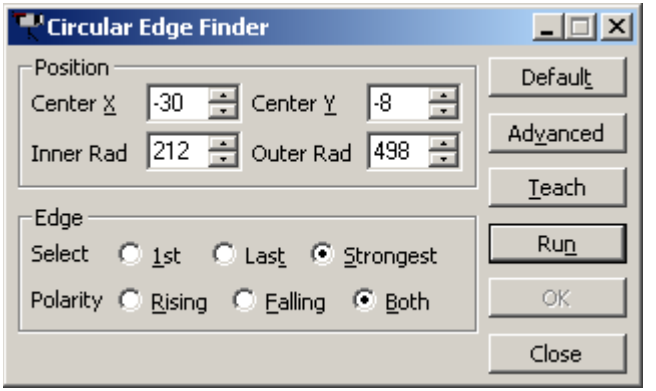


5. If necessary, change the desired Circular Edge Finder parameters (described on the next page).
6. Double-click in the Video window to run the Circular Edge Finder.

Circular Edge Finder Parameters

Click  in the Video window toolbar to display parameters for the selected finder. If necessary, click the **Basic** button in the Circular Edge Finder dialog box to display the following basic parameters:

- Position parameters:
  - **Center X** and **Center Y**—specifies the X and Y locations of the center handle in the finder
  - **Inner Rad** and **Outer Rad**—specifies the radius of the inner circle and radius of the outer circle
- Edge parameters:
  - **Edge Select**—specifies what edge will be used during edge detection: the **1st** edge, the **Last** edge, or the **Strongest** edge
  - **Edge Polarity**—specifies the polarity of the edge used during edge detection: a **Rising** edge (dark-to-light), a **Falling** edge (light-to-dark), or **Both**

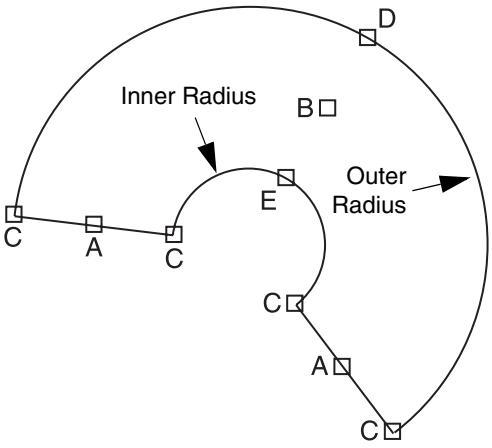


Note: Click the **Advanced** button to view additional Circular Edge Finder parameters.

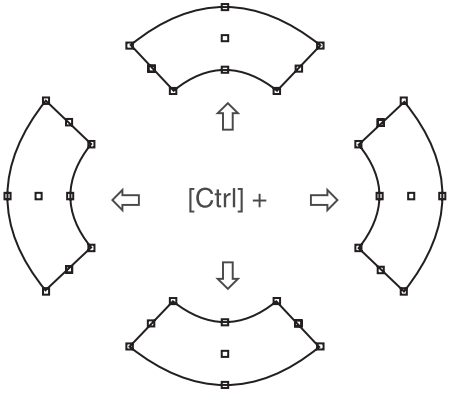
Using the Arc Edge Finder

1. Position an arc in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  in the Video window toolbar.
4. Resize, rotate, and/or reposition the Arc Edge Finder so it matches the curve of the feature you are measuring.

To...	Do this....
Rotate the finder	Right-click on either inside handle (A) or the center handle (B) while dragging the mouse
Adjust the radius of the finder	Right-click on any outside handle (C) while dragging the mouse
Move the finder	Click on center handle (B) while dragging the mouse
Resize the finder	Click on any outside handle (C) while dragging the mouse
Adjust outer radius only	Click on outer radius handle (D) while dragging the mouse
Adjust inner radius only	Click on inner radius handle (E) while dragging the mouse



Tip: Use the [Ctrl] and arrow keys to quickly rotate the finder as shown:

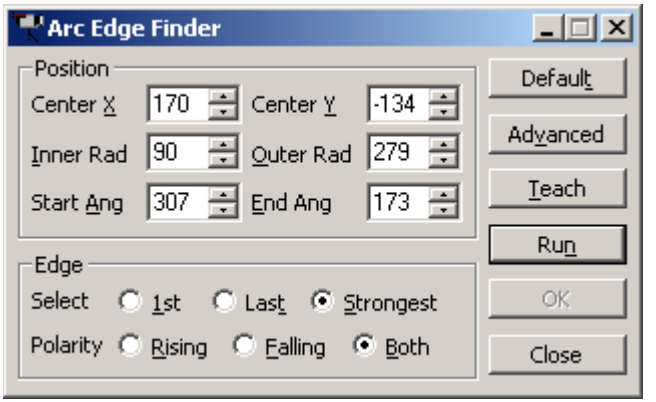


5. If necessary, change the desired Arc Edge Finder parameters (described on the next page).
6. Double-click in the Video window to run the Arc Edge Finder.

Arc Edge Finder Parameters

Click  in the Video window toolbar to display parameters for the selected finder. If necessary, click the **Basic** button in the Arc Edge Finder dialog box to display the following basic parameters:

- Position parameters:
  - **Center X** and **Center Y**—specifies the X and Y locations of the center handle in the finder
  - **Inner Rad** and **Outer Rad**—specifies the radius of the inner arc and radius of the outer arc
  - **Start Ang** and **End Ang**—specifies the angle of the Start and End Arc Finder edges, CCW from 0 degrees
- Edge parameters:
  - **Edge Select**—specifies which edge will be used during edge detection: the **1st** edge, the **Last** edge, or the **Strongest** edge
  - **Edge Polarity**—specifies the polarity of the edge used during edge detection: a **Rising** edge (dark-to-light), a **Falling** edge (light-to-dark), or **Both**



Note: Click the **Advanced** button to view additional Arc Edge Finder parameters.

Using the Crosshair Finder

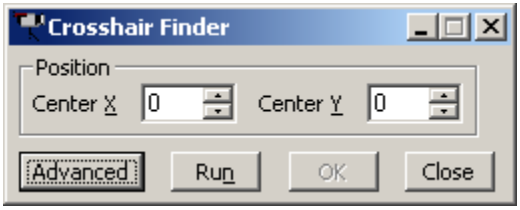
Note: The Crosshair Finder defines a single point on an edge without using video processing. With the Crosshair Finder, you can manually locate a point in the Video window or align edges.

1. Position an edge in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  in the Video window toolbar.
4. Click on the center of the finder and drag the mouse to reposition the finder.
5. If necessary, change the desired Crosshair Finder parameters (described below).
6. Double-click in the Video window to run the Crosshair Finder.

Crosshair Finder Parameters

Click  in the Video window toolbar to display parameters for the selected finder. If necessary, click the **Basic** button in the Crosshair Finder dialog box to display the following basic parameters:

- **Center X** and **Center Y**—specifies the X and Y Video window coordinates of the center of the finder



Note: Click the **Advanced** button to view additional Crosshair Finder parameters.

Using the Autofocus Finder

1. Position a surface or edge in the center of the Video window.

2. Switch to high magnification (recommended, but not required); reposition the surface or edge as required.

3. Adjust the illumination in the Stage and Lights window.
   - Use backlight illumination when focusing on an edge.
   - Use Coaxial Light or Ring Light illumination when focusing on a surface.

4. Use the joystick knob to raise or lower the Z axis to manually focus (by eye) on the edge or surface.

5. Click  in the Video window toolbar.

6. Based on the image displayed in the Video window, select the appropriate Focus Type in the Autofocus (Basic) dialog box.

Click...	To perform...
	an *edge focus* on a backlit, vertical edge with the dark side on the left
	an *edge focus* on a backlit, vertical edge with the dark side on the right
	an *edge focus* on a backlit, horizontal edge with the dark side on the top
	an *edge focus* on a backlit, horizontal edge with the dark side on the bottom
	a *surface focus* on a textured surface
	a *Ronchi focus* on a smooth surface (only available on systems equipped with the optional Ronchi Grid)
	a *laser focus* on a surface (only available on systems equipped with the optional TTL laser)

7. If necessary, resize the Autofocus Finder by dragging the edge or corner of the finder to the desired rectangular size.

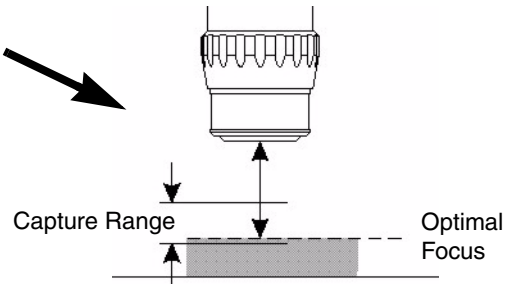
8. If necessary, change the desired Autofcous Finder parameters (described on the next page).

9. Double-click in the Video window to run the Autofcous Finder.

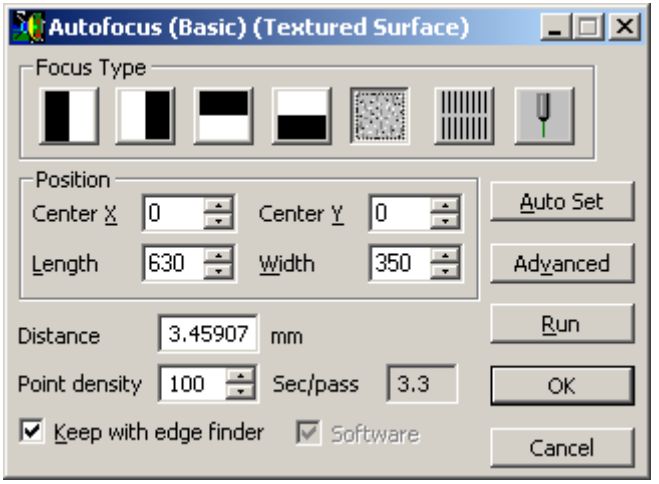
Autofocus Finder Parameters

Autofocus Finder parameters can be changed when the Autofocus Finder is displayed in the Video window. If necessary, click the **Basic** button in the Autofocus dialog box to display the following basic parameters:

- Focus Type (see the table in Step 6 on the previous page)
- Position parameters:
  - Change the center location of the Autofocus Finder by changing the values in the **Center X** and **Center Y** boxes.
  - Change the size of the Autofocus Finder by changing the values in the **Length** and **Width** boxes.
- The **Distance** box specifies the distance the system will move along the Z axis to find the optimal focus (see illustration). Increase the Distance value to increase the capture range; decrease the Distance value to focus more quickly.



- The value in the **Point density** box increases or decreases the number of data points used to calculate the Z axis position during an autofocus.
- Select the **Keep with edge finder** checkbox to include an automatic focus for any finder.
- Select the **Software** checkbox to use software imaging to obtain focus readings.



Note: Click the **Advanced** button to view additional Autofocus parameters.

Using the Smart Finder

1. Position an edge in the Video window.
2. Adjust the backlight illumination in the Stage and Lights window.
3. Click  in the Video window toolbar.
4. Position the top-left point of the finder near the desired edge of the part.
5. Click once to run the finder.
6. Click  in the Video window toolbar to turn off the Smart Finder.

Part Alignment

This section describes how to define a Part Coordinate System (PCS), which involves:

1. Creating an alignment block
2. Measuring reference features
3. Defining a reference plane
4. Defining a reference line
5. Setting the part tilt, rotation, and origin

Part alignment allows you to run a program to measure the same or identical part at another location on the stage. The program will run no matter where the part is placed, **as long as the reference feature locations are specified**.

The QVI Training Part is used to demonstrate this process; use the following illustration for reference.

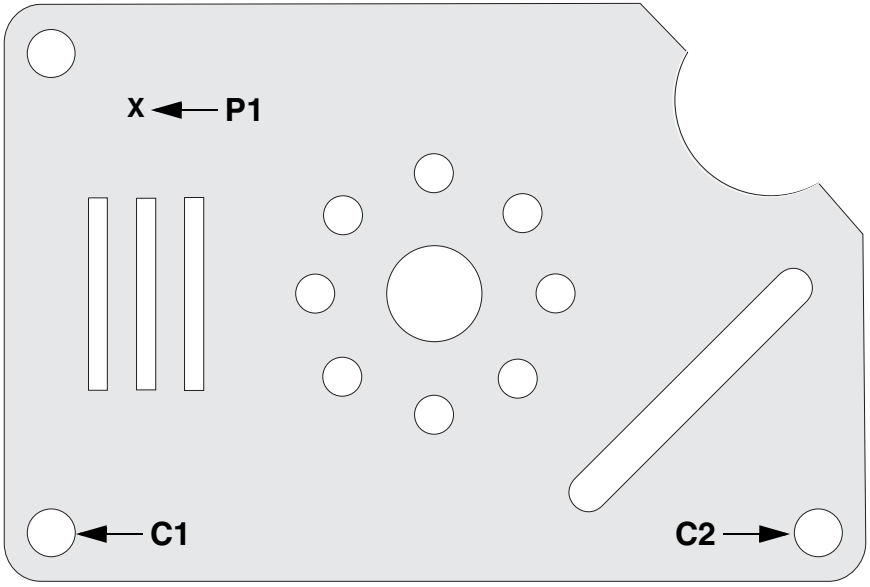


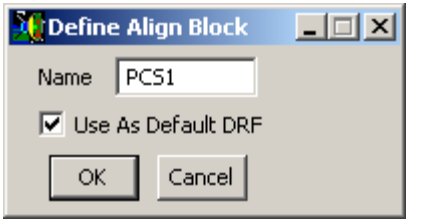
Figure 5-1: Reference Features Used for Part Alignment

1. Create an Alignment Block

1. Click  in the VMS toolbar.

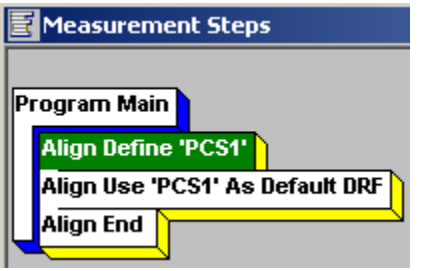
2. Select **Align / Define Align Block** from the main menu.

   The following dialog box appears:



3. Click **OK**.

   The software adds three alignment steps to the Measurement Steps window to define the start and end of the current part coordinate system.



2. Measure Reference Features (C1, C2, and P1)

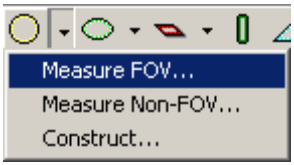
1. Place and secure the QVI Training Part on the stage as shown in Figure 5-1 on page 5-1.

2. Switch to Low Magnification and turn on the backlight.

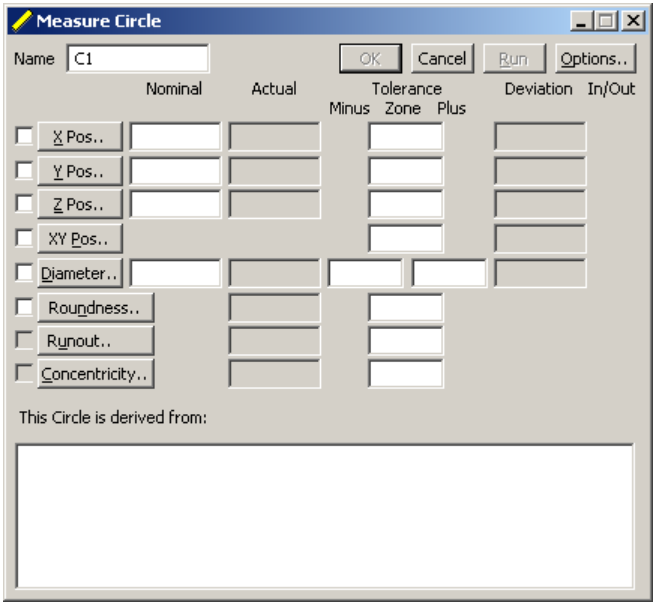
3. Use the joystick to move the stage so the **lower-left hole** in the QVI Training Part appears in the Video window; focus an edge of the hole.

4. Adjust the backlight illumination for sufficient contrast and focus the edge.

5. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure FOV**.



The following dialog box appears:



6. Position the Circular Edge Finder over the lower-left hole so the inner circle of the finder is completely inside the hole and the outer circle is completely outside the hole; adjust the size and position of the finder as required.

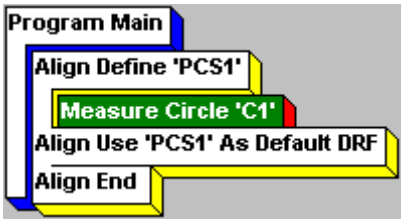
7. Double-click in the Video window to run the Circular Finder and measure the lower-left hole.

8. Click  in the Video window toolbar to accept the finder and save it in the measurement step—this enables the OK button in the Measure Circle dialog box.

9. [Optional] Specify the circle attributes to display in the output by selecting the appropriate checkboxes in the Measure Circle dialog box.

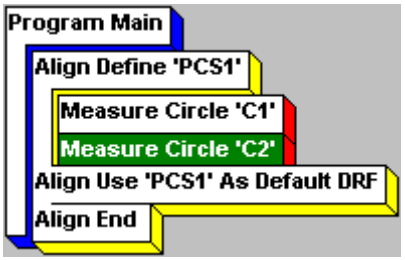
10. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance Zone** boxes in the Measure Circle dialog box.

11. Click **OK** in the Measure Circle dialog box to add the measurement to the program and display it in the Measurement Steps window.



12. Use the joystick to move the stage so the **lower-right hole** in the QVI Training Part appears in the Video window.

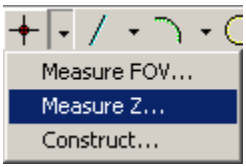
13. Repeat Steps 5 through 11 to measure the lower-right hole.



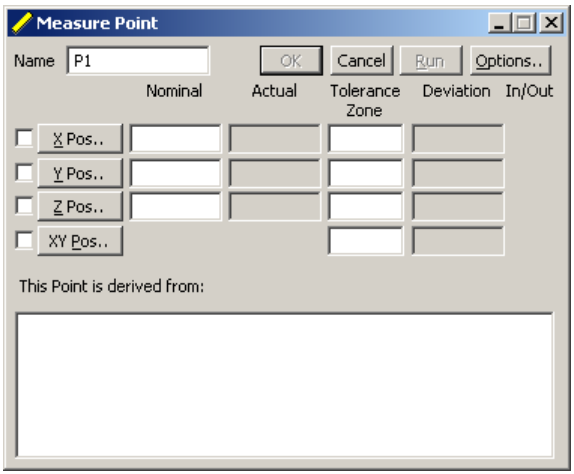
14. Use the joystick to move the stage so the surface near the upper-left hole appears in the Video window.

15. Switch to high magnification and adjust the coaxial illumination as required.

16. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure Z**.



The following dialog box appears:

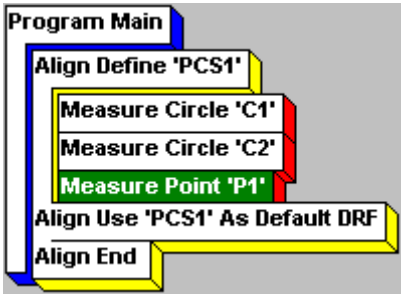


17. In the Basic Autofocus Settings dialog box, click  .

18. Double-click in the Video window to run the finder and measure the point.

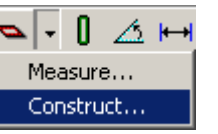
19. Click  in the Video window toolbar to accept the finder and save it in the measurement step—this enables the OK button in the Measure Point dialog box.

20. Click **OK** in the Measure Point dialog box to add the measurement to the program and display it in the Measurement Steps window.

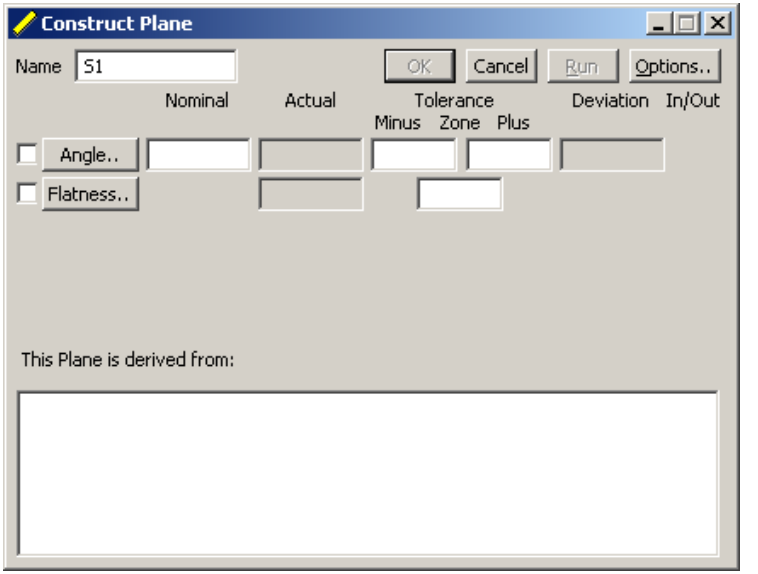


3. Define the Reference Plane (S1)

1. Click the **arrow** directly to the right of  in the VMS toolbar and select **Construct**.

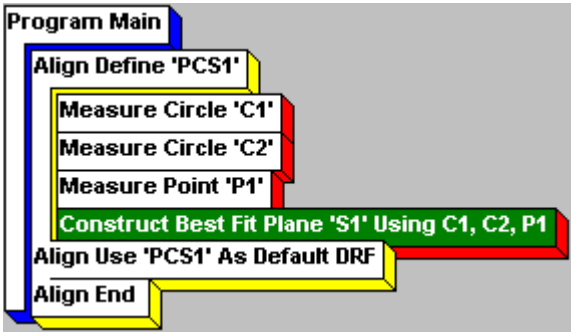


The following dialog box appears:



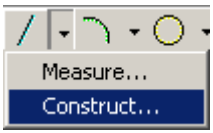
2. Select circle **C1**, circle **C2**, and point **P1** by clicking on them in the Features window—this enables the OK button.

3. Click **OK** to add the construction to the program and display it in the Measurement Steps window.

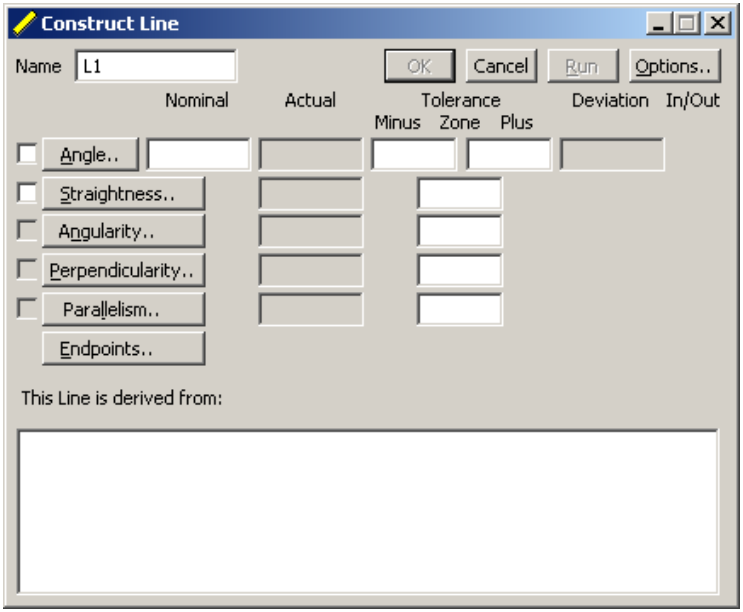


4. Define the Reference Line (L1)

1. Click the **arrow** directly to the right of  in the VMS toolbar and select **Construct**.

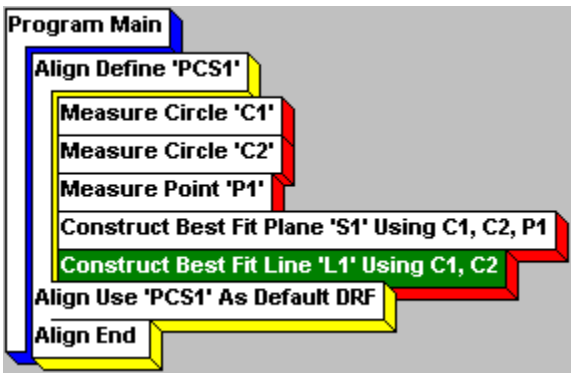


The following dialog box appears:



2. Select circle **C1** and circle **C2** by clicking on them in the Features window—this enables the OK button.

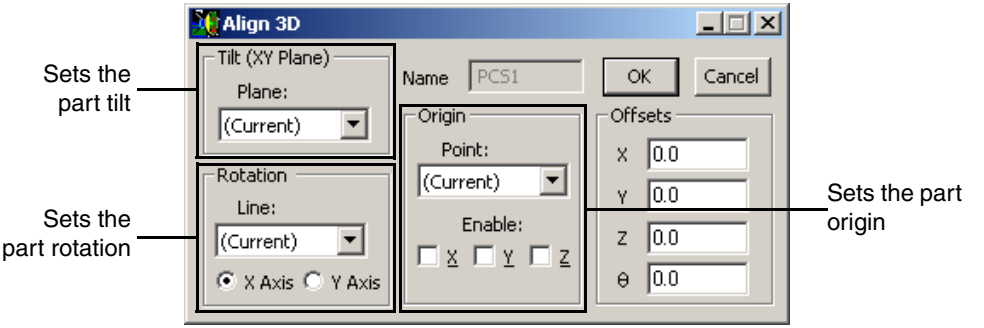
3. Click **OK** to add the construction to the program and display it in the Measurement Steps window.



5. Set the Part Tilt, Part Rotation, and Part Origin

1. Select **Align / Part Align / Plane-Line-Point (3D)** from the main menu.

   The following dialog box appears:



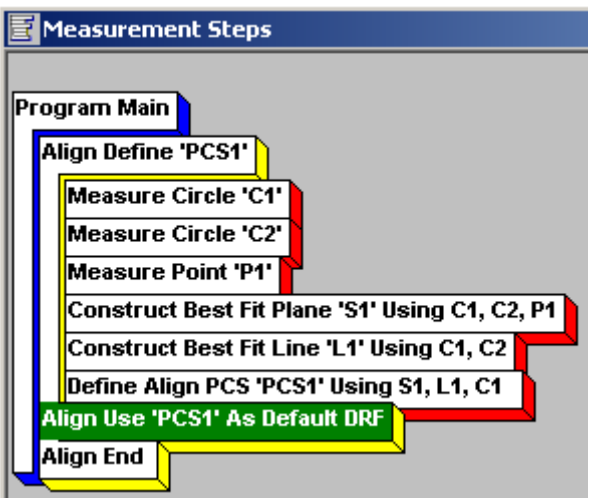
2. In the **Tilt** section, select **S1** (the constructed plane) from the **Plane** pull-down list to set the tilt of the part.

3. In the **Rotation** section, select **L1** (the constructed line) from the **Line** pull-down list. Also, click the **X Axis** radio button to set line L1 as the X axis datum for the part.

4. In the **Origin** section, select **C1** (the measured lower-left hole) from the **Point** pull-down list. Then select the Enable **X**, **Y**, and **Z** checkboxes to set the center point of circle C1 as the X, Y, and Z zero point.

5. Click **OK** to save the changes and close the dialog box.

The Measurement Steps window should now look similar to the following:



Steps inserted between **Align Use** and **Align End** will use the **PCS1** alignment block

Section 6

More information in VMS Reference Guide, Section 6

Measuring Features

This section describes how to measure a:

- Point
- Line (FOV and Non-FOV)
- Arc (FOV and Non-FOV)
- Circle (FOV and Non-FOV)
- Plane
- Distance

Programming a Step

1. Display a feature in the Video window.
2. Select the desired geometry from the VMS toolbar.
3. Position the finder over the feature.
4. Run the finder.
5. Save the finder in the step.
6. Save the step in the program.

Preliminary Steps

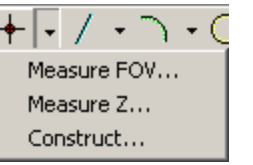
1. Place and secure the part on the stage.
2. Use the joystick to move the stage so the desired feature appears in the Video window.
3. Adjust the illumination as required (see *Stage and Lights Window* on page 2-9).
4. Focus the feature (see *Using the Autofocus Finder* on page 4-12).

Measuring a Point

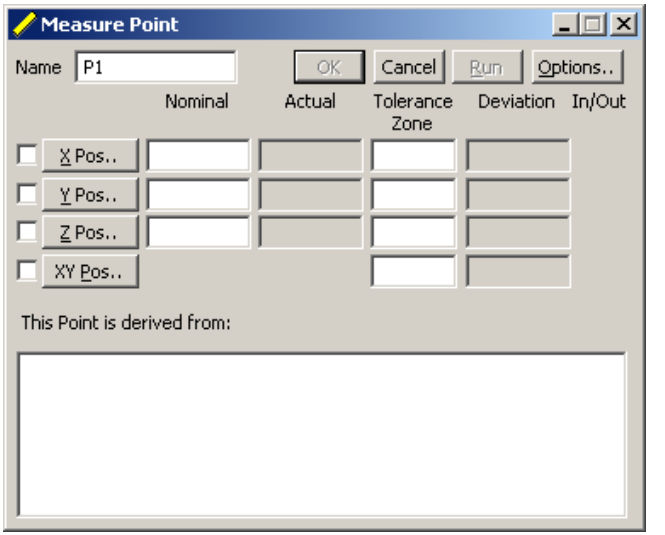
1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select one of the following:

   - **Measure FOV** to measure the XY location of a single point
   - **Measure Z** to measure the Z location of a single point

   The following dialog box appears:

3. **[Measure FOV]** Click  in the Video window toolbar to display the Point (1D) Edge Finder if it is not already displayed.

   [Measure Z] Click  in the Video window toolbar to display the Autofocus Finder if it is not already displayed.

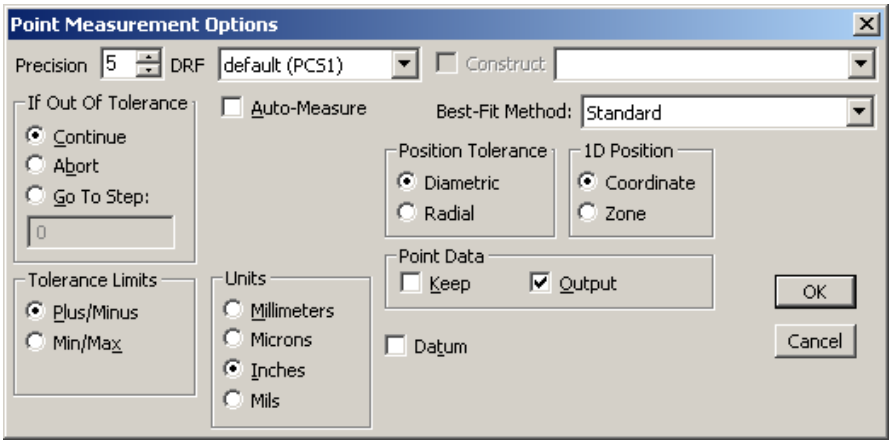
4. Position the finder over the feature (see *Using the Point (1D) Edge Finder* on page 4-3 or *Using the Autofocus Finder* on page 4-12 for more information).

5. Double-click in the Video window to run the finder and measure the point.

6. Click  in the Video window toolbar to accept the finder and save it in the step.

7. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Point dialog box.

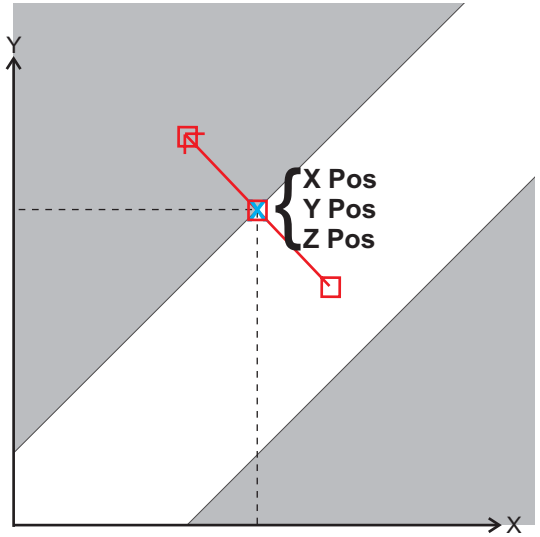
8. [Optional] Click **Options** to change the desired Point Measurement Options; click **OK** to save your changes and close the Options dialog box.



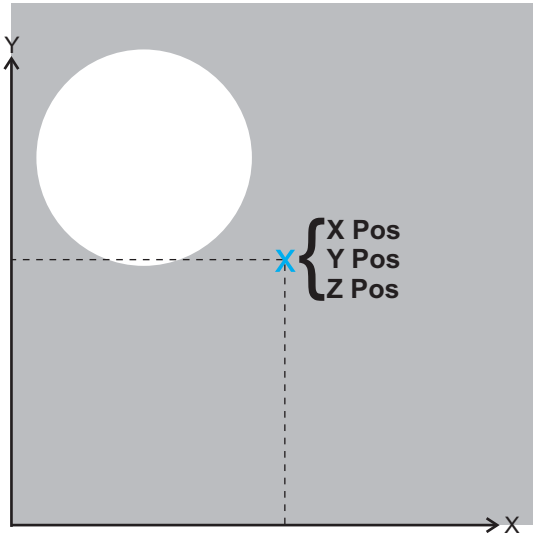
9. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

10. Click **OK** in the Measure Point dialog box to add the measurement to the program and display it in the Measurement Steps window.

Measuring a Point (FOV)



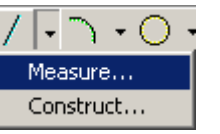
Measuring a Point (Z)



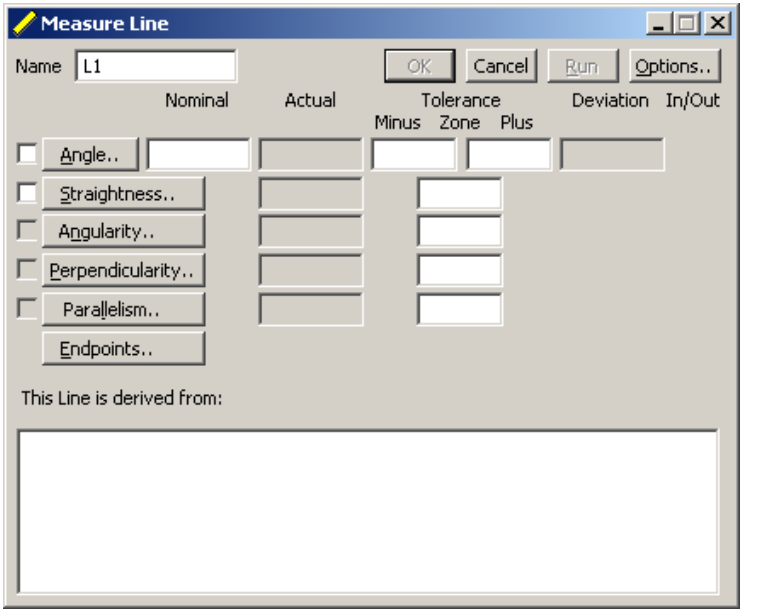
Measuring a Line that Fits in the Field-of-View

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure**.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Line (2D) Edge Finder if it is not already displayed.

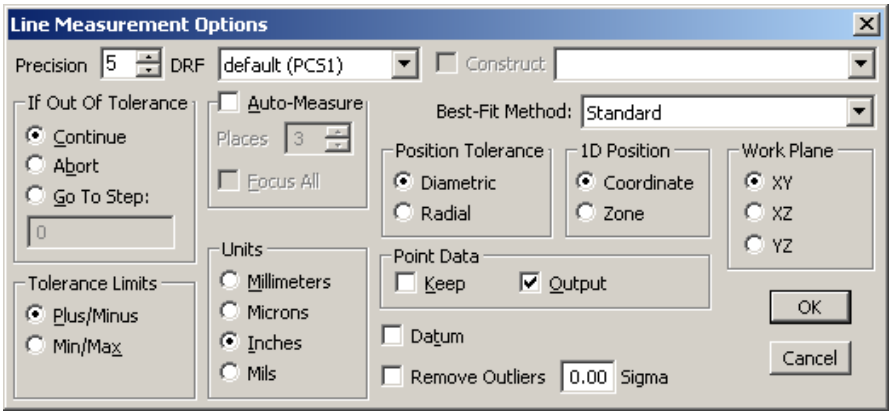
4. Position the finder over the feature (see *Using the Line (2D) Edge Finder* on page 4-5 for more information).

5. Double-click in the Video window to run the finder and measure the line.

6. Click  in the Video window toolbar to accept the finder and save it in the step.

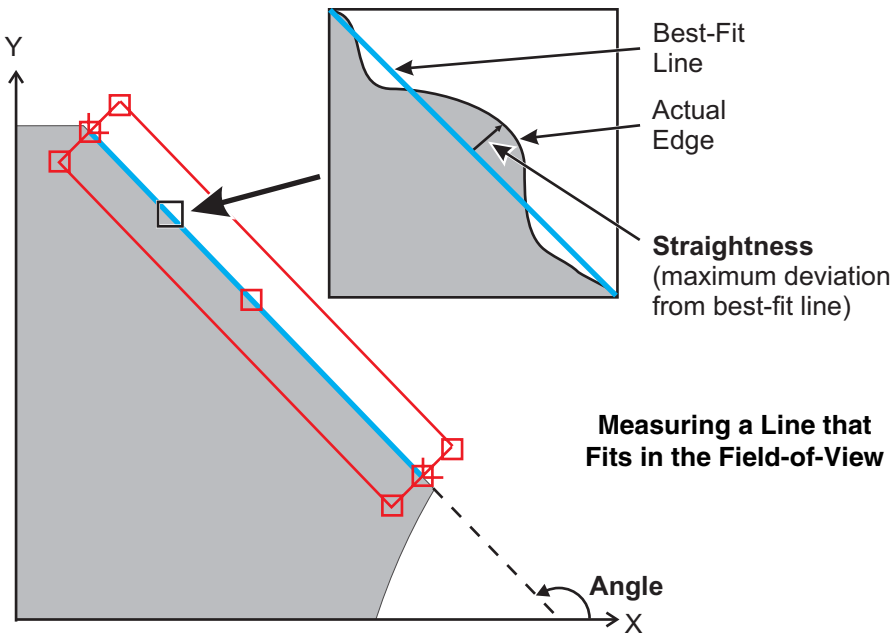
7. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Line dialog box.

8. [Optional] Click **Options** to change the desired Line Measurement Options; click **OK** to save your changes and close the Options dialog box.



9. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

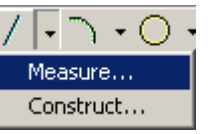
10. Click **OK** in the Measure Line dialog box to add the measurement to the program and display it in the Measurement Steps window.



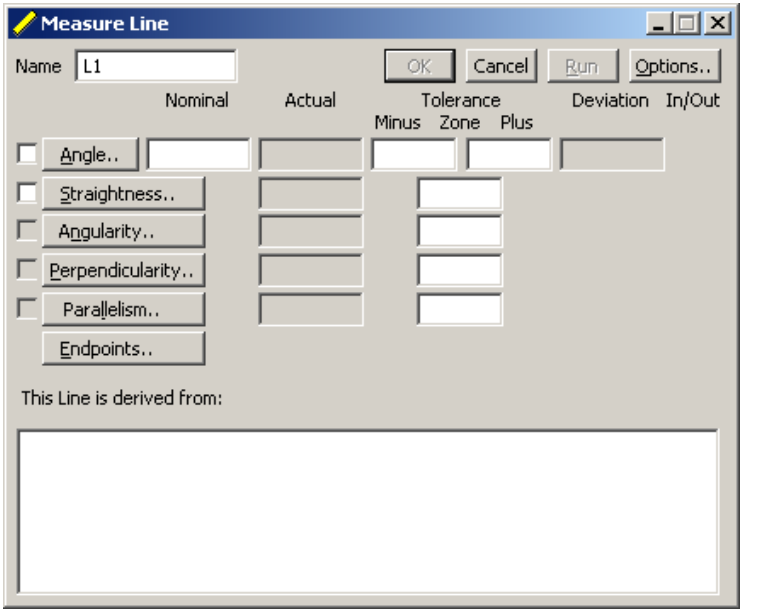
Measuring a Line that is Larger than the Field-of-View

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure**.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Line (2D) Edge Finder if it is not already displayed.

4. Position the finder over one end of the feature (see *Using the Line (2D) Edge Finder* on page 4-5 for more information).

5. Double-click in the Video window to run the finder and measure the line.

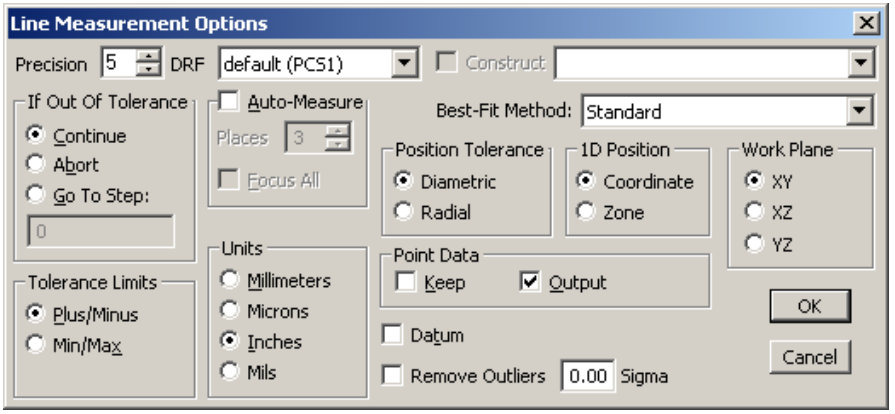
6. Click  in the Video window toolbar to accept the finder and save it in the step.

7. Click  to re-display the Line Finder.

8. Repeat Steps 4 through 6 to measure the opposite end of the line.

9. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Line dialog box.

10. Click **Options** to display the following dialog box:



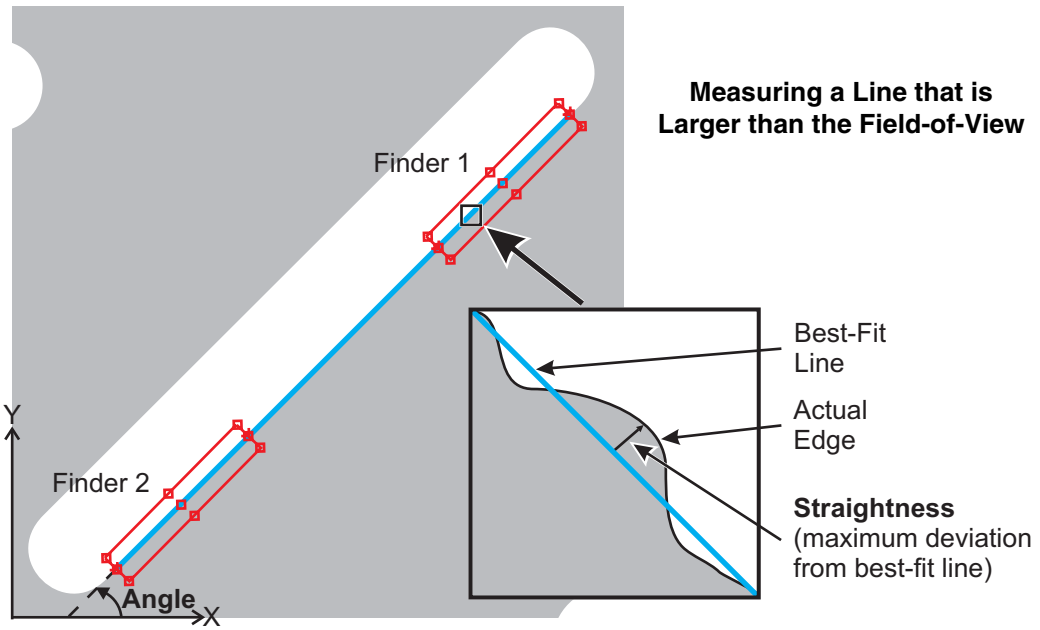
11. Select the **Auto-Measure** checkbox and specify the number of **Places** to run the finder.

12. [Optional] Change the desired Line Measurement Options.

13. Click **OK** to save your changes and close the Options dialog box.

14. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

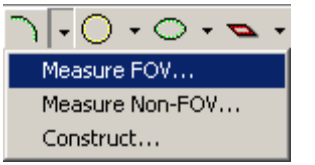
15. Click **OK** in the Measure Line dialog box to add the measurement to the program and display it in the Measurement Steps window.



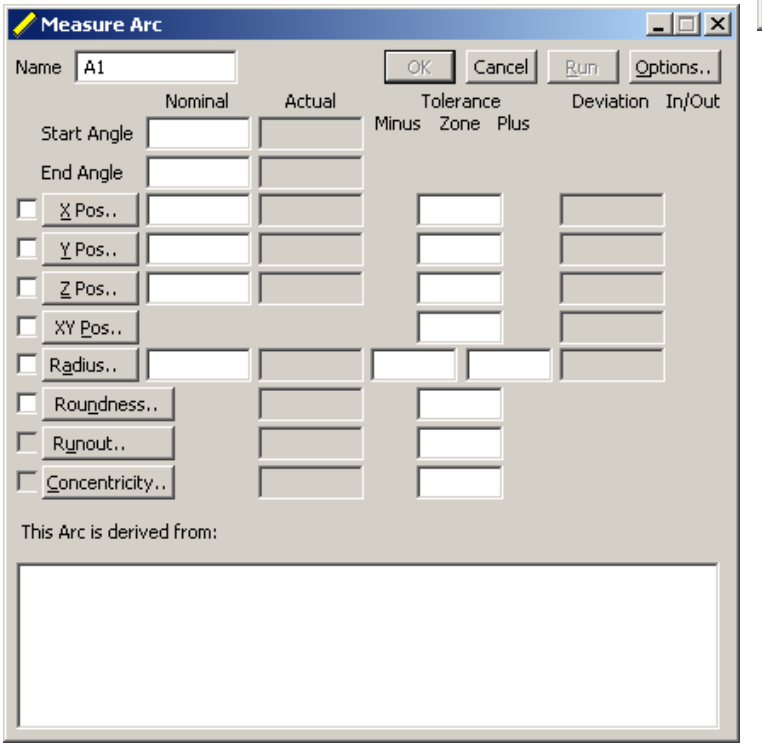
Measuring an Arc that Fits in the Field-of-View

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure FOV**.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Arc Edge Finder if it is not already displayed.

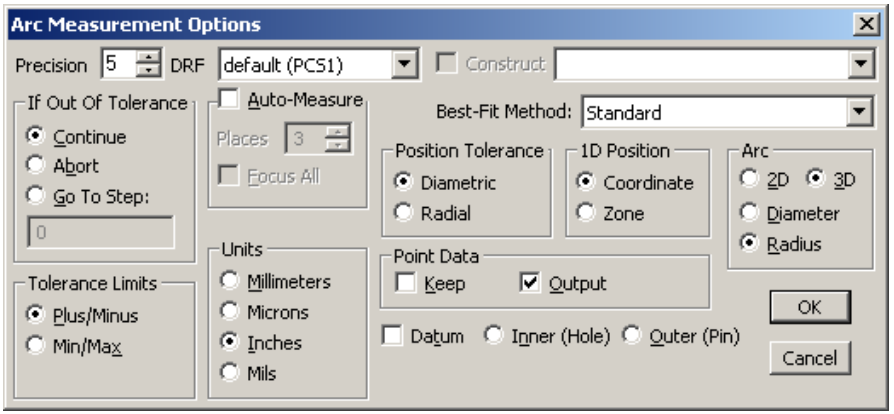
4. Position the finder over the feature (see *Using the Arc Edge Finder* on page 4-9 for more information).

5. Double-click in the Video window to run the finder and measure the arc.

6. Click  in the Video window toolbar to accept the finder and save it in the step.

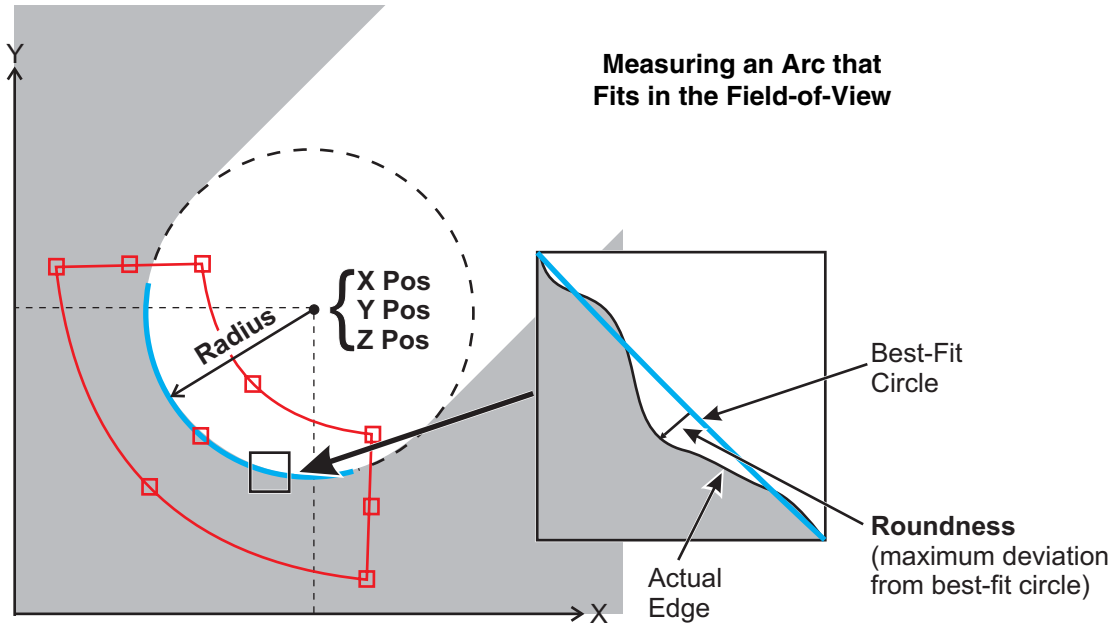
7. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Arc dialog box.

8. [Optional] Click **Options** to change the desired Arc Measurement Options; click **OK** to save your changes and close the Options dialog box.



9. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

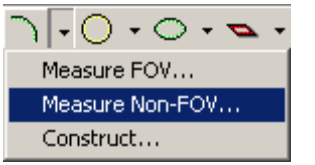
10. Click **OK** in the Measure Arc dialog box to add the measurement to the program and display it in the Measurement Steps window.



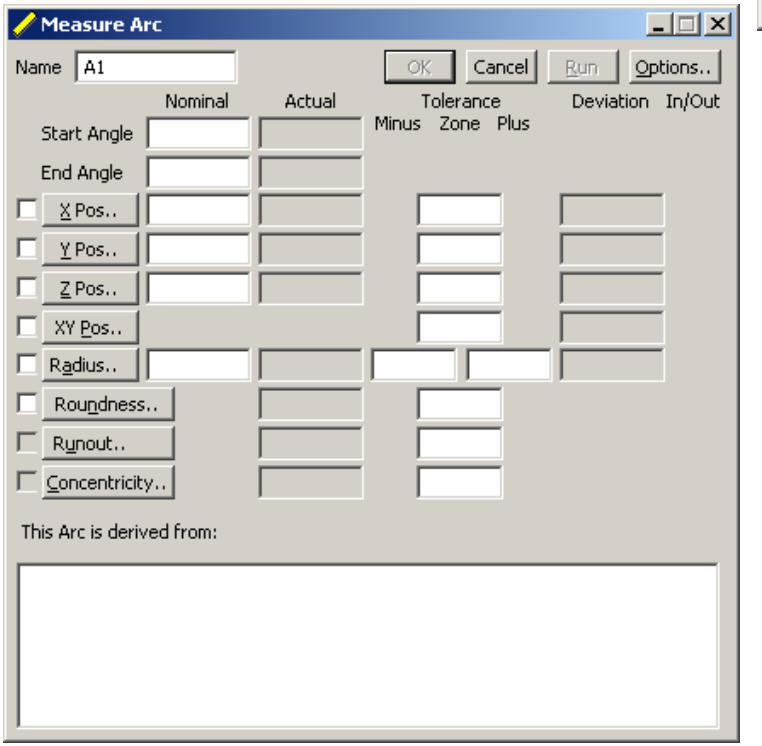
Measuring an Arc that is Larger than the Field-of-View

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure Non-FOV**.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Line (2D) Edge Finder if it is not already displayed.

4. Position the finder over one end of the feature (see *Using the Line (2D) Edge Finder* on page 4-5 for more information).

5. Double-click in the Video window to run the finder and measure the arc.

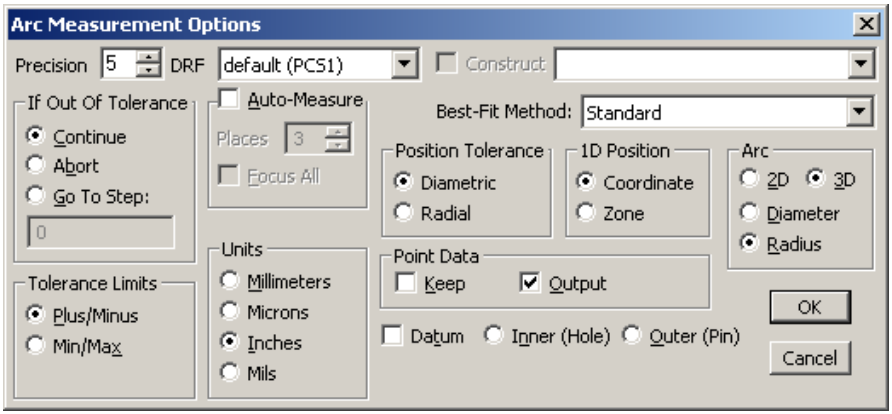
6. Click  in the Video window toolbar to accept the finder and save it in the step.

7. Click  to re-display the Line (2D) Edge Finder.

8. Repeat Steps 4 through 6 to measure the opposite end of the feature.

9. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Arc dialog box.

10. Click **Options** to display the following dialog box:



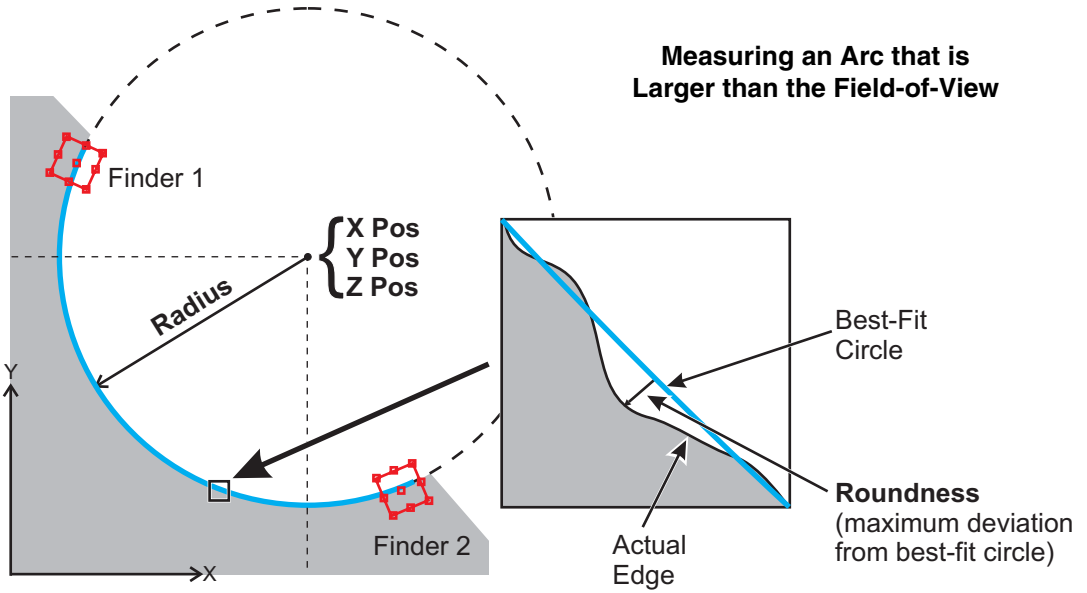
11. Select the **Auto-Measure** checkbox and specify the number of **Places** to run the finder.

12. [Optional] Change the desired Arc Measurement Options.

13. Click **OK** to save your changes and close the Options dialog box.

14. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

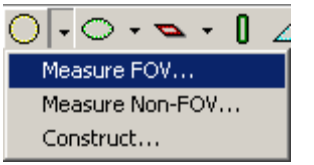
15. Click **OK** in the Measure Arc dialog box to add the measurement to the program and display it in the Measurement Steps window.



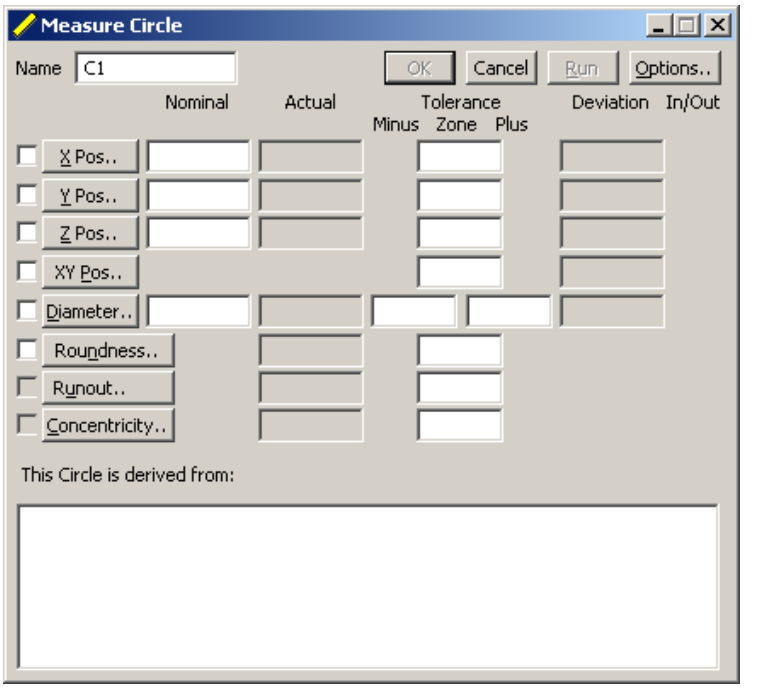
Measuring a Circle that Fits in the Field-of-View

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure FOV**.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Circular Edge Finder if it is not already displayed.

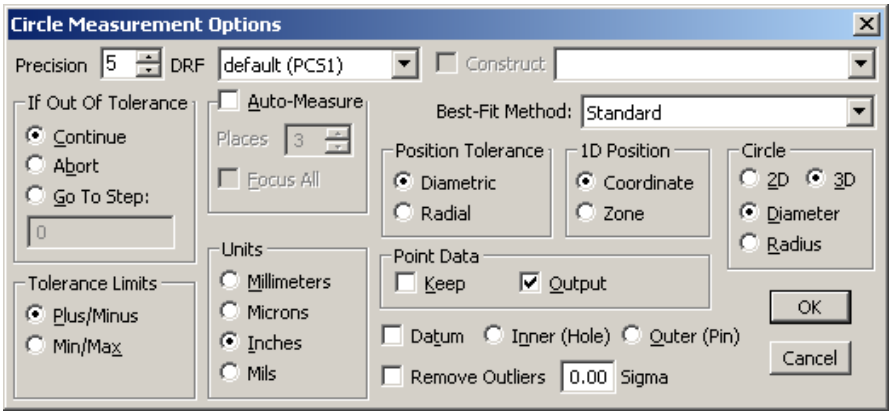
4. Position the finder over the feature (see *Using the Circular Edge Finder* on page 4-7 for more information).

5. Double-click in the Video window to run the finder and measure the circle.

6. Click  in the Video window toolbar to accept the finder and save it in the step.

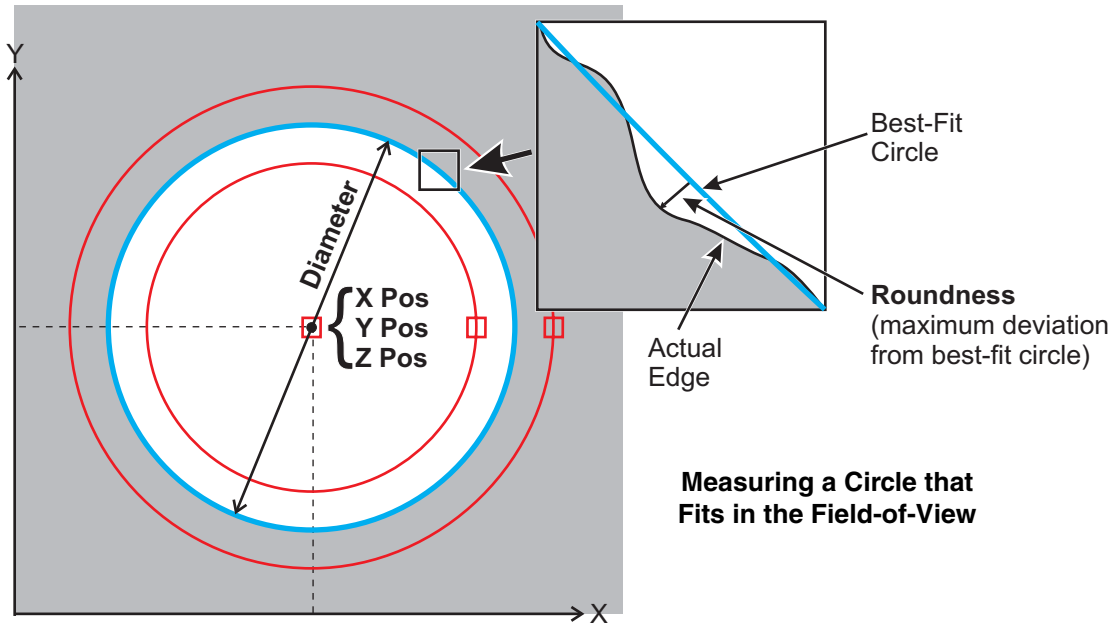
7. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Circle dialog box.

8. [Optional] Click **Options** to change the desired Circle Measurement Options; click **OK** to save your changes and close the Options dialog box.



9. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

10. Click **OK** in the Measure Circle dialog box to add the measurement to the program and display it in the Measurement Steps window.

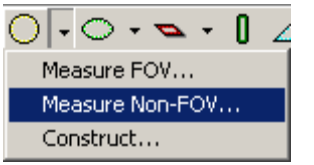


Measuring a Circle that Fits in the Field-of-View

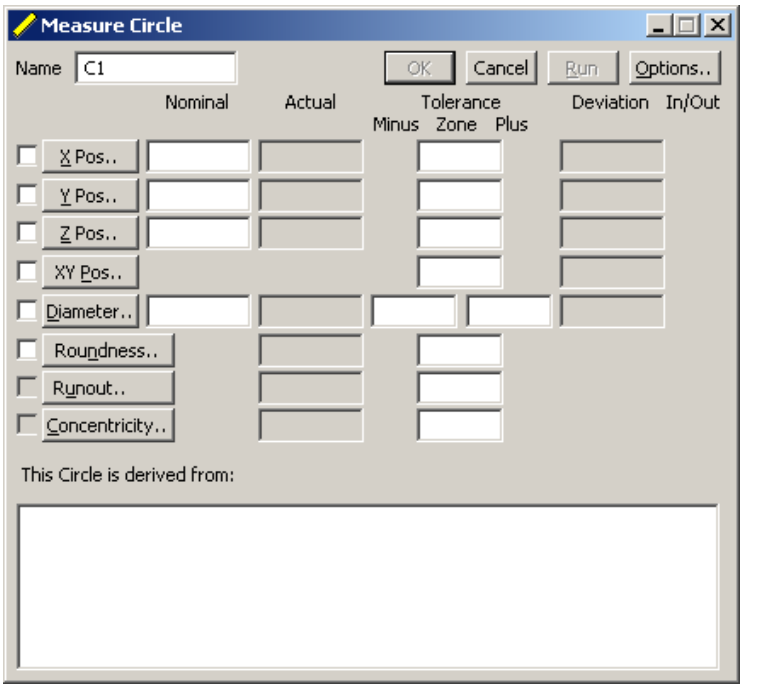
Measuring a Circle that is Larger than the Field-of-View

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure Non-FOV**.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Line(2D) Edge Finder if it is not already displayed.

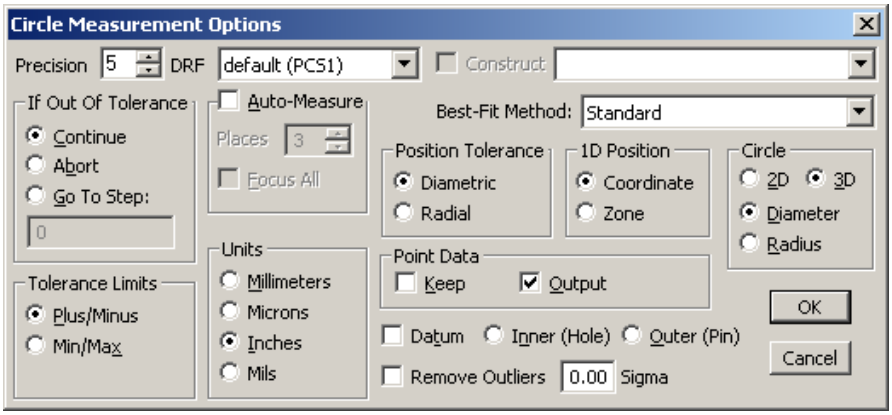
4. Position the finder over the feature (see *Using the Line (2D) Edge Finder* on page 4-5 for more information).

5. Double-click in the Video window to run the finder and measure the circle.

6. Click  in the Video window toolbar to accept the finder and save it in the step.

7. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Circle dialog box.

8. Click **Options** to display the following dialog box:



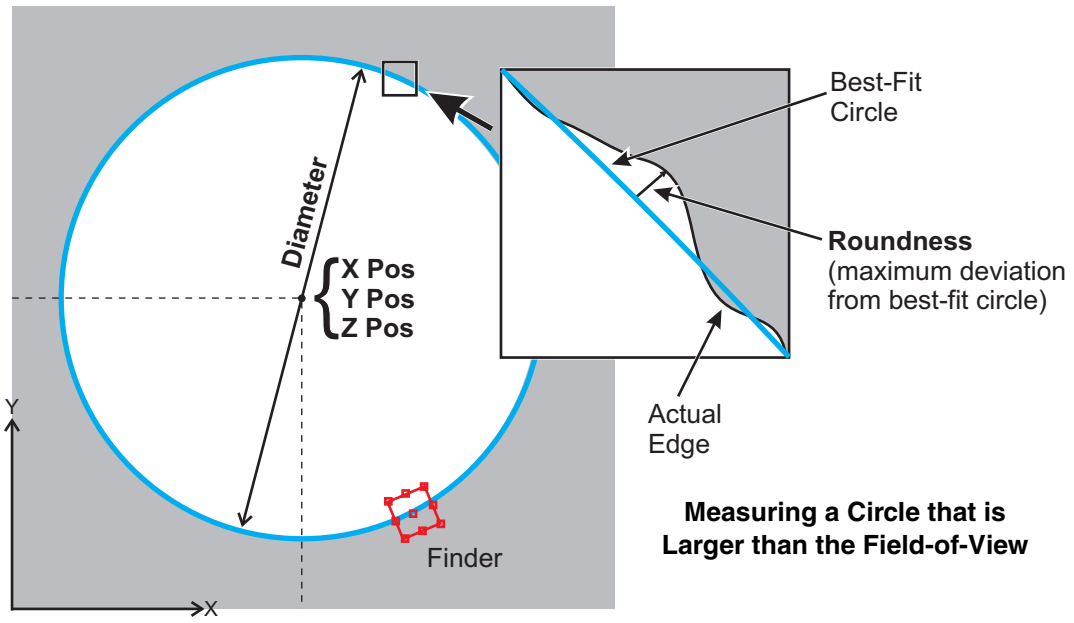
9. Select the **Auto-Measure** checkbox and specify the number of **Places** to run the finder.

10. [Optional] Change the desired Circle Measurement Options.

11. Click **OK** to save your changes and close the Options dialog box.

12. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

13. Click **OK** in the Measure Circle dialog box to add the measurement to the program and display it in the Measurement Steps window.

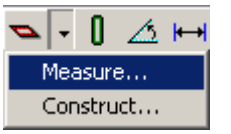


Measuring a Circle that is Larger than the Field-of-View

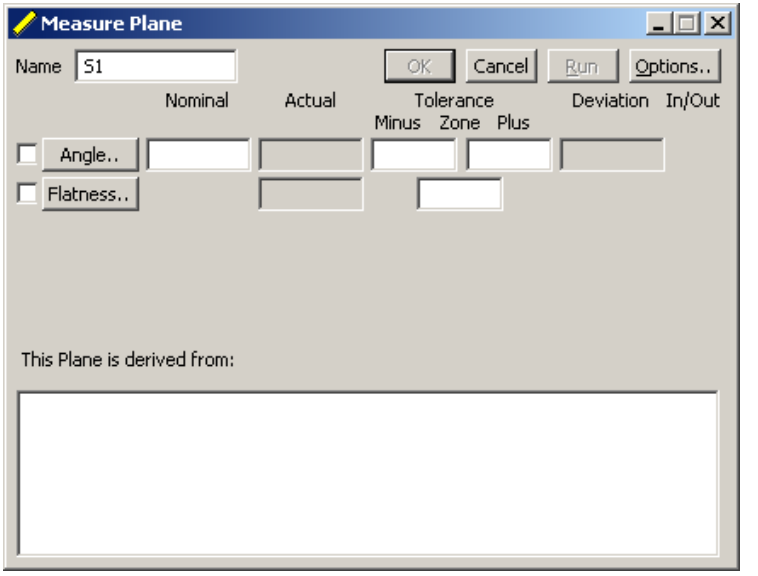
Measuring a Plane

1. Perform the preliminary steps on page 6-1.

2. Click the **arrow** directly to the right of  in the VMS toolbar and select **Measure** from the list.



   The following dialog box appears:



3. Click  in the Video window toolbar to display the Autofocus Finder if it is not already displayed.

4. Use the joystick to move the stage so the first focus point appears in the Video window.

5. Manually focus (by eye) on the part by raising or lowering the Z axis; adjust the illumination if necessary.

6. Select the focus type by clicking the appropriate icon in the Autofocus dialog box (see *Using the Autofocus Finder* on page 4-12 for more information).

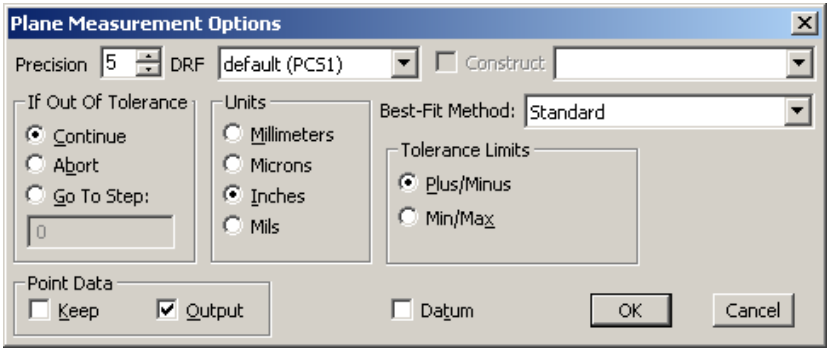
7. Double-click in the Video window to run the Autofocus Finder and measure the focus point.

8. Click  in the Video window toolbar to accept the finder and save it in the measurement step.

9. Repeat Steps 4 though 8 to measure the second and third focus points. Click **OK** in the Autofocus dialog box when finished.

10. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Measure Plane dialog box.

11. [Optional] Click **Options** to change the desired Plane Measurement Options; click **OK** to save your changes and close the Options dialog box.



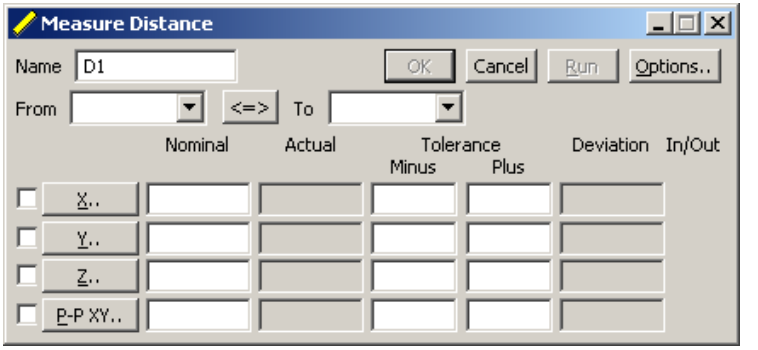
12. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

13. Click **OK** in the Measure Plane dialog box to add the measurement to the program and display it in the Measurement Steps window.

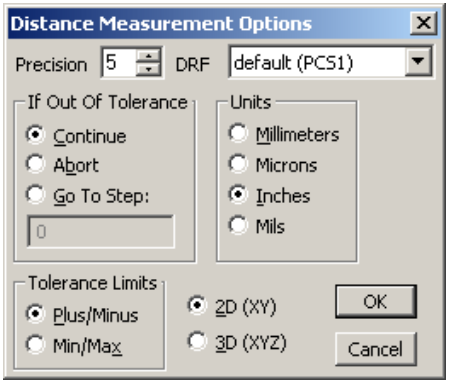
Measuring a Distance

1. Identify the features you want to use in the measurement.
2. Click  in the VMS toolbar.

   The following dialog box appears:



3. Specify the attributes to display in the results output by selecting the appropriate checkboxes.
4. [Optional] Click **Options** to change the desired Distance Measurement Options; click **OK** to save your changes and close the Options dialog box.



5. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.
6. Select two features to use in the distance measurement by:
   - Selecting them from the **From** and **To** drop-down lists in the Measure Distance dialog box
   - Clicking on them in the Features window
   - Selecting them from the Object Names window
7. Click **OK** in the Measure Distance dialog box to add the measurement to the program and display it in the Measurement Steps window.

Section 7

More information in VMS Reference Guide, Section 6

Constructing Features

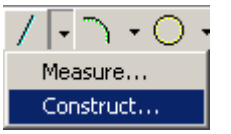
You can construct a feature from two or more previously-measured or -constructed features.

This section describes how to construct a:

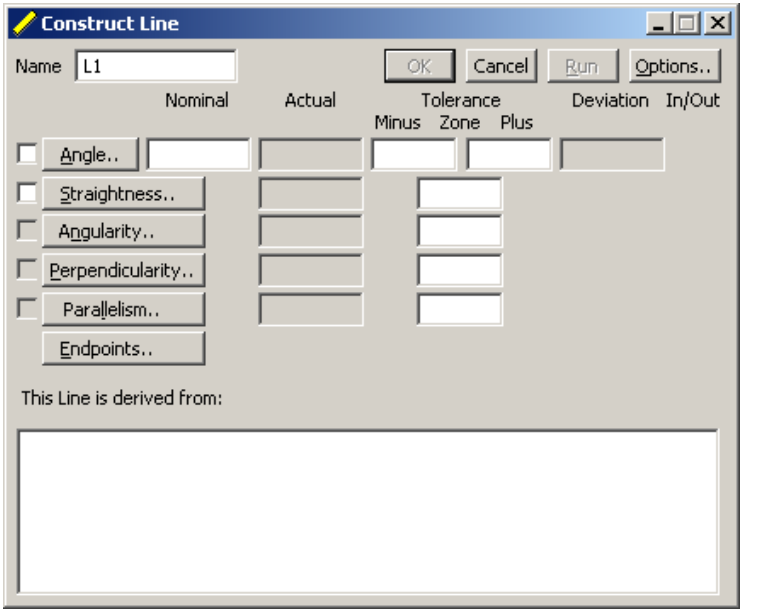
- Line
- Arc
- Circle
- Plane

Constructing a Line

1. Click the **arrow** directly to the right of  in the VMS toolbar and select **Construct**.



   The following dialog box appears:

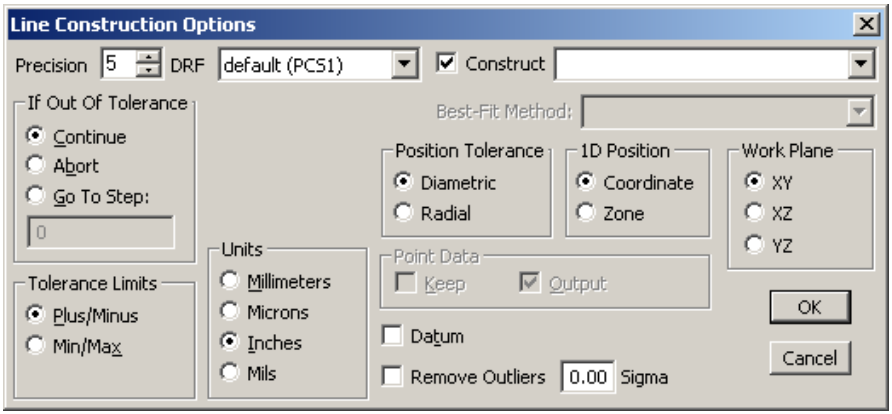


2. Select the first feature to use in the construction by clicking on it in the Features window (the feature color changes to yellow) or selecting it in the Object Names window.

3. Repeat Step 2 to select the second feature to use in the construction.

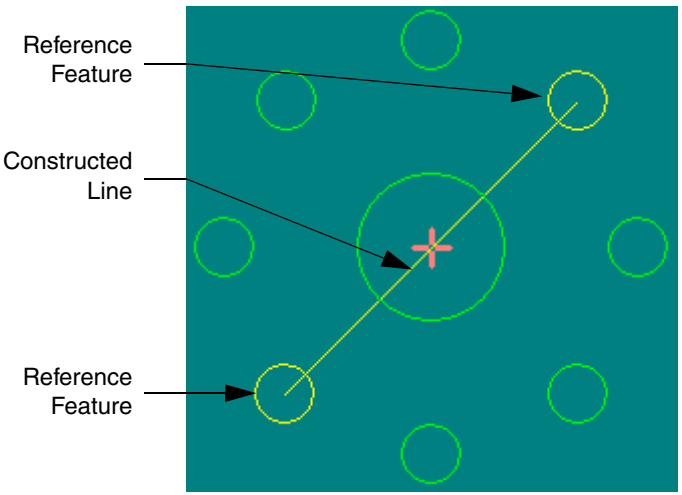
4. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Construct Line dialog box.

5. [Optional] Click **Options** to change the desired Line Construction Options; click **OK** to save your changes and close the Options dialog box.



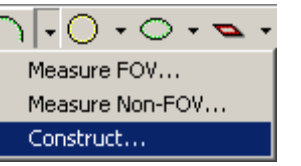
6. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

7. Click **OK** in the Construct Line dialog box to add the construction to the program and display it in the Measurement Steps window.

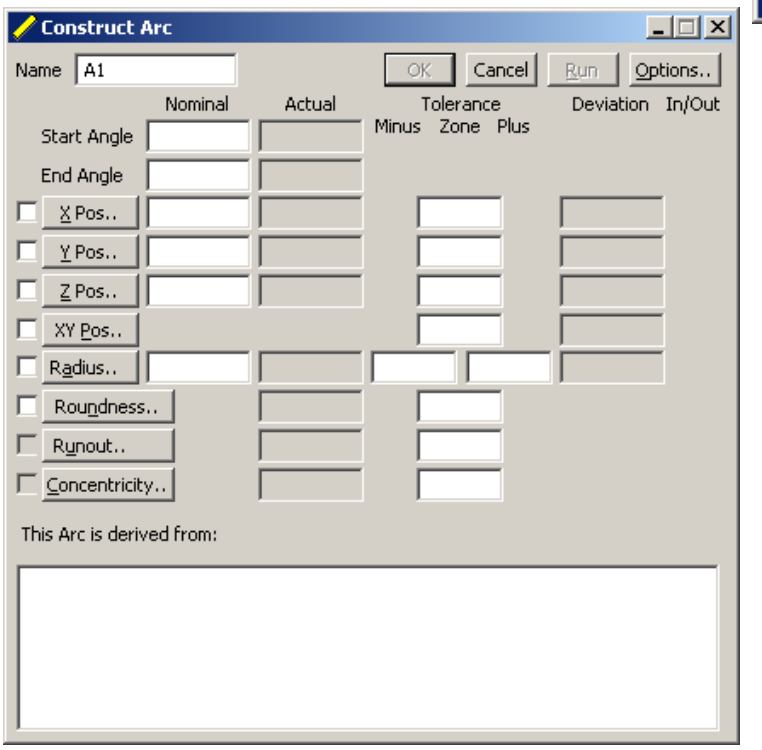


Constructing an Arc

1. Click the **arrow** directly to the right of  in the VMS toolbar and select **Construct**.



   The following dialog box appears:

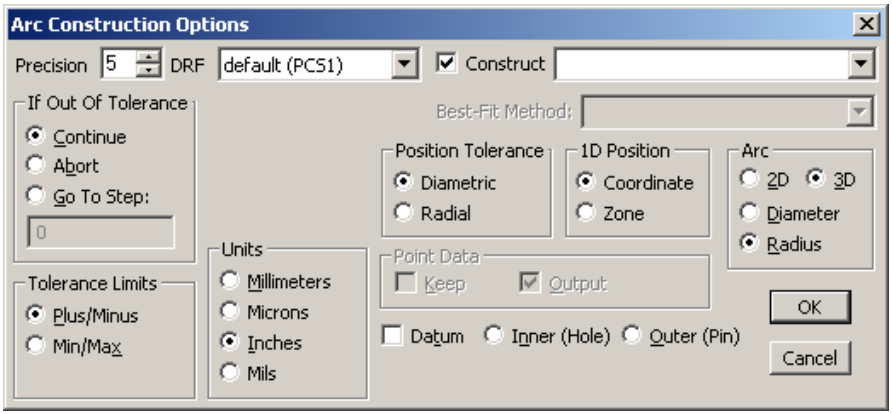


2. Select the first feature to use in the construction by clicking on it in the Features window (the feature color changes to yellow) or selecting it in the Object Names window.

3. Repeat Step 2 to select the second and third features to use in the construction.

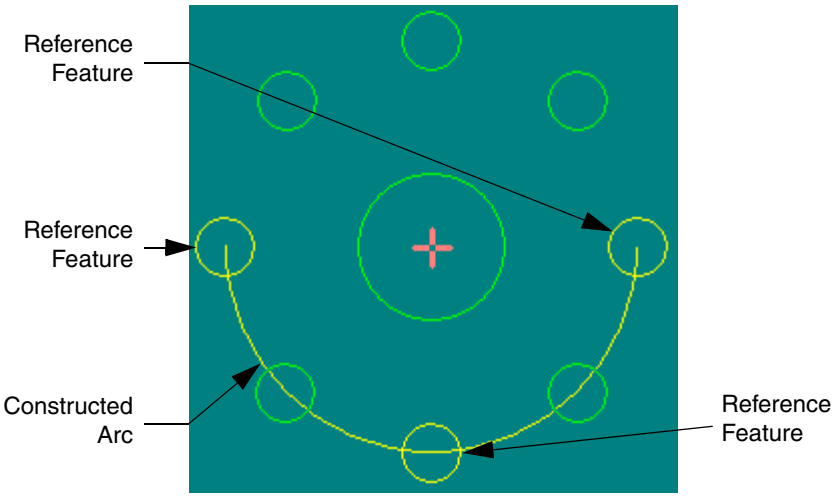
4. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Construct Arc dialog box.

5. [Optional] Click **Options** to change the desired Arc Construction Options; click **OK** to save your changes and close the Options dialog box.



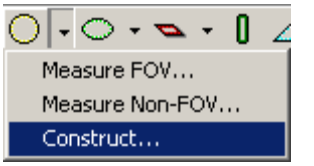
6. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

7. Click **OK** in the Construct Arc dialog box to add the construction to the program and display it in the Measurement Steps window.

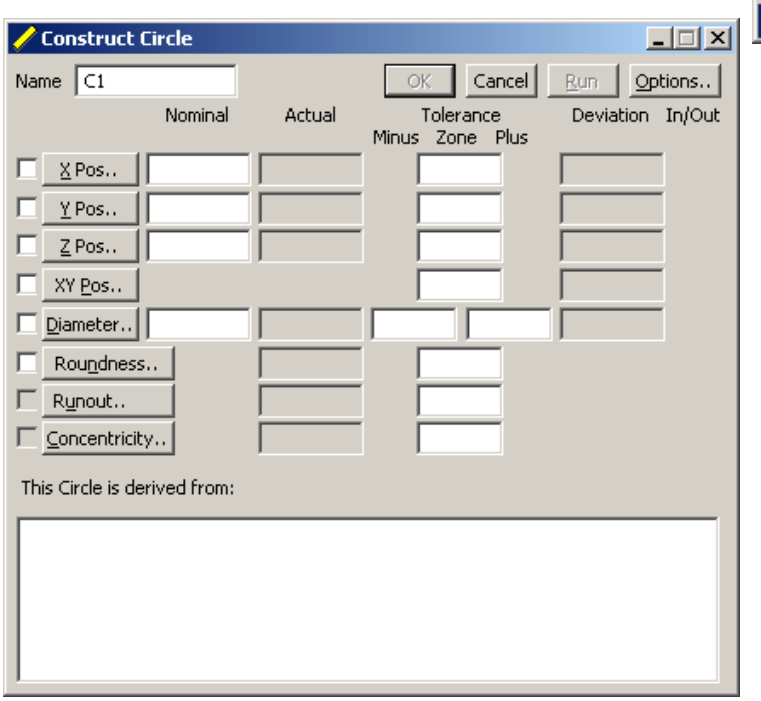


Constructing a Circle

1. Click the **arrow** directly to the right of  in the VMS toolbar and select **Construct**.



   The following dialog box appears:

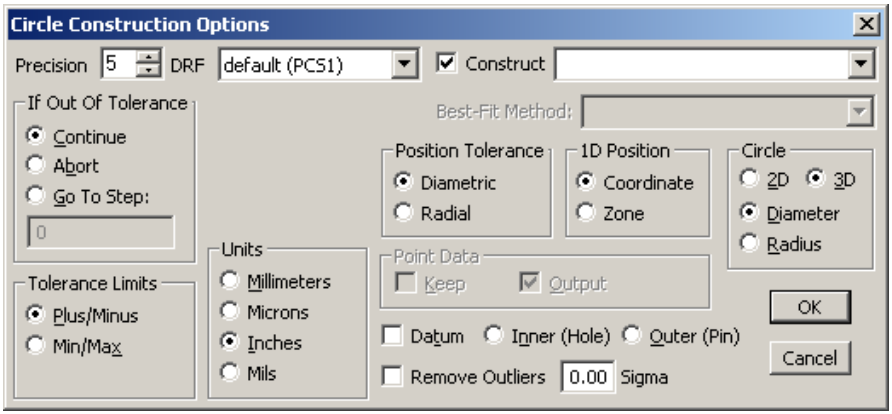


2. Select the first feature to use in the construction by clicking on it in the Features window (the feature color changes to yellow) or selecting it in the Object Names window.

3. Repeat Step 2 to select the second and third features to use in the construction.

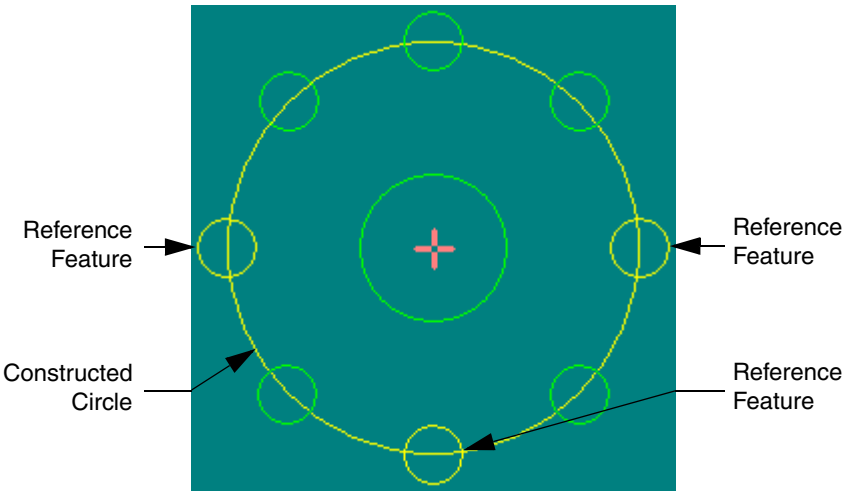
4. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Construct Circle dialog box.

5. [Optional] Click **Options** to change the desired Circle Construction Options; click **OK** to save your changes and close the Options dialog box.



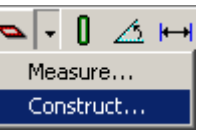
6. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

7. Click **OK** in the Construct Circle dialog box to add the construction to the program and display it in the Measurement Steps window.

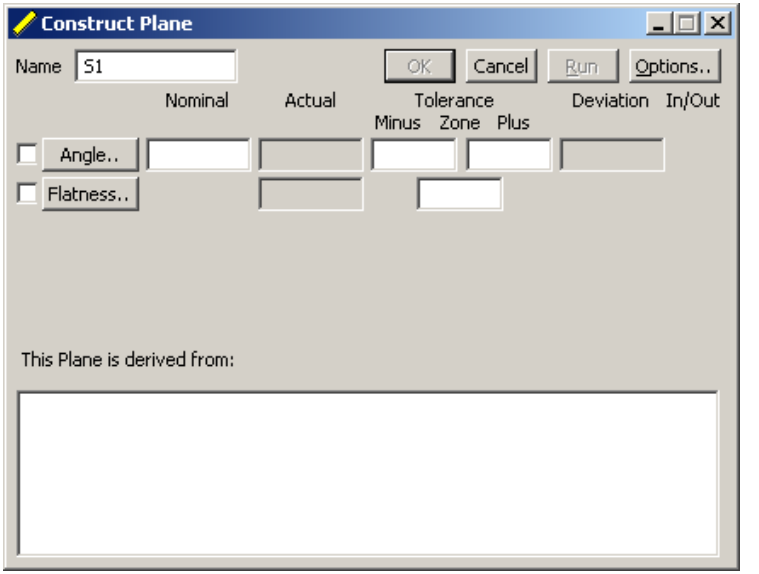


Constructing a Plane

1. Click the **arrow** directly to the right of  in the VMS toolbar and select **Construct** from the list.



   The following dialog box appears:

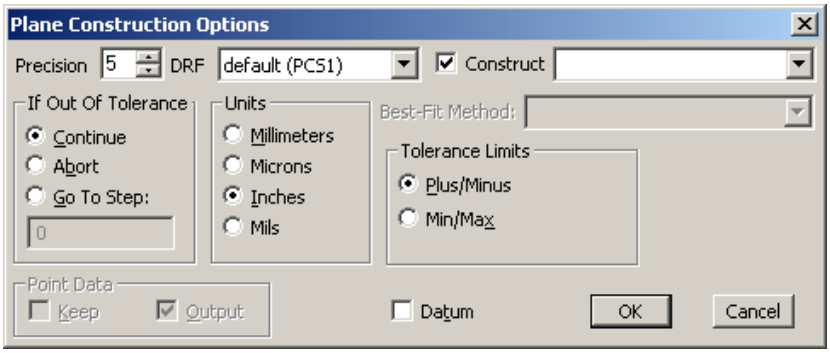


2. Select the first feature to use in the construction by clicking on it in the Features window (the feature color changes to yellow) or selecting it in the Object Names window.

3. Repeat Step 2 to select the second and third features to use in the construction.

4. Specify the attributes to display in the results output by selecting the appropriate checkboxes in the Construct Plane dialog box.

5. [Optional] Click **Options** to change the desired Plane Construction Options; click **OK** to save your changes and close the Options dialog box.



6. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance** boxes.

7. Click **OK** in the Construct Plane dialog box to add the construction to the program and display it in the Measurement Steps window.

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Section 8

More information in VMS Reference Guide, Section 4

Creating a Program

A measurement program consists of individual steps and each step contains the measurement results for a specific feature.

This section describes how to:

- Create a program
- Save a program
- Open a program

How to Create a Program

Before creating a program:

1. Zero the stage (described on page 3-1).
2. Make sure the part is mounted securely on the stage, the part image appears clearly in the Video window, and the part image is focused (described on page 3-3).
3. Select the units of measurement (described on page 3-2).
4. [Optional] Set the Z travel limit (described on page 3-3).

To create a program:

1. Click  in the VMS toolbar.
2. Select the System Alignment and/or define the Part Alignment (described in Section 5).
3. Measure and/or construct features (described in Sections 6 and 7).
4. Specify output options (described in Section 10).
5. Save the program (described on page 8-2).
6. Run the program periodically to check the measurements (described on page 9-1).

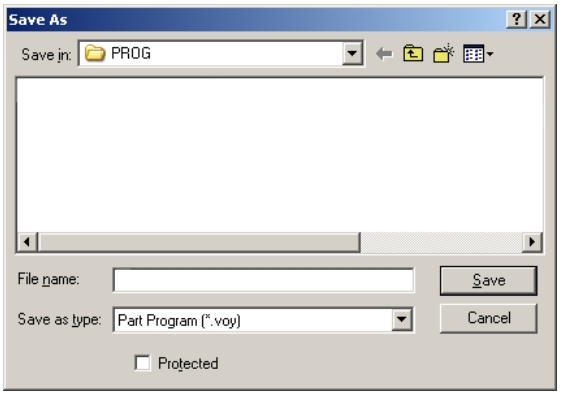
Saving the Measurement Program

1. Click  in the VMS toolbar.

   The the standard Windows Save As dialog box appears:

2. Type a unique name for the program in the **File name** box; change the directory if necessary.

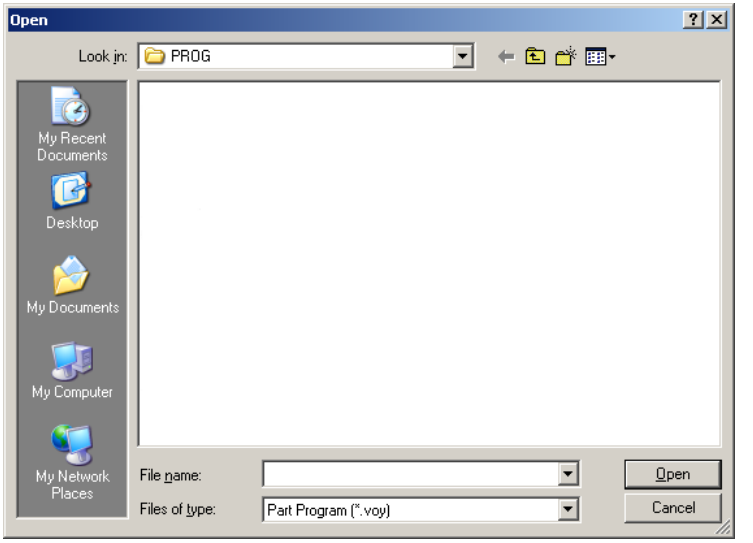
3. Click **Save** to save the program in the selected directory.



Opening a Measurement Program

1. Click  in the VMS toolbar.

   The standard Windows Open dialog box appears:



2. Browse for the program and open it by:
   - Typing the name of the program in the **File name** box and clicking **Open**.
   - Double-clicking on the program.

Section 9

More information in VMS Reference Guide, Section 4

Running a Program

This section describes how to:

- Run a program
- Stop a program

Running a Program

Note: If a program is not currently loaded, create a new program or open an existing one.

To run...	Do this....
the program from the beginning	1. Click  to reset the program. 2. Click  to run the program.
the program from a specific step	1. Select the step to start at by clicking on it in the Measurement Steps window. 2. Click  . 3. Click  to run the program from the selected step.
a single step in the program	1. Select the step to run by clicking on it in the Measurement Steps window. 2. Click  to run the selected step only.

Note: If the part or fixture has been moved since the last run (different stage location), be sure to edit the steps used to define the part alignment before running the program.

Stopping a Program

To stop the program:

- Click  in the VMS toolbar
- Press one of the system E-Stop switches

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Section 10

Outputting Measurement Results

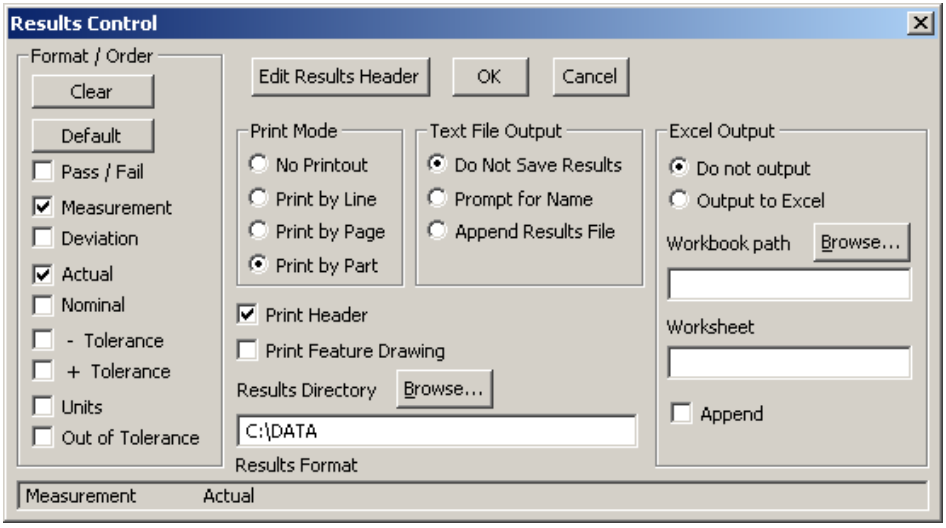
You can output measurement results to a:

- Printer
- Text file
- Microsoft® Excel worksheet

To specify the results output options:

1. Select **Setup / Options / Results Control** from the main menu.

   The following dialog box appears:



2. Specify the results to be output by selecting the desired checkboxes in the **Format / Order** section.

3. To include header information with the output results, select the **Print Header** checkbox.

Note: To change the header information, click **Edit Results Header** and make the desired changes. When finished, click **OK** to save the changes and close the Edit Results Header dialog box.

4. To include a drawing of the part in the output, select the **Print Feature Drawing** checkbox.

5. Select the Print Mode by clicking one of the following radio buttons:
   - **No Printout—**results are not sent to a printer
   - **Print by line**—sends the specified results to the printer after each line of results is generated; this option is only applicable if a dot-matrix printer is used
   - **Print by Page**—sends the specified results to the printer after each full page of results is generated
   - **Print by Part**—sends the specified results to the printer after the results for an entire part are generated

6. Specify the Text File Output mode by clicking one of the following radio buttons:
   - **Do not Save Results**—results are not sent to a file
   - **Prompt for Name**—the software displays a prompt for a file name before sending the results to the specified output file
   - **Append Results File**—the software appends the specified results to the existing data in the specified output file

Note: To change the output results directory, click **Browse** and select the desired directory.

7. Specify the Excel Output mode by clicking one of the following radio buttons:
   - **Do not output**—results are not sent to Excel
   - **Output to Excel**—results are sent to the specified Excel worksheet

Note: To change the workbook path, click **Browse** and select the desired Excel workbook.

Note: To specify a worksheet in the workbook, type its name in the **Worksheet** box.

8. Click **OK** to save the changes and close the Results Control dialog box.

Section 11

Editing a Program

This section describes how to:

- Insert a step
- Edit a step
- Edit a finder
- Delete steps
- Copy steps
- Move steps

Inserting Steps

1. In the Measurement Steps window, select the step the added steps should follow by clicking on it.

2. To insert one or more steps:
   - Measure or construct additional features
   - Right-click in the Measurement Steps window and select **Paste** from the context menu to insert any copied step(s)

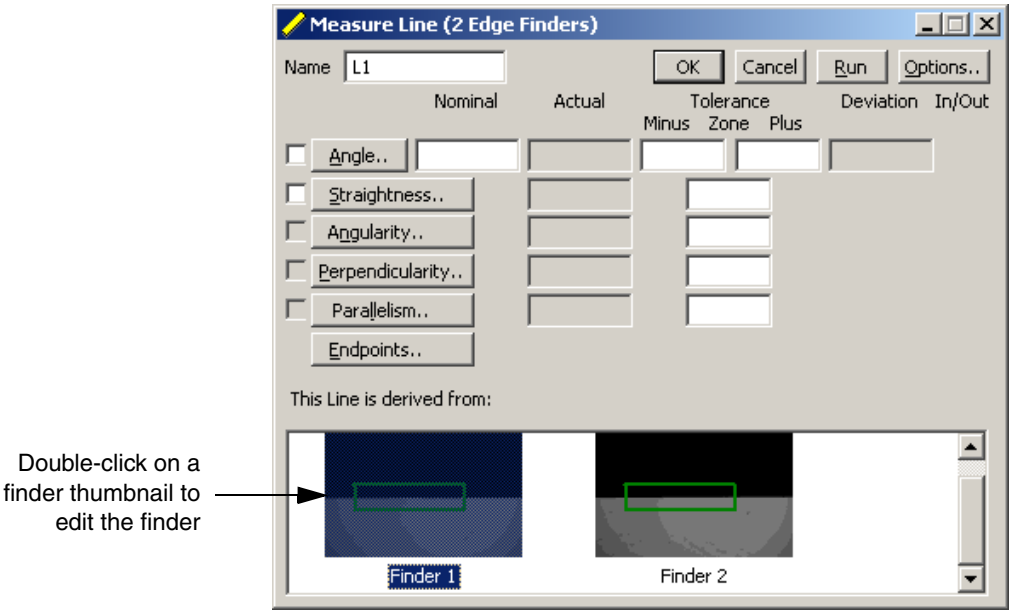
Editing a Step

1. In the Measurement Steps window, double-click on the desired step.

   The measurement/construction dialog box for the selected step appears.

2. Make the desired changes and click **OK**.

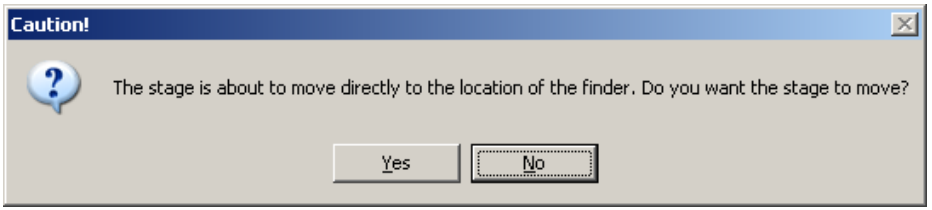
Note: To edit a finder used in the step, double-click on the finder thumbnail and perform Steps 3 through 7 in *Editing a Finder Location*.



Editing a Finder Location

1. In the Measurement Steps window, click on the desired step.
2. Right-click, select **Edit Finder**, and select the finder to edit it.

   The measurement dialog box for the selected step and the following prompt appear:



3. Verify that nothing is in the stage path and click **Yes**.
   - The stage moves to the saved finder location
   - The finder appears in the Video window
   - The feature measurement dialog box appears (finder thumbnail is highlighted, as shown on the previous page)
4. If the finder is not properly aligned to the feature, reposition the stage to align the finder.
5. Double-click in the Video window to run the finder and re-measure the feature.
6. Click  in the Video window toolbar to accept the finder and save it in the step.
7. Click **OK** in the feature measurement dialog box to accept the changes; click Cancel to discard the changes.

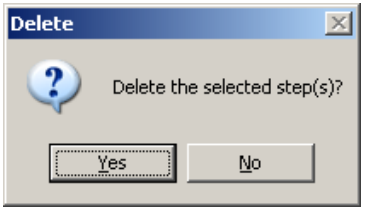
Deleting Steps

1. In the Measurement Steps window, select the desired step(s):

To select...	Do this....
A single step	Click on the desired step.
Multiple steps, in sequence	1. Click on the first step in the sequence. 2. Press and hold the **Shift** key as you click on the last step in the sequence.
Multiple steps, not in sequence	1. Click on the first step you want to delete. 2. Press and hold the **Ctrl** key as you click on the other steps.

2. Right-click in the Measurement Steps window and select **Delete** from the context menu.

   The following confirmation prompt appears:



3. Click **Yes** to delete the selected step(s).

Copying Steps

1. In the Measurement Steps window, select the desired step(s):

To select...	Do this....
A single step	Click on the desired step.
Multiple steps, in sequence	1. Click on the first step in the sequence. 2. Press and hold the **Shift** key as you click on the last step in the sequence.
Multiple steps, not in sequence	1. Click on the first step you want to delete. 2. Press and hold the **Ctrl** key as you click on the other steps.

2. Right-click in the Measurement Steps window and select **Copy** from the context menu.

3. See *Inserting Steps* on page 11-1 for information about inserting the copied steps into the program.

Moving Steps

1. In the Measurement Steps window, select the desired step(s):

To select...	Do this....
A single step	Click on the desired step.
Multiple steps, in sequence	1. Click on the first step in the sequence. 2. Press and hold the **Shift** key as you click on the last step in the sequence.
Multiple steps, not in sequence	1. Click on the first step you want to delete. 2. Press and hold the **Ctrl** key as you click on the other steps.

2. Right-click in the Measurement Steps window and select **Cut** from the context menu.

3. Select the step the moved step(s) should follow by clicking on it in the Measurement Steps window.

4. Right-click in the Measurement Steps window and select **Paste** from the context menu.

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Section 12

Creating a Sample Program

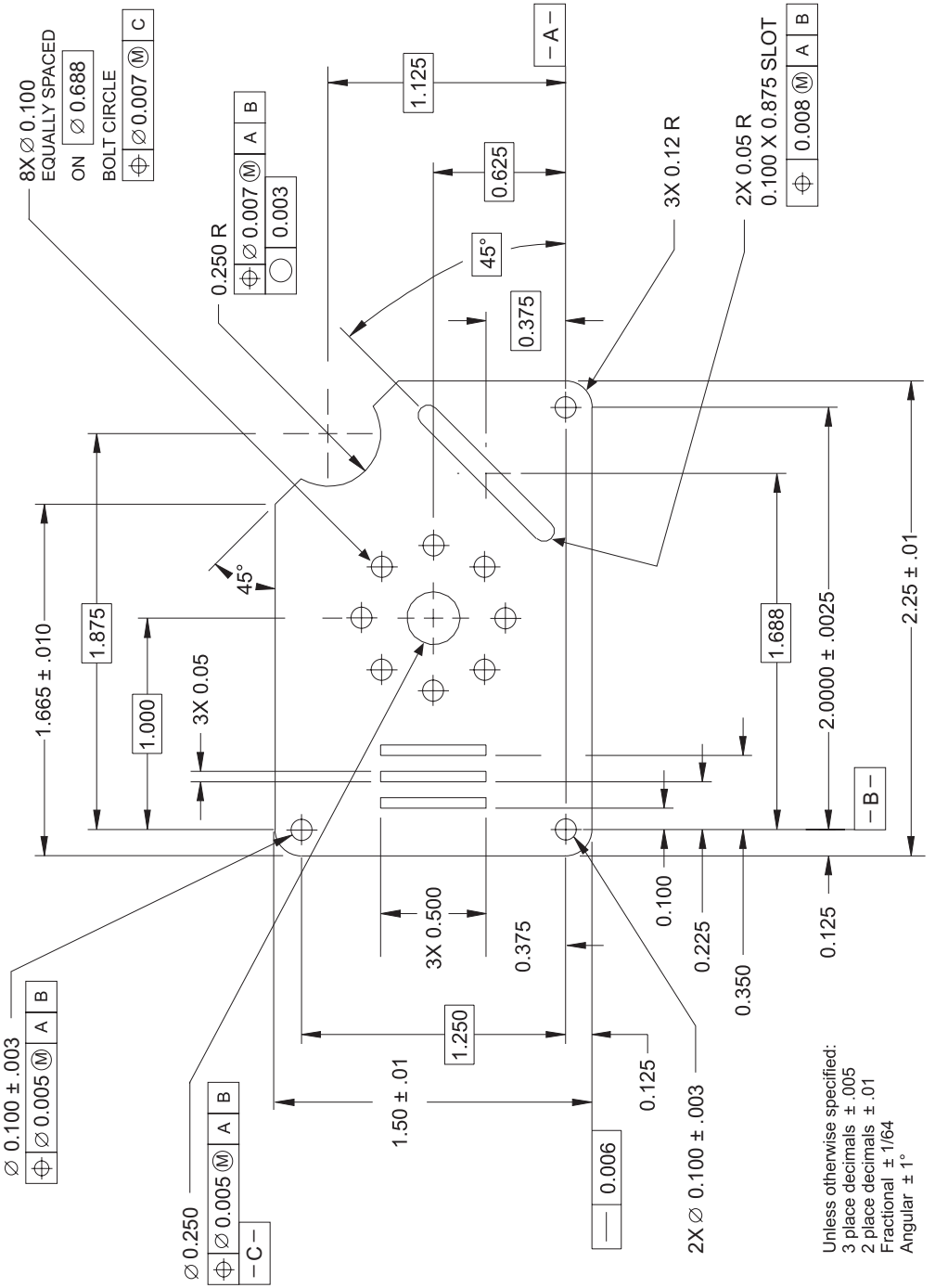
This section describes how to measure the QVI Training Part. The measurements are based on the dimension drawing shown on the next page. The units are in Inches.

Detailed information as to which functions and features you should use is described with the specific measurements, including the dimensions you should look for to verify that the measurements were done properly.

As you measure features, be sure to specify the nominal values and tolerances that are shown in the dimension drawing. If a tolerance is not specified, assume ±0.005 for three-place decimals and ±0.01 for two-place decimals.

Note: In this sample program, you will measure all of the features first, followed by constructing features from measured features. When you create your own measurement programs you can measure and construct features in whatever way is most suitable for you.

Dimension Drawing



1. Set Up the Part and Define the Part Alignment

1. Verify that nothing is in the stage path and click **Zero Stage** in the Stage and Lights window to zero the stage.

2. Place and secure the QVI Training Part on the stage as shown in Figure 5-1 on page 5-1.

3. Use the joystick to move the stage so the bottom edge of the part appears in the Video window.
   - Turn on the backlight so there is sufficient contrast.
   - Raise or lower the Z axis until the image is sharp and focused.

4. Select **Setup / Options / Measurement** from the main menu and click the **Inches** radio button.

5. Click **OK** to close the Measurement Options dialog box.

6. Click  in the Video window toolbar and focus on the bottom edge of the part.

7. Click  in the VMS toolbar.

8. Define the Part Coordinate System (PCS), as described in Section 5.
   - Create an alignment block (described on page 5-2).
   - Measure the lower-left hole (C1), the lower-right hole (C2), and a point (P1) near the upper-left hole (described on page 5-3).
   - Define a reference plane (S1) using C1, C2, and P1 (described on page 5-6).
   - Define a reference line (L1) using C1 and C2 (described on page 5-7).
   - Set the part tilt, part rotation, and part origin (described on page 5-8).

2. Measure and Construct the Features

1. Use this table to perform the first set of measurements:

Measurement	Function	Feature	Dimension
Right edge	Measure	Line (L2)	Angle = 90
Rounded slot edge	Measure	Line (L3)	Angle = 45
Rounded slot edge	Measure	Line (L4)	Angle = 45
Rounded slot corner	Measure FOV	Arc (A1)	Radius = 0.050
Rounded slot corner	Measure FOV	Arc (A2)	Radius = 0.050
Distance between slot corners	—	Distance (D1)	0.875
Distance between slot edges	—	Distance (D2)	0.100
Lower slanted edge	Measure	Line (L5)	Angle = 45
Semicircle on right	Measure Non FOV	Arc (A3)	Radius = 0.250
Upper slanted edge	Measure	Line (L6)	Angle = 45
Top edge	Measure	Line (L7)	Y = 1.375
Upper-left hole	Measure FOV	Circle (C1)	Diameter = 0.100
Upper-left corner	Measure FOV	Arc (A4)	Radius = 0.120
Left edge	Measure	Line (L8)	X = -0.125
Lower-left corner	Measure FOV	Arc (A5)	Radius = 0.120
Bottom edge	Measure	Line (L9)	Y = -0.125
Lower-right corner	Measure FOV	Arc (A6)	Radius = 0.120

2. Click  in the VMS toolbar to save your work.

3. Use this table to perform the second set of measurements:

Measurement	Function	Feature	Dimension
Top edge of left slot	Measure	Line (L10)	Y = 0.875
Left edge of left slot	Measure	Line (L11)	X = 0.100
Bottom edge of left slot	Measure	Line (L12)	Y = 0.375
Right edge of left slot	Measure	Line (L13)	X = 0.150
Top edge of middle slot	Measure	Line (L14)	Y = 0.875
Left edge of middle slot	Measure	Line (L15)	X = 0.100
Bottom edge of middle slot	Measure	Line (L16)	Y = 0.375
Right edge of middle slot	Measure	Line (L17)	X = 0.150
Top edge of right slot	Measure	Line (L18)	Y = 0.875
Left edge of right slot	Measure	Line (L19)	X = 0.100
Bottom edge of right slot	Measure	Line (L20)	Y = 0.375
Right edge of right slot	Measure	Line (L21)	X = 0.150

4. Click  in the VMS toolbar to save your work.

5. Use this table to perform the third set of measurements:

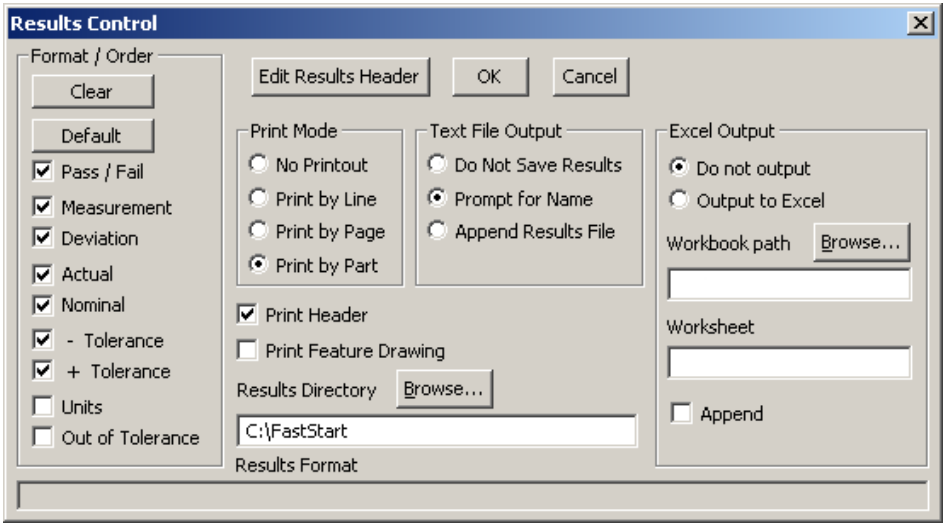
Measurement	Function	Feature	Dimension
Large hole in the middle of the part	Measure FOV	Circle (C4)	Diameter = 0.250
Small hole (1) next to large hole	Measure FOV	Circle (C5)	Diameter = 0.100
Small hole (2) next to large hole	Measure FOV	Circle (C6)	Diameter = 0.100
Small hole (3) next to large hole	Measure FOV	Circle (C7)	Diameter = 0.100
Small hole (4) next to large hole	Measure FOV	Circle (C8)	Diameter = 0.100
Small hole (5) next to large hole	Measure FOV	Circle (C9)	Diameter = 0.100

Measurement	Function	Feature	Dimension
Small hole (6) next to large hole	Measure FOV	Circle (C10)	Diameter = 0.100
Small hole (7) next to large hole	Measure FOV	Circle (C11)	Diameter = 0.100
Small hole (8) next to large hole	Measure FOV	Circle (C12)	Diameter = 0.100
Construct a bolt circle using C5, C6, C7, C8, C9, C10, C11, and C12	Construct	Circle (C13)	—

6. Click  in the VMS toolbar to save your work.

3. Specify the Output Options

1. Select **Setup / Options / Results Control** from the main menu.



2. In the **Format / Order** area, select the following checkboxes:
   - Pass / Fail
   - Measurement
   - Deviation
   - Actual
   - Nominal
   - - Tolerance
   - + Tolerance

3. Click **Edit Results Header** and enter the appropriate header information.

4. Click **OK** in the Edit Results Header dialog box.

5. Select the **Print Header** checkbox.

6. If a printer is connected to the system, click the **Print by Part** radio button to output the measurement results to a printer. Otherwise, click the **No Printout** radio button.

7. Click the **Prompt for Name** radio button to output the measurement results to a text file. Then click **Browse** and create a folder on the C: drive named FastStart.

8. Click **OK** to save the output settings.

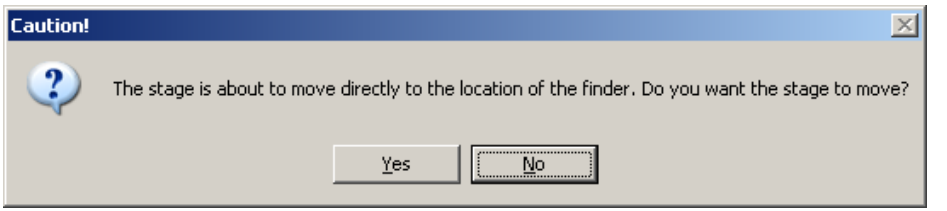
4. Edit the Program

Note: This procedure describes how to edit the finder locations for the reference features used to define the part alignment.

1. Move the QVI Training Part to a different stage location and re-secure it to the stage. This simulates placing an identical part at another stage location.

2. Select circle **C1** by clicking on it in the Measurement Steps window. Then right-click and select **Edit Finder / Circle Finder** from the context menu.

   The measurement dialog box for the selected step and the following prompt appear:



3. Verify that nothing is in the stage path and click **Yes**.

   The stage moves to the saved finder location and the Circular Edge Finder appears in the Video window.

4. Use the joystick to move the stage so the lower-left hole is aligned to the finder.

5. Double-click in the Video window to run the finder and re-measure the feature.

6. Click  in the Video window toolbar to accept the finder and save it in the step.

7. Click **OK** in the feature measurement dialog box to accept the new finder location.

8. Select circle **C2** by clicking on it in the Measurement Steps window. Then right-click and select **Edit Finder / Circle Finder** from the context menu.

9. Repeat Steps 3 through 7 to edit the finder location.

10. Select point **P1** by clicking on it in the Measurement Steps window. Then right-click and select **Edit Finder / Autofocus** from the context menu.

11. Repeat Steps 3 through 7 to edit the finder location.

5. Run the Measurement Program and View the Results

1. Click  in the VMS toolbar to reset the program.
2. Click  in the VMS toolbar to run the program.

   The system measures the QVI Training Part by following the steps in the program and:

   - Displays the results in the Results window
   - Sends the results to the printer (if specified)
   - Sends the results to the specified output file

3. View the results and verify the accuracy of the measurements by checking them against the dimension drawing on page 12-2.

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