VMS

Fast Start Guide

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About This Manual

Welcome!

Quality Vision International, Inc. (QVI) has produced this Fast Start Guide as part of its ongoing effort to provide users with useful, comprehensive documentation. This manual has been developed using documentation standards and a design that enhances readability and makes information easier to find.

NOTE: This manual is current with version 9.x.x of the VMS software.

Structure of this Manual

Section	Description
Getting Started	Describes how to start the software, stage a part and view part features, change the measurement units and coordinates, and access the VMS Help system.
User Interface	Describes the software user interface and joystick controls.
Basics	Describes how to open a program, run a program, and stop a program.
Finders	Describes the commonly used finders available in the VMS software.
Part Alignment	Describes how to define a Part Coordinate System (PCS).
Feature Measurements	Describes how to measure common features.
Feature Constructions	Describes how to construct common features from previously measured or constructed features.
Part Programming	Describes how to create a measurement program, output measurement results, edit a program, and create a sample program to measure the QVI training part.
Reference Information	Describes the software security dongle and license file.

Technical Support

For more information about technical support and customer service for your QVI product, contact the QVI channel partner or the QVI division that provided your QVI system.

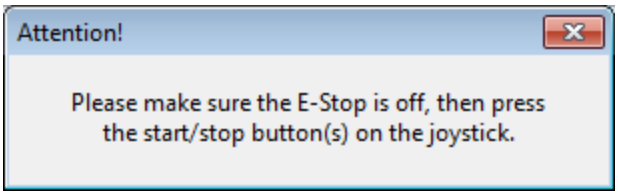
NOTE: Contact information for technical support is on the serial number label on your QVI system.

QVI offers customer service and technical support contracts tailored to meet your specific needs and to protect the value of your investment.

Getting Started

Starting the Software

1. Double-click the VMS application icon on the Windows Desktop.
2. When the following prompt appears, verify the system is not in E-Stop Mode and then press the Stop / Start button(s) on the joystick.



Zeroing the Stage

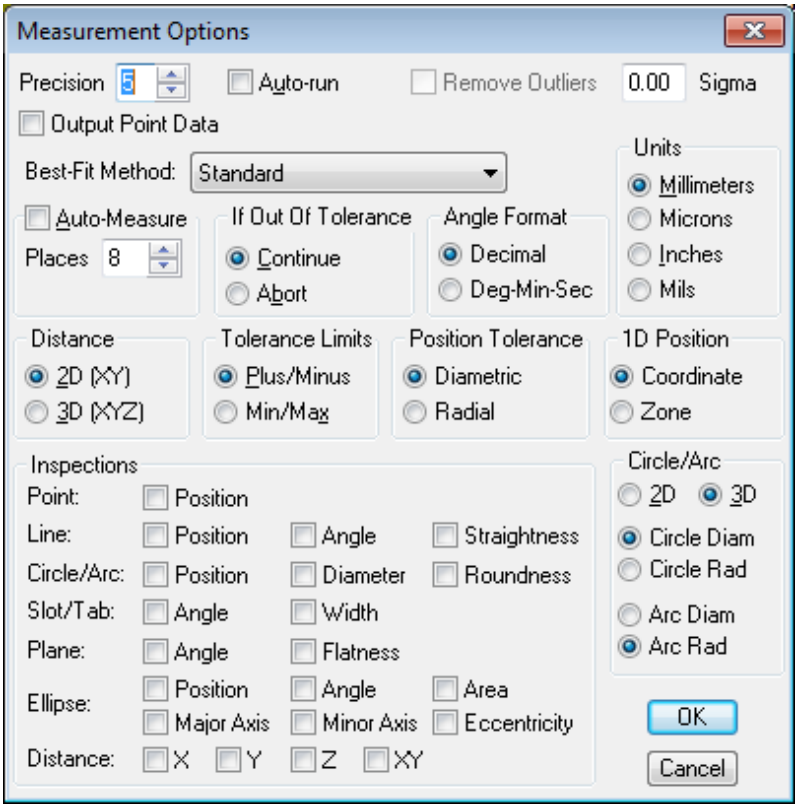
1. Verify the stage path is clear.
2. In the Stage and Lights window, click **Zero Stage** to zero the stages.

   The system drives the X, Y, and Z transports to their home positions.

NOTE: If the Stage and Lights window is not displayed, select the **Windows** ribbon, and then select the **Stage and Lights** check box.

Selecting the Units of Measurement

1. Select the **Setup** ribbon, and then select **Measurement** in the Options section.
2. In the Units section of the Measurement Options dialog box, select the desired units of measurement by selecting the appropriate option.



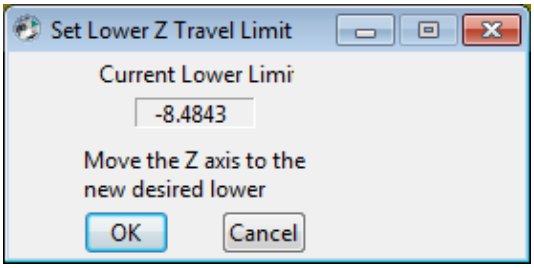
3. Click **OK** to save the changes and close the dialog box.

Staging a Part and Viewing Features

1. Verify the stage glass is clean.
2. Clear the stage of any obstructions.
3. Place the desired part on the stage so it is level (see warnings about stage load capacity and stage glass in your system hardware documentation).
4. Secure the part to the stage so it will not move when the stage moves.
5. Switch to low magnification (if applicable) 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 2-12).
    - To view an edge, use backlight illumination
    - To view a surface, use coaxial illumination
7. Using the joystick, drive the transports so the desired edge or surface appears in the Video window.
8. Adjust the illumination as required.
9. Using the joystick, raise or lower the Z-axis assembly to focus the image.

Setting the Lower Z Travel Limit

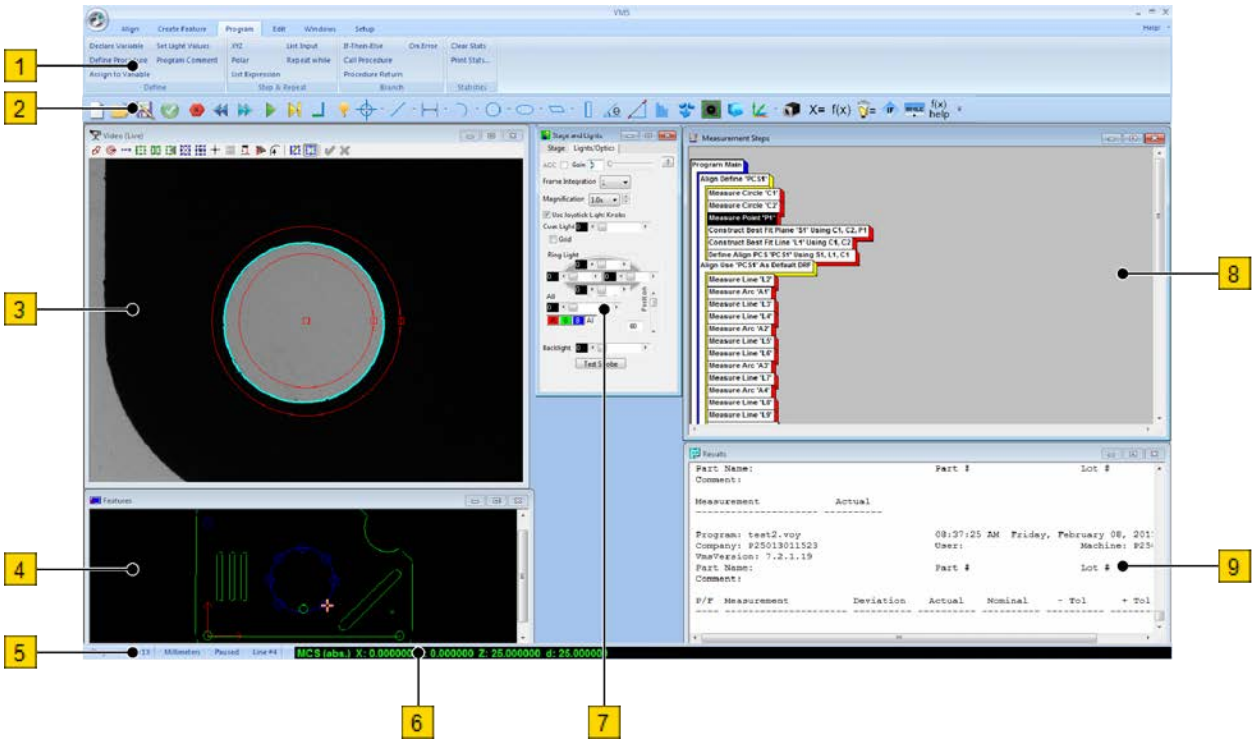
1. Select the **Setup** ribbon, and then select **Z Limit** in the Basic section.
2. Using the joystick, raise or lower the Z-axis assembly to the desired lower limit position.
3. Click **OK** in the displayed dialog box to set the lower limit and prevent Z from moving below the current point until the limit is changed again.



Accessing the VMS Help System

Select **Help > Contents** to access the VMS Help system.

User Interface



1. VMS Ribbons
2. VMS Toolbar
3. Video Window
4. Features Window
5. System Status
6. Digital Readout (DRO)
7. Stage and Lights Window
8. Measurement Steps Window
9. Results Window

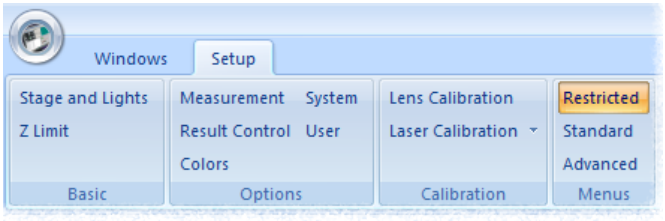
Figure 2-1: Default Screen Layout (Operator View)

VMS Ribbons

The VMS ribbons at the top of the screen provide access to all of the functions in the VMS software. The ribbons replace the menus found in previous versions of the software.

You can control which ribbons are displayed by selecting the desired option in the Menus section on the Setup ribbon.

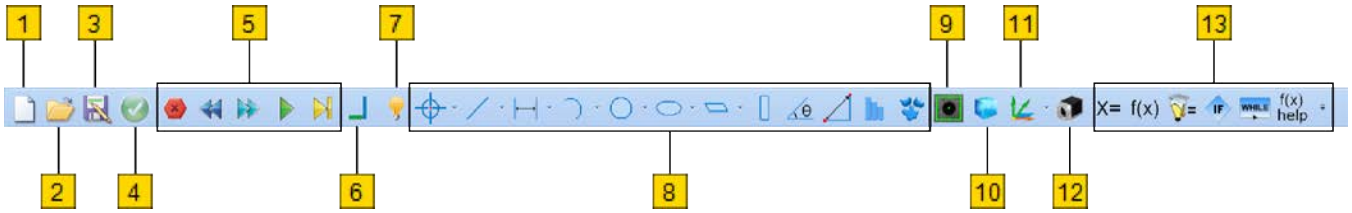
- **Restricted**



- **Standard**

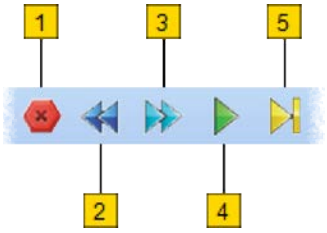
- **Advanced**

VMS Toolbar



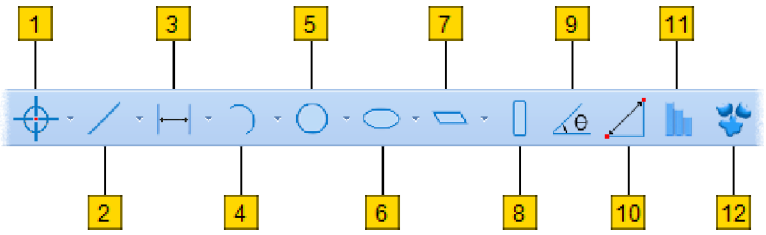
1. New program
2. Open program
3. Save program
4. Accept Finder
5. Program Control Icons
6. Enable stage move confirmation message
7. Display Stage and Lights window
8. Measurement Icons
9. Define Area of Interest
10. Display View3D window
11. Create align block
12. Display Image Acquisition dialog
13. Programming Icons

Program Control Icons



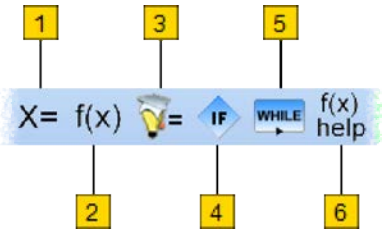
1. Stop program
2. Reset program
3. Jump to step
4. Run program
5. Run single step

Measurement Icons



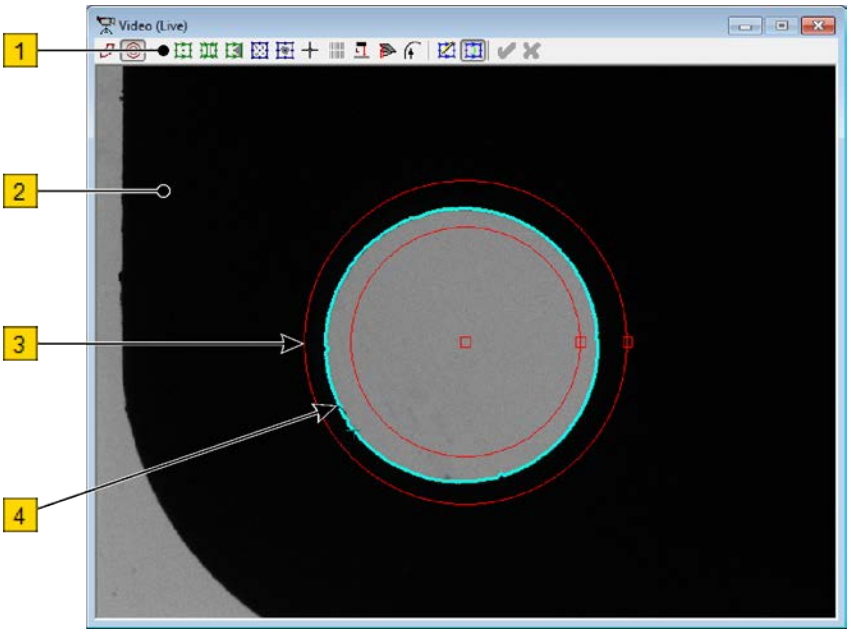
1 Define Point
2 Define Line
3 Define Line Width
4 Define Arc
5 Define Circle
6 Define Ellipse
7 Define Plane
8 Construct Slot/Tab
9 Measure Angle
10 Measure Distance
11 Define Histogram
12 Blob Analysis

Programming Icons



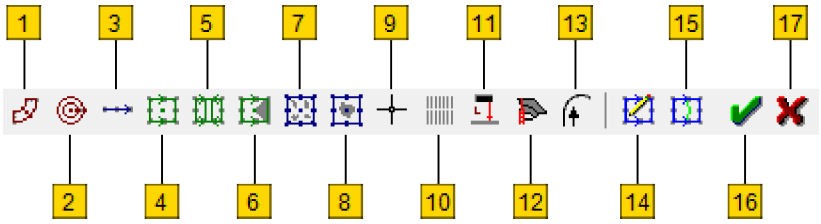
1 Create variable assignment
2 Create procedure call
3 Displays Set Light Values dialog box
4 Create If-Then-Else statement
5 Create While statement
6 Display Function and Structure Help

Video Window



1. Video Window Toolbar
2. Live video image
3. Selected finder (red)
4. Found edge points (cyan)

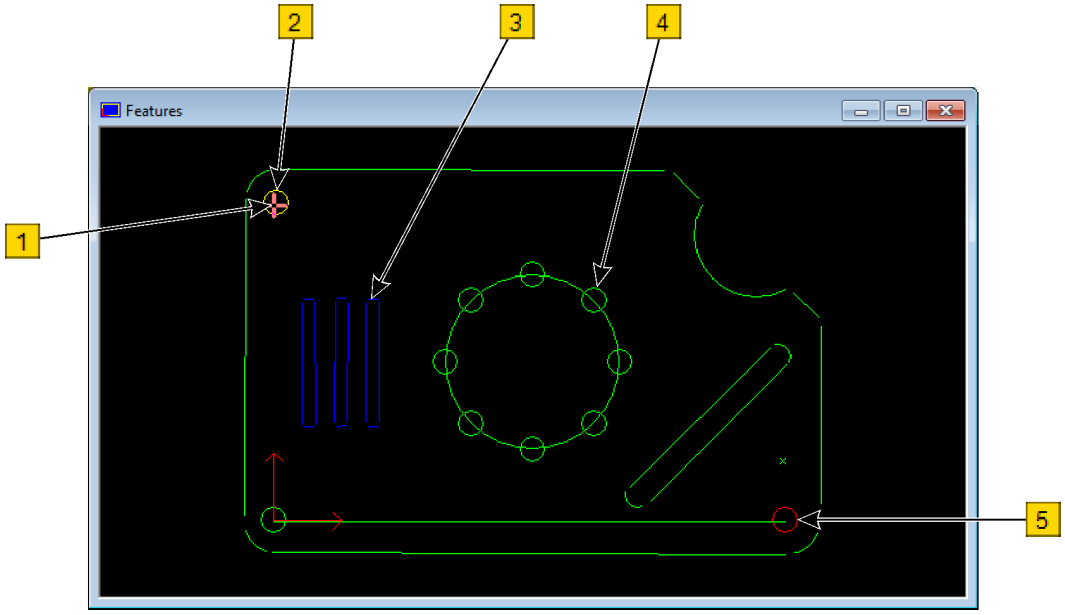
Video Window Toolbar



1. Arc Edge Finder (see Using the Arc Edge Finder on page 4-12)
2. Circle Edge Finder (see Using the Circle Edge Finder on page 4-10)
3. Single Point Edge Finder (see Using the Single Point Edge Finder on page 4-4)
4. Line Edge Finder (see Using the Line Edge Finder on page 4-6)
5. Line Width Edge Finder (see Using the Line Width Edge Finder on page 4-8)
6. Corner Point Edge Finder
7. Blob Finder (see Using the Blob Finder on page 4-17)
8. Centroid Point Finder
9. Crosshair Finder (see Using the Crosshair Finder on page 4-14)
10. Autofocus Finder (see Using the Autofocus Finder on page 4-15)
11. Laser Finder
12. SmartFinder
13. Edge Trace Finder
14. Edit Finder Parameters
15. Show Finders While Running
16. Accept Finder
17. Reject Finder

Features Window

The Features window shows all the measured and constructed features.



1 Current stage location

2 **Yellow** — Selected feature

3 **Blue** — Feature not selected or inspected

4 **Green** — All measured attributes passed inspection

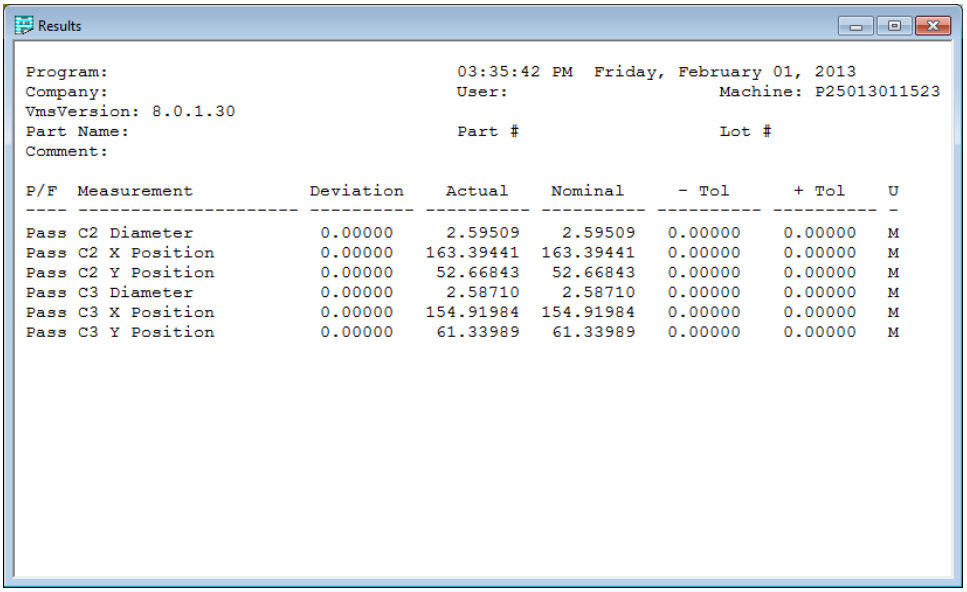
5 **Red** — One or more measured attributes failed inspection

Right-click in the Features window to access the following options:

- **Stage View** displays a graphical representation of the stage
- **Part View** (shown above) displays a graphical representation of the part being measured
- **Set Zoom Factor** specifies the magnification factor
- **Set Mouse Z** sets the Z coordinate that is used when you move the stage using the mouse in the Features window
- **Inverse Zoom** changes the appearance of the zoom box
- **Select All Features** selects all the features in the Features window
- **Delete Selected Features** deletes all selected features
- **Print Part** prints a drawing of the Features window in Part View
- **Auto-build steps for Features** inserts a measurement step in the program for each select 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 access the following options:

- **Copy** copies the selected text
- **Clear** deletes all the displayed text
- **Select All** selects all the displayed text

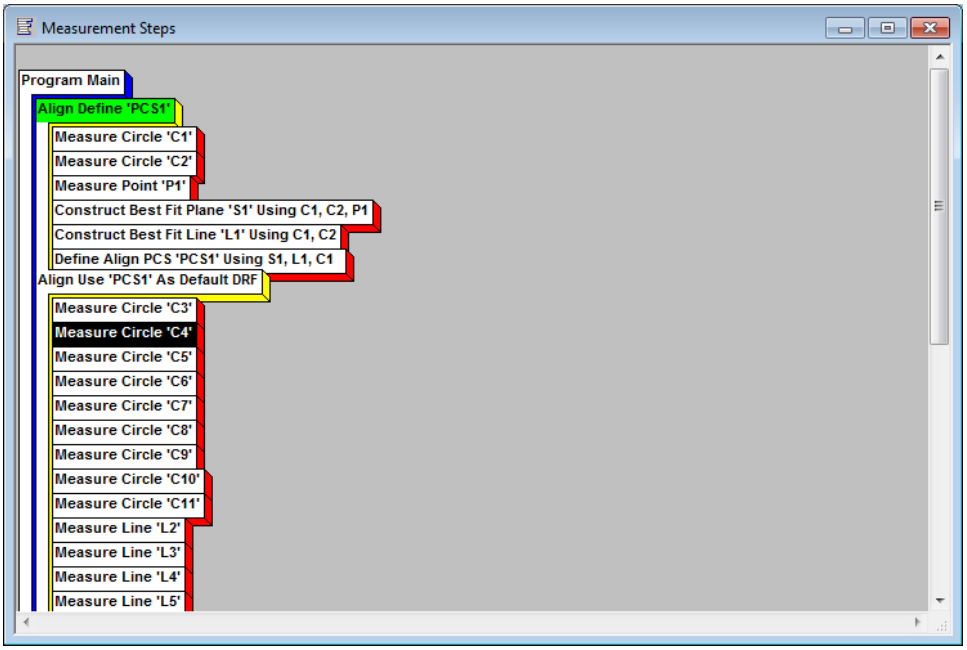
Measurement Steps Window

The Measurement Steps window shows all the steps in the program, in the order the system will perform them to measure the part.

The steps can be displayed as text, as 3D blocks (shown below), or in a tree view. To change the view, right-click in the Measurement Steps window and select the desired option.

When displayed as 3D blocks, the steps have the following characteristics:

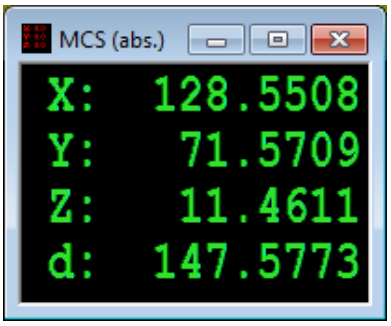
- Colors and stacking appearance show different levels in the program, indicating which steps in the program are contained in or controlled by other steps in the program
- Each block includes a brief description of the step
- The color on the top surface of each block changes to indicate special conditions:
    - **Black with White text** indicates the step has been selected
    - **Bright Green** indicates the next step in the program when you pause the program
    - **Dark Green** indicates the selected step is the next step in the program
    - **Red with Black Text** indicates the selected step is being edited



DRO Window

Select the **Windows** ribbon, and then select the **Digital Read Out** check box to display the DRO window, which shows 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 reappears 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 access the following options:

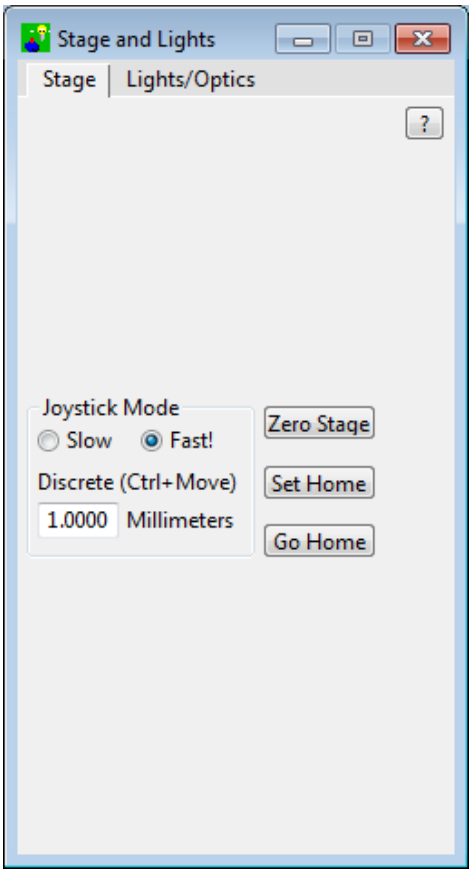
- **Zero DRO** zeros the digital readouts
- **Show MCS** displays the coordinates using the Machine Coordinate System (MCS)
- **Show PCS** displays the coordinates using the Part Coordinate System (PCS)

Stage and Lights Window

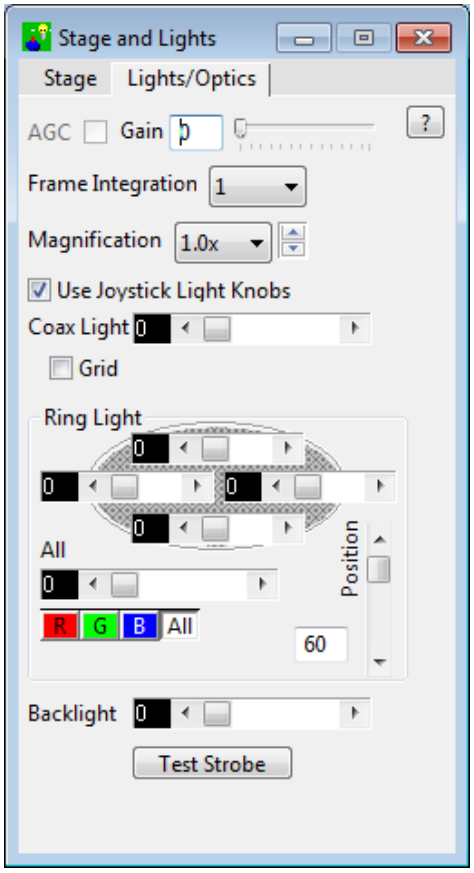
Click  on the VMS Toolbar to display the Stage and Lights window.

Controls on the **Stage tab** include:

- **Zero Stage** button: Zeros the stages
- **Set Home** button: Sets the home position
- **Go Home** button: Drives the stages to the home position
- **Slow** and **Fast!** options: Controls stage response to joystick deflection
- **Discrete** box: Controls the distance the stage will move when you hold down Ctrl while using the joystick



Controls on the **Lights/Optics tab** include:



- **AGC** check box: Turns on automatic gain control
- **Gain** slider: Sets the camera sensitivity
- **Frame Integration** drop-down list: Controls how many times the exposure time is multiplied
- **Magnification** drop-down list: Changes the magnification (if applicable)
- **Use Joystick Light Knobs** check box: Enables the light control knobs on the joystick
- **Coax Light** slider: Adjusts the intensity of the coaxial light (direct illumination)
- **Ring Light** slider: Adjusts the light intensity in the four quadrants of the programmable ring light
    - Use the **All** slider to adjust all four quadrants equally
    - Use the **Ring Width** slider (not shown in the above image) to control the number of rings that are on (systems with a multi-ring programmable ring light)
    - Use the **R**, **G**, **B**, and **All** buttons to use Red, Green, Blue, and White light, respectively (systems with a multi-color programmable ring light)
    - Use the **Position** slider to adjust the Z position of the illuminator (systems with a motorized programmable ring light)
- **Backlight** slider: Adjusts the intensity of the LED backlight
- **Test Strobe** button: Turns on the strobe lights for a few seconds so you can see what the video image will look like when strobing is on

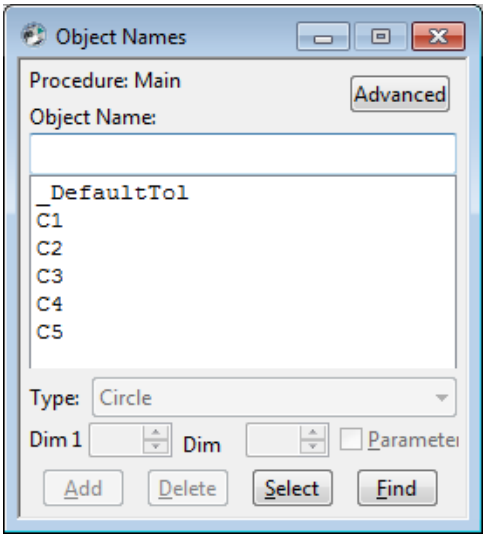
NOTE: The optimum light level varies depending on the part and the type of lighting used. When measuring features, try using different light levels.

Object Names Window

Select the **Windows** ribbon, and then select the **Object Names** check box to display the Object Names window, which displays a list of all the features that have been measured and constructed.

NOTE: The software displays the Object Names window automatically when you select a construct function.

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



Joystick Controls

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 back (negative Y)
Along the Z axis	Rotate the knob on top of the joystick to the left (counterclockwise) to raise (positive Z) the optics, and rotate the knob to the right (clockwise) to lower (negative Z) the optics

Basics

Opening a Measurement Program

1. Click  on the VMS Toolbar (or press Ctrl+O).
2. In the standard Windows Open dialog box, browse for the desired routine and do either of the following to open it:
   - Type the name of the routine in the File Name box and click **Open** (or press Enter).
   - Double-click the program you want to open.

NOTE: You do not need a measurement program in order to measure a part; you can simply mount a part on the stage or in a fixture and start measuring features.

Running a Measurement Program

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. See Editing a Program on page 8-5.

To run…	Do this…
The program from the beginning	1. Click  (or press Ctrl+R) to reset the program. 2. Click  (or press F5) to run the program.
The program from a specific step	1. Select the step to you want to start at by clicking it in the Measurement Steps window. 2. Click  (or press Ctrl+G) to jump to the selected step. 3. Click  (or press F5) to run the program from the selected step.
A single step in the program	1. Select the step you want to run by clicking it in the Measurement Steps window. 2. Click  (or press F8) to run the selected step only.

Stopping a Measurement Program

You can stop a measurement program at any time by clicking  on the VMS Toolbar, by pressing **Ctrl+Break**, or by pressing one of the system E-Stops.

Finders

About Finders

Finders are on-screen tools used to collect point data for measuring features on parts. Select a finder in the Video window that is similar to the shape of the feature you want to measure. For example, select the Line Edge Finder to measure a straight edge or select the Arc Edge Finder to measure a curved edge. Each finder returns (finds) one or more points from the feature on the part. These returned points help you measure parts using the measurement programs that you create.

You can rotate, resize, and move finders to help you measure a feature. The flexibility and accuracy of the finders is an important part of the accurate measurement capability of the VMS software.

Types of Finders

Icon	Displays this Finder…	Description
	Arc Edge Finder	Defines all points on a radius
	Circle Edge Finder	Defines all points on a circle
	Single Point Edge Finder	Defines a single point on an edge
	Line Edge Finder	Defines multiple points along a straight or slightly curved edge
	Line Width Edge Finder	Defines multiple points along two parallel straight edges
	Blob Finder	Locates regular or irregular shapes by finding connected sets of pixels within a given brightness range
	Crosshair Finder	Defines a single point
	Autofocus Finder	Finds the optimal focus point

NOTE: This manual describes the most commonly used finders. For information about other finders available in VMS, see the VMS Help System for more information.

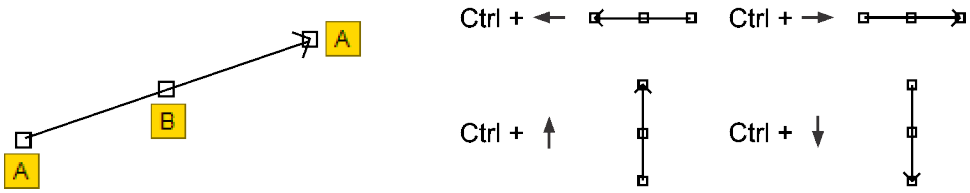
If a Finder Fails

Cause	What to Do
Dirty stage glass	Clean the stage glass before staging a part
Part moved during stage move	Secure the part to the stage or in a fixture 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 or the Video window
Incorrect finder parameters	Change finder parameters as required

Using the Single Point Edge Finder

1. Position an edge in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click on the Video window toolbar to display the Single Point Edge finder.
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 either outside handle (A) while dragging the mouse.
Resize the finder	Click either outside handle (A) while dragging the mouse.
Move the finder	Click the center handle (B) while dragging the mouse.



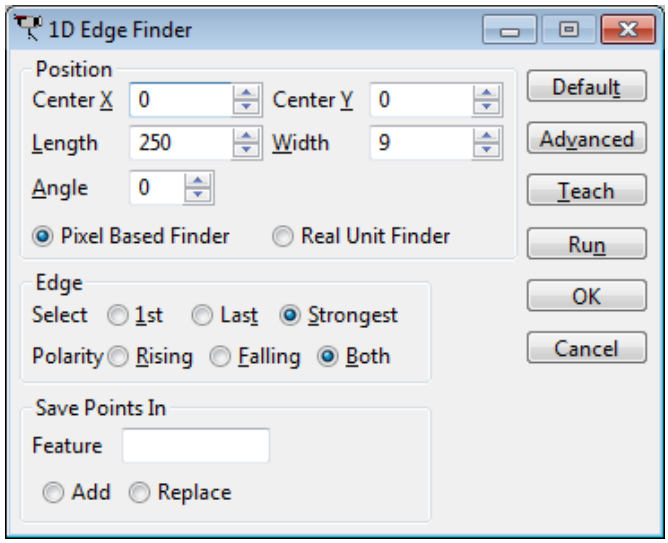
NOTE: Use the Ctrl key and arrow keys to rotate the finder quickly as shown.

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

Point Edge Finder Parameters

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

- **Position** parameters
  - **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
  - **Length** specifies the size in scan direction, perpendicular to the edge
  - **Width** specifies the size perpendicular to the scan direction, parallel to the edge
  - **Angle** specifies the angle (in degrees) of rotation of the finder — 0 represents no rotation, and all other values up to 359 rotate the finder to the left (counterclockwise direction)
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
- **Edge** parameters
  - **Edge Select** specifies which edge will be used during edge detection — **1st** edge, **Last** edge, or **Strongest** edge
  - **Edge Polarity** specifies the polarity of the edge used during edge detection — **Rising** edge (dark-to-light), **Falling** edge (light-to-dark), or **Both**

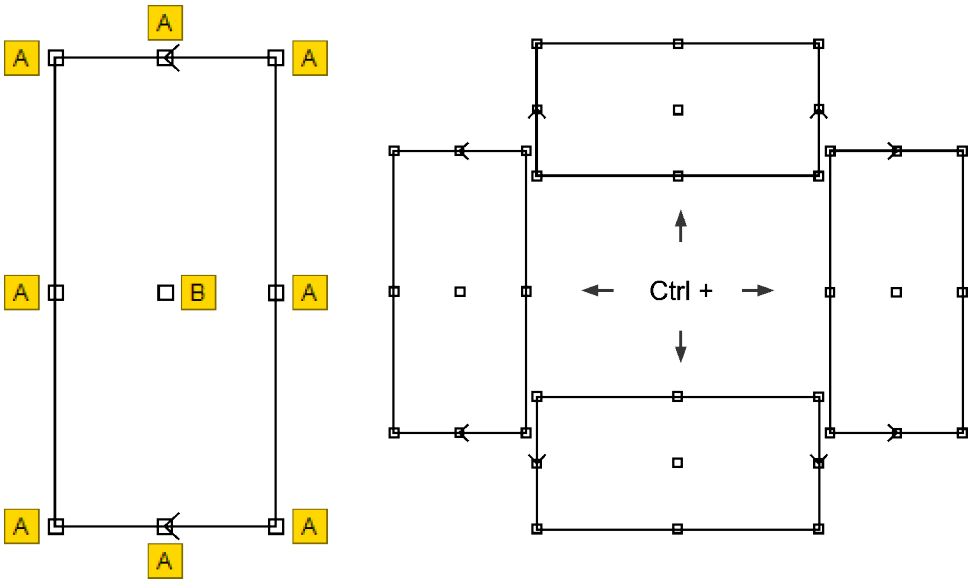


NOTE: Click **Advanced** to view additional parameters.

Using the Line Edge Finder

1. Position a straight edge in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  on the Video window toolbar to display the Line Edge finder.
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 any outside handle (A) while dragging the mouse.
Resize the finder	Click any outside handle (A) while dragging the mouse.
Move the finder	Click the center handle (B) while dragging the mouse.



NOTE: Use the Ctrl key and arrow keys to rotate the finder quickly as shown.

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

Line Edge Finder Parameters

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

- **Position** parameters
  - **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
  - **Length** specifies the size in scan direction, perpendicular to the edge
  - **Width** specifies the size perpendicular to the scan direction, parallel to the edge
  - **Angle** specifies the angle (in degrees) of rotation of the finder — 0 represents no rotation, and all other values up to 359 rotate the finder to the left (counterclockwise direction)
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
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  - **Edge Select** specifies which edge will be used during edge detection — **1st** edge, **Last** edge, or **Strongest** edge
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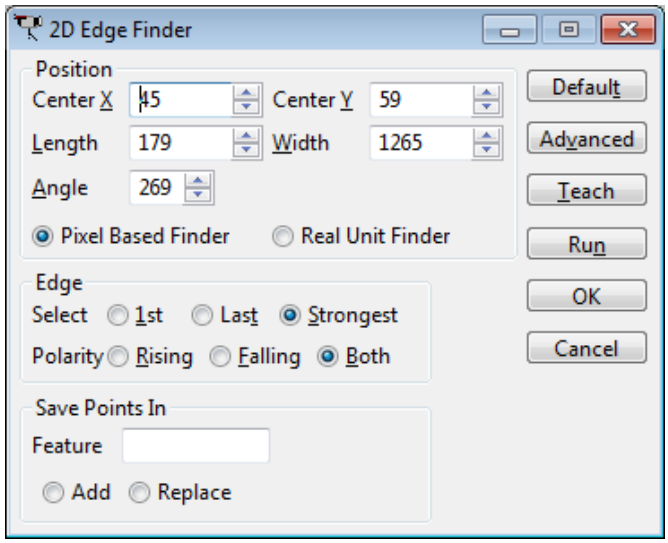
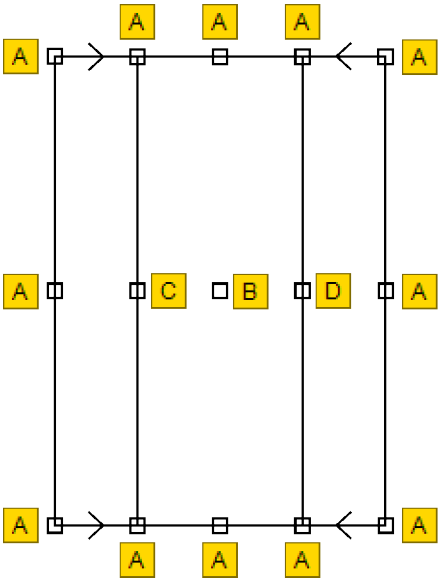


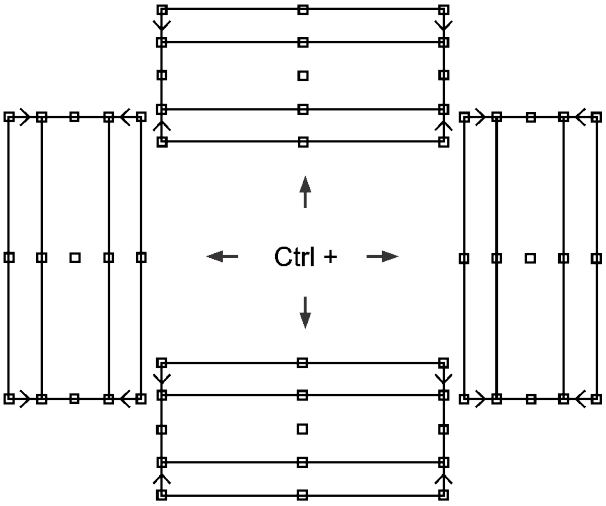
NOTE: Click **Advanced** to view additional parameters.

Using the Line Width Edge Finder

1. Position two parallel straight edges in the Video window.
2. Adjust the backlight illumination for sufficient contrast and focus the edge.
3. Click  on the Video window toolbar to display the Line Width Edge finder.
4. Resize, rotate, and/or reposition the finder so it is over the two desired edges.

To…	Do this…
Rotate the finder	Right-click any outside handle (A) while dragging the mouse.
Resize the finder	Click any outside handle (A) while dragging the mouse.
Move the finder	Click the center handle (B) while dragging the mouse.
Resize the inner boundaries	Click the appropriate inside handle (C or D) while dragging the mouse.





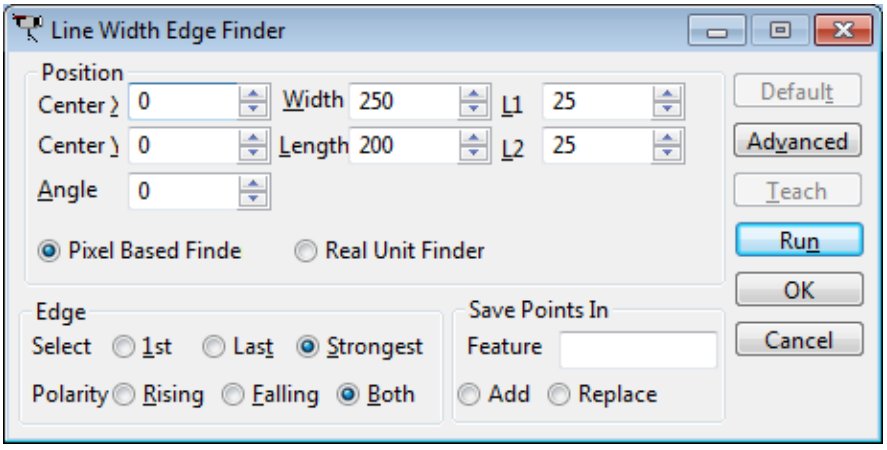
NOTE: Use the Ctrl key and arrow keys to rotate the finder quickly as shown.

5. If necessary, change the desired Line Width Edge finder parameters (described next).
6. Double-click in the Video window to run the finder.

Line Width Edge Finder Parameters

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

- **Position** parameters
  - **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
  - **Length** specifies the size in scan direction, perpendicular to the edge
  - **Width** specifies the size perpendicular to the scan direction, parallel to the edge
  - **L1** and **L2** specify the size of the first and second search areas
  - **Angle** specifies the angle (in degrees) of rotation of the finder — 0 represents no rotation, and all other values up to 359 rotate the finder to the left (counterclockwise direction)
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
- **Edge** parameters
  - **Edge Select** specifies which edge will be used during edge detection — **1st** edge, **Last** edge, or **Strongest** edge
  - **Edge Polarity** specifies the polarity of the edge used during edge detection — **Rising** edge (dark-to-light), **Falling** edge (light-to-dark), or **Both**

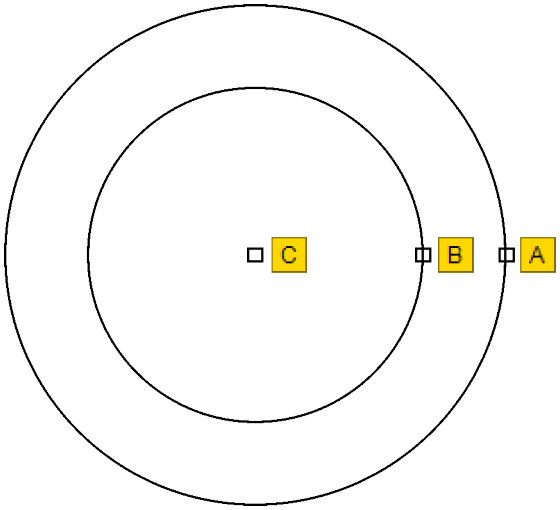


NOTE: Click **Advanced** to view additional parameters.

Using the Circle 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  on the Video window toolbar to display the Circle Edge finder.
4. Position the inner circle of the finder inside the feature and the outer circle outside the feature; resize and/or reposition the finder if necessary.

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

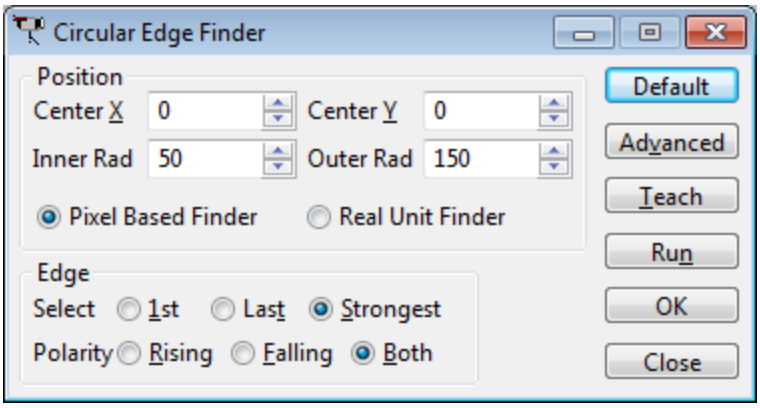


5. If necessary, change the desired Circle Edge finder parameters (described next).
6. Double-click in the Video window to run the finder.

Circle Edge Finder Parameters

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

- **Position** parameters
  - **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
  - **Inner Rad** and **Outer Rad** specify the radius of the inner circle and the radius of the outer circle
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
- **Edge** parameters
  - **Edge Select** specifies which edge will be used during edge detection — **1st** edge (counted from inner diameter to outer diameter), **Last** edge, or **Strongest** edge
  - **Edge Polarity** specifies the polarity of the edge used during edge detection — **Rising** edge (dark-to-light), **Falling** edge (light-to-dark), or **Both**

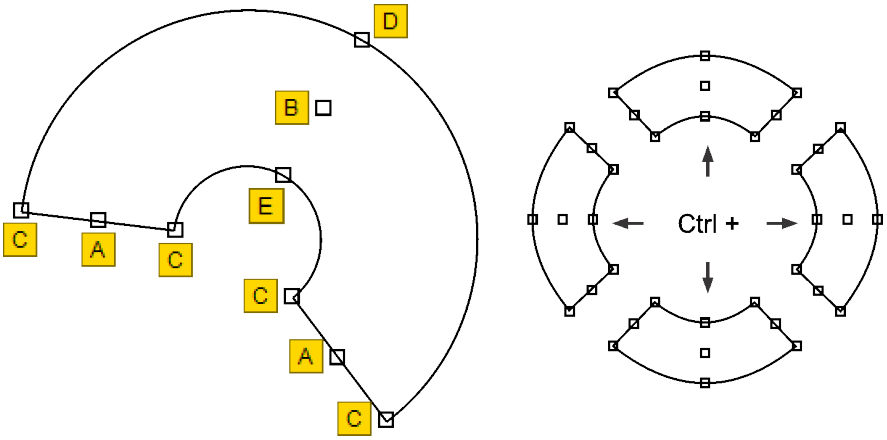


NOTE: Click **Advanced** to view additional parameters.

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  on the Video window toolbar to display the Arc Edge finder.
4. Resize, rotate, and/or reposition the Arc Edge finder so it matches the curve of the feature you want to measure.

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



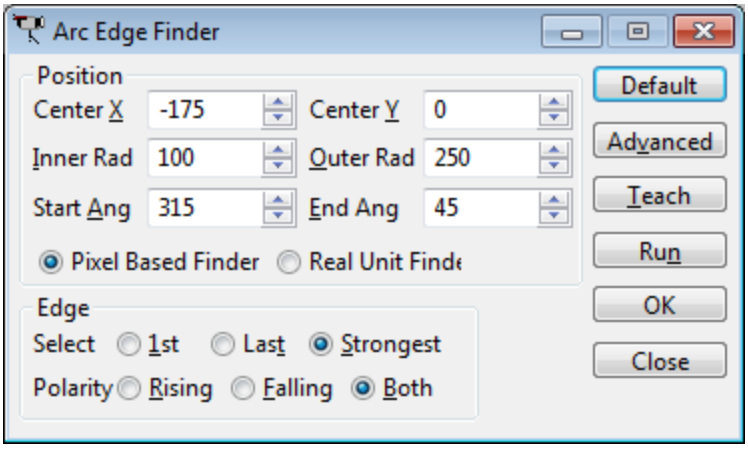
NOTE: Use the Ctrl key and arrow keys to rotate the finder quickly as shown.

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

Arc Edge Finder Parameters

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

- **Position** parameters
  - **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
  - **Inner Rad** and **Outer Rad** specify the radius of the inner arc and the radius of the outer arc
  - **Start Ang** specifies the angle of rotation of the first edge of the finder
  - **End Ang** specifies the angle of rotation of the second edge of the finder
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
- **Edge** parameters
  - **Edge Select** specifies which edge will be used during edge detection — **1st** edge (counted from inner diameter to outer diameter), **Last** edge, or **Strongest** edge
  - **Edge Polarity** specifies the polarity of the edge used during edge detection — **Rising** edge (dark-to-light), **Falling** edge (light-to-dark), or **Both**



NOTE: Click **Advanced** to view additional parameters.

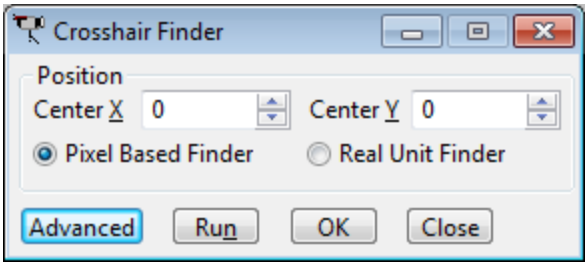
Using the Crosshair Finder

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

Crosshair Finder Parameters

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

- **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
- Select the **Pixel Based Finder** option to display the finder position in number of pixels or select the **Real Unit Finder** option to display the finder position in millimeters



NOTE: Click **Advanced** to view additional parameters.

Using the Autofocus Finder

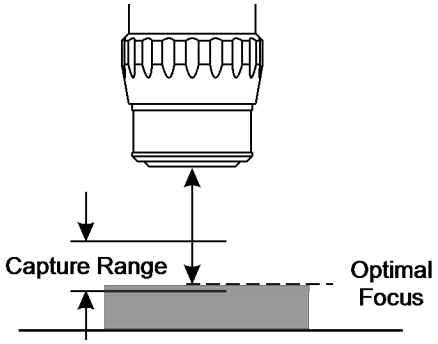
1. Position a surface or edge in the center of the Video window.
2. Switch to high magnification (if applicable), and reposition the surface or edge as required.
3. Using the appropriate sliders in the Stage and Lights window, adjust the illumination.
    - Use backlight illumination to focus an edge.
    - Use coaxial light or PRL illumination to focus a surface.
4. Using the joystick, raise or lower the optical assembly to manually focus (by eye) the edge or surface displayed in the Video window.
5. Click  on the Video window toolbar to display the Autofocus finder.
6. Based on the image displayed in the Video window, select the appropriate focus type in the Autofocus parameters dialog box.

Click…	To perform…
	an **edge focus** on a backlit, vertical edge
	an **edge focus** on a backlit, horizontal edge
	a **surface focus** on a textured surface
	a **grid focus** on a smooth surface (only available on systems equipped with the optional grid projector)
	a **laser focus** on a surface (only available on systems equipped with the optional TTL laser)

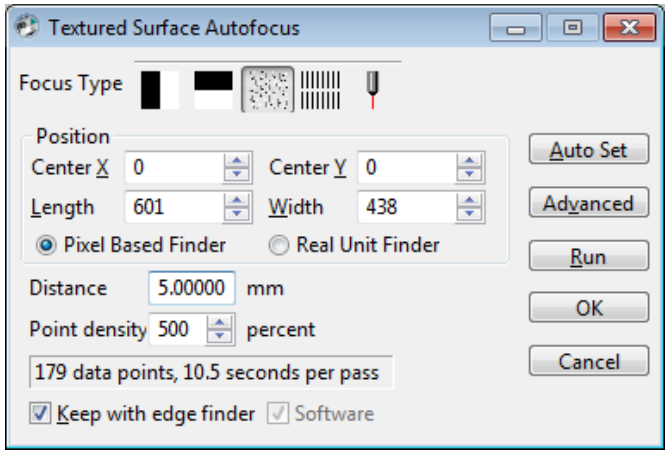
7. If necessary, resize the Autofocus finder by dragging the edge or corner of the finder graphic to the desired rectangular size.
8. If necessary, change the desired Autofocus finder parameters (described next).
9. Double-click in the Video window to run the finder.

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

- **Focus Type** (see the table in Step 6 on the previous page)
- **Position** parameters
  - Use the **Center X** and **Center Y** boxes to change the center location of the finder
  - Use the **Length** and **Width** boxes to resize the finder
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
- **Distance** specifies the distance the system will move in Z to obtain the optimal focus (see illustration)
  - Increase the Distance value to increase the capture range
  - Decrease the Distance value to focus more quickly



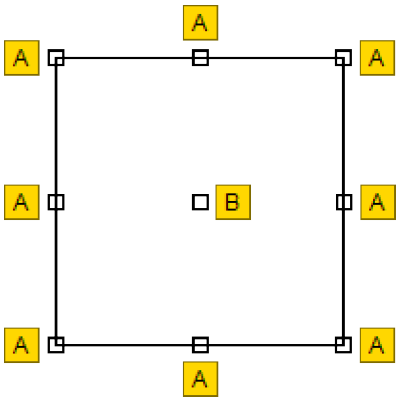
- **Point density** increases or decreases the number of data points used to calculate the Z position during an autofocus
- Select the **Keep with edge finder** check box to include an automatic focus for any finder



NOTE: Click **Advanced** to view additional parameters.

1. Position the desired features in the Video window.
2. Adjust the illumination and focus the features.
3. Click  on the Video window toolbar to display the Blob finder.
4. Resize, rotate, and/or reposition the finder so it is entirely over the desired features.

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



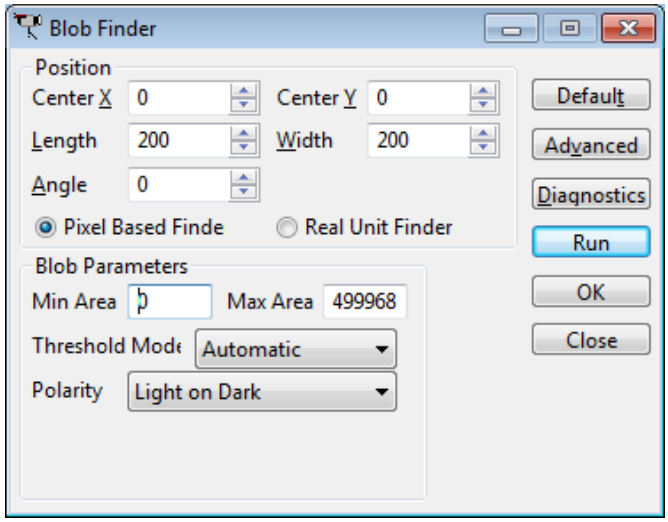
5. If necessary, change the desired Blob finder parameters (described next).
6. Double-click in the Video window to run the finder.

NOTE: Since the Blob finder returns more than one feature result, it requires a special Blob Analysis step that extracts the feature results into an array of Blob features. See the VMS Help System for more information.

Blob Finder Parameters

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

- **Position** parameters
  - **Center X** and **Center Y** specify the X location and Y location of the center handle in the finder with respect to the center of the field of view — **to center the finder in the Video window, set each of these to 0**
  - **Length** and **Width** specify the size of the finder
  - **Angle** specifies the angle (in degrees) of rotation of the finder — 0 represents no rotation, and all other values up to 359 rotate the finder to the left (counterclockwise direction)
  - Select the **Pixel Based Finder** option to display the finder position and AOI dimensions in number of pixels or the **Real Unit Finder** option to display the finder position and AOI dimensions in millimeters
- **Blob** parameters
  - **Min Area** and **Max Area** specify the minimum and maximum blob size (in pixels) that will be included in the results
  - **Automatic** threshold mode analyzes the selected area of the image and chooses a threshold based on the histogram
  - **Manual** threshold mode allows you to set the minimum and maximum brightness value
  - **Polarity** specifies whether the blobs are the light or dark objects in the Video window



NOTE: Click **Advanced** to view additional parameters.

Part Alignment

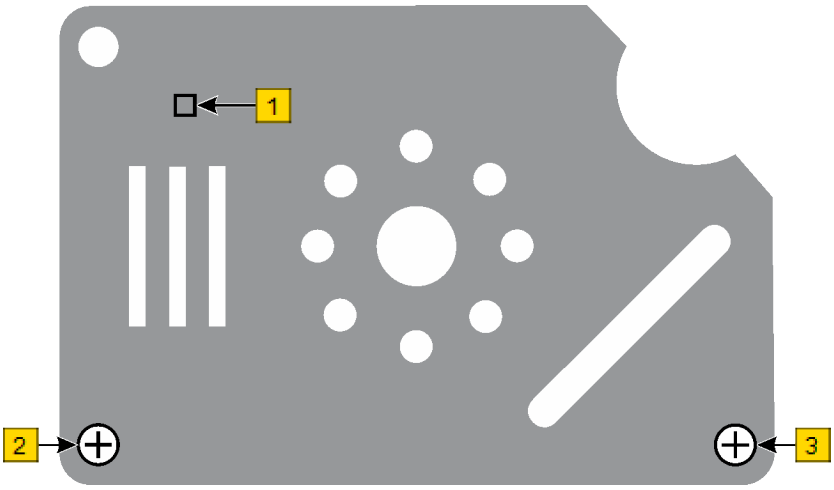
About Part Alignment

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 located, as long as you specify the reference feature locations first.

Part alignment involves the following basic steps:

1. Create an alignment block (see page 5-3).
2. Measure reference features (see page 5-3).
3. Define a reference plane (see page 5-7).
4. Define a reference line (see page 5-8).
5. Set the part tilt, part rotation, and part origin (see page 5-10).

In this section, we will use the QVI training part to demonstrate this process. Use the following illustration for reference.



1 P1

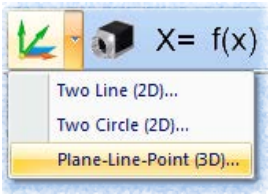
2 C1

3 C2

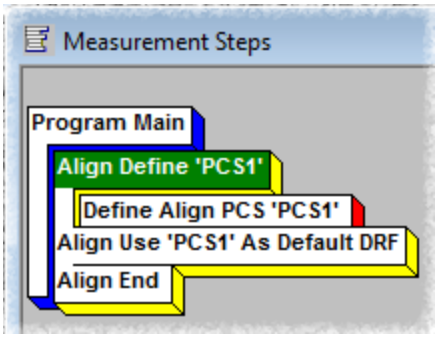
Figure 5-1: Reference Features Used for Part Alignment

Creating an Alignment Block

1. Select **New** in the VMS File menu (or press Ctrl+N).
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Plane-Line-Point (3D)**.



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



Measuring Reference Features (C1, C2, and P1)

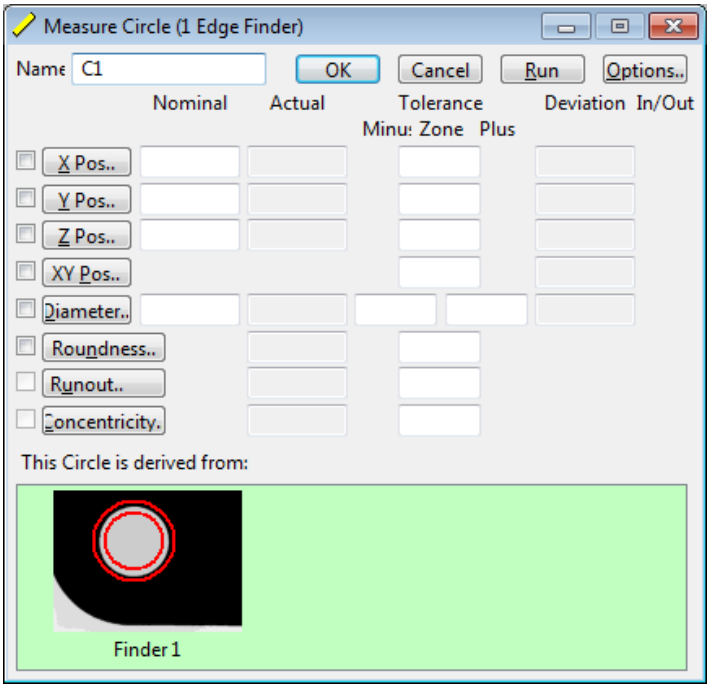
1. Place and secure the QVI training part on the stage in the orientation shown in Figure 5-1 on page 5-2.
2. Switch to low magnification (if applicable) and increase the backlight illumination.
3. Using the joystick, drive the transports to position the **lower-left hole** in the Video window.
4. Adjust the backlight illumination for sufficient contrast and focus the edge.

5. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure FOV**.

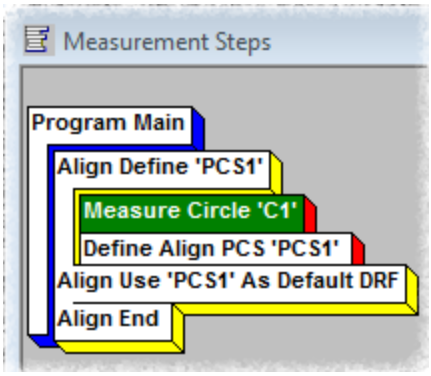
6. Position and/or resize the Circle Edge finder over the lower-left hole so the inner circle of the finder is completely inside the hole and the outer circle is completely outside the hole.

7. Double-click in the Video window to run the Circle Edge finder and measure the lower-left hole.

8. Click  on 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.

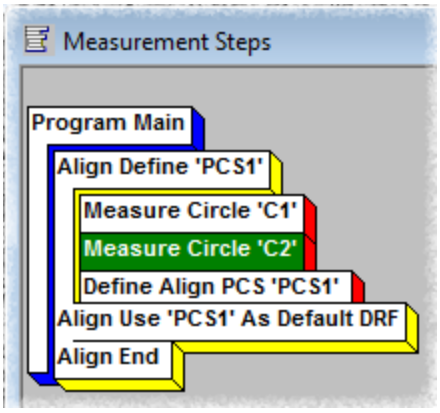


9. In the Measure Circle dialog box, click **OK** to add the step to the program.



10. Using the joykstick, drive the transports to position the **lower-right hole** in the Video window.

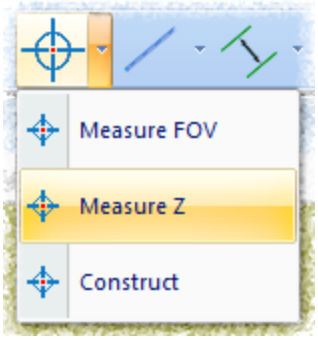
11. Repeat Steps 5 through 9 to measure the lower-right hole and add the step to the program.



12. Using the joystick, drive the transports to position the **surface near the upper-left hole** in the Video window.

13. Switch to high magnification (if applicable) and increase the coaxial illumination.

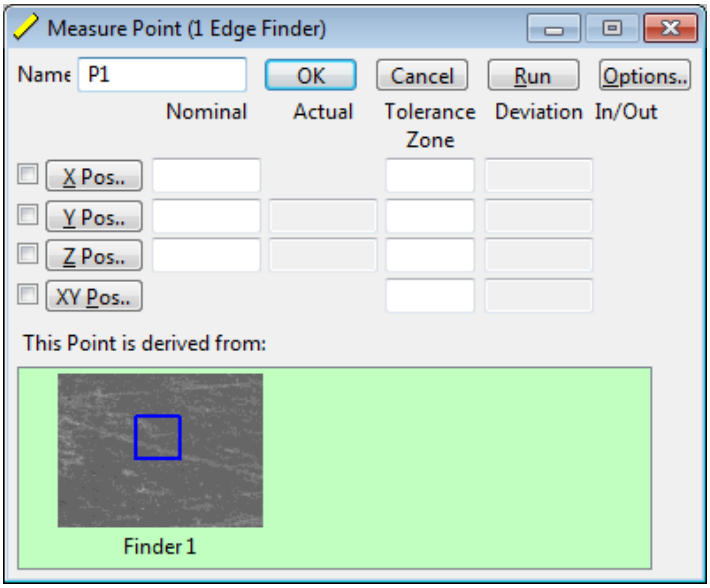
14. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure Z**.



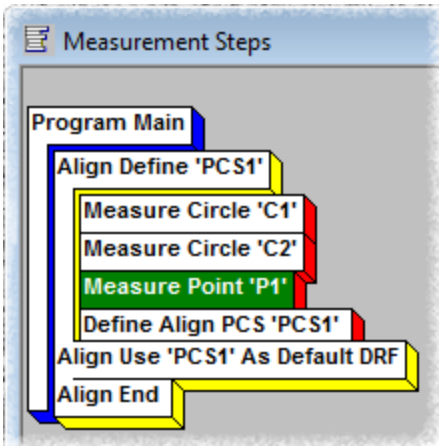
15. In the Autofocus Settings dialog box, click  .

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

17. Click  on 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.

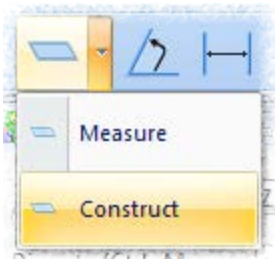


18. In the Measure Point dialog box, click **OK** to add the step to the program.

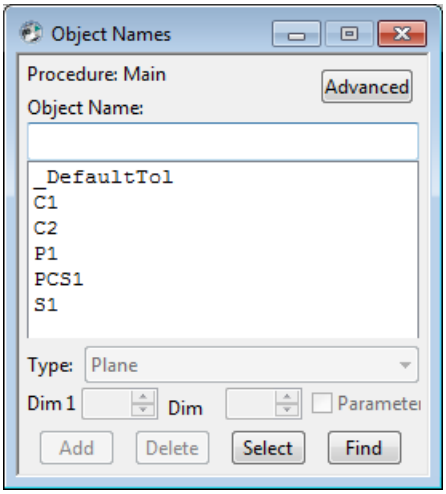


Defining the Reference Plane (S1)

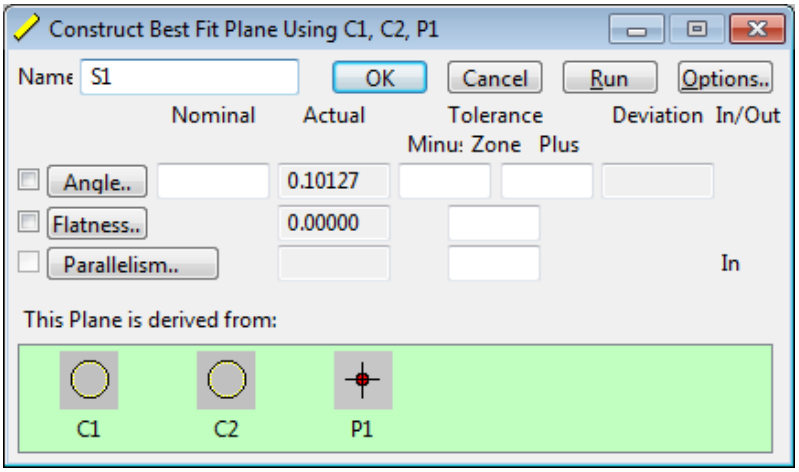
1. Click the arrow directly to the right of  on the VMS Toolbar, and select **Construct**.



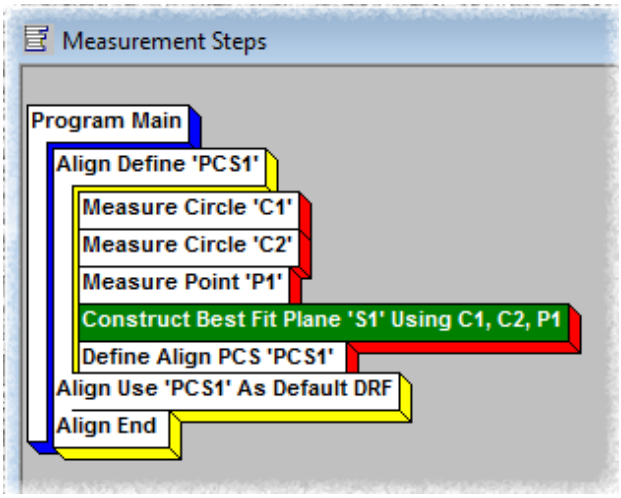
2. Select circle **C1** in the Object Names dialog box, and then click **Select**.



3. Repeat Step 2 to select circle **C2** and point **P1** — this enables the OK button in the Construct Plane dialog box.

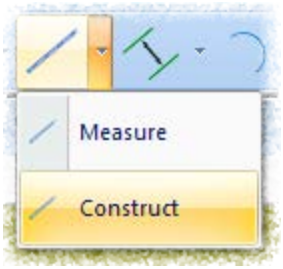


4. Click **OK** in the Construct Plane dialog box to add the step to the program.

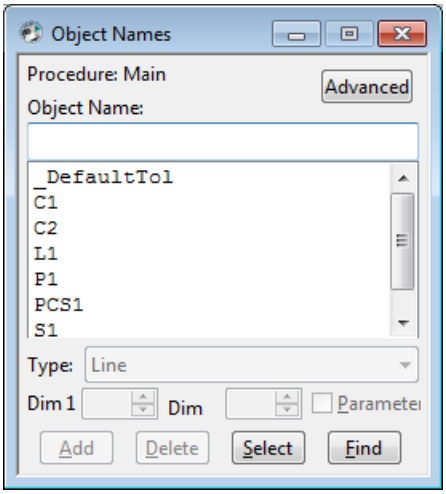


Defining the Reference Line (L1)

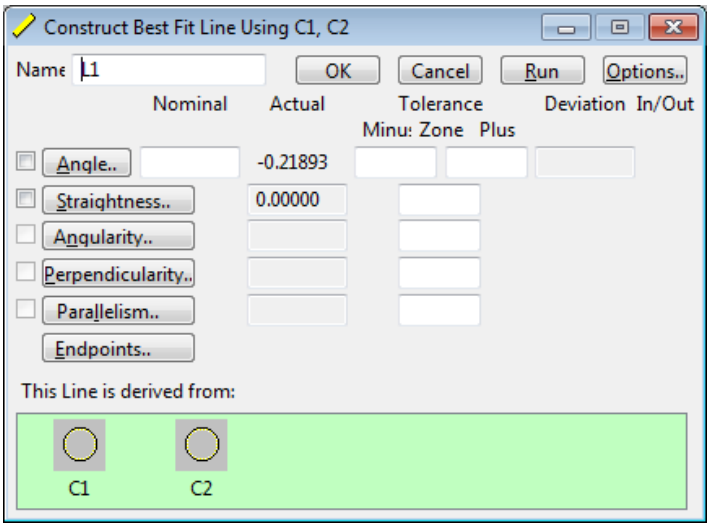
1. Click the arrow directly to the right of  on the VMS Toolbar, and select **Construct**.



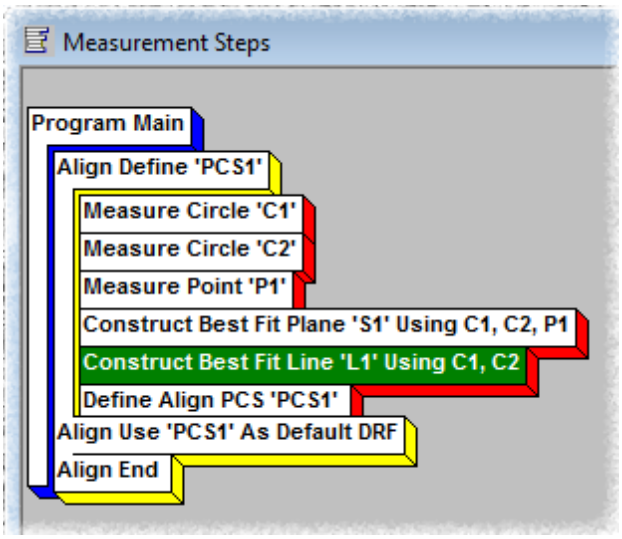
2. Select circle **C1** in the Object Names dialog box, and then click **Select**.



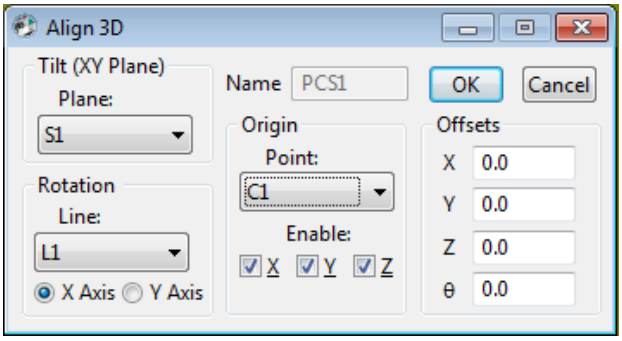
3. Repeat Step 2 to select circle **C2** — this enables the OK button in the Construct Line dialog box.



4. Click **OK** in the Construct Plane dialog box to add the step to the program.

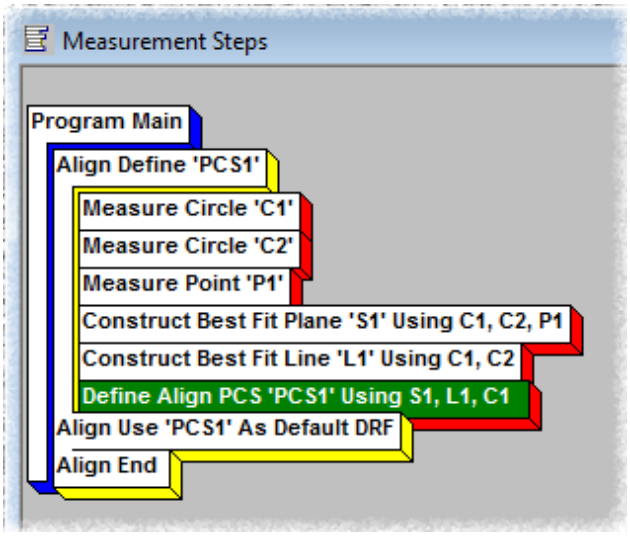


1. In the Align 3D dialog box, do the following:
   - In the **Tilt** section, select **S1** (the constructed plane) in the **Plane** list to set the tilt of the part.
   - In the **Rotation** section, select **L1** (the constructed line) in the **Line** list. Also, select the **X axis** option to set line L1 as the X-axis datum for the part.
   - In the **Origin** section, select **C1** (the measured lower-left hole) in the **Point** list. Then select the **Enable X**, **Y**, and **Z** check boxes to set the center point of the circle as the X, Y, and Z zero point.



2. 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.

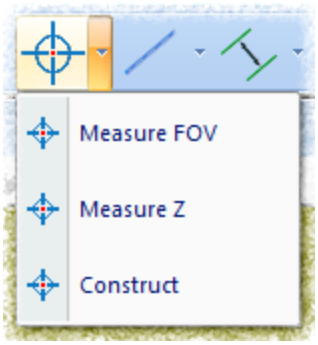
Feature Measurements

Preliminary Steps for Measuring a Feature

1. Place and secure the part on the stage.
2. Using the joystick, drive the transports so the desired feature appears in the Video window.
3. Adjust the illumination as required (see Stage and Lights Window on page 2-12).
4. Focus the feature (see Using the Autofocus Finder on page 4-15).

Measuring a Point

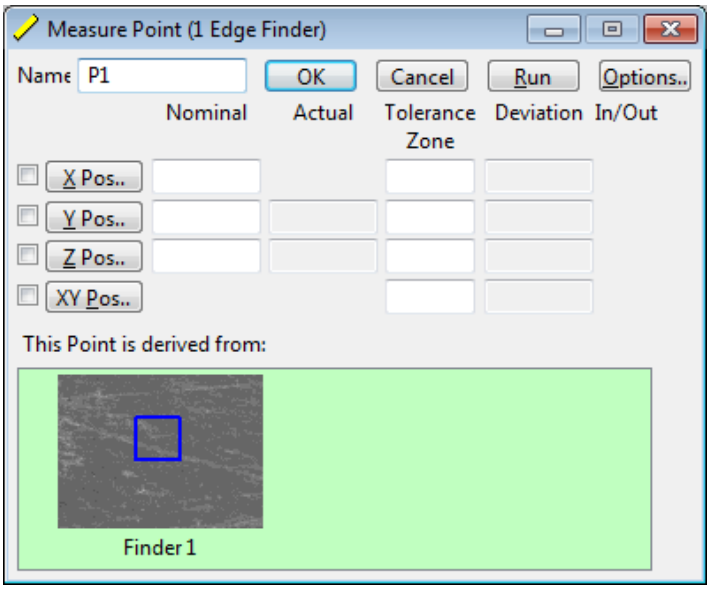
1. Perform the preliminary steps outlined above.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select one of the following:
   - **Measure FOV** to measure the XY location of a single point
   - **Measure Z** to measure the Z location of a single point



3. **[Measure FOV]** Click on the Video window toolbar to display the Point Edge finder if it is not already displayed.

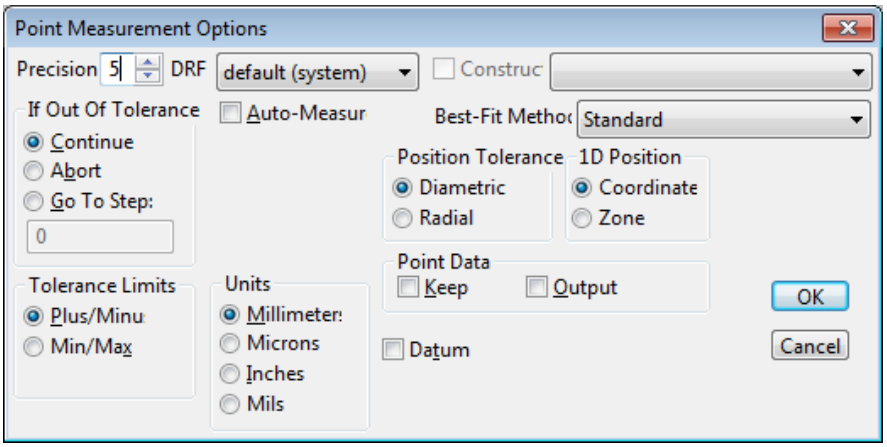
   [Measure Z] Click  on the Video window toolbar to display the Autofocus Finder if it is not already displayed.
4. Position the finder over the feature (see Using the Single Point Edge Finder on page 4-4 or Using the Autofocus Finder on page 4-15 for more information).
5. Double-click in the Video window to run the finder and measure the point.
6. Click  on 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 check boxes in the Measure Point dialog box.

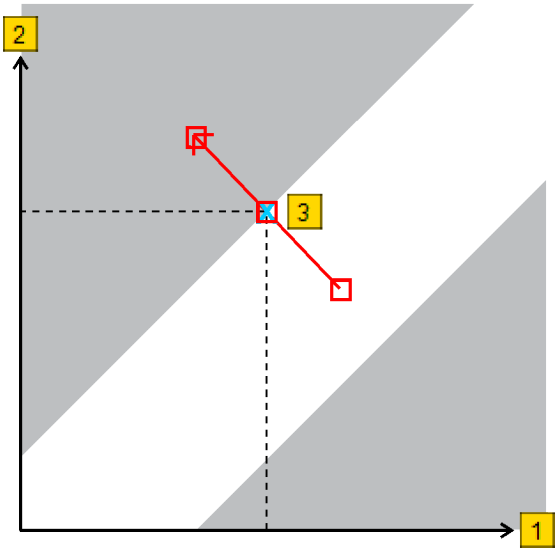


8. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance Zone** boxes.

9. [Optional] Click **Options** to change the desired point measurement options; click **OK** to save the changes and close the dialog box.



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

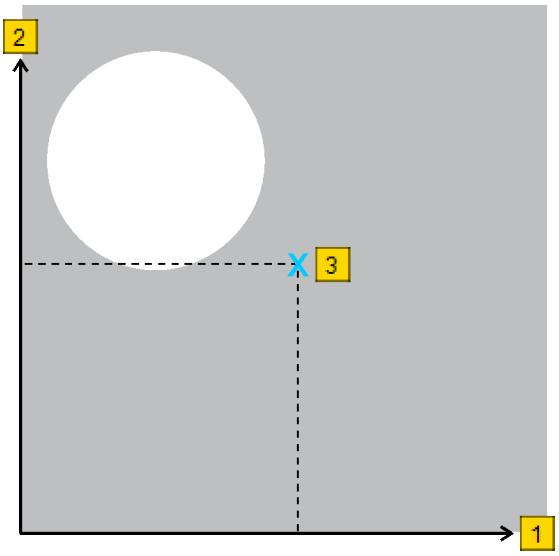


1 X Axis

2 Y Axis

3 X Position, Y Position, Z Position

Figure 6-1: Measuring a Point (FOV)



1 X Axis

2 Y Axis

3 X Position, Y Position, Z Position

Figure 6-2: Measuring a Point (Z)

Measuring a Line that Fits in the Field of View

1. Perform the preliminary steps on page 6-2.

2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure**.

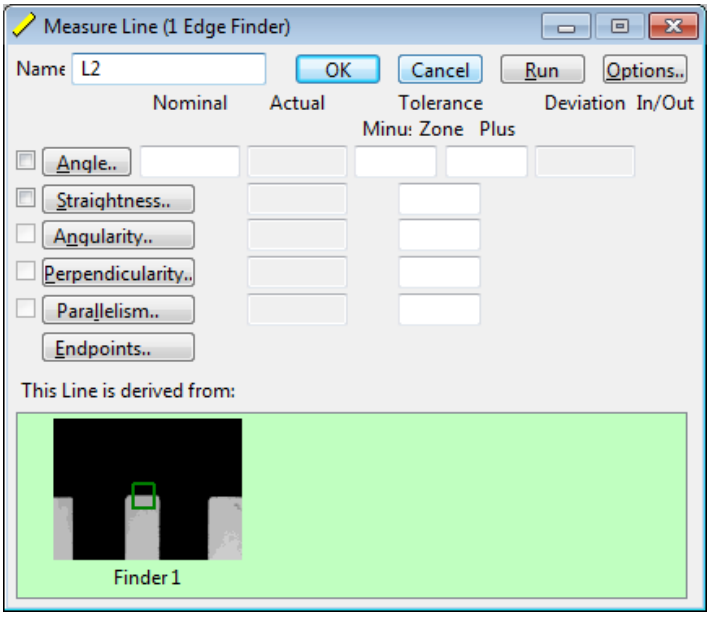
3. Click  on the Video window toolbar to display the Line Edge finder if it is not already displayed.

4. Position the finder over the feature (see Using the Line Edge Finder on page 4-6 for more information).

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

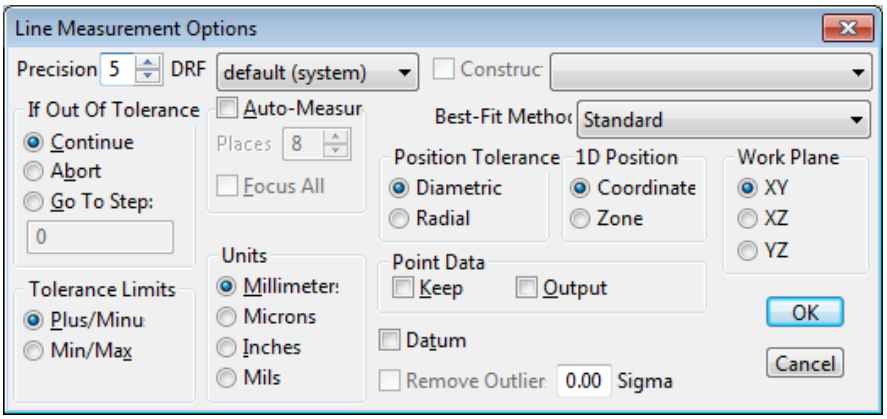
6. Click  on the Video window toolbar to accept the finder and save it in the step.

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

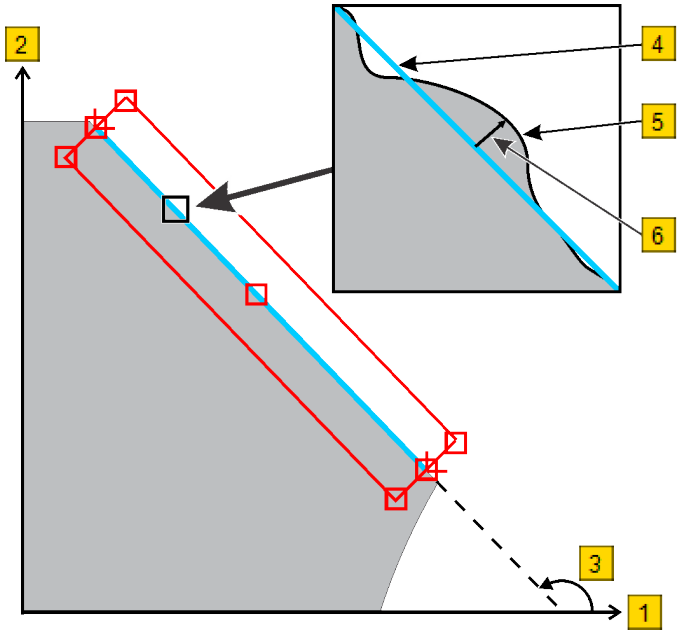


8. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance Zone** boxes.

9. [Optional] Click **Options** to change the desired line measurement options; click **OK** to save the changes and close the dialog box.



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



1 X Axis
2 Y Axis
3 Angle
4 Best-Fit Line
5 Actual Edge
6 Straightness — maximum deviation from best-fit line

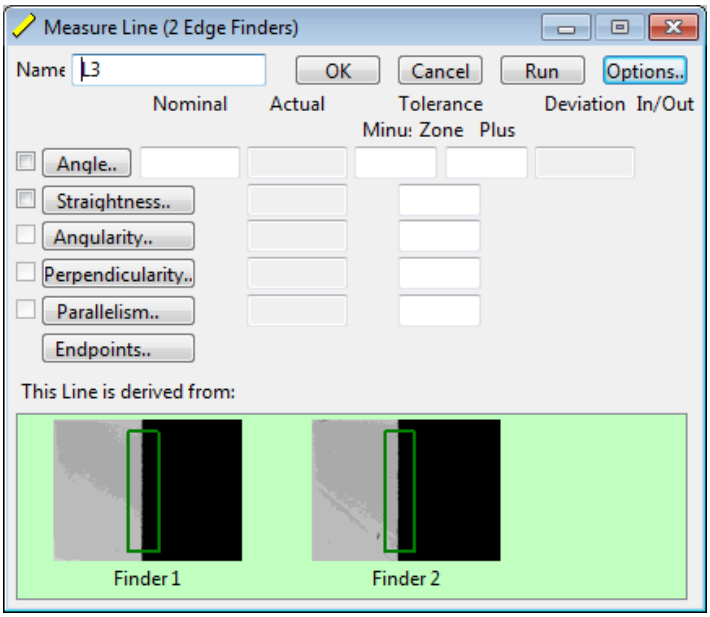
Figure 6-3: Measuring a Line that Fits in the Field of View

Measuring a Line that is Larger than the Field of View

1. Perform the preliminary steps on page 6-2.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure**.

3. Click  on the Video window toolbar to display the Line Edge finder if it is not already displayed.
4. Position the finder over one end of the feature (see Using the Line Edge Finder on page 4-6 for more information).
5. Double-click in the Video window to run the finder and measure the line.
6. Click  on the Video window toolbar to accept the finder and save it in the step.
7. Using the joystick, drive the transports so the opposite end of the feature appears in the Video window.
8. Repeat Steps 4 through 6 to measure the opposite end of the feature.

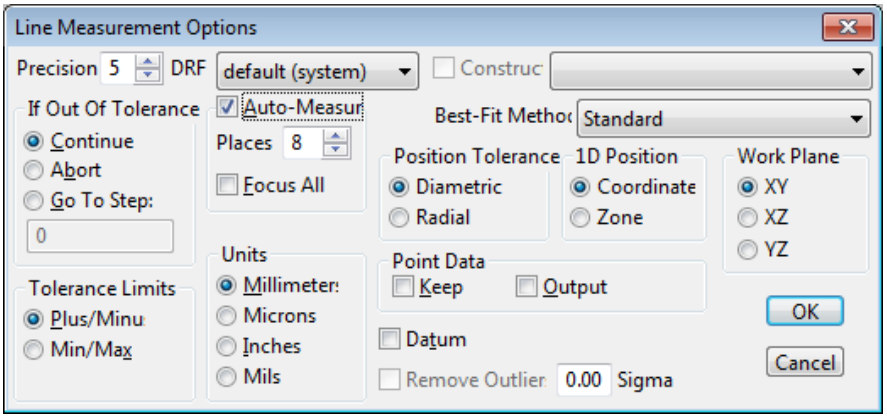
9. Specify the attributes to display in the results output by selecting the appropriate check boxes in the Measure Line dialog box.



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

11. Click **Options**.

12. In the Line Measurement Options dialog box, select the **Auto-Measure** check box and specify the number of **Places** to run the finder (the default is 8).

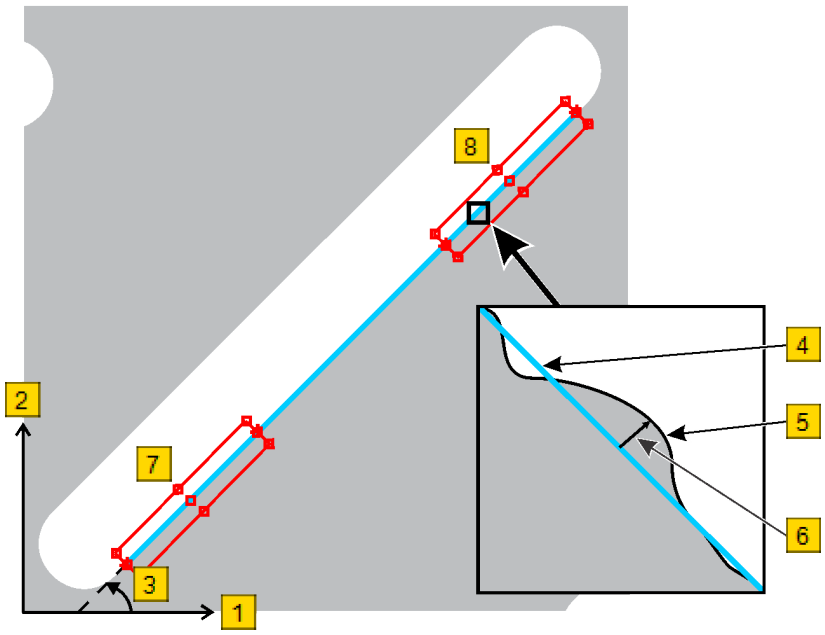


13. [Optional] Change any other desired options.

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

15. Click **Run** in the Measure Line dialog box to measure the entire line.

16. Click **OK** to add the step to the program and display it in the Measurement Steps window.



1 X Axis

2 Y Axis

3 Angle

4 Best-Fit Line

5 Actual Edge

6 Straightness — maximum deviation from best-fit line

7 Finder 1

8 Finder 2

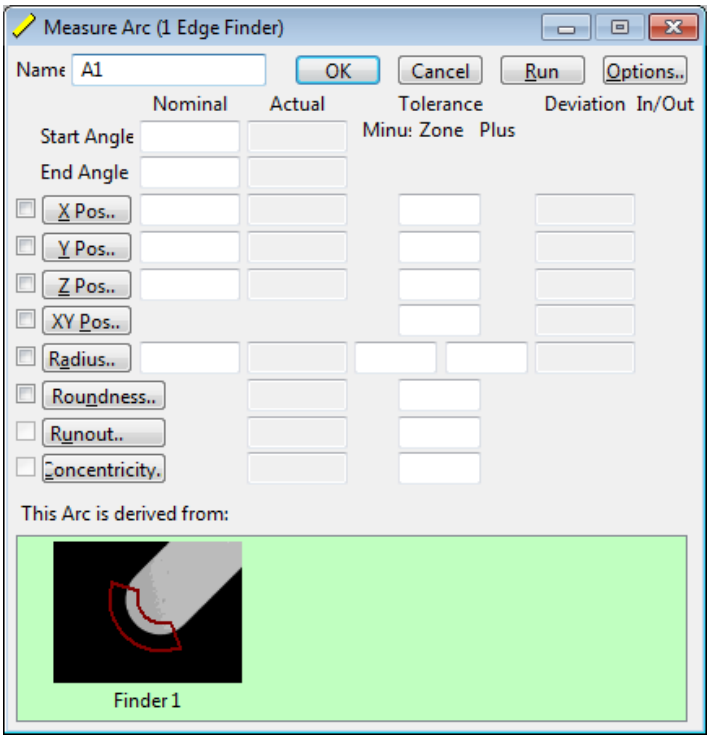
Figure 6-4: Measuring a Line that is Larger than the Field of View

Measuring an Arc that Fits in the Field of View

1. Perform the preliminary steps on page 6-2.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure FOV**.

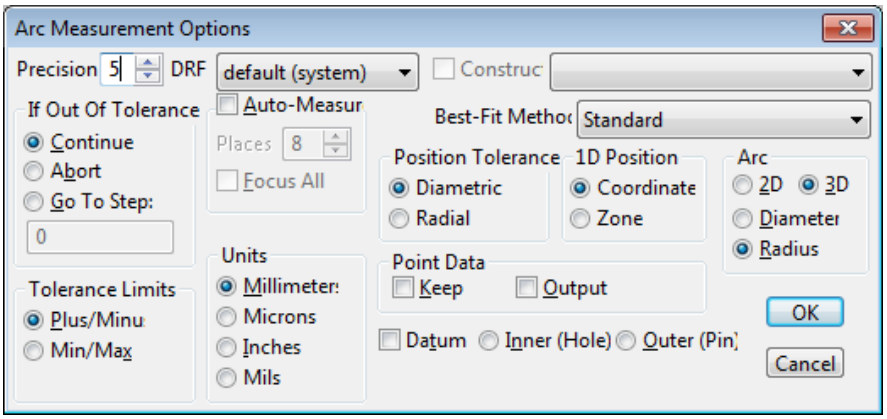
3. Click  on the Video window toolbar to display the Arc Edge finder if it is not already displayed.
4. Position the finder over the feature (see Using the Arc Edge Finder on page 4-12 for more information).
5. Double-click in the Video window to run the finder and measure the arc.
6. Click  on the Video 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 check boxes in the Measure Arc dialog box.

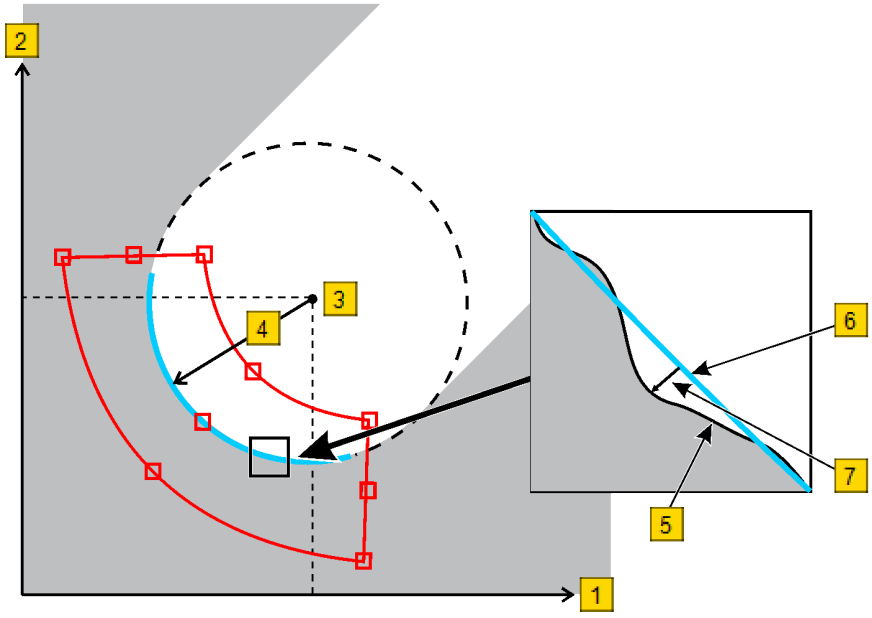


8. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance Zone** boxes.

9. [Optional] Click **Options** to change the desired arc measurement options; click **OK** to save the changes and close the dialog box.



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



1 X Axis

2 Y Axis

3 X Position, Y Position, Z Position

4 Radius

5 Actual Edge

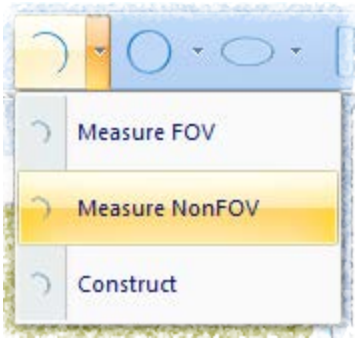
6 Best-Fit Circle

7 Roundness — maximum deviation from best-fit circle

Figure 6-5: Measuring an Arc that Fits in the Field of View

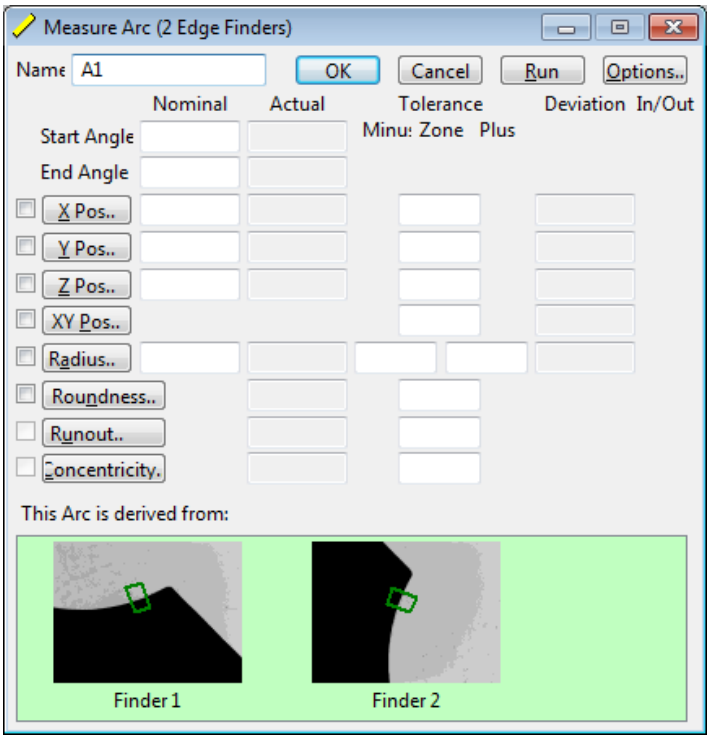
Measuring an Arc that is Larger than the Field of View

1. Perform the preliminary steps on page 6-2.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure NonFOV**.



3. Click  on the Video window toolbar to display the Arc Edge finder if it is not already displayed.
4. Position the finder over one end of the feature (see Using the Arc Edge Finder on page 4-12 for more information).
5. Double-click in the Video window to run the finder and measure the arc.
6. Click  on the Video window toolbar to accept the finder and save it in the step.
7. Using the joystick, drive the transports so the opposite end of the feature appears in the Video window.
8. Repeat Steps 4 through 6 to measure the opposite end of the feature.

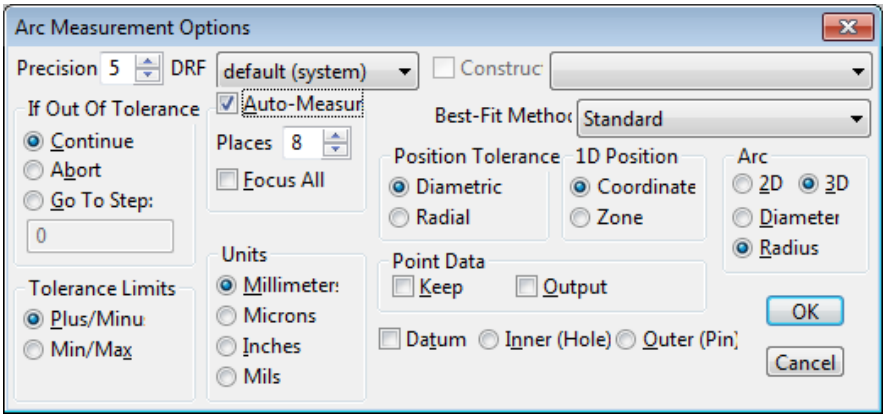
9. Specify the attributes to display in the results output by selecting the appropriate check boxes in the Measure Arc dialog box.



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

11. Click **Options**.

12. In the Arc Measurement Options dialog box, select the **Auto-Measure** check box and specify the number of **Places** to run the finder (the default is 8).

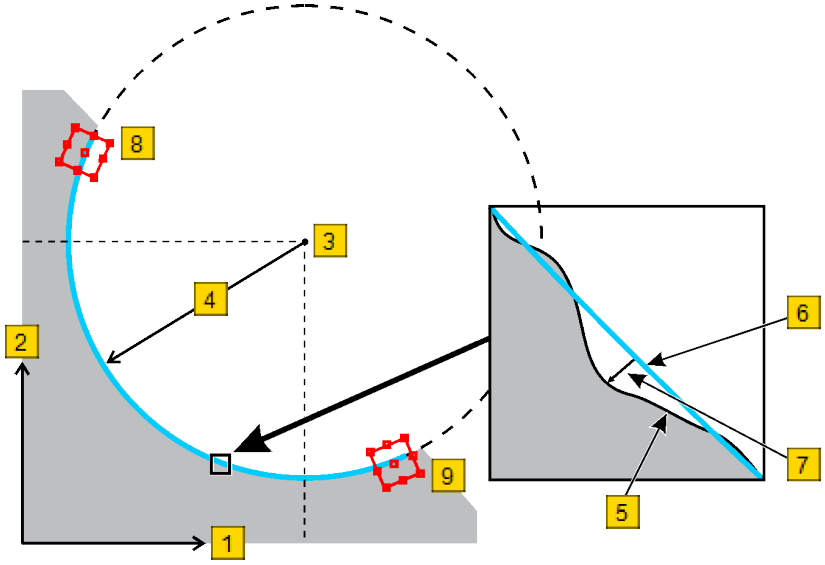


13. [Optional] Change any other desired options.

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

15. Click **Run** in the Measure Arc dialog box to measure the entire arc.

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



1 X Axis

2 Y Axis

3 X Position, Y Position, Z Position

4 Radius

5 Actual Edge

6 Best-Fit Circle

7 Roundness — maximum deviation from best-fit circle

8 Finder 1

9 Finder 2

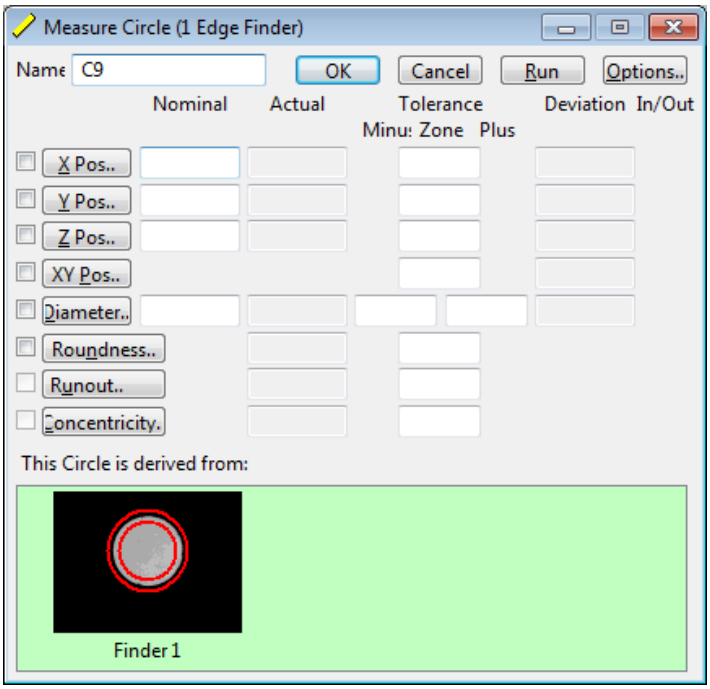
Figure 6-6: Measuring an Arc that is Larger than the Field of View

Measuring a Circle that Fits in the Field of View

1. Perform the preliminary steps on page 6-2.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure FOV**.

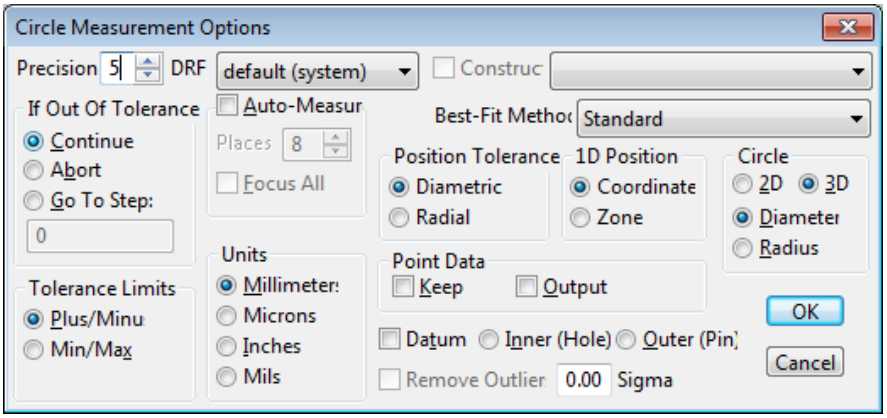
3. Click  on the Video window toolbar to display the Circle Edge finder if it is not already displayed.
4. Position the finder over the feature (see Using the Circle Edge Finder on page 4-10 for more information).
5. Double-click in the Video window to run the finder and measure the circle.
6. Click  on 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 check boxes in the Measure Circle dialog box.

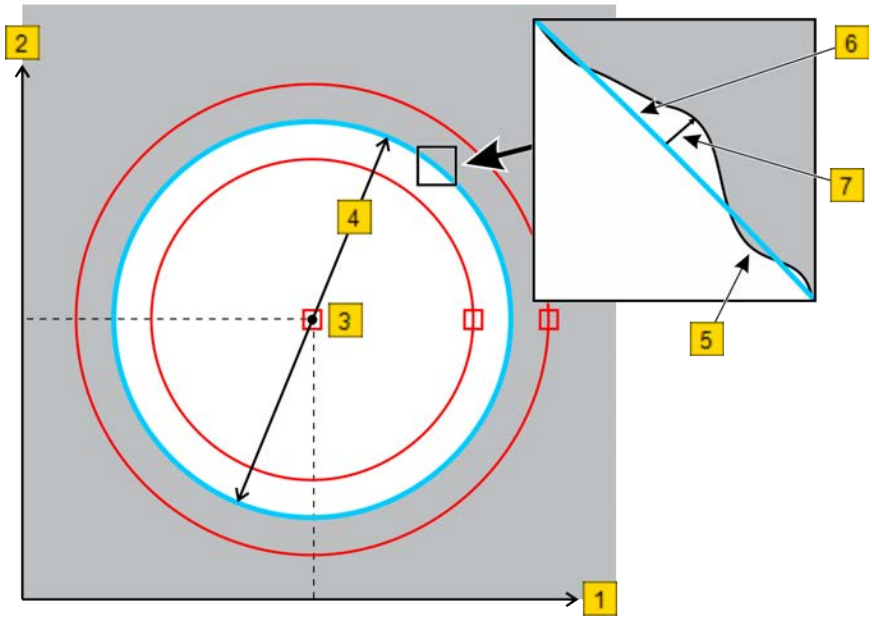


8. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance Zone** boxes.

9. [Optional] Click **Options** to change the desired circle measurement options; click **OK** to save the changes and close the dialog box.



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



1 X Axis

2 Y Axis

3 X Position, Y Position, Z Position

4 Diameter

5 Actual Edge

6 Best-Fit Circle

7 Roundness — maximum deviation from best-fit circle

Figure 6-7: Measuring a Circle that Fits in the Field of View

Measuring a Circle that is Larger than the Field of View

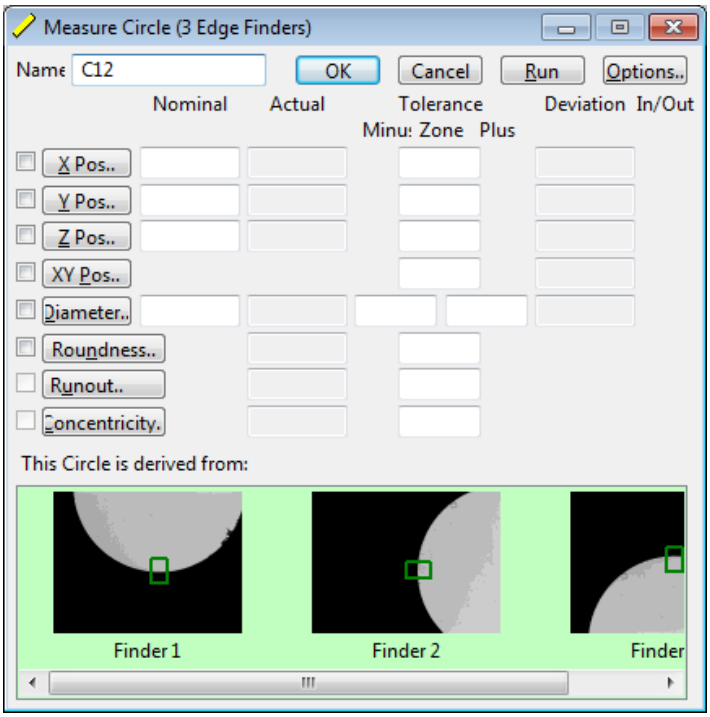
1. Perform the preliminary steps on page 6-2.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure NonFOV**.

3. Click  on the Video window toolbar to display the Line Edge finder if it is not already displayed.
4. Position the finder over the edge of the feature (see Using the Line Edge Finder on page 4-6 for more information).
5. Double-click in the Video window to run the finder and measure the edge.
6. Click  on the Video window toolbar to accept the finder and save it in the step.
7. Using the joystick, drive the transports to position another part of the feature in the Video window.

NOTE: When measuring a circle that is larger than the field of view, we recommend placing three finders (spaced as far apart as possible) on the feature.

8. Repeat Steps 4 through 6 to measure the feature.
9. Repeat Steps 7 and 8 to measure a third part of the feature.

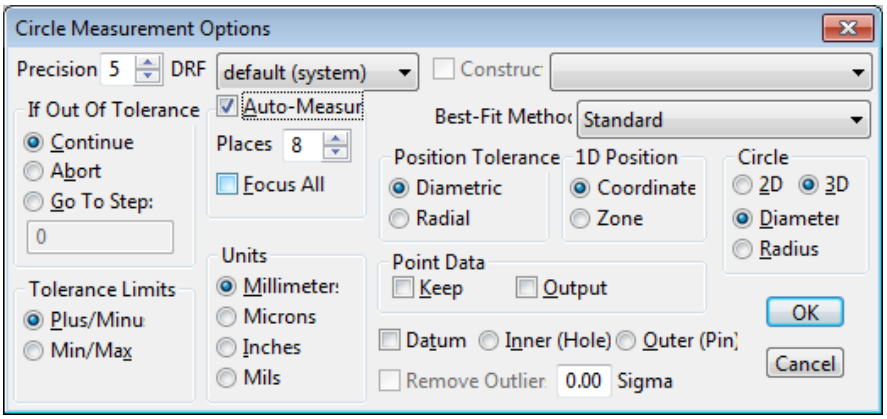
10. Specify the attributes to display in the results output by selecting the appropriate check boxes in the Measure Circle dialog box.



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

12. Click **Options**.

13. In the Circle Measurement Options dialog box, select the **Auto-Measure** check box and specify the number of **Places** to run the finder (the default is 8).

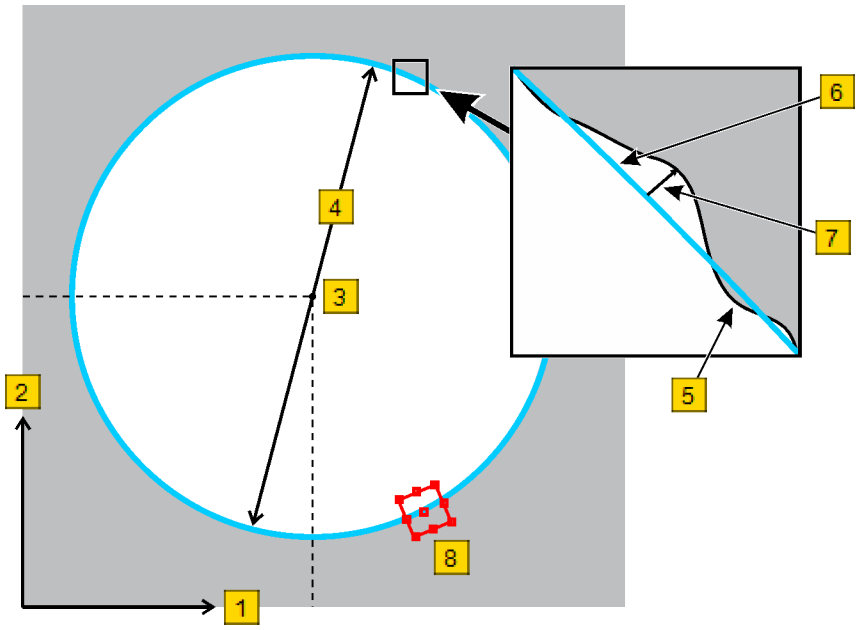


14. [Optional] Change any other desired options.

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

16. Click **Run** in the Measure Circle dialog box to measure the entire circle.

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



1 X Axis

2 Y Axis

3 X Position, Y Position, Z Position

4 Diameter

5 Actual Edge

6 Best-Fit Circle

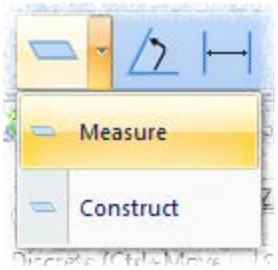
7 Roundness — maximum deviation from best-fit circle

8 Finder

Figure 6-8: Measuring a Circle that is Larger than the Field of the View

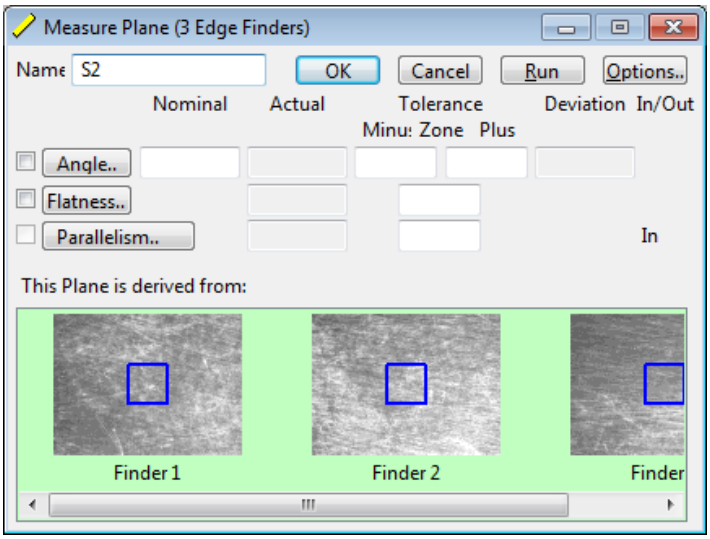
Measuring a Plane

1. Perform the preliminary steps on page 6-2.
2. Click the arrow directly to the right of  on the VMS Toolbar, and select **Measure**.



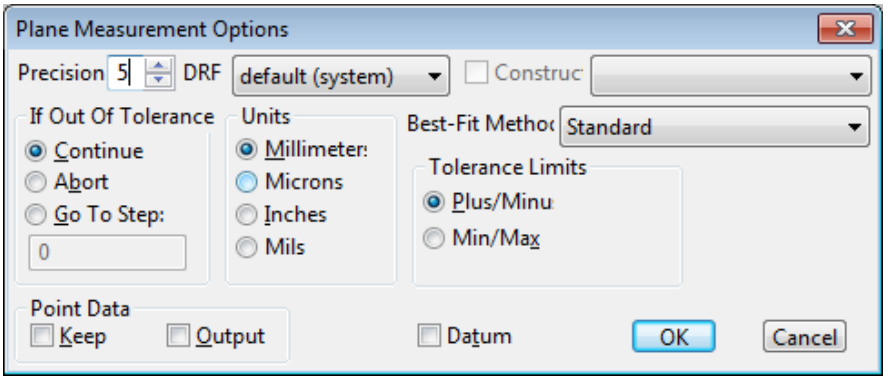
3. Click  on the Video window toolbar to display the Autofocus Finder if it is not already displayed.
4. Using the joystick, drive the transports to position the first focus point in the Video window; adjust the illumination if necessary.
5. Manually focus (by eye) the surface.
6. In the displayed Autofocus dialog box, click  to select surface focus mode.
7. Double-click in the Video window to run the finder and measure the focus point.
8. Click  on the Video window toolbar to accept the finder and save it in the step.
9. Repeat Steps 4 through 8 to measure the second and third focus points. Click **OK** in the Autofocus finder dialog box when finished.

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



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

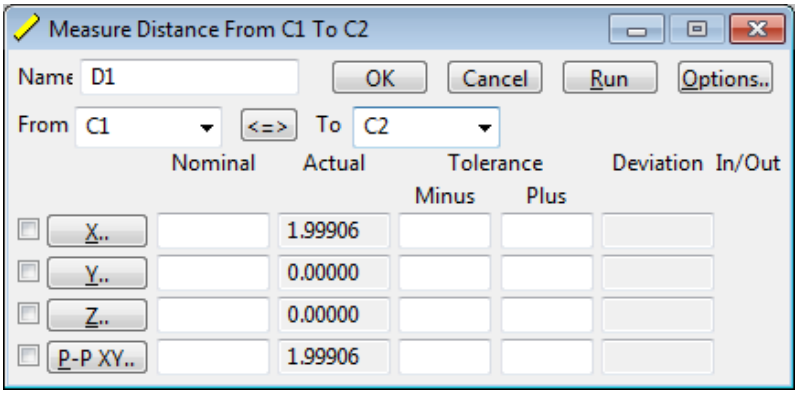
12. [Optional] Click **Options** to change the desired plane measurement options; click **OK** to save the changes and close the dialog box.



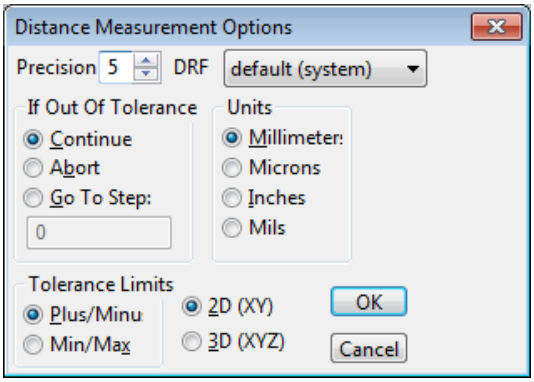
13. Click **OK** in the Measure Plane dialog box to add the step to the program and display it in the Measurement Steps window.

Measuring a Distance

1. Click  on the VMS Toolbar.
2. Select the two features you want to use in the measurement by doing one of the following:
   - Select the desired features in the **From** and **To** lists in the Measure Distance dialog box
   - Click the desired features in the Features window
   - Select the desired features in the Object Names window
3. Specify the attributes to display in the results output by selecting the appropriate check boxes in the Measure Distance dialog box.



4. [Optional] Enter nominal values and tolerances in the **Nominal** and **Tolerance Zone** boxes.
5. [Optional] Click **Options** to change the desired distance measurement options; click **OK** to save the changes and close the dialog box.

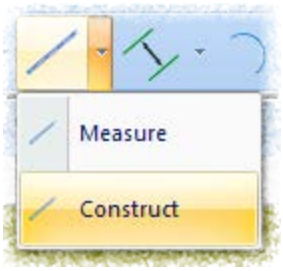


6. Click **OK** in the Measure Distance dialog box to add the step to the program and display it in the Measurement Steps window.

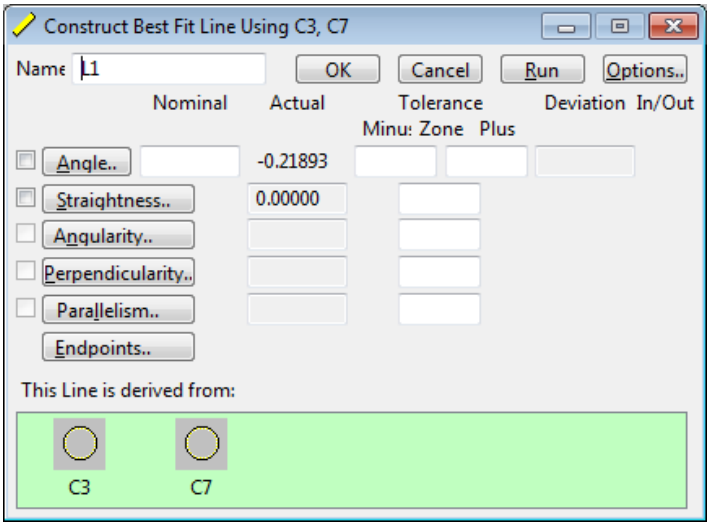
Feature Constructions

Constructing a Line

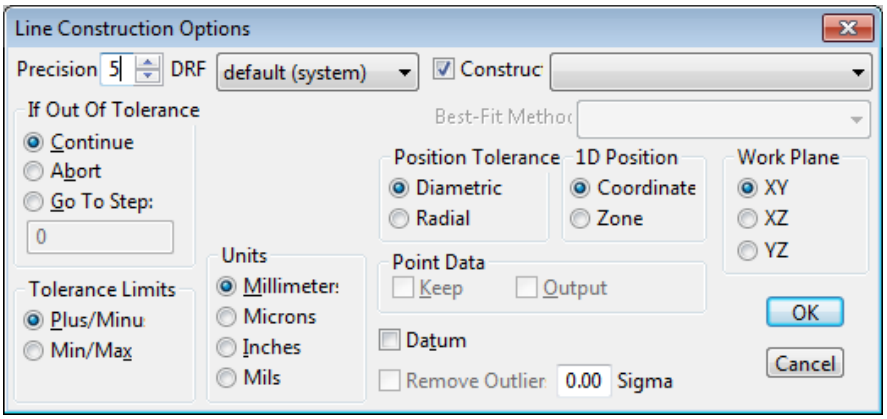
1. Click the arrow directly to the right of  on the VMS Toolbar, and select **Construct**.



2. Select the first feature you want to use in the construction by clicking it in the Features window (feature color changes to yellow) or by selecting it in the Object Names window.
3. Repeat Step 2 to select the second feature you want to use in the construction.
4. Specify the attributes you want to display in the results output by selecting the appropriate check boxes in the Construct Line dialog box.

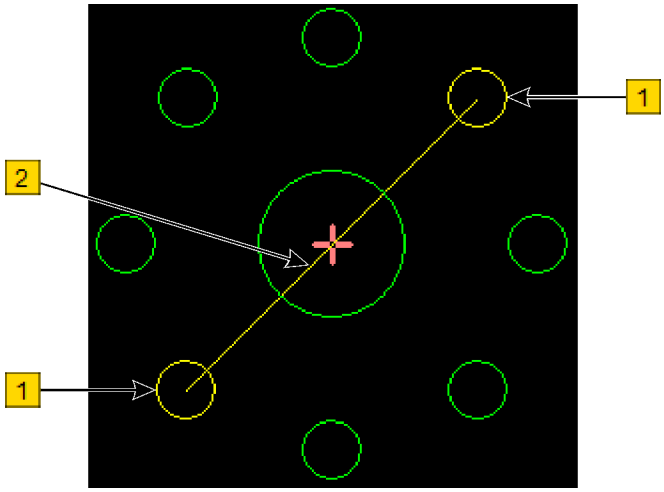


5. [Optional] Click **Options** to change any of the line construction options; click **OK** to save the changes and close the dialog box.



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

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



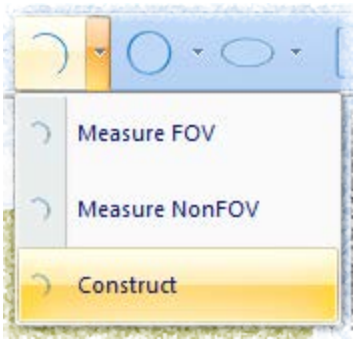
1 Reference Feature

2 Constructed Line

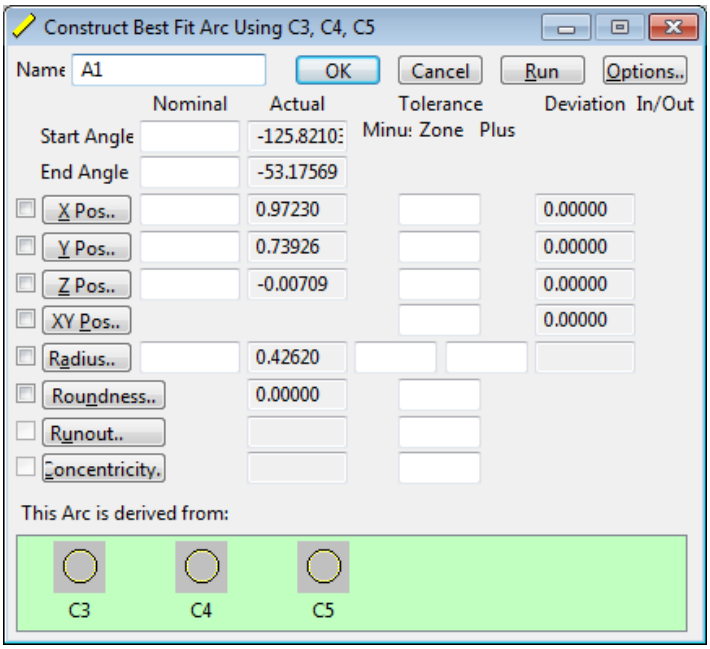
Figure 7-1: Constructing a Line from Two Circles

Constructing an Arc

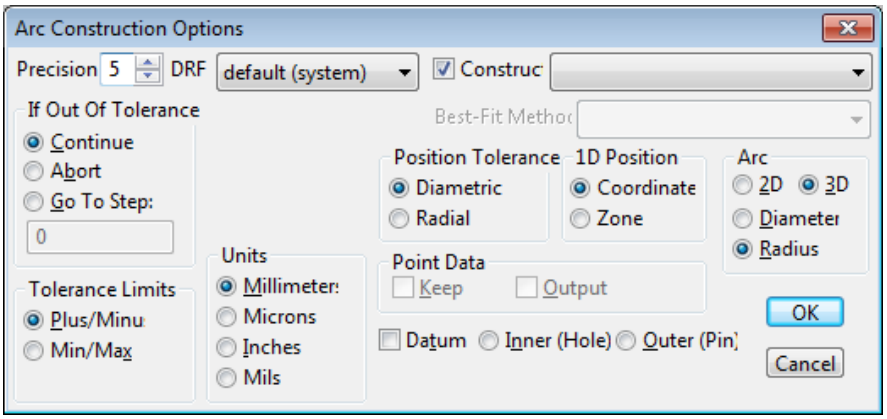
1. Click the arrow directly to the right of  on the VMS Toolbar, and select **Construct**.



2. Select the first feature you want to use in the construction by clicking it in the Features window (feature color changes to yellow) or by selecting it in the Object Names window.
3. Repeat Step 2 to select the second and third features you want to use in the construction.
4. Specify the attributes you want to display in the results output by selecting the appropriate check boxes in the Construct Arc dialog box.

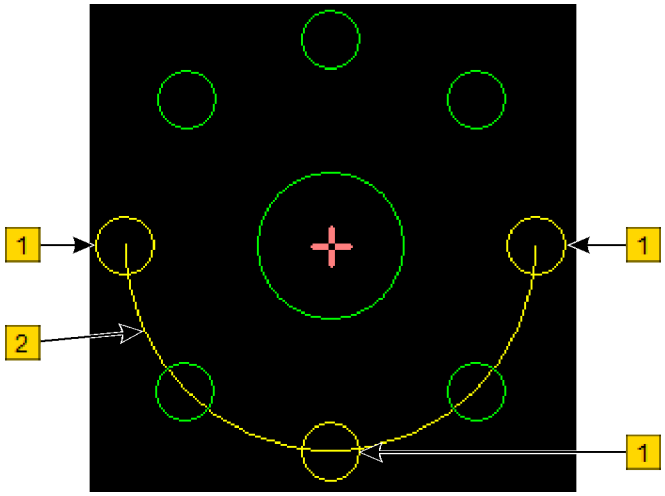


5. [Optional] Click **Options** to change any of the arc construction options; click **OK** to save the changes and close the dialog box.



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

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



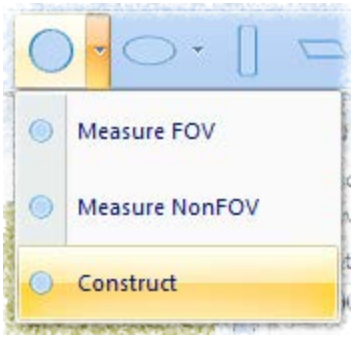
1 Reference Feature

2 Constructed Arc

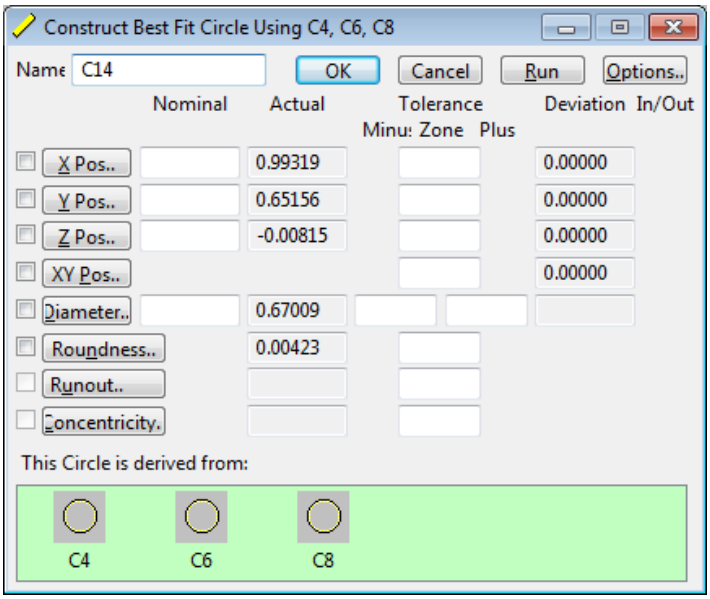
Figure 7-2: Constructing an Arc from Three Circles

Constructing a Circle

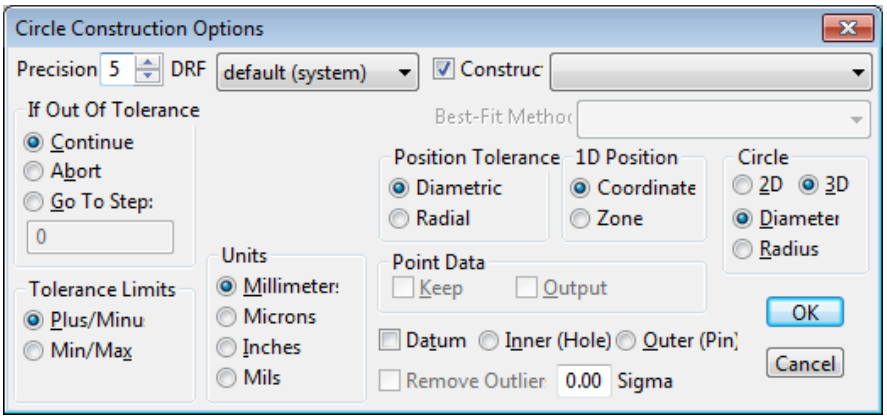
1. Click the arrow directly to the right of  on the VMS Toolbar, and select **Construct**.



2. Select the first feature you want to use in the construction by clicking it in the Features window (feature color changes to yellow) or by selecting it in the Object Names window.
3. Repeat Step 2 to select the second and third features you want to use in the construction.
4. Specify the attributes you want to display in the results output by selecting the appropriate check boxes in the Construct Circle dialog box.

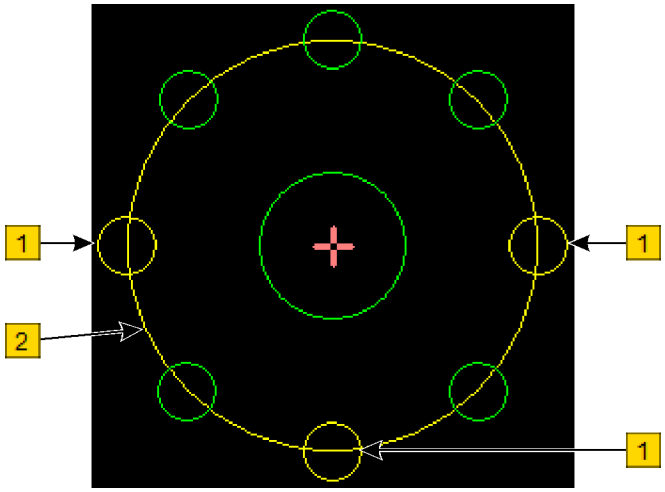


5. [Optional] Click **Options** to change any of the line construction options; click **OK** to save the changes and close the dialog box.



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

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



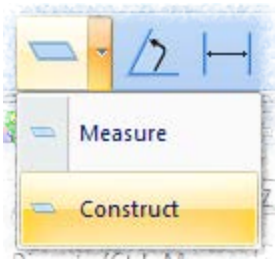
1 Reference Feature

2 Constructed Circle

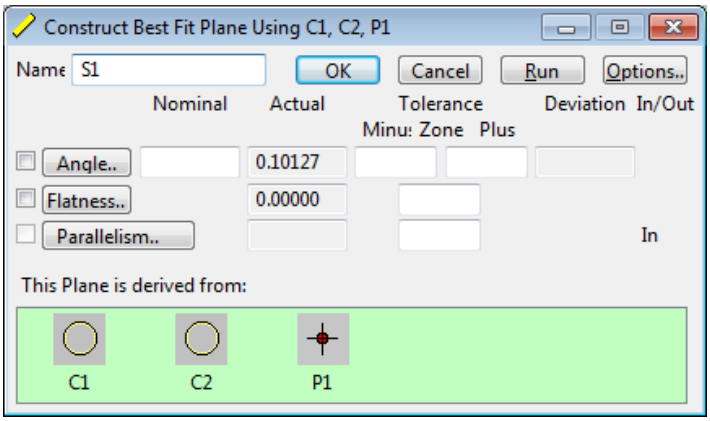
Figure 7-3: Constructing a Circle from Three Circles

Constructing a Plane

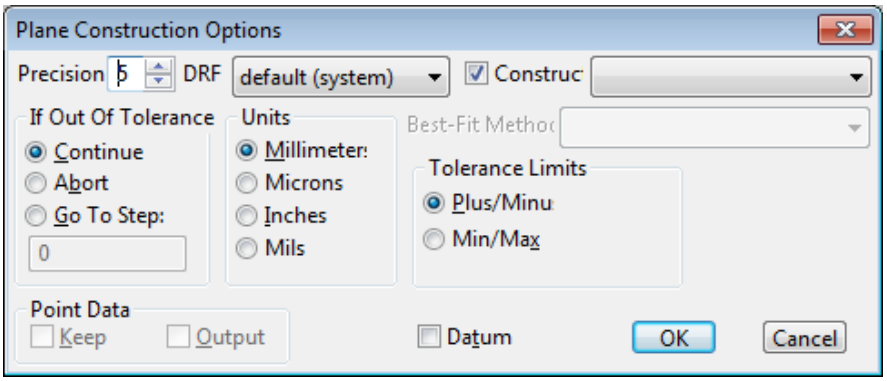
1. Click the arrow directly to the right of  on the VMS Toolbar, and select **Construct**.



2. Select the first feature you want to use in the construction by clicking it in the Features window (feature color changes to yellow) or by selecting it in the Object Names window.
3. Repeat Step 2 to select the second and third features you want to use in the construction.
4. Specify the attributes you want to display in the results output by selecting the appropriate check boxes in the Construct Plane dialog box.



5. [Optional] Click **Options** to change any of the plane construction options; click **OK** to save the changes and close the dialog box.



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

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

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Part Programming

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.

Creating a Program

Before creating a program:

1. Zero the stage (described on page 1-2).
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 1-4).
3. Select the units of measurement (described on page 1-3).
4. [Optional] Set the lower Z travel limit (described on page 1-4).

To create a program:

1. Select **New** in the VMS File menu (or press Ctrl+N).
2. Select System Alignment and/or define the Part Alignment (described on page 5-3).
3. Measure and/or construct features.
4. Specify output options (described on page 8-3).
5. Save the program (described on page 8-2)
6. Run the program periodically to check the measurements (described on page 3-2).

Saving a Program

1. Click  on the VMS Toolbar (or press Ctrl+S).
2. In the standard Windows Save As dialog box, type a unique name for the routine. You can also change the folder if you want.
3. Click **Save**.

Outputting Measurement Results

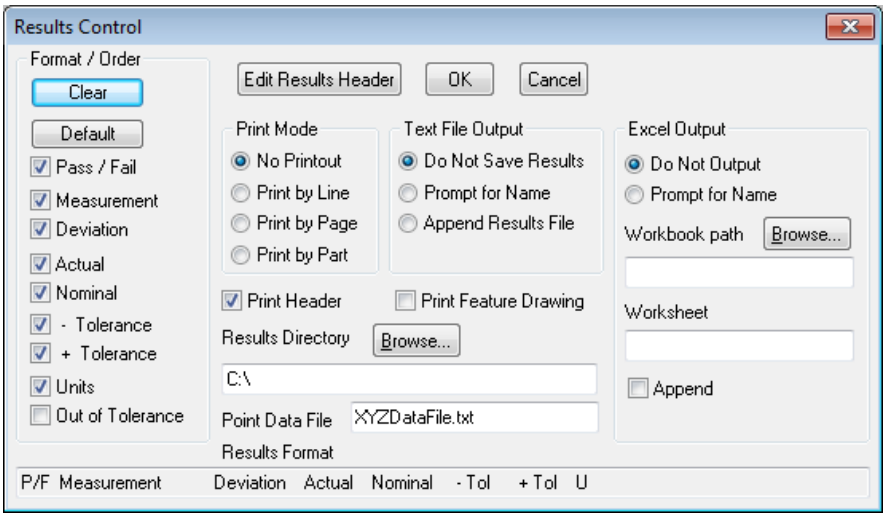
You can output measurement results to any of the following:

- Printer
- Text file
- Microsoft® Excel worksheet

To specify the results output options:

1. Select the **Setup** ribbon, and then select **Results Control** in the Options section.
2. In the Results Control dialog box, select the results you want to output by selecting the appropriate check boxes in the Format / Order section.

   NOTE: The order in which you select the check boxes determines the order in which the columns will appear in the output. The current order appears at the bottom of the Results Control dialog box.



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

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

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

5. Select the Print Mode by selecting one of the following options:
    - **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 selecting one of the following options:
    - **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 folder, click **Browse** and select the desired folder.
7. Specify the Excel Output mode by selecting one of the following options:
    - **Do not output** — results are not sent to an Excel worksheet
    - **Output to Excel** — results are sent to the specified Excel worksheet

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

Editing a Program

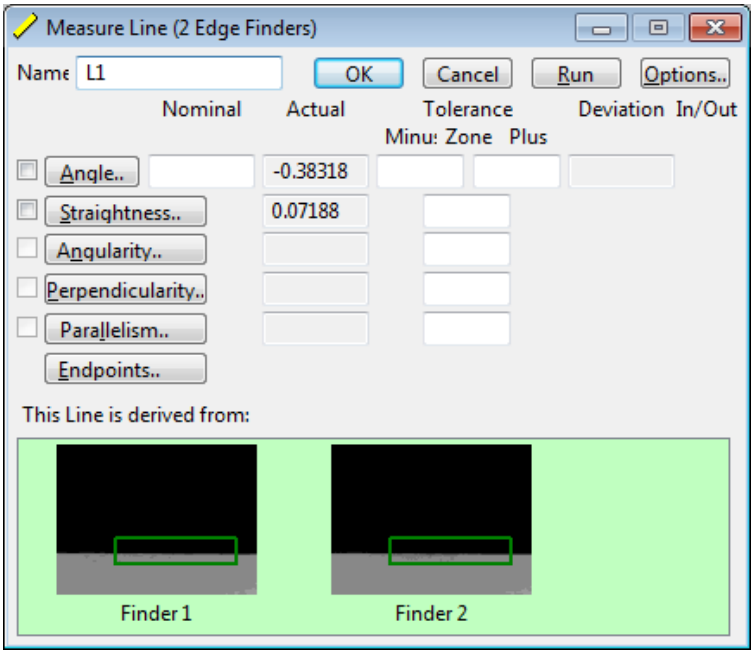
This section describes the following:

Editing a Step

1. Double-click the desired step in the Measurement Steps window to display the measurement or construction dialog box for that step.
2. Make the desired changes and click **OK**.

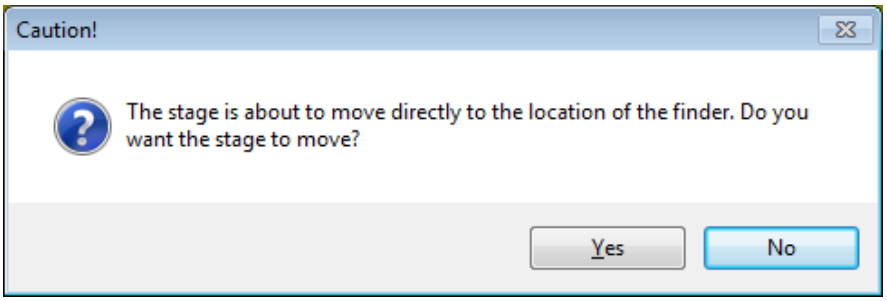
NOTES:

- To edit a finder used in the step, double-click anywhere on the thumbnail for the finder, and then perform Steps 3 through 7 in Editing a Finder Location on page 8-6.
- In the header of the dialog box, the software indicates the number of finders used in the step.

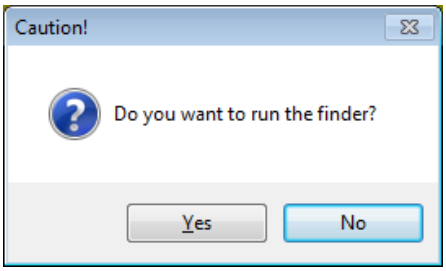


Editing a Finder Location

1. Right-click the desired step in the Measurement Steps window, select **Edit Finder**, and then select the finder you want to edit.
2. Verify the stage path is clear, and then click **Yes** in response to the displayed message.
   - The transports move to the saved finder location
   - The finder appears in the Video window
   - The feature measurement dialog box appears (finder thumbnail is highlighted)



3. Click **No** in response to the following message:



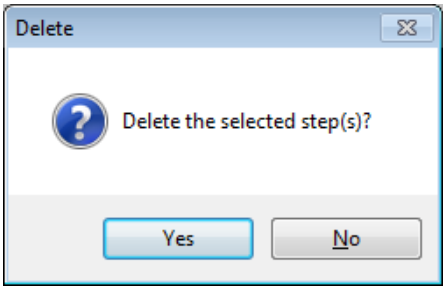
4. If the finder is not properly aligned to the feature, drive the transports and/or reposition the finder to align the finder.
5. Double-click in the Video window to run the finder and remeasure the feature.
6. Click  on the Video window toolbar to accept the finder and save it in the step.
7. Click **OK** in the feature measurement dialog box to accept the changes and save the step; click Cancel to discard the changes.

Deleting Steps

1. Select the desired step(s) in the Measurement Steps window.

To select…	Do this…
A single step	Click the desired step.
Multiple steps, in sequence	Click the first step in the sequence, and then hold down **Shift** as you click the last step in the sequence.

2. Right-click in the Measurement Steps window, and select **Delete**.
3. Click **Yes** in response to the displayed message to delete the selected step (s).



Copying Steps

1. Select the desired step(s) in the Measurement Steps window.

To select…	Do this…
A single step	Click the desired step.
Multiple steps, in sequence	Click the first step in the sequence, and then hold down **Shift** as you click the last step in the sequence.

2. Right-click in the Measurement Steps window, and select **Copy**.
3. See Inserting Steps on page 8-8 for information on how to insert the copied steps into the program.

Inserting Steps

1. Select the step you want the added steps to follow by clicking it in the Measurement Steps window.
2. To insert one or more steps, do either of the following:
   - Measure or construct additional features.
   - Right-click in the Measurement Steps window and select **Paste** to insert any copied step(s).

Moving Steps

1. Select the desired step(s) in the Measurement Steps window.

To select…	Do this…
A single step	Click the desired step.
Multiple steps, in sequence	Click the first step in the sequence, and then hold down **Shift** as you click the last step in the sequence.

2. Right-click in the Measurement Steps window, and select **Cut**.
3. Click the desired step in the Measurement Steps window that you want the cut step(s) to follow.
4. Right-click in the Measurement Steps window, and select **Paste**.

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.

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 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.

Perform the following procedures to create a sample program:

1. Set Up the Part and Define the Part Alignment
2. Measure and Construct Features
3. Specify Output Options
4. Edit the Program
5. Run the Program and View the Results

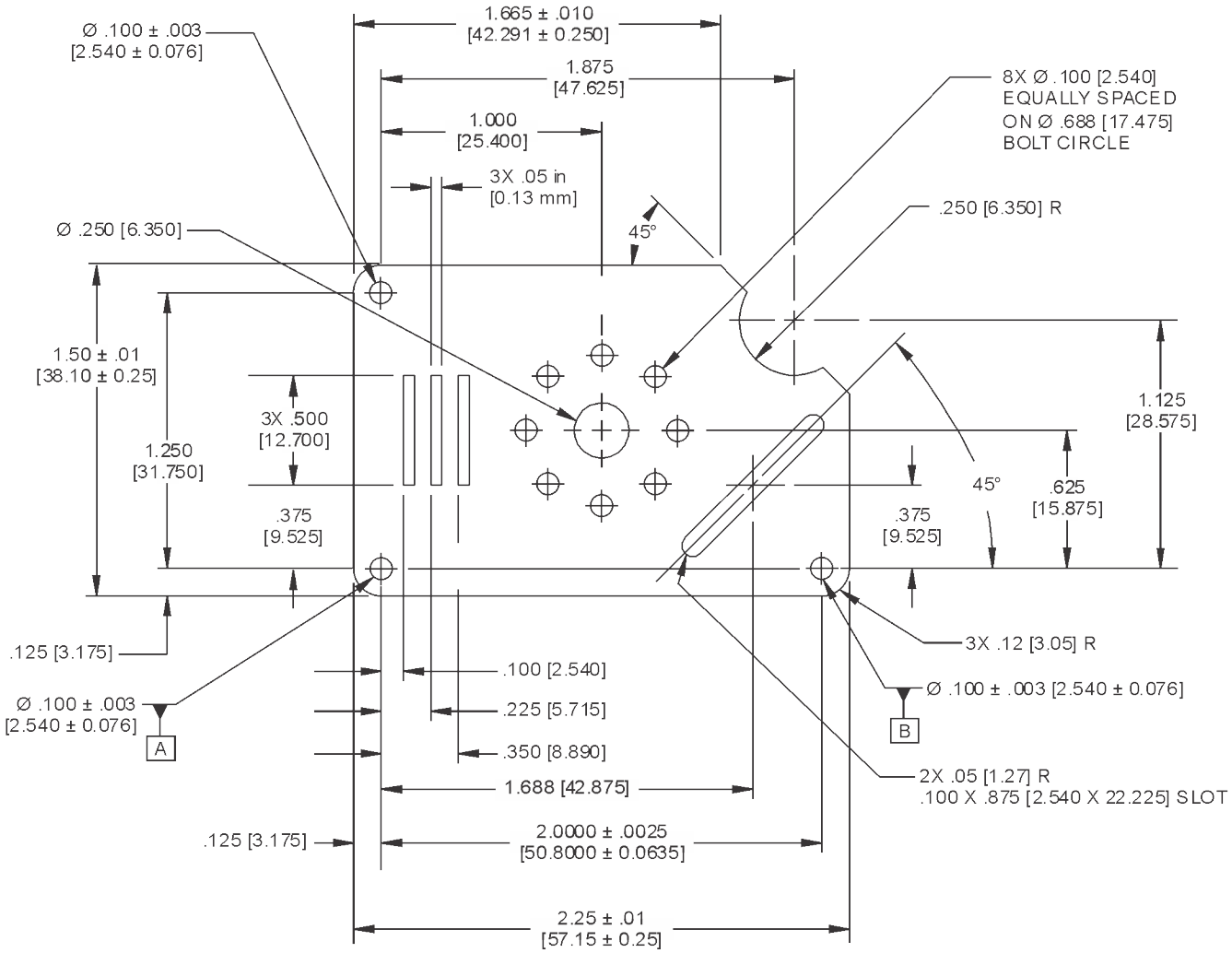
NOTES:

- 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 whichever order is most suitable for you.
- This sample program was created on a system configured with dual magnification optics and a 1X front lens installed.

QVI Training Part

The QVI training part (P/N 790012) is a stamped metal part most suitable for measurement of its two dimensional features using backlit video. It is provided for testing and self training.

Dimension Drawing:



XX [XX] = in [mm]

Unless otherwise specified:

- X.XXX dimension tolerance: ± .005 [0.125]
- X.XX dimension tolerance: ± .01 [0.25]
- Angular dimension tolerance: ± 1°

Set Up the Part and Define the Part Alignment

1. Verify that there are no obstructions in the stage path, and then click **Zero Stage** in the Stage and Lights window to zero the stage.
2. Place and secure the QVI training part on the stage, in the orientation shown on page 8-10.
3. Using the joystick, drive the transports so the bottom edge of the part appears in the Video window.
   - Adjust the intensity of the backlight so there is sufficient contrast.
   - Raise or lower the Z-axis assembly until the image is sharp and focused.
4. Select the **Setup** ribbon, and then select **Measurement** in the Options section.
5. In the Units section of the Measurement Options dialog box, select the **Inches** option.
6. Click **OK** to close the Measurement Options dialog box.
7. Click  on the Video window toolbar, and focus the bottom edge of the part.
8. Select **New** in the VMS File menu (or press Ctrl+N).
9. Define the Part Coordinate System (PCS).
   a. Create an alignment block (described on page 5-3).
   b. 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).
   c. Define a reference plane (S1) using C1, C2, and P1 (described on page 5-7).
   d. Define a reference line (L1) using C1 and C2 (described on page 5-8).
   e. Set the part tilt, part rotation, and part origin (described on page 5-10).
10. Click  on the VMS Toolbar (or press Ctrl+S) to save your work.

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 = .050"
Rounded slot corner	Measure FOV	Arc (A2)	Radius = .050"
Distance between slot corners	—	Distance (D1)	.875"
Distance between slot edges	—	Distance (D2)	.100"
Lower slanted edge	Measure	Line (L5)	Angle = 45°
Semicircle on the right	Measure Non FOV	Arc (A3)	Radius = .250"
Upper slanted edge	Measure	Line (L6)	Angle = 45°
Top edge	Measure	Line (L7)	Y = 1.375"
Upper-left hole	Measure FOV	Circle (C3)	Diameter = .100"
Upper-left corner	Measure FOV	Arc (A4)	Radius = .120"
Left edge	Measure	Line (L8)	X = -.125"
Lower-left corner	Measure FOV	Arc (A5)	Radius = .120"
Bottom edge	Measure	Line (L9)	Y = -.0125"
Lower-right corner	Measure FOV	Arc (A6)	Radius = .120"

2. Click  on the VMS Toolbar (or press Ctrl+S) 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 = .875"
Left edge of left slot	Measure	Line (L11)	X = .100"
Bottom edge of left slot	Measure	Line (L12)	Y = .375"
Right edge of left slot	Measure	Line (L13)	X = .150"
Top edge of middle slot	Measure	Line (L14)	Y = .875"
Left edge of middle slot	Measure	Line (L15)	X = .225"
Bottom edge of middle slot	Measure	Line (L16)	Y = .375"
Right edge of middle slot	Measure	Line (L17)	X = .275"
Top edge of right slot	Measure	Line (L18)	Y = .875"
Left edge of right slot	Measure	Line (L19)	X = .350"
Bottom edge of right slot	Measure	Line (L20)	Y = .375"
Right edge of right slot	Measure	Line (L21)	X = .400"

4. Click  on the VMS Toolbar (or press Ctrl+S) to save your work.

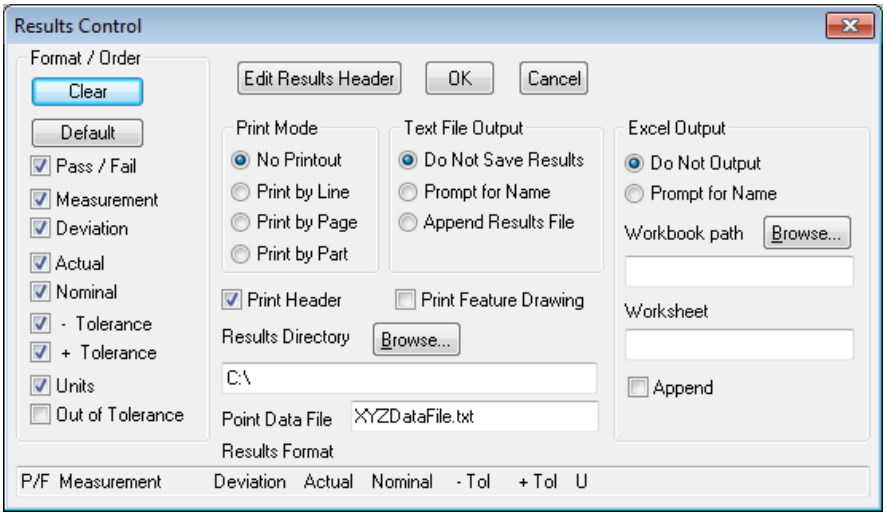
5. Use this table to perform the third set of measurements.

Measurement	Function	Feature	Dimension
Large in the middle of the part	Measure Non FOV	Circle (C4)	Diameter = .250"
Small hole (1) next to large hole	Measure FOV	Circle (C5)	Diameter = .100"
Small hole (2) next to large hole	Measure FOV	Circle (C6)	Diameter = .100"
Small hole (3) next to large hole	Measure FOV	Circle (C7)	Diameter = .100"
Small hole (4) next to large hole	Measure FOV	Circle (C8)	Diameter = .100"
Small hole (5) next to large hole	Measure FOV	Circle (C9)	Diameter = .100"
Small hole (6) next to large hole	Measure FOV	Circle (C10)	Diameter = .100"
Small hole (7) next to large hole	Measure FOV	Circle (C11)	Diameter = .100"
Small hole (8) next to large hole	Measure FOV	Circle (C12)	Diameter = .100"
Bolt circle using C5, C6, C7, C8, C9, C10, C11, and C12	Construct	Circle (C13)	—

6. Click  on the VMS Toolbar (or press Ctrl+S) to save your work.

Specify Output Options

1. Select the **Results** ribbon, and then select **Results Control** in the Options section to display the Results Control dialog box.
2. In the Format / Order section, select the following check boxes:
   - Pass / Fail
   - Measurement
   - Deviation
   - Actual
   - Nominal
   - - Tolerance
   - + Tolerance
   - Units

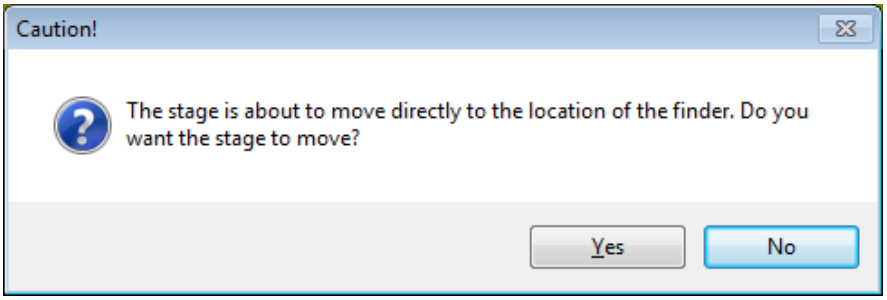


3. Click **Edit Results Header** and enter the appropriate header information.
4. Click **OK** in the Edit Results Header dialog box.
5. Select the **Print Header** check box.
6. If a printer is connected to the system, select the **Print by Part** option in the Print Mode section to output the measurement results to a printer. Otherwise, select the **No Printout** option.
7. Select the **Prompt for Name** option in the Text File Output section to output the measurement results to a text file. Then click **Browse** and create a folder on the C: drive named "QVI_Training_Part".
8. Click **OK** to save the output settings.

Edit the Program

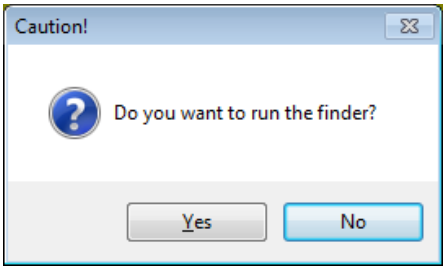
This procedure describes how to edit the finder locations for the reference features used to define the part alignment.

1. Move the training part to a different location on the stage to simulate placing an identical part at another stage location. **Be sure to resecure the part to the stage.**
2. Right-click circle **C1** in the Measurement Steps window, and select **Edit Finder > Circle Finder**.
3. Verify the stage path is clear, and then click **Yes** in response to the following prompt.



   The transports move to the saved finder location and the finder appears in the Video window.

4. Click **No** in response to the following prompt:



5. Using the joystick, drive the transports to align the lower-left hole to the finder.
6. Double-click in the Video window to run the finder and remeasure the feature.
7. Click ✔ on the Video window toolbar to accept the finder and save it in the step.
8. Click **OK** in the feature measurement dialog box to save the step.
9. Right-click circle **C2** in the Measurement Steps window, and select **Edit Finder > Circle Finder**.
10. Repeat Steps 3 and 4.

11. Using the joystick, drive the transports to align the lower-right hole to the finder.
12. Repeat Steps 6 through 8 to edit the finder location, remeasure the feature, and save the step.
13. Right-click point **P1** in the Measurement Steps window, and select **Edit Finder > Autofocus**.
14. Repeat Steps 3 and 4.
15. Using the joystick, drive the transports to position the surface of the part in the Video window; adjust the illumination if necessary.
16. Repeat Steps 6 through 8 to edit the finder location, remeasure the feature, and save the step.

Run the Program and View the Results

1. Click  on the VMS Toolbar (or press Ctrl+R) to reset the program.
2. Click  (or press F5) to run the program.

   The system does the following:

   - Measures the training part by following the steps in the program
   - Displays the results in the Results window
   - Sends the measurement results to the printer (if specified)
   - Sends the measurement 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 8-10.

Reference Information

Software Security

Your license to operate the VMS software requires both a software security dongle and associated license file. The software will only work if these two security components are in place.

NOTES:

- Refer to Troubleshooting Software Security if you have trouble accessing protected software.
- To ensure the software has full access to the required license file, do not deny read or write permission to the C:\Program Files\QVI\QVI License Manager\License Files folder or any files in this folder.
- With the purchase of your QVI system you receive a limited license to the measurement software. Measurement software licenses must be periodically renewed. **Renewal is free, and the process is simple. Visit www.qvii.com/renew or contact the QVI channel partner or the QVI division that provided your QVI product to renew the license prior to expiration. Be sure to renew by the renewal date to avoid downtime.**
- Do not change the date or time on the system controller to an earlier date or time. If you must change the time, close the software first. Then wait the same length of time that you adjusted the clock before restarting the software. If you start the software before the appropriate length of time has elapsed, you may be unable to use the software and you may need a new license file. For users in the GMT +6 or greater time zones, we recommend changing the time zone instead of the time. Contact the QVI channel partner or the QVI division that provided your QVI system for more information.

Software Security Dongle

The software security dongle is a hardware device that prevents unauthorized use of the software and its options. The dongle is attached to the machine and it is programmed at the factory to enable customer-specific applications and software options that you are authorized to use. It is shipped with the manufactured system or with separately purchased software updates and options.

The dongle must be securely plugged into an addressable USB port on the system controller, and its accompanying license file must be in a specific folder.

NOTE: The dongle will enable only the associated maintenance and minor releases. This means that a minor release (for example, version 1.1) will run with the dongle issued for its major release (for example, version 1).

License File

Each software security dongle has a corresponding license file. The license file contains information about the options enabled on your system, and it can only be used with the dongle that has been programmed specifically for your system.

A new license file (not dongle) is required for each major release of the applications and options that it is supplied for (for example, version 1).

Troubleshooting Software Security

If you have trouble accessing software that is protected by the software security dongle and license file, the system displays the messages listed below.

- If you attempt to initialize protected software that is not enabled by the connected dongle, the following message appears:

  The application you are trying to access is not enabled for use, contact QVI customer service.

- If you attempt to initialize protected software when the dongle is disconnected, the following message appears:

  The application you are trying to access requires the presence of a security dongle that cannot be found. Make sure the dongle supplied with the software is securely seated in an addressable USB port and try again.

- If you attempt to initialize protected software when the license file is absent, the following message appears:

  The application you are trying to access requires the presence of a license file that cannot be found. Make sure the license file supplied with the software is installed on the system controller and try again.

- If the dongle is disconnected while the application is running, the application will pause and display the following message:

  Please put the QVI dongle in the USB port.

Certain applications and options may continue to operate even if the security dongle is disconnected. In these cases, you are allowed to save any open part routines. However, the *File / New* and *File / Open* functions are disabled and you will receive an error message if you attempt to use either of these functions. To continue normal operation, reinsert or reseat the dongle and click **Retry**.

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The software described in this manual is based in part on the work of the Independent JPEG Group.

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