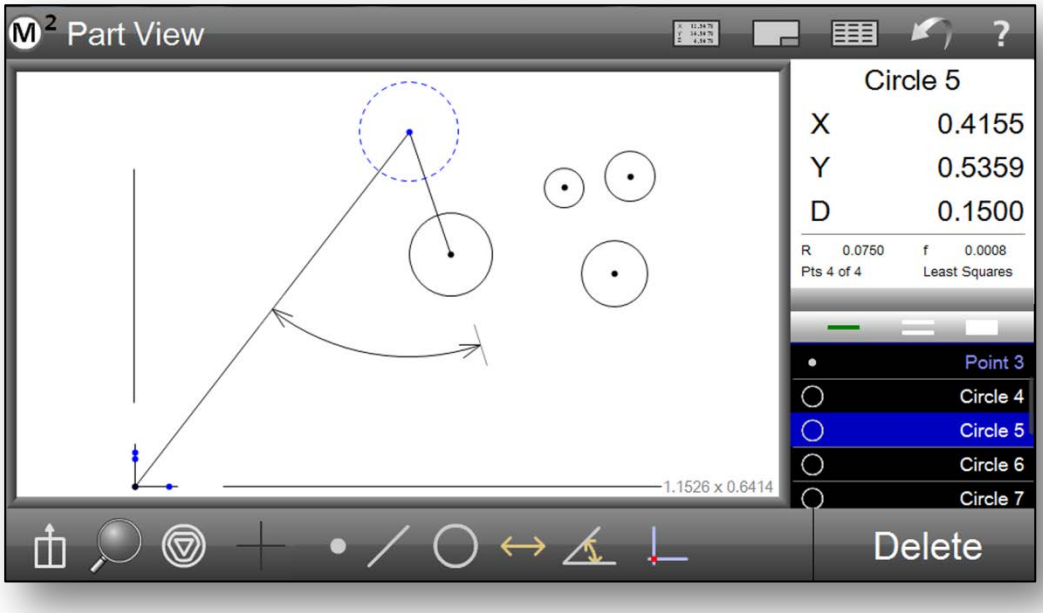


Optical Edge and Crosshair Software

User's Guide

December, 2013 PN# 15000-00 Revision 2

Automation and Metrology International, LLC
8808 Tyler Blvd, Mentor, OH 44060
1-888-354-2525 | sales@auto-met.com
Request a quote: auto-met.com

M2
Optical Edge and Crosshair Software

User's Guide

Optical Edge and Crosshair System

Metlogix Incorporated
175 Canal Street
Manchester, NH 03101 USA
Telephone 603.836.4452
Facsimile 603.369.6499
info@metlogix.com
www.metlogix.com

M2 Optical Edge and Crosshair System User's Guide

Published by:
Metlogix Incorporated
175 Canal Street
Manchester, NH 03101 USA

User's Guide part number: 15000-00 Revision 2
Publishing date: December, 2013
Printed in United States of America
Copyright © 2013 by Metlogix, Incorporated, Manchester, New Hampshire

M2 software version: 1.40.04

All information set forth in this document, all rights to such information, any and all inventions disclosed herein and any patents that might be granted by employing the materials, methods, techniques or apparatus described herein are the exclusive property of Metlogix, Incorporated., Manchester, New Hampshire.

Terms, conditions and features referenced in this document are subject to change without notice.

No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of Metlogix, Inc. Requests to Metlogix, Inc. for permission should be addressed to the Customer Services Department, Metlogix, Incorporated, 175 Canal Street, Manchester, New Hampshire 03101.

Limit of liability and disclaimer of warranty

While this guide was prepared with great care, Metlogix makes no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. The advice, methods and instructions contained in this book might not be suitable for your situation. When in doubt regarding suitability, you are encouraged to consult with a professional where appropriate. Metlogix shall not be liable for any loss of profit or any damages, including but not limited to special, incidental, consequential or other damages.

Trademarks

Metlogix, is a registered trademark of Metlogix, Incorporated.

Windows is a registered trademark of the Microsoft Corporation in the United States and other countries.

Introduction

The M2 Software User Guide describes the operation of the M2 precision measuring software. The M2 software supports manual part positioning and feature measurement under user control, and CNC part positioning and automated measurement under program control. While it is likely that this Guide includes some material that doesn't apply to your specific M2 system, the concepts explained here can easily be applied to all M2 systems.

The concepts explained in this Guide are necessary for the operation of any M2 system. Operators and supervisors will find the contents invaluable in conducting measurements, programming automatic functions and reporting results. A few user setup functions are also described that will help users and supervisors customize the M2 measurement tools, user interface screens and report formats.

Prerequisites

Operators and supervisors are assumed to understand dimensional metrology theory and practice, and have a good working knowledge of Microsoft Windows operating system use and conventions.

Conventions & Terms

The term "M2 system" refers to the M2 software and the measuring hardware connected to it.

Icons

This guide uses the following icons to highlight information:

CAUTIONS & IMPORTANT INFORMATION

The exclamation point icon indicates important information regarding equipment operation or maintenance, or a situation or condition that can lead to equipment malfunction or damage. Do not proceed until the information is read and thoroughly understood.

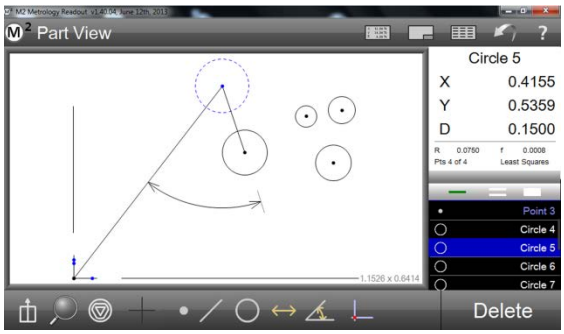
NOTE

The question mark icon indicates important supplementary information about an activity or concept.

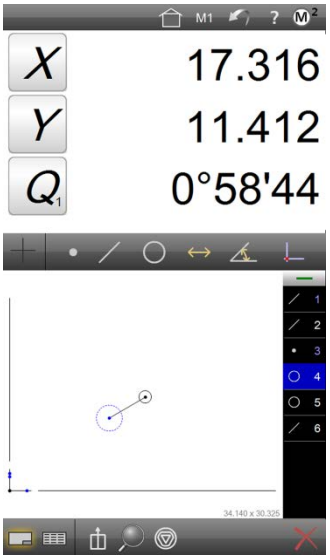
M2 Display Versions

The M2 software is provided to the user in either the horizontal or vertical display version and cannot be changed in the field. With a few minor exceptions, the user interface screens, toolbars, menus and function buttons of horizontal and vertical versions are identical. Once the user interfaces for the horizontal and vertical versions are described in this section, screen images shown in the remaining sections will be oriented horizontally.

The horizontal and vertical user interfaces are described in detail in Section 2: User Interface.



Horizontal version



Vertical version

Menu path navigation

While this discussion of menu path navigation includes screen images oriented horizontally, the concepts described here apply equally well to the vertical version.

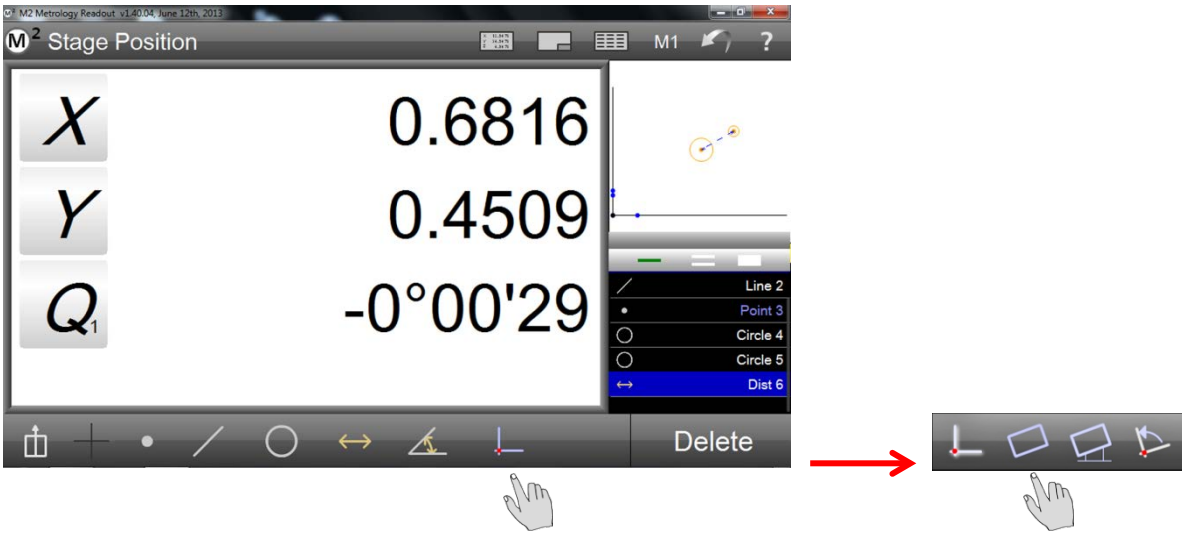
Many references are made in this guide to measurement tools that are displayed by touching or clicking the mouse cursor on a series of toolbar buttons and menu items. This kind of navigation path and the shorthand used to describe it are demonstrated in this example of displaying the Measure Skew button of the Datum menu, accessed through the Measure toolbar. The long form instruction to perform this operation is:

Press or click the Datum button of the Measure toolbar and then press or click the Skew button.

The shorthand that will be used in instructions to describe this operation is:

Measure toolbar > Datum button > Skew

A graphic representation of the operation is shown below.



NOTE

Toolbar buttons can be touched with a fingertip or clicked with a mouse cursor in M2 touchscreen systems. Generally, instructions in this guide will use the term "press" to indicate a finger press or mouse click.

Getting Help

Help is available in this guide, in the electronic version of this guide accessed from the Help menu (question mark icon) of the System toolbar, from your Metlogix distributor or system provider and from our product support page at www.metlogix.com.

Should it become necessary to contact your Metlogix distributor or system provider, be prepared to supply the following information:

- The M2 software version number, found in the About Settings screen accessed through the M2 System menu (M2 logo in the System toolbar)
- Information describing the measuring system hardware which can be found in the Hardware Settings screen also accessed from the About Settings screen
- A detailed description of the problem and the steps that you've taken to resolve it

Contents

Introduction 5

Prerequisites 5

Conventions & Terms 5

Icons 5

M2 Display Versions 5

Menu path navigation 6

Getting Help 6

Section 1: System Overview 1

The M2 Part Inspection Software 1

Section 2: User Interface 3

Mouse click or finger press 3

Screen Organization 3

Viewport Screen Navigation 3

Horizontal Screens 4

Vertical Screens 8

Toolbars, Menus and Function buttons 14

Measure Toolbar Functions 14

Probe 14

Measure Point 15

Measure Line 15

Circle and Arc 15

Distance 15

Angle 16

Datum 16

Preferences 16

Goto Move button (CNC systems) 16

Zoom menu 17

Change Feature Type button 17

System toolbar 17

System menu 17

Viewport indication 18

Home View (vertical version) 18

DRO (stage position) 18

Part View 18

Report 18
Optical Magnification indication 18
Undo button 18
Help button 18
Report Toolbar 19
Report Format menu 19
Hide Row button 19
Edit Cell button 19
Export Data menu 19
Report Filters menu 20
Import DXF Nominals (CNC systems) 20
Program Edit toolbar 20
Resume Playback button 20
Single Step button (CNC systems) 20
Play From Here button 20
Record Into button 21
Re-measure Feature button 21
Add User Message button 21
Delete Program Step button 21
Feature List 21

Section 3: Probes 23
Simple Crosshair Probe 23
Manual Edge Detection Probe 23
Auto Edge Detection Probe 23
Points Required for Feature Measurements 23
Points 23
Lines 23
Circles and Arcs 24
Distances 24
Angles 24
Datum Point Features 24
Skew Features 24
Using Probes 25
Simple Crosshair Probe 25
Manual Edge Detection Crosshair Probe 26
Auto Edge Detection Crosshair Probe 27
Optical Edge Teach 28

Edge Logic Function 29
Auto Point Entry 29
Probe behavior in program playback 30

Section 4: Measuring, Constructing and Creating Features 31
Preparing for Measurement Activities 31
Establishing a Reference Frame 32
Skew alignment 32
Part Datum 32
Probing and Measuring Features 34
Probing Features 34
Repeat Mode Feature Measurements 35
Auto Finish Function 36
CNC Measurement Functions 36
Constructing Features 41
Point Constructions 41
Circle Constructions 41
Arc Constructions 42
Line Constructions 42
Angle Constructions 42
Distance Constructions 42
Feature Construction Procedures 42
Construction Procedures for all Other Features 44
Changing Constructed Feature Type 44
Creating Features 45

Section 5: Feature List, Feature Detail and Part View Functions 47
The Feature List 47
Displaying Features 47
Selecting features 48
Deleting Features from the Feature List 50
Feature Detail screen 50
Part View screen 52
Accessing the Part View screen 52
Selecting Features in the Part View screen 53
Zooming and Panning 53
Displaying Feature Numbers 54
Displaying a Grid 54

Section 6: Reference Frames 55
Establishing a Reference Frame 55
Skew alignment 55
Part Datuming 56
Constructing a Part Datum Point from one or more Parent Features 56
Creating a Datum by Manually Zeroing the X and Y Coefficients of a Feature 56
Rotating and Offsetting a Reference Frame 57
Rotating the Measurement Reference Frame 57
Offsetting the Skew Alignment 58

Section 7: Tolerancing 61
Supported Tolerances 61
Applying Tolerances to a Single Feature 62
Keypad Entry of Nominal Values 63
Go to the Tolerance Screen, Select and Enter Tolerance 64
Go to the Deviation Screen to Observe Results 64
Entering Nominal Values using Auto-Round 65
Entering Nominal and Tolerance Values using Place Tolerancing 65
Importing Nominal Values From a DXF Drawing File (CNC systems) 67
Applying Tolerances to a Group of Features 69

Section 8: Reporting Data 71
Selecting a Report Format 71
Editing Report Cells 72
Hiding Report Data 73
Customizing Report Templates 74
Specifying Printout Settings 74
Displaying Feature Numbers on Printed Reports 75

Section 9: Exporting Data 77
Specifying Export Settings 77
Exporting a Data File 78

Section 10: Programming 79
Part Fixturing Modes 80
No Part Fixturing 80
Temporary Part Fixturing 80
Permanent Part Fixturing 80

Creating and Saving a Part Program 81
Temporary or no Part Fixturing 81
Permanent Part Fixturing (CNC only) 82
Playing a Program 84
Playing Programs with Permanent Fixtures (CNC only) 85
Playing Programs with Temporary or no Fixtures 85
Editing programs 87
Adding Program Steps 88
Re-measuring Feature Steps 89
Deleting Program Steps 89
Playing from a Selected Step 90
Single-stepping program execution (CNC systems) 90
Adding a User Message 90
DXF Import and Auto Programming (CNC enabled systems) 91

Product Warranty 93

SOFTWARE LICENSE AGREEMENT 95
1. Definitions 95
2. Software License 95
2.1 Limited Use 96
2.1.1 96
2.1.2 96
2.1.3 General Use 96
2.1.4 Distribution from a Server 96
2.1.5 Dual Boot Platform 96
2.1.6 Documentation 96
3. Intellectual Property Ownership 96
4. Restrictions and Requirements 97
4.1 Notices 97
4.2 Use Obligations 97
4.3 No Modifications 97
4.4 No Reverse Engineering 97
4.5 No Unbundling 97
4.6 No Transfer 97
4.7 No Service Bureau 97
4.8 MetLogix M Series Restrictions 97
5. Updates 98

6. Limited Warranty 98
7. Disclaimer 98
8. Limitation of Liability 98
9. Export Rules 99
10. General Provisions 99
11. Notice to U.S. Government End Users 99
12. Compliance with Licenses 99
13. Peer to Peer Communications 100

Section 1: System Overview

The M2 Part Inspection Software

The M2 inspection software is advanced metrology software for performing two and three axis measurements at very high levels of precision and accuracy. Measurements can be performed using optical comparators, measuring microscopes and a variety of other crosshair measurement systems. All M2 systems rely on externally generated crosshairs. Component inspection can be performed as part of prototype development, in-line production or final quality inspection.

User interaction with the software can be through a conventional mouse interface or through the M2 MultiTouch Logic. MultiTouch Logic greatly increases ease of use by allowing pan and zoom of the Part View screen with simple finger pinch, swipe and press actions in touch screen systems.

Part feature points are entered manually using simple crosshair probe, or automatically using optical edge detection. The probes include:

- **Simple crosshair**
  This simple crosshair probe is used for manual point entry.
- **Manual optical edge detection**
  This optical edge detection crosshair identifies the location of a point as the crosshair probe crosses an edge, the point is then entered manually by the user.
- **Auto edge detection**
  This optical edge detection crosshair identifies the location of the point as the crosshair probe crosses an edge, and then enters the point automatically.

NOTE
M2 probes are discussed in detail in Section 3: Probes.

A graphic Part View screen displays probed part features and facilitates the construction of new features such as distances and tangents from probed parent features. Feature numbers can be added to features in the Part View screen. The feature numbers will also be shown in reports.

Tolerances can be applied to single features as unique parameters, or can be applied using a more traditional place-tolerance function. Tolerances can also be applied to groups of features.

Feature Detail screens display informative drawings that include point cloud distribution, data fit type, actual values, nominal values, deviations and tolerance results.

Microsoft Windows 7 or 8 provides the operating system basis of functionality, performance and reliability necessary to address a wide variety of application requirements such as exporting data, printing reports and interfacing to third-party applications.

Part measuring programs are created automatically during the measurement process. Programs can be saved when measurements have been completed and played back later to measure like parts.

CNC-enabled M2 systems include DXF auto-programming functions that convert DXF drawing files to part measurement programs automatically. Tolerance nominal values can also be imported from DXF drawing files.

Section 2: User Interface

The M2 Software interface consists of viewport screens and toolbars containing menus and function buttons that work in cooperation to perform and display measurements on a color LED touchscreen. The software interface is organized into:

- Two context sensitive viewports
- The Feature List
- The System toolbar
- The Measure toolbar
- The Report toolbar
- The Program Edit toolbar

The two context sensitive viewports display digital readout (DRO) coordinates, Part View graphics, a detailed view of individual parts and the report form of measurement and tolerance data. Viewports change to support measurement, tolerance and report activities. Viewports appear in either horizontal or vertical orientations. The horizontal and vertical versions are described in detail separately in this section. However, since the horizontal and vertical user interface functions are nearly identical, only the horizontal version will be shown throughout the remainder of this guide.

The Feature List displays and provides access to all part features that have been measured, constructed or created. The Feature List also displays program steps in the program playback or program edit modes.

The System, Measure, Report and Program Edit toolbars contain buttons that control overall measurement, reporting and the program edit functions. Toolbar buttons also provide access to submenus that initiate other specific actions. The horizontal and vertical toolbar button allocations are slightly different. However, horizontal and vertical toolbar button functions are identical.

Mouse click or finger press

The user interface can be navigated and controlled by clicking a mouse cursor on the desired screen location or by pressing the desired location with a fingertip. Additional functions are accessed by long-clicking or long-pressing a screen location. Throughout the remainder of this guide, instructions and examples will use the term “press” to indicate either a mouse click or a finger press on the screen.

Screen Organization

The organization of screens and toolbars changes to support measurement activities that include measuring part features, constructing and creating features, applying tolerances, preparing and sending reports, exporting and saving data and playing or editing part program files. Representative screen organization examples are shown in the following pages. Examples are shown for horizontal and vertical screen versions. Each example shows a slightly different set of measurement and reporting functions.

Viewport Screen Navigation

Viewport screen navigation is very straightforward and intuitive. Generally, screen navigation simply follows the usual workflow of measurement, application of tolerances, reporting or exporting results or editing a part program. The screen images included in this section show the basic viewport screen configurations and the sequence of presses that change the screen contents from one configuration to another. Viewport screens include:

- DRO
- Measure Feature
- Part View
- Feature Detail
- Program Playback

- Program Edit
- Report

The Feature List is always shown.

NOTE

Toolbars and function buttons will be described after this introduction to M2 interface screens. The interface screens, toolbars and function buttons will be described again in more detail as part of instructions and examples of measuring, tolerancing, programming and reporting later in this guide

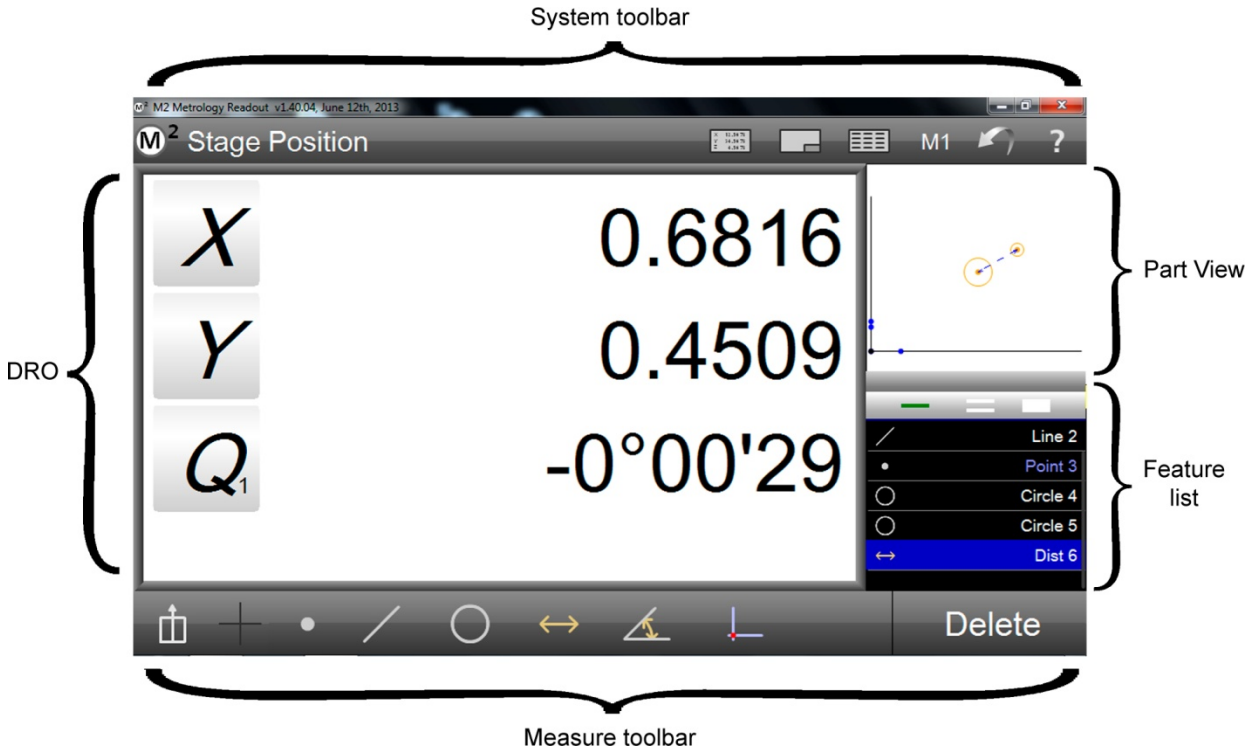
Horizontal Screens

Horizontal versions include the following screens in the large main view:

- DRO
- Measure Feature
- Part View
- Feature Detail
- Program Playback
- Program Edit
- Report

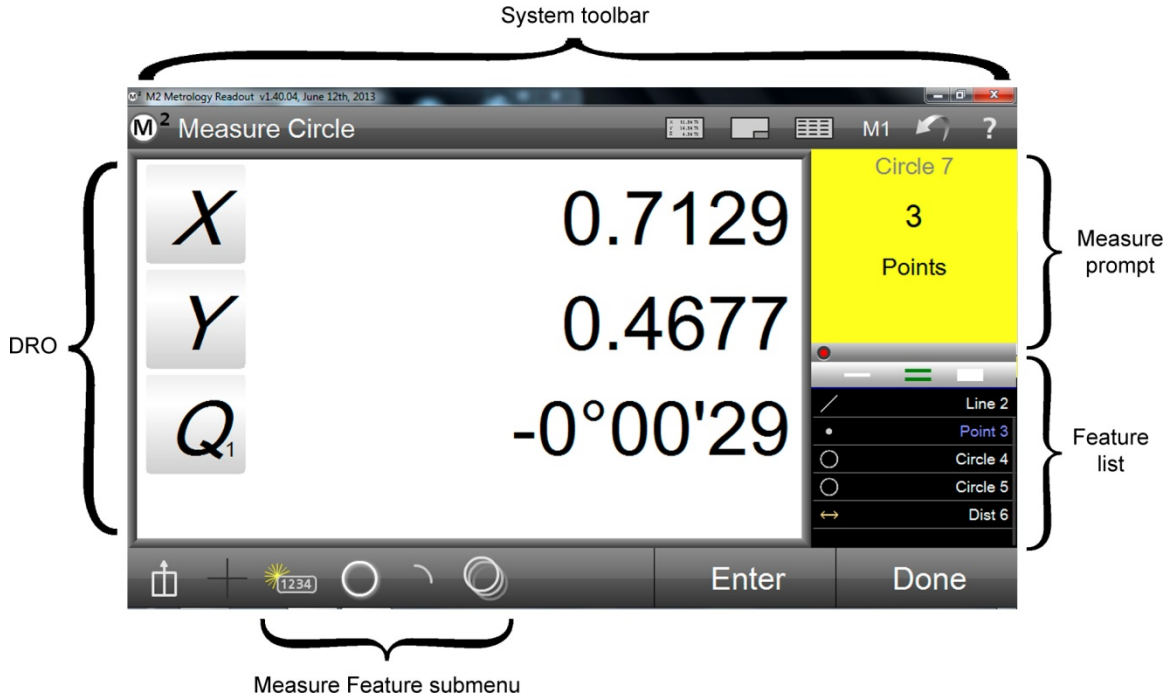
DRO

The default display of the DRO is shown below. The DRO is displayed in the main viewport and the Part View is shown in the upper right viewport. This view is displayed at startup. To obtain this view from another screen configuration, press the DRO button in the System toolbar.



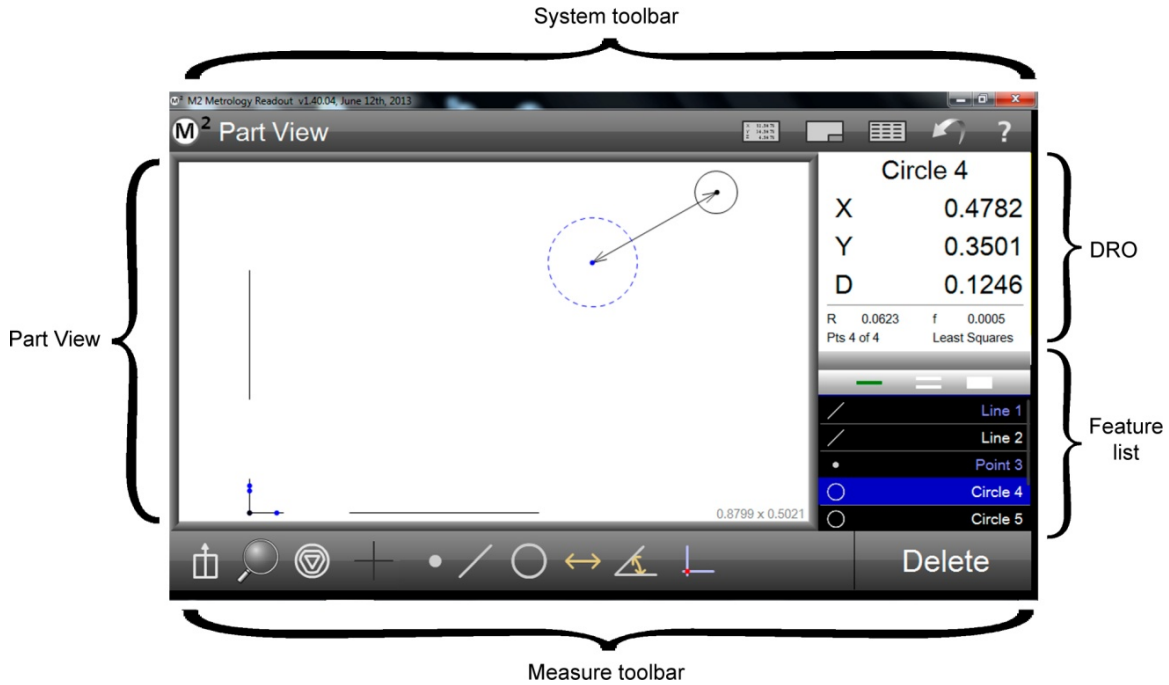
Measure Feature

The DRO is also displayed during feature measurements. The DRO is displayed in the main viewport and the Measure Prompt is shown in the upper right viewport. This view is displayed whenever measurements are being conducted. Stage coordinates are shown in the DRO and the number of acquired points is shown in the Measure Prompt. The Measure feature submenu for the selected feature type will be shown in the Measurement toolbar.



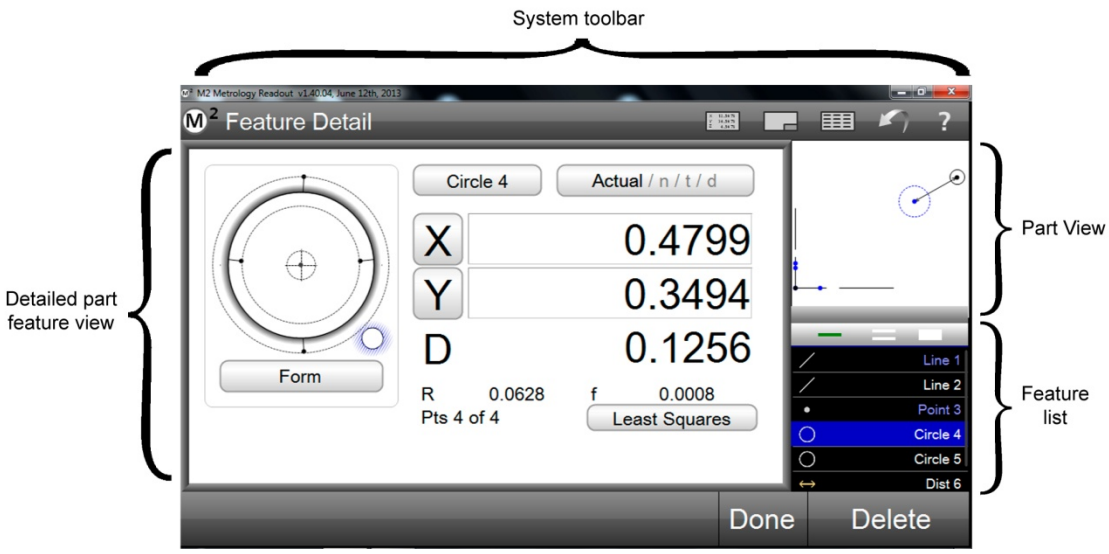
Part View

The Part View is displayed in the main viewport and the DRO is shown in the upper right viewport. The Part View displays a drawing of probed, constructed and created features with the measurement datum. To obtain this view from another screen configuration, press the Part View button in the System toolbar.



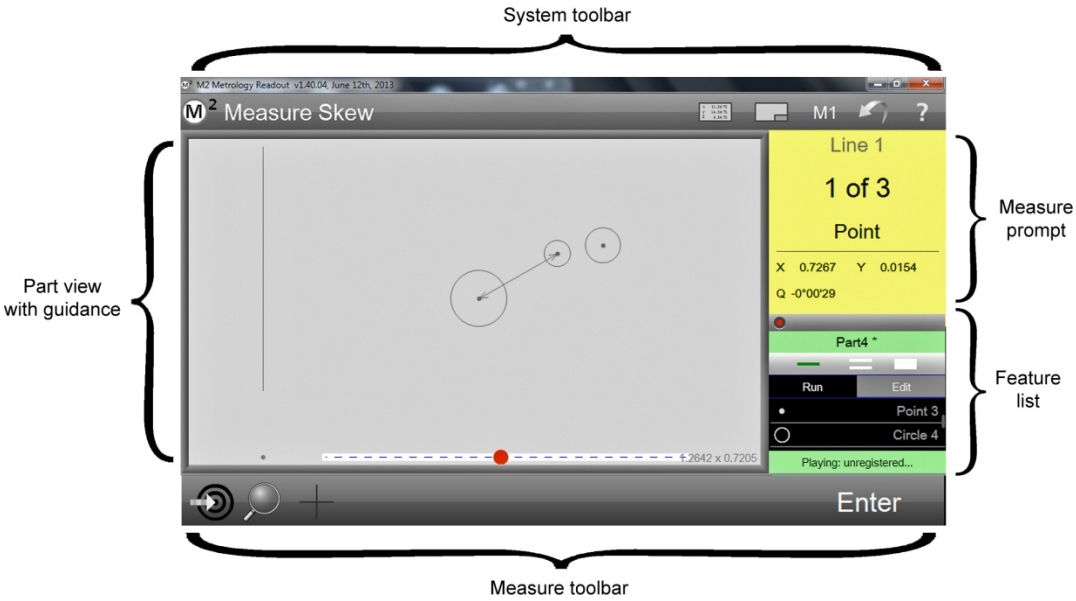
Feature Detail

The Feature Detail view is displayed in the main viewport and the Part View is shown in the upper right viewport. The Feature Detail screen displays a selected feature with probed points that passed or failed any assigned tolerances, and Feature Detail information including position coordinates, feature geometric parameters such as diameter, form, number of probed points and the geometric fit type. The geometric fit type can be changed and tolerances can be assigned, edited or deleted using tools provided by this screen. Press a feature in the Feature List to display the Feature Detail screen. The screen will be discussed in detail in Section 7: Tolerancing.



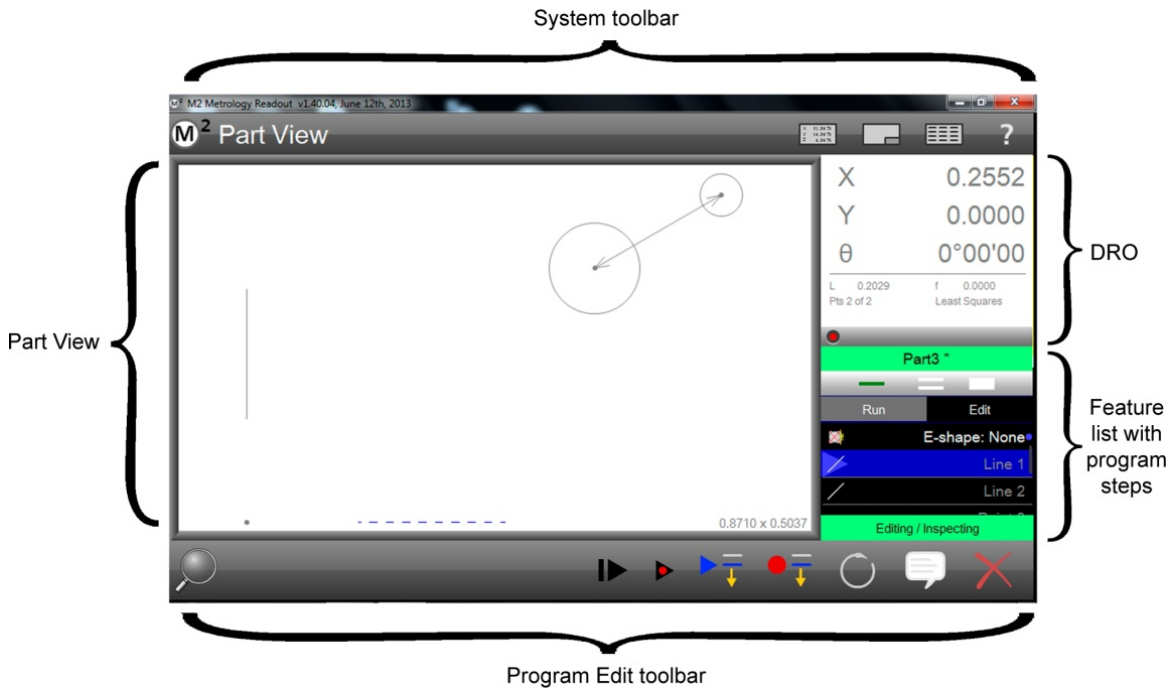
Program Playback

The Part View is also displayed during program playback. The Part View is displayed in the main viewport and the Measure Prompt is shown in the upper right viewport. The Part View screen includes a flashing dot that indicates the next point to be probed. The flashing dot is red until the probe is positioned near the required point location. As the probe nears the required location, the dot becomes green. However, the dot remains red until datum probing is complete. This view is displayed whenever measurements are being conducted during program playback.



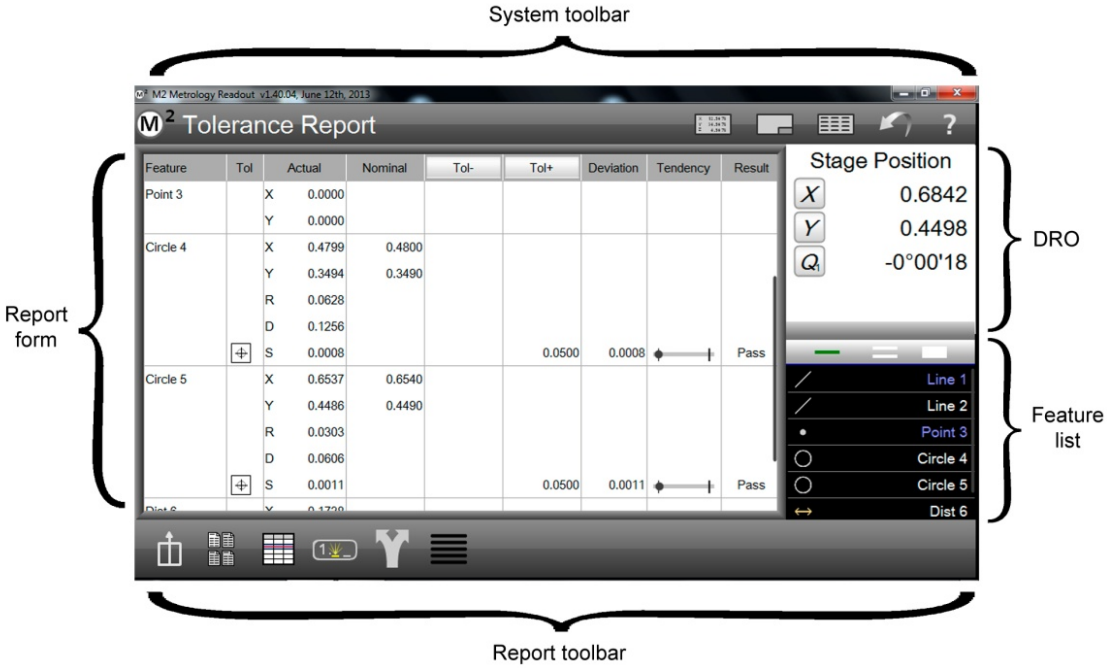
Program Edit

The Part View is also displayed during program editing. The Part View is displayed in the largest viewport and the DRO is shown in the upper right viewport. The Feature List displays all of the steps of the current program. This view is displayed whenever a program is being edited.



Report

The Report View is displayed in the main viewport and the DRO is shown in the upper right viewport. The Report View is used to format, edit and display reports of feature measurements and tolerance results. To obtain this view from another screen configuration, press the Report View button in the System toolbar.



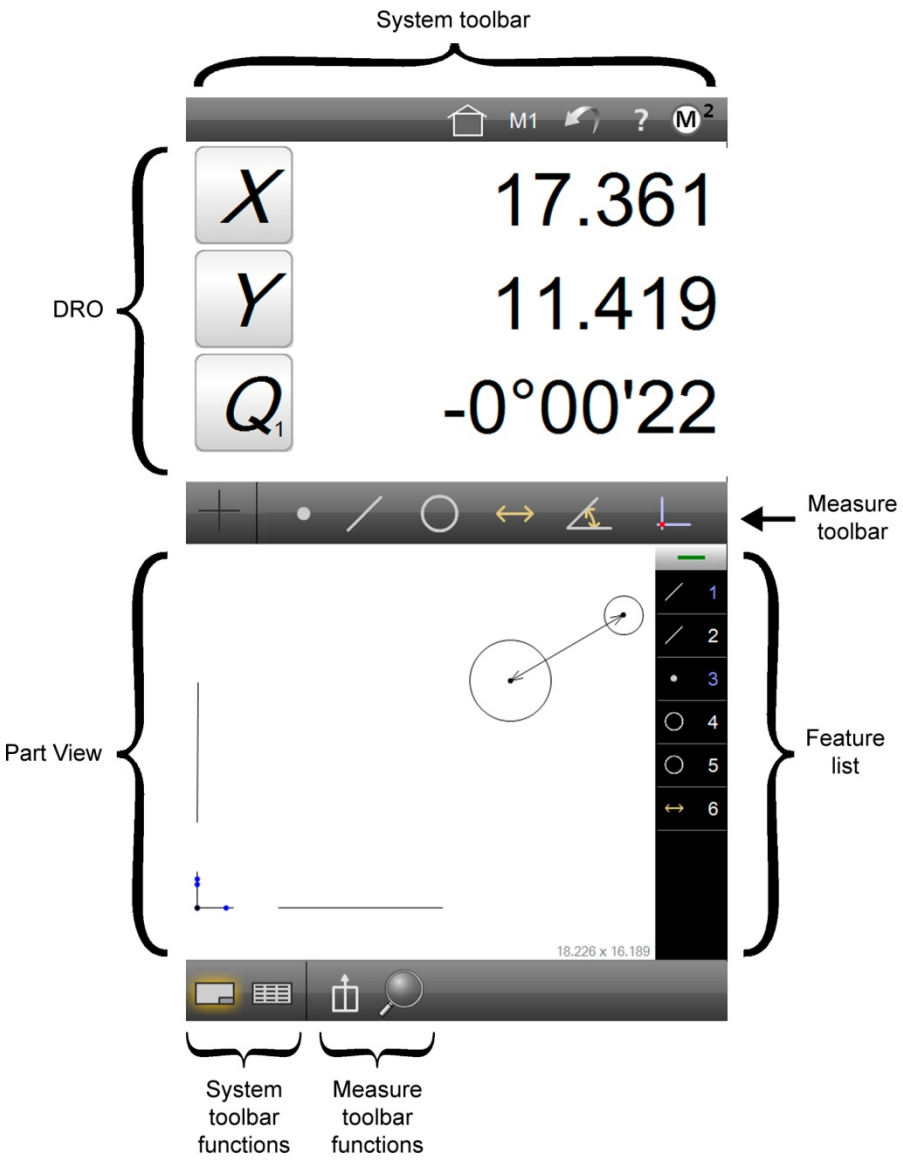
Vertical Screens

Vertical versions can include the following screens in two large viewports:

- DRO and Part View
- Measure Feature and Part View
- Feature Detail and Part View
- Program Playback
- Program Edit
- Report View

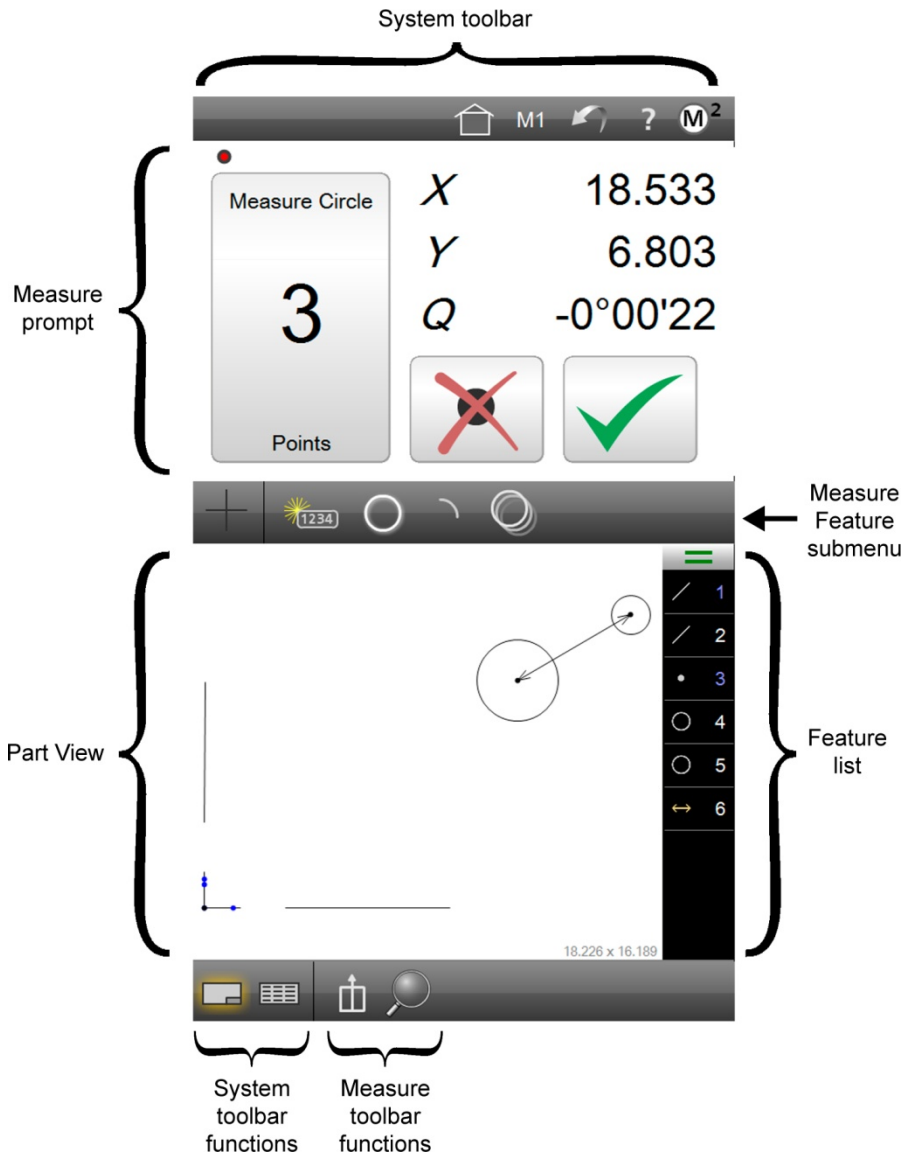
DRO and Part View

The default display of the DRO and Part View is shown here. The DRO is displayed above the Part View at startup. To obtain this view from another screen configuration, press the Home button in the System toolbar.



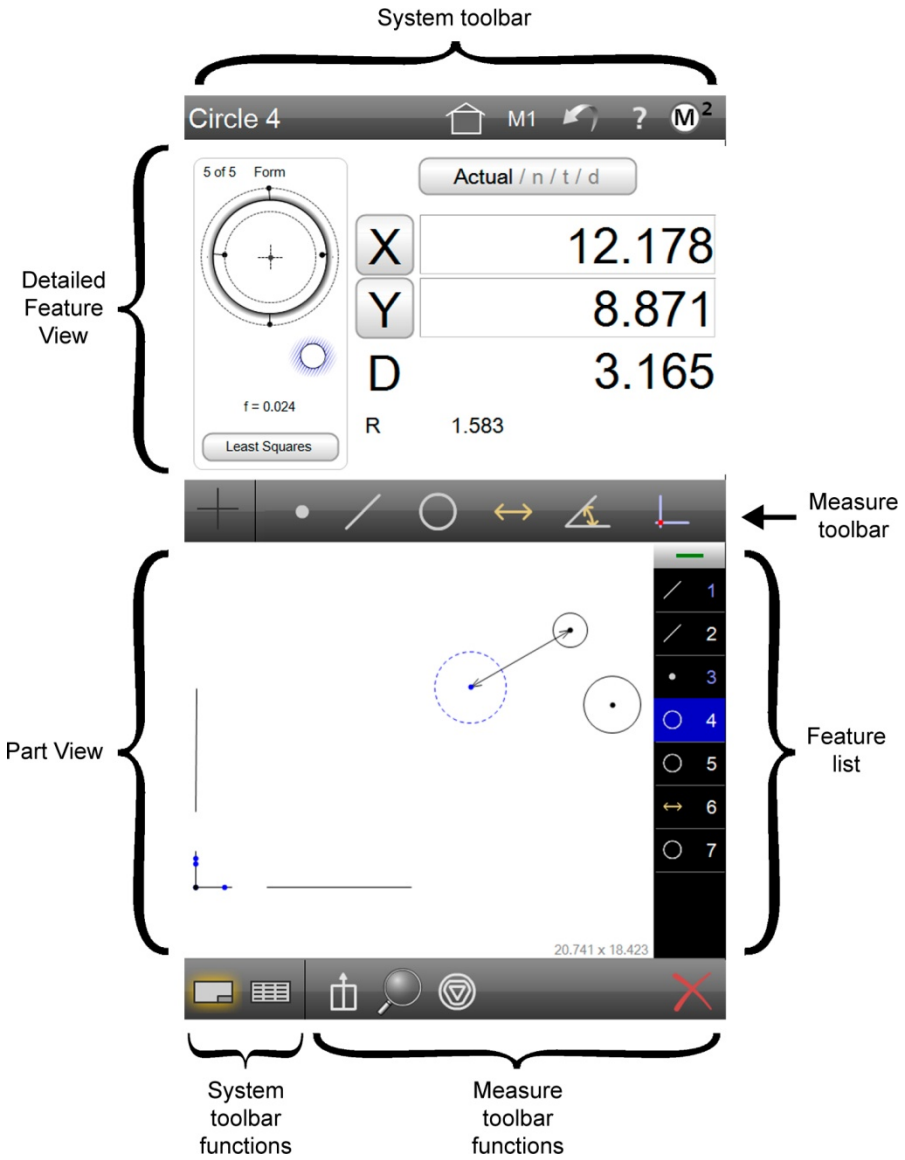
Measure Feature and Part View

The Part View is also displayed during measurements. The Measure Prompt is shown above the Part View. This view is displayed whenever measurements are being conducted. Stage coordinates are shown in the DRO portion of the Measure Prompt with the number of acquired points. The Measure Feature submenu for the selected feature measurement will be shown in the Measurement toolbar.



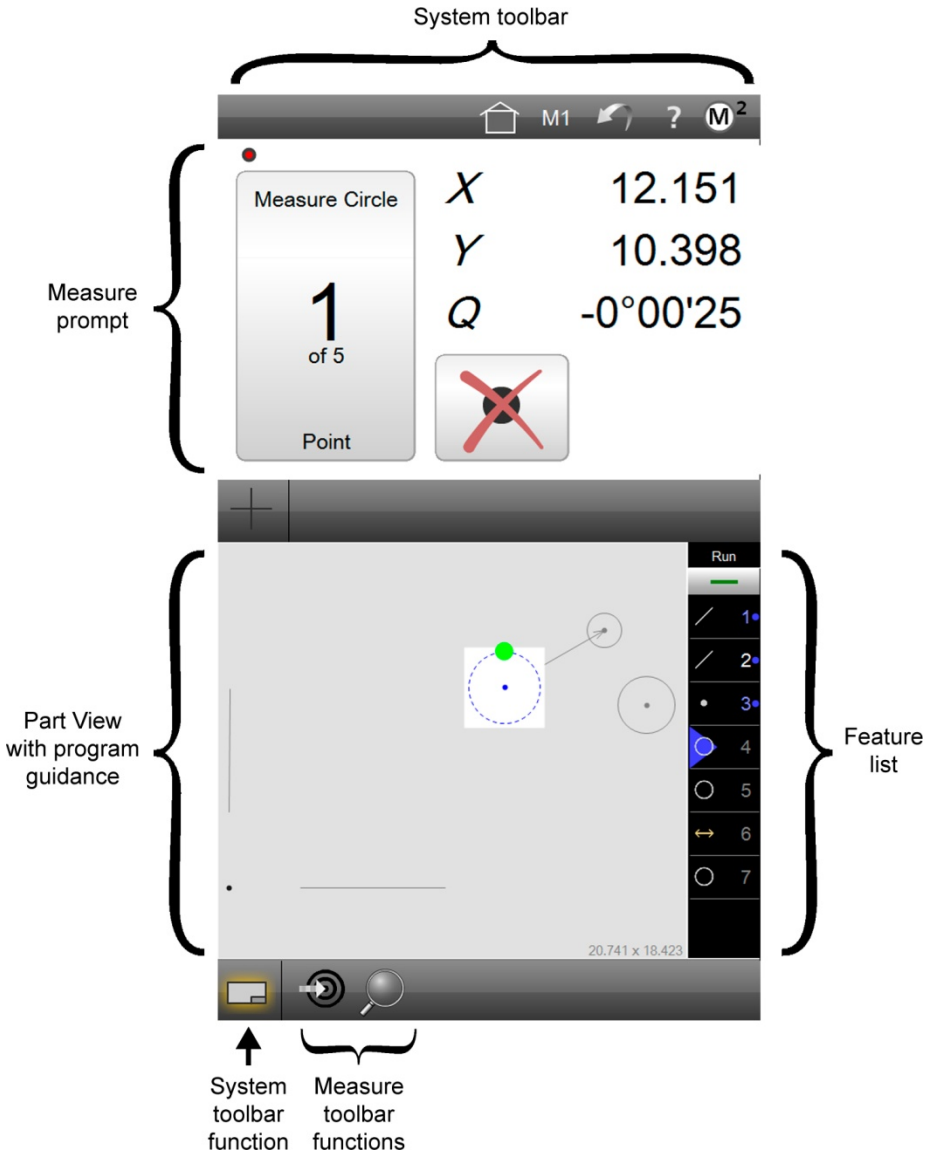
Feature Detail and Part View

The Feature Detail view is displayed above the Part View. The Feature Detail screen displays a selected feature with probed points that passed or failed any assigned tolerances, and Feature Detail information including position coordinates, feature geometric parameters such as diameter, form, number of probed points and the geometric fit type. The geometric fit type can be changed and tolerances can be assigned, edited or deleted using tools provided by this screen. Press a feature in the Feature List to display the Feature Detail screen. The screen will be discussed in detail in Section 7: Tolerancing.



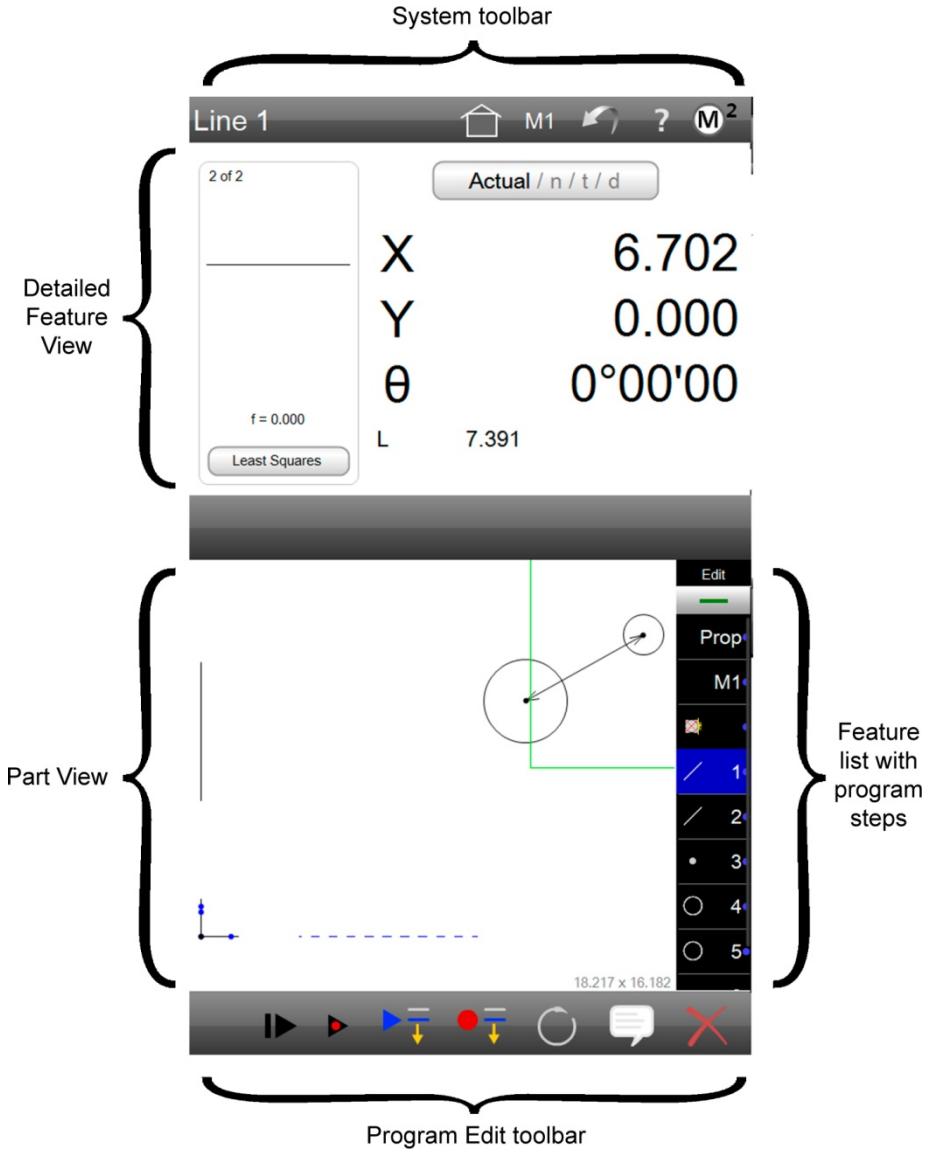
Program Playback

The Part View is also displayed during program playback. The Part View is displayed under the Measure Prompt. The Part View screen includes a flashing dot that indicates the next point to be probed. The flashing dot is red until the crosshair is positioned near the required point location. As the crosshair nears the required location, the dot becomes green. The dot remains red during the probing of the reference frame. This view is displayed whenever measurements are being conducted during program playback.



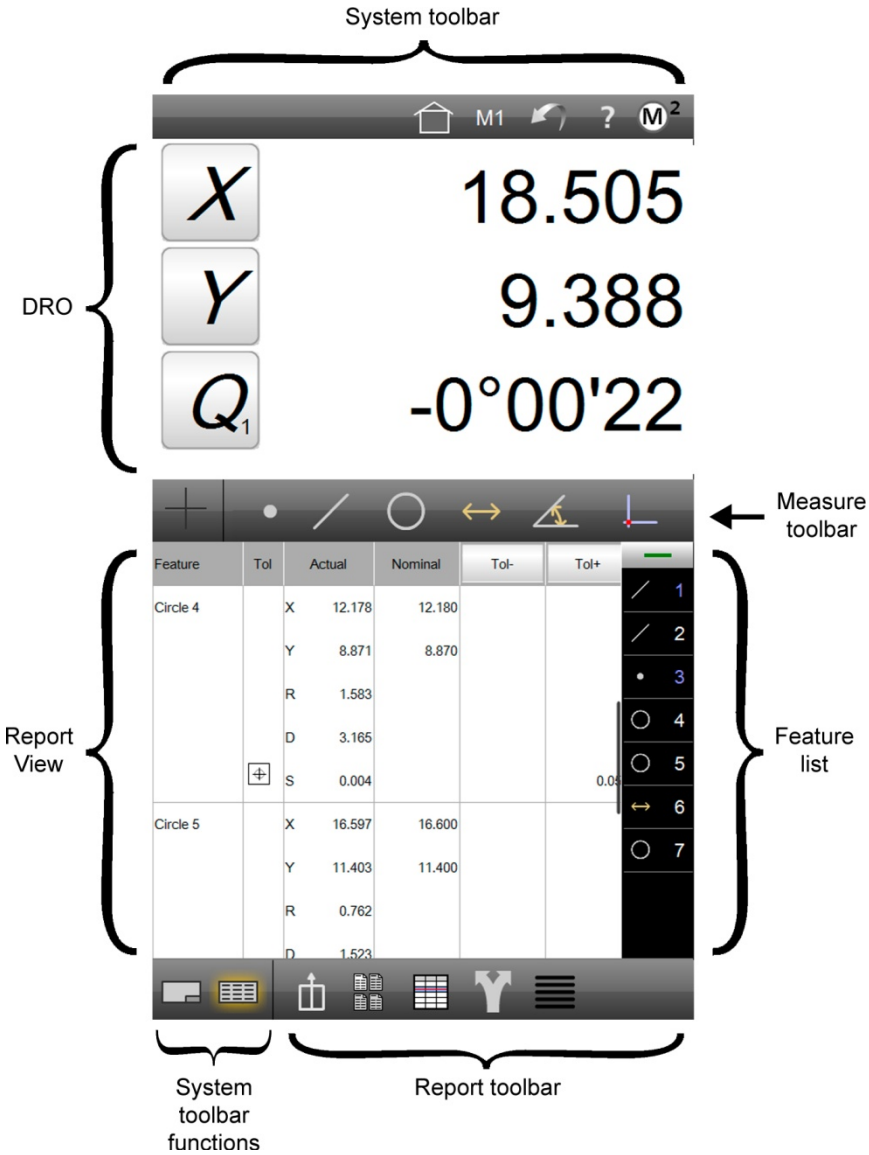
Program Edit

The Part View is also displayed during program editing. The Part View is displayed in the bottom viewport and the Detailed Feature view is shown in the top viewport. The Feature List displays all of the steps of the current program. This view is displayed whenever a program is being edited.



Report View and DRO

The Report View is displayed under the DRO. The Report View is used to format, edit and display reports of feature measurements and tolerance results. To obtain this view from another screen configuration, press the Report View button in the System toolbar.



Toolbars, Menus and Function buttons

Toolbars contain button icons that either perform an operation directly or display a menu of buttons that belong to a specific category of operation. Toolbars include:

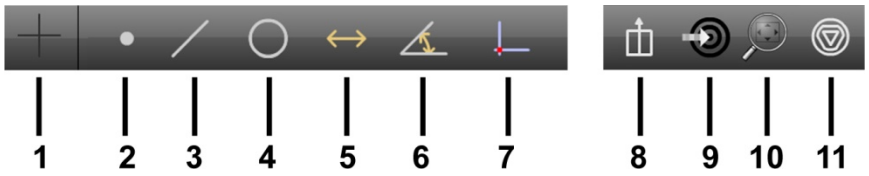
- Measure toolbar
- System toolbar
- Report toolbar
- Program Edit toolbar

NOTE

The arrangement of toolbars and button icons is different in the horizontal and vertical screen versions. Therefore, the descriptions of toolbars, menus and function buttons provided here is representative of both and function definitions can be applied equally well to either version.

Measure Toolbar Functions

The Measurement toolbar functions are distributed across the bottom toolbar in horizontally oriented systems and across the middle and bottom toolbars in the vertically oriented systems. Measurement toolbar functions are shown below.



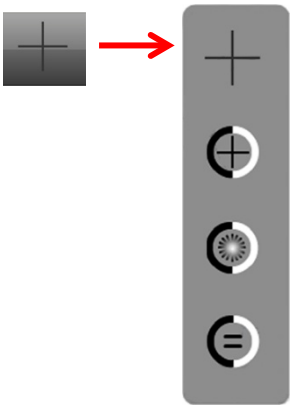
The Measure toolbar menu buttons include:

1 Probe menu
2 Measure Point
3 Measure Line
4 Measure Circle or Measure Arc
5 Measure Distance
6 Measure Angle
7 Measure Datum and Measure Skew
8 Preferences
9 Goto Move (CNC systems)
10 Zoom
11 Change Feature Type

Probe

Press the Probe button to display a submenu of measurement probes. Probe types will be discussed in detail in Section 3: Probes. Probe types include (from top to bottom):

- Simple crosshair
- Manual optical edge detection
- Auto edge detection
- Optical edge teach



Measure Point

Press the Measure Point button to initiate a single point measurement and display the submenu of point measurement function buttons.

Point measurement function buttons include:

- Create point by entering data
- Probe a single point
- Probe a series of points

Measure Line

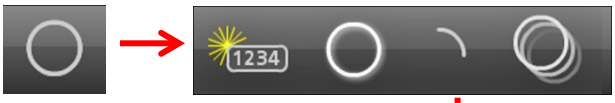
Press the Measure Line button to initiate a single line measurement and display the submenu of line measurement function buttons.

Line measurement function buttons include:

- Create Line by entering data
- Probe a single line
- Probe a series of lines

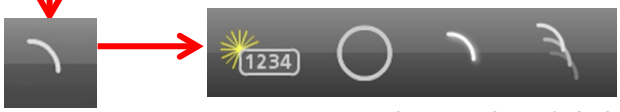
Circle and Arc

Press the Measure Circle button to initiate a single circle measurement and display the submenu of circle and arc measurement function buttons.



Circle and Arc measurement function buttons include:

- Create circle by entering data
- Probe a single circle
- Initiate a single arc measurement and display arc measurement function buttons



- Probe a series of circle

Arc measurement function buttons include:

- Create arc by entering data
- Return to circle function buttons and measure circle
- Probe a single arc
- Probe a series of arcs

Distance

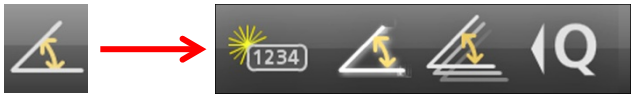
Press the Measure Distance button to initiate a single distance measurement and display the submenu of Distance measurement function buttons.

Distance measurement function buttons include:

- Create Distance by entering data
- Probe a single distance
- Probe a series of distances

Angle

Press the Measure Angle button to initiate a single angle measurement and display the submenu of angle measurement function buttons.



Angle measurement function buttons include:

- Create angle by entering data
- Probe a single angle
- Probe a series of angles
- Measure a rotated crosshair

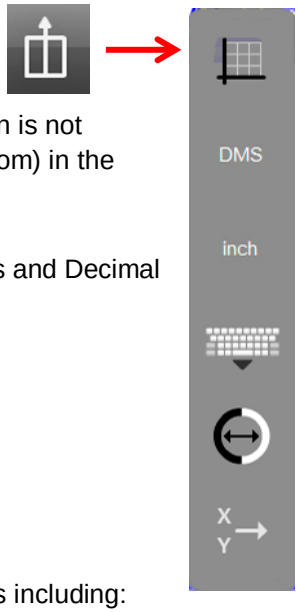
Datum

Press the Measure Datum button to initiate a datum measurement and display the submenu of Datum measurement function buttons used to create a measurement reference frame.

Datum measurement function buttons include:

- Probe or construct a datum point
- Probe or construct a part skew
- Create an offset skew
- Rotate the coordinate system around the datum point

Preferences



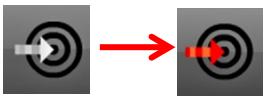
Press the Preferences button to display the utility functions specified as “Extra” in the Desktop Settings screen accessed from the M2 System Menu. Utility functions can be hidden, displayed in the System toolbar or contained in the Preferences menu. When no utilities are specified as “Extra” in the Desktop Settings screen, the Preferences Menu button is not shown in the Measure toolbar. All available utility functions are shown here (from top to bottom) in the Preferences menu:

- Toggles the displayed coordinate system between Polar and Cartesian
- Toggles the display of angular units of measure between Degrees/Minutes/Seconds and Decimal Degrees
- Toggles the display of linear units of measure between millimeters and inches
- Displays the on-screen keyboard
- Initiates an optical distance calibration
- Sends selected feature data to the RS-232 serial port

Goto Move button (CNC systems)

The Goto function prepares CNC enabled systems to perform one of three CNC goto moves including:

- Goto position
- Goto feature
- Goto Part View location



Press the Goto button to enable CNC goto moves. The button arrow will turn red and the M2 screen will display green control borders around the interface areas where goto commands can be executed. The Goto function is described in detail in Section 4: Measuring, Constructing and Creating Features.

Zoom menu

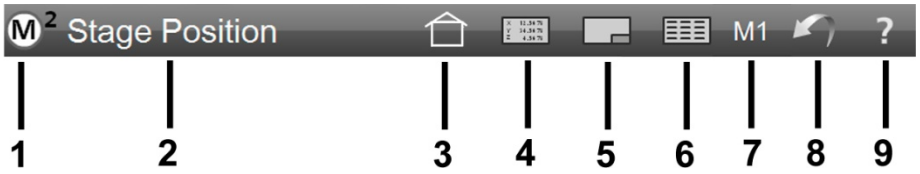
Press the Zoom button to display the zoom magnification functions available for the Part View. Zoom functions include (from top to bottom):

- Zoom to include all features
- Zoom to include all features selected in the Features list
- Zoom to include all features in closed by the user marquee (press and drag to create a marquee)

Change Feature Type button

The Change Feature Type button changes the feature type of the feature selected in the Feature List or Part View when the feature can be defined by identical parameters. For example, a circle feature can be changed to an arc. The Change Feature button is not shown when there are no alternative feature types for the selected feature.

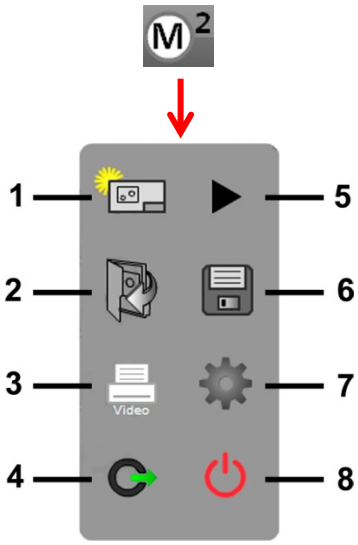
System toolbar



The System toolbar function buttons can be configured in the Desktop Settings screen to contain any of the utility functions described earlier in the Preferences menu description. When no utility functions are specified for the system menu (desktop), the minimum buttons contained in the System menu include:

1 System menu
2 Main viewport content indication
3 Home View button (vertical version). The default home screen displays the DRO and Part Views.
4 DRO (stage position)
5 Part View
6 Report View
7 Optical magnification
8 Undo
9 Help

System menu



Press the System Menu button to display the system functions including:

1 New Part: clears the current part Feature List and part data in preparation for new part measurements
2 Open part file: displays an open file dialog for opening a previously saved part file
3 Print: prints the contents of the main viewport (DRO, Part View, report)
4 User login: used to switch to a different user login account. User Account passwords and privileges are setup in the Security Settings screen.
5 Play program: initiates the playback of the current or loaded part program
6 Save program: displays a save part dialog for saving the current part file
7 Settings screens: provides access to the M2 Settings Screen menu
8 Exit M2: closes the M2 program

NOTE

The M2 does not save the current part upon closing. Be careful to save your current part file before exiting the M2 if you wish to retain your measurement session activities.

Viewport indication

The indication will display the name of the current main viewport contents and will provide useful information during program playback such as "Measure Circle":

- Stage position
- Part View
- Report
- Measure Feature (current measurement)

Home View (vertical version)

Press the Home View button to quickly display the home view screen. The Home View is typically the most used arrangement of viewports. The home view displays the DRO above the Part View.

DRO (stage position)

Press the DRO button to display the current stage position.

Part View

Press the Part View button to display the current Part View drawing of probed part features.

Report

Press the Report button to display a report of feature measurement and tolerance data in the report format selected in the Report Format menu of the Report toolbar. The Report toolbar will be discussed in detail after this discussion of the System toolbar.

Optical Magnification indication

The current system optical magnification is displayed. This is also a menu that provides access to the other defined magnifications in the system. This indication is only displayed when more than one magnification is configured in the system.

Undo button

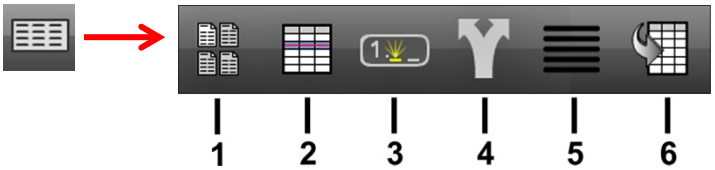
Press the Undo button to erase the last software operation.

Help button

Press the Help button to display a hyperlinked version of this M2 User's Guide.

Report Toolbar

The Report toolbar is displayed when the Report button is pressed in the System toolbar to display the feature measurement and tolerance report in the main viewport.

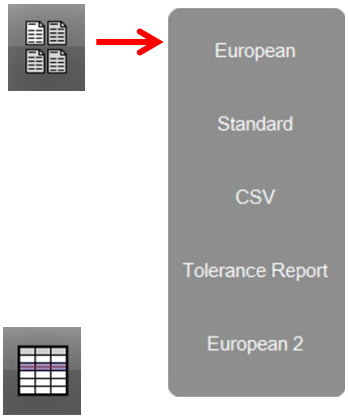


The Report toolbar contains:

1 Report Format menu
2 Hide Row button
3 Edit Cell button
4 Export Data menu
5 Report Filters menu
6 Import DXF Nominals (CNC systems)

Report Format menu

Press the Report Format button to display the menu of report format types. Report formats include:



- European
- Standard
- CSV
- Tolerance Report
- European 2

Hide Row button

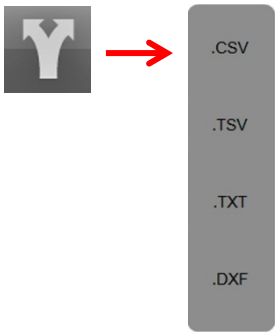
Press the Hide Row button to hide selected report rows in printed or exported report data. Long press the hide row button to hide all rows that are not currently selected.

Edit Cell button

Press the Edit Cells button to enable the alphanumeric editing of report cells. Editable cells will become highlighted in green.

Export Data menu

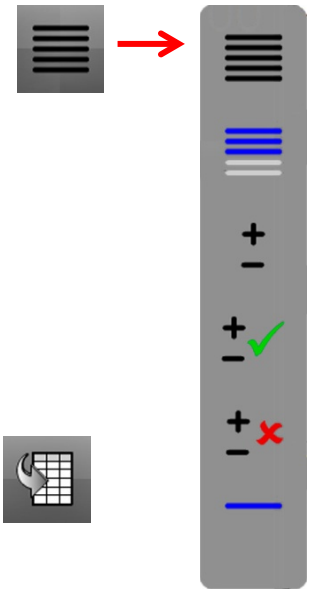
Press the Export Data button to select an export format from the menu of export formats and export the report data.



NOTE

The DXF Export option is only available on CNC systems or on manual systems that have the Digital Comparator option enabled.

Report Filters menu



Press the Report Filters button to select a filter from Report Filters menu. Printed and exported reports will include only the filtered data. Report filters are discussed in more detail in Section 8: Reporting Data. Filters include (from top to bottom):

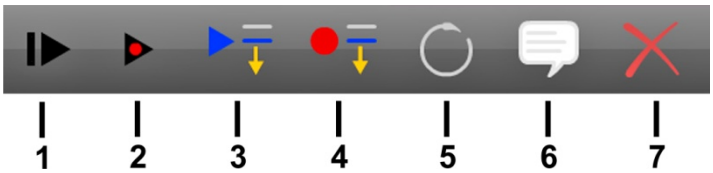
- Filter All
- Filter Selected
- Filter Toleranced
- Filter Passed Tolerance
- Filter Failed Tolerance
- Filter Feature Type

Import DXF Nominals (CNC systems)

Press the Import DXF Nominals button to display a file import dialog and specify a DXF drawing file from which part feature nominal tolerance values will be extracted. Importing DXF nominal values will be discussed in detail in Section 7: Tolerancing.

Program Edit toolbar

The Program Edit toolbar is displayed when an M2 program is placed in the edit mode. Program recording, playback and editing are discussed in detail in Section 10: Programming.



The Program Edit toolbar contains:

1 Resume Playback button
2 Single Step button
3 Play From Here button
4 Record Into button
5 Re-measure Feature button
6 Add User Message button
7 Delete Program Step button

Resume Playback button

Press the Resume Playback button to reinitiate program playback after the program has been paused.

Single Step button (CNC systems)

Press the Single Step button to execute the program in single feature steps. Single feature steps can be executed in forward and reverse directions.

Play From Here button

Press the Play From Here button to reinitiate program playback from the current program line location.

Record Into button

Press the Record Into button to insert a new program step after the current location.

Re-measure Feature button

Press the Re-measure Feature button to replace the feature measurement at the current location with new feature measurement.

Add User Message button

Press the Add User Message button to insert a user-defined message before the current location.

Delete Program Step button

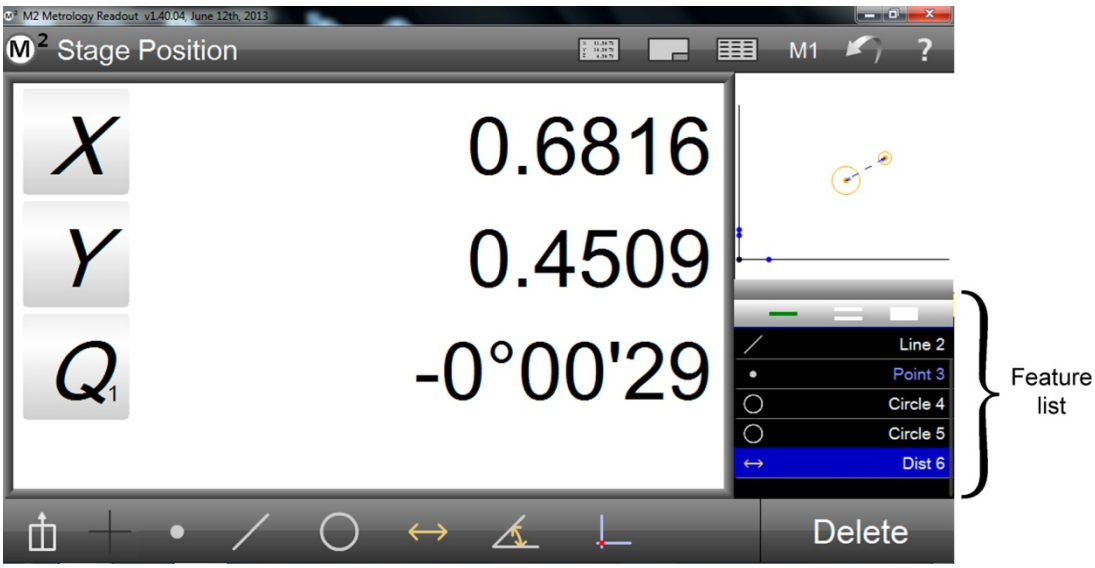
Press the Delete Feature Step button to delete the feature step at the current location.

NOTE

Various program steps can be deleted, such as feature measurements and magnification steps. However, program steps that are part of the datum creation cannot be deleted. Additionally, datum features cannot be re-measured or edited into a program with the Record Into function.

Feature List

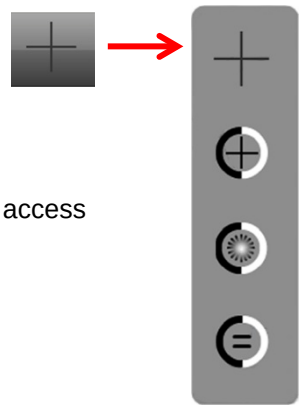
The Feature List is discussed in detail in [Section 5: Feature List and Part View Functions](#).



Section 3: Probes

Features are measured by probing points along the edge of the feature. Points are probed as part of either an explicit or automatic feature measurement using one of the M2 simple or optical edge crosshair probes. There are two main categories of probes:

- Simple crosshair
- Optical edge detection crosshairs
    - Manual edge detection
    - Auto edge detection



M2 systems that support optical edge detection probes will display a probe menu providing access to the (from top to bottom):

- Simple crosshair probe
- Manual edge detection probe
- Auto edge detection probe
- Probe Teach (optical edge calibration)

Systems without optical edge support will always be prepared to accept points entered manually using the simple crosshair.

Simple Crosshair Probe

Crosshair probes are used to measure a single point at a time by manually lining up the crosshair center with a point to be probed on the feature edge and then pressing the Enter button or pressing in the Measure Prompt screen. The DRO stage position is continually updated.

Manual Edge Detection Probe

The manual edge detection crosshair center must be aligned by the user but incorporates a relatively large area of edge detection that will detect a point on the feature edge automatically generating a tone as the crosshair center passes over the light/dark transition at a feature edge. The point location is retained by the system and must then be entered by pressing the Enter button or pressing in the Measure Prompt screen. The point location is retained by the system until the next edge is crossed. Manual edge detection increases measurement accuracy and reduces measurement time. The DRO stage position is updated only when a new edge is detected.

Auto Edge Detection Probe

Like the manual edge detection crosshair, the auto edge detection crosshair must be aligned with the part by the user and detects feature edges as explained above, but the detected point is entered automatically without the need for user interaction, further reducing measurement time. The DRO stage position is updated only when a new edge is detected.

Points Required for Feature Measurements

The minimum number of points required for each feature type and recommendations regarding probing are provided below. Probing more than the minimum required number of points increases measurement accuracy.

Points

Require one or more points. When more than one point is probed, a least squares fit is applied to the data cloud.

Lines

Require two or more points. When more than two points are probed, the data fit type specified in the Feature Detail screen is applied to the feature's data cloud. Points should be evenly distributed along the line.

Circles and Arcs

Require three or more points. When more than three points are probed, the data fit type specified in the Feature Detail screen is applied to the feature's data cloud. Circle points should be evenly distributed around the circle. Arc points begin at one end of the arc and finish at the other, with intermediate points evenly distributed along the arc. Arcs greater than 180 degrees can also be interpreted as circles by the M2 software. To change a feature between an arc and a circle:

- Select the feature in the Part View
- Press the Change Feature Type button in the Measure toolbar.

Distances

Require two points.

Angles

Require two or more points on each leg of the angle. Points are probed first on one leg and then on the other leg of the angle. Additional points can then be probed to increase measurement accuracy.

Datum Point Features

Require a minimum of one point. When more than one point is probed, a least squares fit is applied to the data cloud.

Skew Features

Require a minimum of two points. The skew feature is of fundamental importance to the creation of a reference frame; therefore more than the required minimum number of points should be probed along the skew line to ensure skew accuracy. When more than two points are probed, a least squares fit is applied to the data cloud.

Using Probes

Three probes are supported by the M2 system:

- Simple crosshair probe
- Manual edge detection crosshair probe
- Auto edge detection crosshair probe

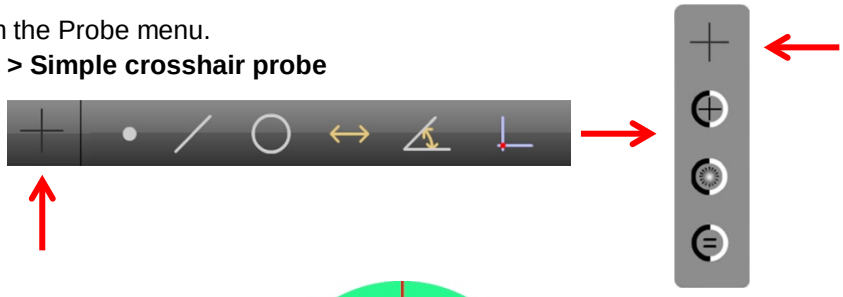
Automatic point entry can be enabled for the simple crosshair or the manual optical edge crosshair when used in conjunction with the countdown timer. Auto Point Entry and the countdown timer are discussed in Auto Point Entry later in this section.

Simple Crosshair Probe

The simple crosshair consists of two lines crossed at 90 degrees. Single points are acquired manually or automatically during program playback (in CNC enabled systems) by positioning the crosshair intersection over a feature. To use the simple crosshair probe:

1 Select the simple crosshair probe from the Probe menu.

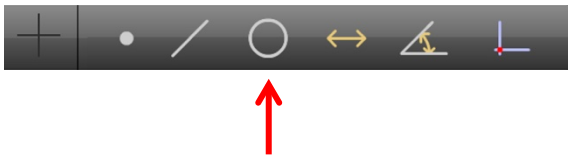
Measure toolbar > Probe menu > Simple crosshair probe

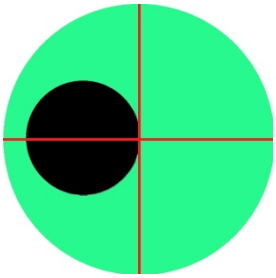


2 Select a feature type to probe (circle in this example).

Measure toolbar > Measure Circle button

3 Position the crosshair probe over a feature edge.





Crosshair at edge

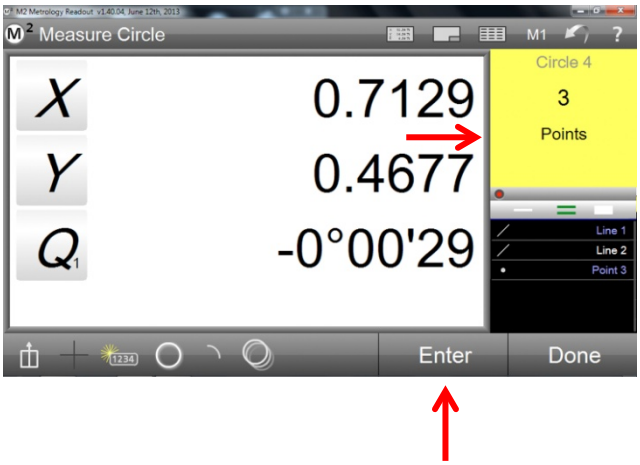
4 Press the Enter button or press in the Measure Prompt to fire the probe. A single point will be entered.

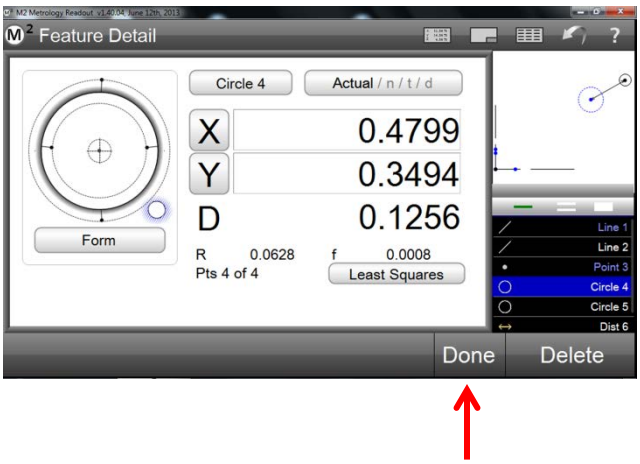
Measure toolbar > Enter button or in Measure Prompt

5 Probe the required number of points and then press the Done button to complete the feature measurement.

Measure toolbar > Done button

The feature will be shown in the Feature List and in the Feature Detail screen.





Manual Edge Detection Crosshair Probe

The manual edge detection crosshair includes an edge detection zone around the crosshair intersection. When the crosshair is positioned near an edge and the edge is recognized by the system, a tone is produced to alert the operator, the probe is fired and the point location is retained in the system until another edge is crossed. Single points are acquired manually or automatically in program playback (in CNC enabled systems) as the crosshair intersection passes over a feature edge. The operator must press the Enter Button or press in the Measure Prompt to enter the point. To use the manual edge detection crosshair probe:

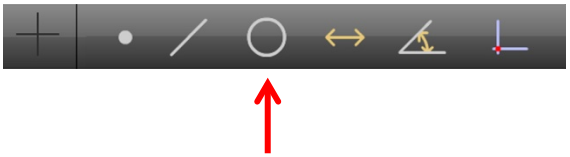
1 Select the manual edge detection crosshair probe from the Probe menu.

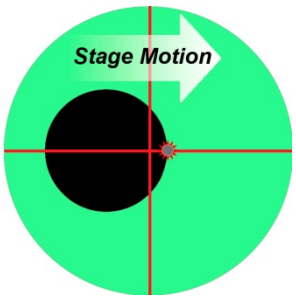
Measure toolbar > Probe menu > Manual edge detection crosshair probe

2 Select a feature type to probe (circle in this example).

Measure toolbar > Measure Circle button

3 Sweep the crosshair probe over a feature edge. The probe will fire and a tone will be produced.





Crosshair sweeps over edge from outside feature to inside

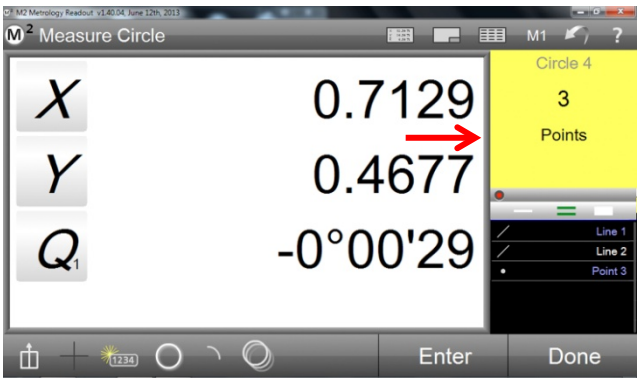
4 Press the Enter button or press in the Measure Prompt to enter the point.

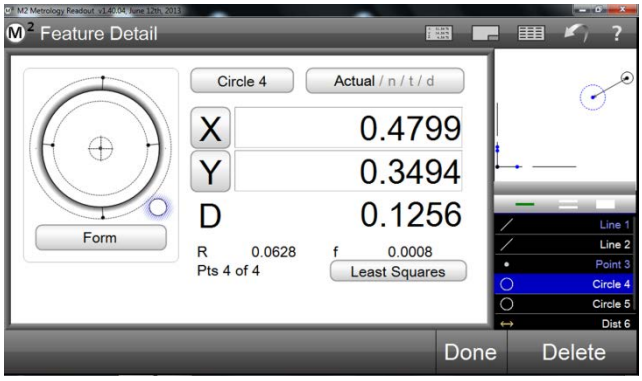
Measure toolbar > Enter button or in Measure Prompt

5 Probe the required number of points and then press the Done button to complete the feature measurement.

Measure toolbar > Done button

The feature will be shown in the Feature List and in the Feature Detail screen.





NOTE

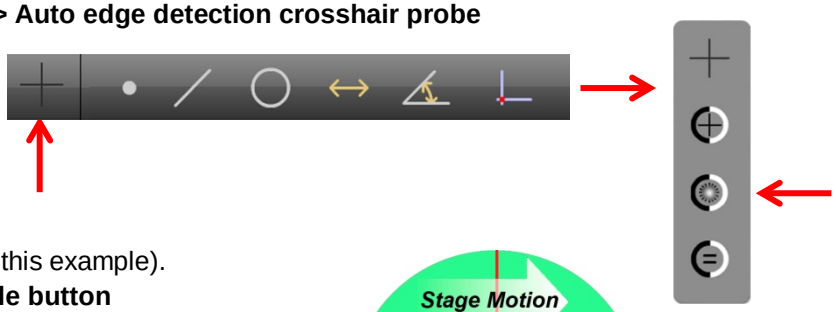
The DRO updates the stage position only after a new edge crossing when an edge detection probe is used to probe features.

Auto Edge Detection Crosshair Probe

The auto edge detection crosshair includes an edge detection zone around the crosshair intersection. When the edge is recognized by the system, a tone is produced to alert the operator, the probe is fired and a point is entered. Single points are acquired manually or automatically in program playback (in CNC enabled systems) as the crosshair passes over a feature edge. To use the auto edge detection crosshair probe:

1 Select the auto edge detection crosshair probe from the Probe menu.

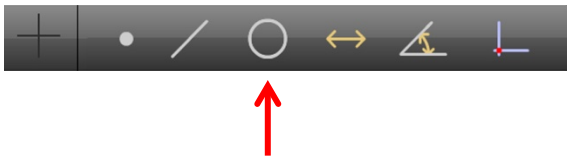
Measure toolbar > Probe menu > Auto edge detection crosshair probe

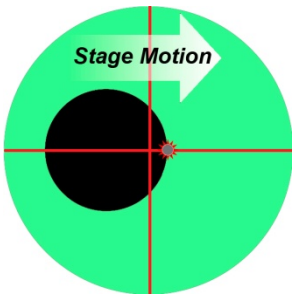


2 Select a feature type to probe (circle in this example).

Measure toolbar > Measure Circle button

3 Sweep the crosshair probe over a feature edge. The probe will fire, a tone will be produced and the point will be entered.



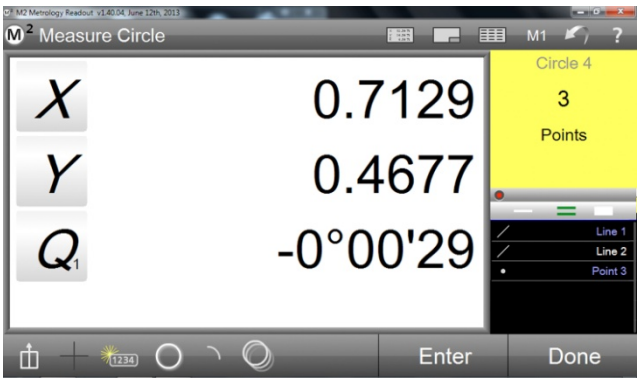


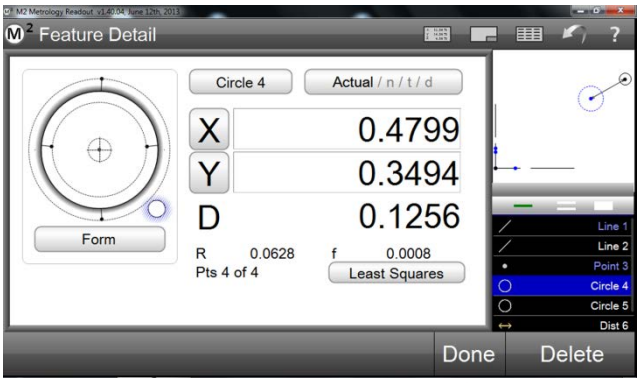
Crosshair sweeps over edge from outside feature to inside

4 Probe the required number of points and then press the Done button to complete the feature measurement.

Measure toolbar > Done button

The feature will be shown in the Feature List and in the Feature Detail screen.





NOTE

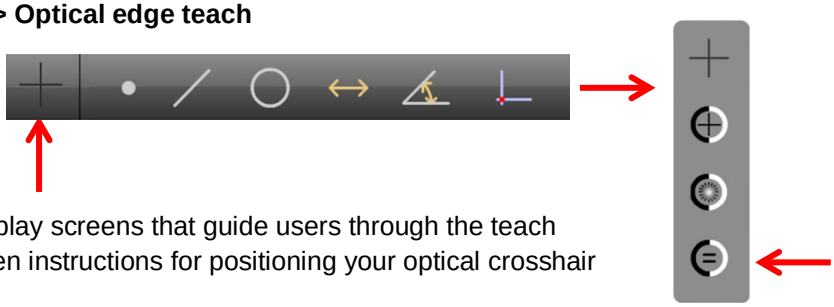
The DRO updates the stage position only after a new edge crossing when an edge detection probe is used to probe features.

Optical Edge Teach

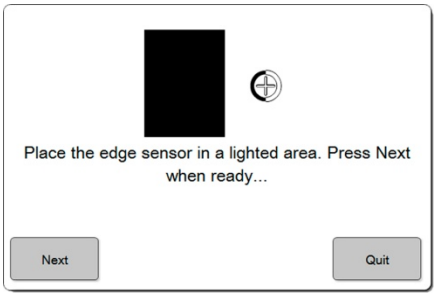
Optical Edge Teach is a basic edge recognition calibration required by the M2 optical edge detector system. The optical edge teach calibration should be performed when lighting, magnification, lens or other system conditions change. To perform the optical edge teach calibration:

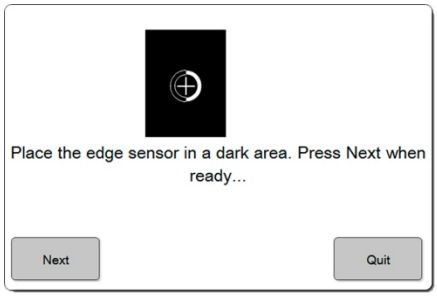
1 Select the optical edge teach from the Probe menu.

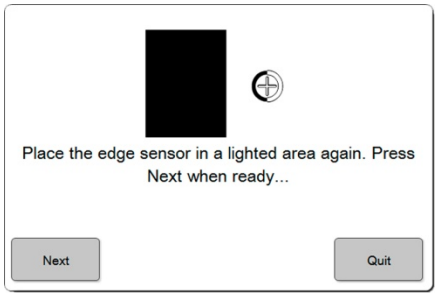
Measure toolbar > Probe menu > Optical edge teach



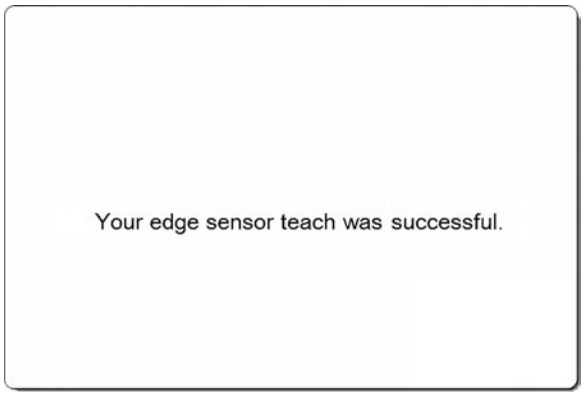
2 The Optical Edge Teach wizard will display screens that guide users through the teach calibration process. Follow the on-screen instructions for positioning your optical crosshair sensor and performing the calibration.



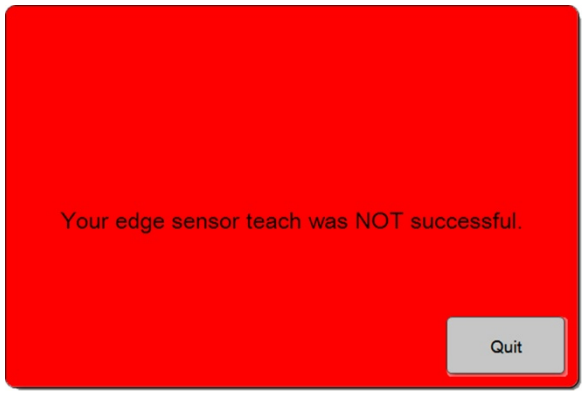




3 At the completion of the teach calibration process a message will be displayed indicating success or failure.



Successful teach calibration



Teach calibration failure

After a successful optical teach calibration, the optical edge probes can be used to perform feature measurements. If the teach calibration process fails, confirm that the part is in focus, the part and stage are clean and that the lighting is appropriate and attempt the calibration process again. If the calibration failure persists, contact your system provider for assistance.

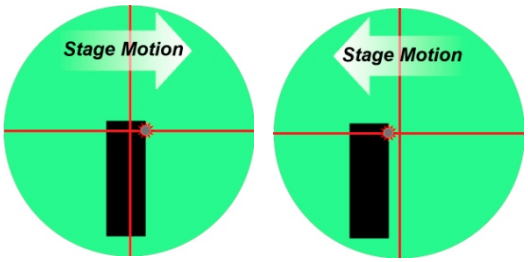
NOTE

Optical edge calibrations must be performed each time a new magnification is added to the system, the lens is replaced or the light source is changed. The calibrations are retained by the system for each optical magnification. Unless the lighting or optical lens is changed after the calibration, it is unnecessary to perform an optical edge calibration when the comparator magnification is changed during routine measurement activities.

Edge Logic Function

Edge Logic is an optical edge measurement function that reduces measurement time by enabling gesture driven control of start and stop measure commands and by automatically determining and entering the feature type for lines, circles, arcs and distances. To use the Edge Logic function:

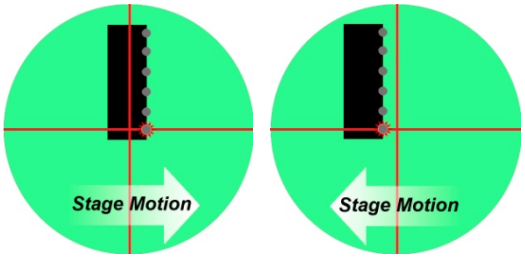
1 Cross a feature edge at the same point twice in opposite directions to start the measurement. The Measure Prompt screen will display “Measure anything”.



Crosshair sweeps from outside to inside ***Crosshair sweeps from inside to outside***

2 Probe a sequence of points on the feature edge (line in this example). As soon as enough points are probed for the system to determine the feature type, the Measure Prompt screen will display the feature type. Continue probing until you are ready to finish the measurement.

3 Cross a feature edge at the last point twice in opposite directions to complete the measurement and enter the feature. The feature will be shown in the Feature List and in the Feature Detail screen.



Crosshair sweeps from outside to inside ***Crosshair sweeps from inside to outside***

NOTE

The default distance between the two points that either start or stop edge logic measurements is adequate for most applications, but can be adjusted to accommodate special machine characteristics in the Measure Settings screen.

NOTE

Arcs greater than 180 degrees can be interpreted as circles by the M2 software. To change a feature between an arc and a circle:

- ***Select the feature in the Part View***
- ***Press the Change Feature Type button in the Measure toolbar.***

Auto Point Entry

Auto Point Entry can be enabled for the simple crosshair probe in the interactive mode and in the program playback mode for non-CNC systems. When the Auto Point Entry function is enabled, a point is collected by the system each time the stage is moved to position the part under the probe. The automatic point entry is delayed until the stage has been motionless for a short time to ensure that the probe is located where the user intended. The timer that controls this delay can be configured in the Auto Enter fields of the Measure Settings screen. The default values will be adequate for most applications. To use the Auto Point Entry function:

1 Select the simple crosshair probe from the probe menu.

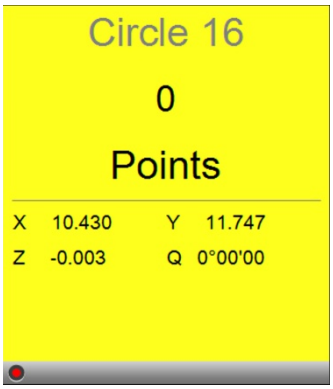
Measure toolbar > Probe menu > Simple crosshair probe

2 Select the desired feature to measure.

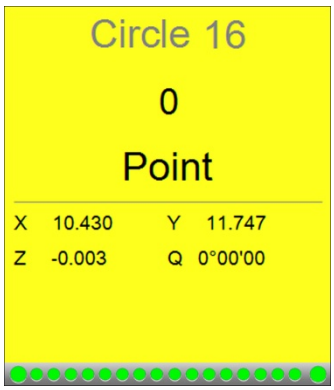
Measure toolbar > Desired Measure Feature button

3 A small red dot will appear in the bottom of the Measure Prompt screen. This red dot is the activation button for the Auto Point Entry timer. Press the red dot to enable the timer.
4 Move the stage to position the feature under the probe. As the stage is moved, the dots will turn green indicating that the timer is armed.
5 When the stage stops moving, the dots will turn yellow and begin to disappear to the left. Shortly before the point is probed the dots will turn red. A point will automatically be probed at the current crosshair position. When the point is entered, the dots will become black. When the stage is moved again, the timer will restart and green dots will be shown again.

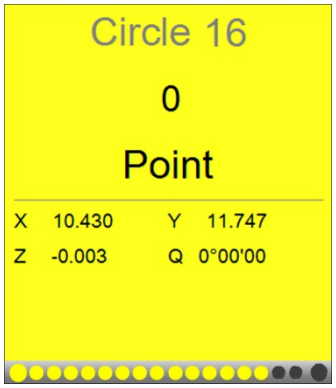
NOTE
The stage can be moved to reposition the point to be probed while the timer is counting down and the dots are either green or yellow. When the dots are red, moving the stage will not restart the timer. If you accidentally enter an incorrect point position, simply press the Undo button in the system toolbar to remove the point.



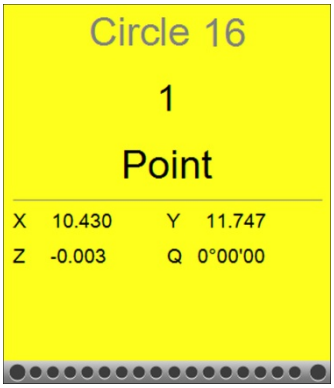
Activation red dot



Stage moving, timer armed



Stage stopped



Point entered

Probe behavior in program playback

Part programs are recorded as measurements are performed. During program playback, the part program remembers the approximate probe position of each edge that was recorded as part of a feature measurement. As program playback proceeds, the system simply moves to the next recorded position to find an edge. Thus, program playback can be viewed as a collection of stage positions and their associated candidate points. The optical edge probe used for the recorded measurement is inconsequential to the manner in which points are collected during playback.

Once part registration has been established, the system advances to the next programmed stage position with a screen press or Enter button press in manual systems, and occurs automatically in CNC systems. All valid candidate points will be collected automatically until the feature measurements are complete.

Section 4: Measuring, Constructing and Creating Features

Measurements can be performed on manual and CNC enabled systems using the simple crosshair, the manual optical edge probe or the auto optical edge probe.

Explicit feature measurements are always performed by pressing the desired Measure Feature button and then probing at least a minimum number of required points on the feature's edge. Edge Logic can be used to reduce measurement time by enabling gesture driven control of start and stop measure commands and by automatically determining and entering the feature type for lines, circles, arcs and distances. When Edge Logic is used in CNC enabled systems in conjunction with Auto Finish, a user specified number of points will be probed automatically based on a few explicitly probed seed points. Edge Logic is explained in Section 3: Probes. The use of Edge Logic in CNC enabled systems is explained later in this section.

Auto Point Entry can be used with the simple crosshair probe in the interactive mode and in the program playback mode for non-CNC systems to reduce measurement time. When the Auto Point Entry function is enabled, a point is collected by the system automatically after a short delay each time the stage is moved to a new feature position. Auto Point Entry is explained in Section 3: Probes.

Feature constructions are performed by pressing the desired Measure Feature button and then selecting the parent features from the Feature List or from the Part View that will be used for the construction. When the feature construction is complete the resulting construction will be added to the Feature List and Part View.

Features are created by pressing the desired Measure Feature button, pressing the associated Create Feature button and entering the desired feature parameter data into the fields provided.

Measurement activities can include:

- Measuring features by probing
- Constructing features
- Creating new features based on data provided by the user

Users can perform quick checks of individual part features without establishing a reference frame or can establish a reference frame including a part skew and zero datum in preparation for formal measurements that will be compared to part drawings and be recorded as a part program.

Preparing for Measurement Activities

To prepare for measurements:

- Verify that the part and stage are clean
- Confirm that the part lighting is adequate
- Select the desired magnification
- Optimize the part focus
- Select the desired feature measurement type
- Select the desired probe
- Perform an optical edge teach calibration if necessary (explained in Section 3: Probes)

Establishing a Reference Frame

While a reference frame might be unnecessary for quick checks of part features in prototyping or similar environments, a reliable measurement reference must be established prior to a formal manufacturing inspection process or program playback. The M2 measurement reference frame consists of:

- Skew alignment (secondary alignment)
- Part Datum (measurement coordinate system origin)

Skew alignment

When a part is misaligned (twisted) in the XY plane, small cosine errors can be generated during the measurement process. These errors can be eliminated by creating a skew alignment for the part. The skew alignment performs a precise measurement of the part misalignment in the XY plane. Once the misalignment is known to the system, subsequent feature measurements are automatically compensated to eliminate cosine errors. Measurement data in the Feature Detail and DRO screens will reflect measurements of a perfectly aligned part.

To create a skew alignment:

1 Select the desired probe from the probe menu.

Measure toolbar > Probe menu > Desired probe

2 Press the Skew button of the Datum menu.

Measure toolbar > Datum menu > Skew button

3 Probe a minimum of two points well distributed along the entire length of the desired part reference edge.

NOTE

The skew alignment is of fundamental importance to subsequent feature measurements. Probing more points on the reference edge will increase measurement accuracy.

4 Press the Done button to complete the measurement and enter the skew line into the Feature List.

Measure toolbar > Done button

Part Datum

Creating the part datum point is the final step in establishing a valid reference frame. The part datum can be created by:

- Probing a single point
- Constructing a point from one or more parent features
- Manually zeroing the X and Y position coefficients of a feature

Probing a Part Datum Point

The part datum can be created directly by probing a point. To probe a part datum point:

1 Select the desired crosshair probe from the probe menu.

Measure toolbar > Probe menu > Simple or optical edge crosshair probe

2 Press the Datum button.

Measure toolbar > Datum button

3 Probe the desired data point as described earlier.

4 Press the Done button to complete the measurement and enter the part datum point into the Feature List.

Measure toolbar > Done button

Constructing a Skew or Part Datum Point from Parent Features

The skew alignment and part datum can be constructed from one or more parent features that are contained within the Feature List when simply probing a skew line or datum point is not convenient or possible. Supported point and line constructions are specified in Constructing Features later in this section.

Skew

To construct a skew line from a pair of positional features:

1. Press the Skew button.
   Measure toolbar > Datum button > Skew button
2. Select the desired parent features in the Feature List, such as two circles.
3. Press the Done button to complete the construction and enter the part skew alignment into the Feature List.
   Measure toolbar > Done button

Part Datum

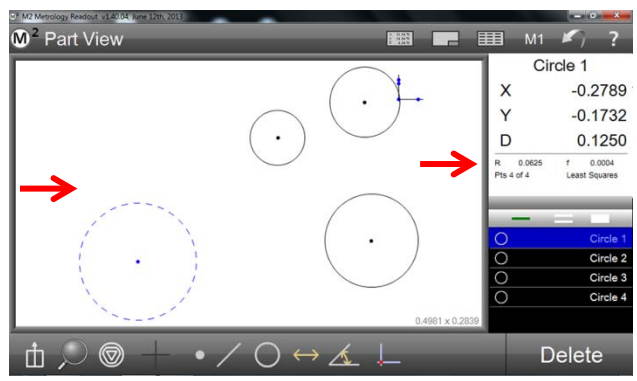
To construct a datum point from a single positional feature:

1. Press the Datum button.
   Measure toolbar > Datum button
2. Select the desired parent feature in the Feature List.
3. Press the Done button to complete the construction and enter the part datum point into the Feature List.
   Measure toolbar > Done button

Creating a Datum by Manually Zeroing the X and Y Coefficients of a Feature

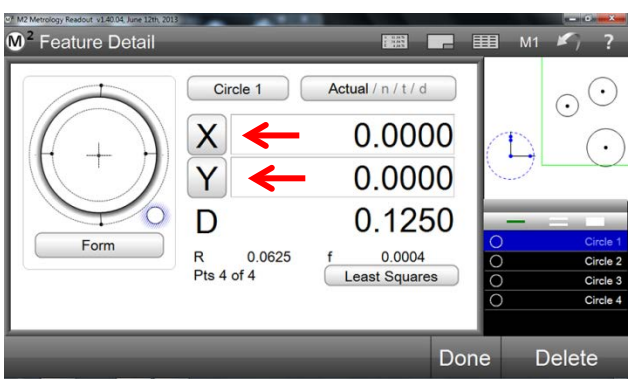
Any positional feature contained in the Feature List can be used as a part datum by manually zeroing the X and Y position coefficients. The X and Y coefficients can be zeroed in the Feature Detail screen. To zero the X and Y coefficients of a feature:

1. Select the desired positional feature in the Feature List or in the Part View.

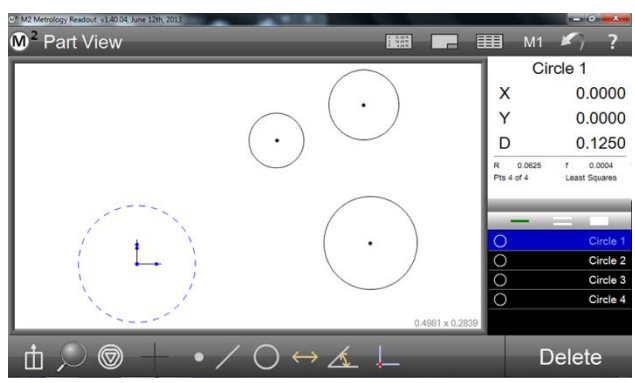


Select the feature and press the DRO

2. Press the X coefficient button and then the Y coefficient button in the Feature Detail or DRO screen. The X and Y values will become zero establishing the geometric center point of the feature as the part datum point.



Press the X and Y coefficient buttons



The center of the feature will become the datum

Probing and Measuring Features

Measurements can be performed on manual and CNC enabled systems using the simple crosshair, the manual optical edge probe or the auto optical edge probe. Features can be probed manually or automatically as part of a part program using optical edge detection in CNC enabled systems. Probed features are shown in the Part View and entered into the Feature List.

The following feature measurements are supported by the M2 system:

- Points
- Lines
- Circles and arcs
- Distances
- Angles

Occasionally the system can misinterpret probed data points, particularly when there is not an even distribution of points collected along the entire feature edge. This can lead to feature identification errors. The Change Feature Type button can be used to change the type of a feature selected in the Feature List or Part View when identification errors occur. For example, a circle feature can be changed to an arc. The Change Feature button is not shown in the Measure toolbar when there are no alternative feature types for the selected feature.

Detailed feature information including coefficients, geometric form, fit type and the data cloud of points probed is always available in the Feature Detail screen discussed in Section 5: Feature List, Feature Detail and Part View Functions. A graphic drawing of the feature and the data cloud of points probed is also available in the Feature Detail screen. Tolerances can be applied to measured features and are discussed in Section 7: Tolerancing.

Probing Features

Features are probed using the simple crosshair, manual optical edge crosshair or auto optical edge crosshair. Features are measured by probing one point at a time as the user aligns the probe on the feature edge until at least a minimum number of required points have been probed. The number of points required for point probing is discussed in detail in Points Required for Feature Measurements contained in Section 3: Probes. Feature measurements become more accurate as the number of points probed increases beyond the minimum number required.

The process of probing a feature with a given probe is identical for all features. Since the use of probes has been discussed thoroughly in Section 3: Probes and in the beginning of this section, an example of probing a feature with each probe type is provided here and should be sufficient for a complete understanding of probing features.

Probing Features with the Simple Crosshair Probe

To probe features with the simple crosshair probe:

1. Select the simple crosshair from the probe menu.
   Measure toolbar > Probe button > Simple crosshair
2. Press any Measure Feature button in the Measure toolbar.
   Measure toolbar > Desired Measure Feature button
3. Position the center of the crosshair probe on an edge.
4. Press Enter or in the Measure Prompt screen to fire the probe and capture the point.
   Measure toolbar > Enter button/Measure prompt
5. Continue probing until the required number of points has been probed and then press the Done button to complete the measurement. The feature will be shown in the Part View window and added to the Feature List.
   Measure toolbar > Done button

Probing Features with the Manual Optical Edge Crosshair Probe

To probe features with the manual optical edge crosshair probe:

1. Select the manual optical edge crosshair probe from the probe menu.
   Measure toolbar > Probe button > Manual optical edge crosshair probe
2. Press any Measure Feature button in the Measure toolbar.
   Measure toolbar > Desired Measure Feature button
3. Sweep the center of the crosshair probe over an edge of the feature to be measured. A tone will indicate that the edge was detected.
4. Press Enter or in the Measure Prompt screen to enter the point.
   Measure toolbar > Enter button/Measure prompt
5. Continue probing until the required number of points has been probed and then press the Done button to complete the measurement. The feature will be shown in the Part View window and added to the Feature List.
   Measure toolbar > Done button

Probing Features with the Auto Optical Edge Crosshair Probe

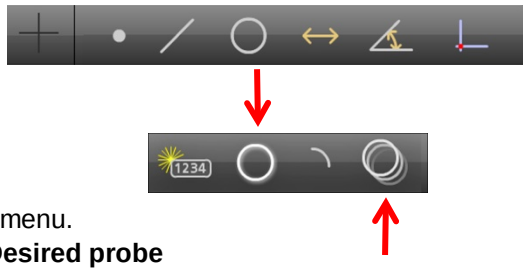
To probe features with the auto optical edge crosshair probe:

1. Select the auto optical edge crosshair probe from the probe menu.
   Measure toolbar > Probe button > Auto optical edge crosshair probe
2. Press any Measure Feature button in the Measure toolbar.
   Measure toolbar > Desired Measure Feature button
3. Sweep the center of the crosshair probe over an edge of the feature to be measured. A tone will indicate that the edge was detected and the point will be entered.
4. Continue probing until the required number of points has been probed and then press the Done button to complete the measurement. The feature will be shown in the Part View window and Feature List.
   Measure toolbar > Done button

Repeat Mode Feature Measurements

When measuring in the repeat mode, the Measure Feature button does not need to be pressed between each measurement of identical feature types. The system prepares the next feature measurement automatically at the completion of each feature measurement. The repeat mode facilitates the measurement of a large number of like features sequentially. The repeat mode is available for all feature types using the following procedure:

1. Press the Measure Feature button for the desired feature type (a circle was selected in this example). The submenu for that feature type will be shown.
2. Press the Measure Repeat button for that feature.
   Measure toolbar > Desired Measure Feature button > Repeat measure button



3. Select the desired probe from the probe menu.
   Measure toolbar > Probe button > Desired probe
4. Probe the first feature until the necessary points have been collected.
5. Press the Done button to conclude the first measurement. The new feature will appear in the Feature List and Part View
   Measure toolbar > Done button
6. Continue measuring like features and then press the Done button to exit the repeat mode.
   Measure toolbar > Done button

Auto Finish Function

The Auto Finish function completes a feature measurement automatically when a user specified number of points has been probed on a feature edge. The number of probed points is specified separately for each feature type. When the specified number of points has been probed for a given feature, the measurement is finished, the feature is entered into the Feature List, displayed in the Part View and the feature data and graphic are shown in the Feature Detail screen. The Feature Detail screen is displayed until:

- The stage is moved to perform the next feature measurement
- The Done or Delete button is pressed
- A System toolbar menu button is pressed

To specify the number of points to auto finish a measurement for each feature type:

1. Display the System menu
   System toolbar>System menu button
2. Display the Settings screens menu
   System menu>Settings screens button
3. Display the Measure Settings screen
   Settings screen menu>Measure
4. Enter the desired number of points to auto finish a measurement for each feature type into the fields provided
5. Set the Auto Finish Enabled field to Yes and press the Done button

NOTE

Point values must be equal to or greater than the minimum required for each feature type. The minimum required for each feature type is described in Points Required for Feature Measurements in Section 3: Probes.

CNC Measurement Functions

Measurement functions supported on CNC enabled systems include:

- Goto Move
- Auto Circle
- Auto Finish on Edge Logic

Goto Move

The Goto Move function moves the stage to a user specified location. The stage location can be specified by pressing in a screen or by entering stage coordinates. The Goto Move function can be initiated when either the DRO or the Part View screens are in the main viewport.

Enabling the Goto Move Function

To enable the Goto Move function:

1. Press the Goto button. The button arrow will turn red and the M2 screen will display green control borders around the interface areas where goto commands can be executed.
   Measure toolbar > Goto button

The Goto Move Function includes:

- When DRO in main viewport
  - Goto feature
  - Goto specified coordinates (coordinates specified in the Part View)
- When Part View in main viewport
  - Goto feature
  - Goto specified coordinates (coordinates specified in the DRO)
  - Goto Part View location

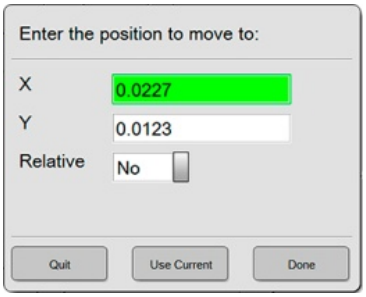
Goto Feature

To execute a Goto feature CNC move:

1. Press the Goto button.
   Measure toolbar > Goto button
2. Press the feature in the Feature List that you would like to go to.
3. The system will execute a goto move to the selected feature.

Goto Specified Coordinates (Absolute/Relative)

To execute a goto specified coordinates CNC move:



1. Press the Goto button.
   Measure toolbar > Goto button
2. *When the DRO is in the main viewport*:
   - Press in the Part View to display the Goto position dialog.

   When the Part View is in the main viewport:
   - Press in the DRO to display the Goto position dialog.
3. Select the Goto type, absolute or relative, and enter the desired values for the X, and Y axes.
4. Press Done to execute the goto move.
   Measure toolbar > Done button

NOTE

Goto absolute position executions are always recorded, and will be played back during program execution. These steps can be edited or deleted using the edit and delete program step functions from the program edit mode. Program editing will be discussed in detail in Section 10: Programming.

Goto Part View Location

To execute a goto Part View location CNC move:

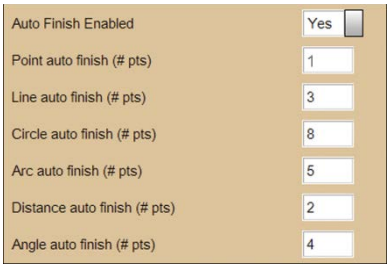
1. *When the Part View is displayed in the large viewport*, press the Goto button.
   Measure toolbar > Goto button
2. Press or click in the Part View at the desired location. The stage will move to the pressed location.

Auto Circle

The Auto Circle function automatically probes a user specified number of points evenly distributed on the edge of a circle. When the specified number of points has been probed, the measurement is finished, the circle feature is entered into the Feature List, displayed in the Part View and the feature data and graphic are shown in the Feature Detail screen. The Feature Detail screen is displayed until:

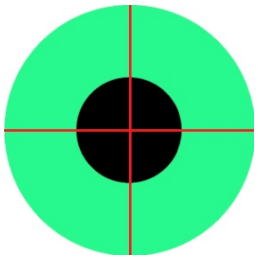
- The stage is moved to perform the next feature measurement
- The Done or Delete button is pressed
- A System toolbar menu button is pressed

To specify the number of points probed in an auto circle measurement:



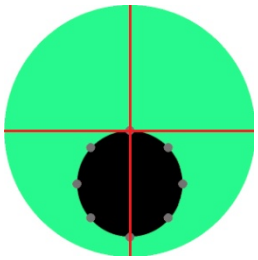
1. Display the System menu
   System toolbar>System menu button
2. Display the Settings screens menu
   System menu>Settings screens button
3. Display the Measure Settings screen
   Settings screen menu>Measure
4. Enter the desired number of points for an auto circle measurement into the Circle Auto Finish (# pts) field
5. Set the Auto Finish Enabled field to Yes and press the Done button

To conduct an auto circle measurement:



1. Select the auto optical edge crosshair probe from the probe menu.
   Measure toolbar > Probe button > Auto optical edge crosshair probe
2. Position the crosshair in the approximate center of the circle.
3. Press the Measure Circle button in the Measure toolbar.
   Measure toolbar > Measure Circle button
2. Press the Auto Circle button in the Measure Circle submenu.
   Measure Circle submenu > Auto Circle button

The system will move the stage radially to probe an evenly distributed number of points as specified in the Circle Auto Finish field and will complete the circle measurement.



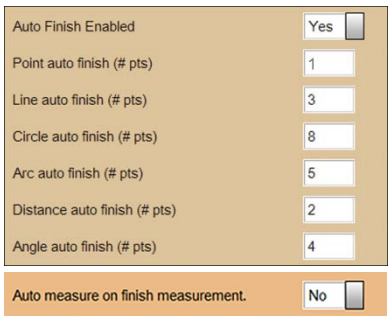
Auto Finish on Edge Logic

The Auto Finish on Edge Logic function starts and stops a measurement using Edge Logic, and probes an evenly distributed number of points specified in the Auto Finish Settings screen. This function is supported for lines, circles and arcs.

Configure Auto Finish and Enable Auto Finish on Edge Logic

Specify the number of points to auto finish a measurement for each feature type:

1. Display the System menu
   System toolbar>System menu button
2. Display the Settings screens menu
   System menu>Settings screens button
3. Display the Measure Settings screen
   Settings screen menu>Measure
4. Enter the desired number of points to auto finish a measurement for each feature type into the fields provided
5. Set the Auto Finish Enabled field to Yes
6. Set the Auto Measure on Finish Measurement field to Yes.
7. Press the Done button



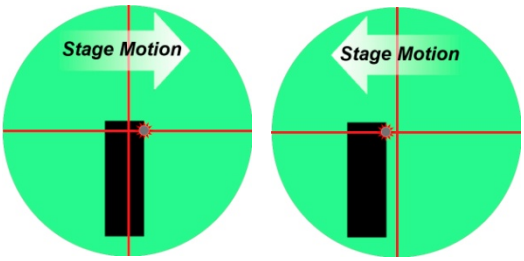
NOTE

Point values must be equal to or greater than the minimum required for each feature type. The minimum required for each feature type is described in [Points Required for Feature Measurements](#) in [Section 3: Probes.](#)

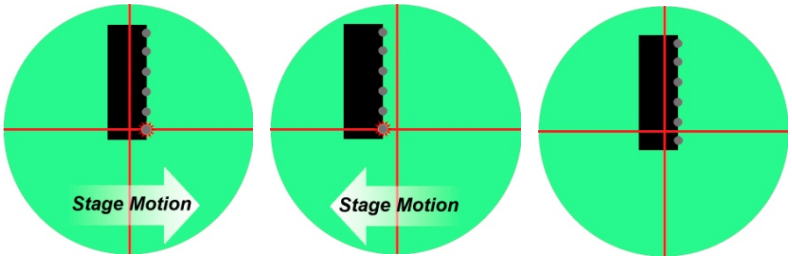
Using Auto Finish on Edge Logic for Measuring Lines

To use the Auto Finish on Edge Logic function to measure a line:

1. Define the start point. Cross the line edge at the start point twice in opposite directions to start the measurement. The Measure Prompt screen will display “Measure anything”.
2. Define the stop point. Cross the line edge at the stop point twice in opposite directions. The system will then move the stage to probe additional points until the total number of points equals the number specified earlier for lines in the Line Auto Finish settings field. The measurement will be completed and the line feature will be shown in the Feature List and in the Feature Detail screen.



Crosshair sweeps from outside to inside ***Crosshair sweeps from inside to outside***



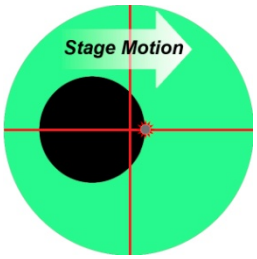
Crosshair sweeps from outside to inside ***Crosshair sweeps from inside to outside*** ***All points probed***

Using Auto Finish on Edge Logic for Measuring Circles and Arcs

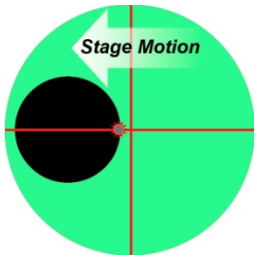
To use the Auto Finish on Edge Logic function to measure circles and arcs (a circle is shown in this example):

1 Define the start point. Cross the circle or arc edge at the start point twice in opposite directions to start the measurement. The Measure Prompt screen will display “Measure anything”.

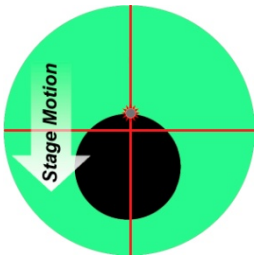
2 Probe a point on the circle or arc edge at a location that will fall in the approximate middle between the start and stop points.



Crosshair sweeps from outside to inside

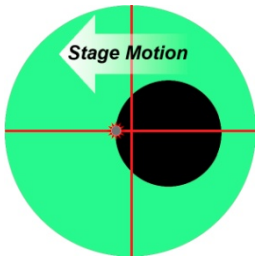


Crosshair sweeps from inside to outside

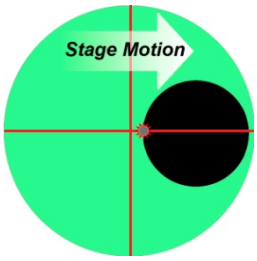


Crosshair sweeps from outside to inside

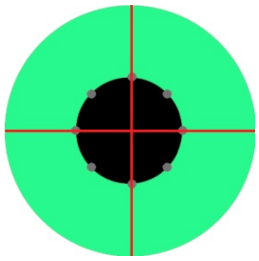
3 Define the stop point. Cross the circle or arc edge at the stop point twice in opposite directions. The system will then move the stage to probe additional points until the total number of points equals the number specified earlier for the circle or arc in the Circle Auto Finish settings field or Circle Auto Finish settings field. The measurement will be completed and the circle or arc feature will be shown in the Feature List and in the Feature Detail screen.



Crosshair sweeps from outside to inside



Crosshair sweeps from inside to outside 1



All points probed

Constructing Features

Part features are constructed from one or more parent features contained within the Feature List. The following feature constructions are supported by the M2 system:

- Points
- Lines
- Circles and arcs
- Distances
- Angles

Features can be constructed from positional and non-positional parents. For the purposes of constructing features, the center points of positional features are used as points. The number of points required for the feature construction is identical to the number required for feature measurement and is discussed in detail in Points Required for Feature Measurements contained in Section 3: Probes. Positional features include:

- Points
- Circles and arcs

Non-positional features include:

- Lines
- Distances
- Angles

Point Constructions

Point constructions include:

- Average point from any combination of positional features
- Center point of circle or arc
- Start point, Center point, endpoint, or anchor point of a line. The anchor point is the point on the line closest to the datum.
- Start point and endpoint of a distance
- Apex point of an angle
- Midpoint between two positional features
- Intersection of two lines
- Intersection 1 or 2 between circle and circle, arc and arc or circle and arc
- Intersection 1 or 2 between line and circle or line and arc
- Point online perpendicular to a positional feature
- Tangent point 1 or 2 on circle from a point

Circle Constructions

Circle constructions include:

- Gauge circle between lines using parent lines and created circle (discussed later)
- Gauge circle between two arcs using parent arcs and created circle (discussed later)
- Gauge circle between three lines with circle tangent to each line
- Bolt circle from three or more circles
- Average circle from three or more circles
- Circle from three or more positional features
- Duplicate circle
- Circle from arc

Arc Constructions

Arc constructions include:

- Duplicate arc
- Arc from circle
- Arc from three or more positional features

Line Constructions

Line constructions include:

- Duplicate line
- Perpendicular line from line
- Gauge line from two parent lines and a created line (discussed later)
- Average of multiple lines
- By sector line and perpendicular by sector
- Line from 2 or more positional features
- Tangent line 1 and 2 between circles
- Tangent line 1 or 2 between point and circle
- Line from a distance
- Perpendicular line to a line through a positional feature
- Line parallel to a line through a positional feature
- Line tangent 1 or 2 to a circle and perpendicular to a line
- Line from a line and angle (rotated by the angle)

Angle Constructions

Angle constructions include:

- Duplicate angle
- Angle of a line starting at + X direction
- Angle between lines: included, 180-, 180+ and 360-

Distance Constructions

Distance constructions include:

- Duplicate distance
- Circumference of a circle
- Links of a line
- Distance between two angle apexes
- Minimum, center or maximum between circles or circle and arc or arcs
- Minimum, center or maximum between point and circle or point and arc
- Minimum, center or maximum between line and circle or line and arc (perpendicular distance)
- Minimum, center or maximum between lines
- Perpendicular from point to line
- Sum of two distances

Feature Construction Procedures

There are two procedures for feature construction:

- Gauge circle and gauge line constructions
- All other feature constructions

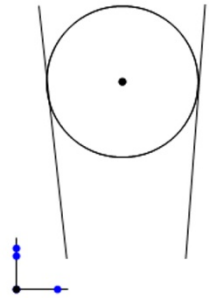
Construction Procedures for Gauge Circle and Gauge Line

Gauge circle and gauge line constructions include:

- Gauge circle between 2 lines
- Gauge circle between 2 arcs
- Gauge line between 2 lines

Gauge circle between two lines

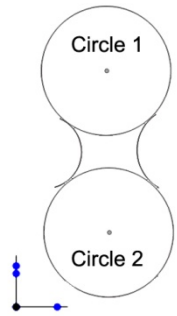
To construct a gauge circle between two lines:



1. Create a circle of the desired diameter (creating features is discussed immediately after this section). The diameter of the created circle must be larger than the minimum distance between the two lines.
2. Press the Measure Circle button.
   Measure toolbar > Measure Circle button
3. Select the desired two parent lines and the created circle from the Feature List.
4. Press the Done button to complete the construction. The gauge circle will be shown between the two parent lines in the Part View and will be added to the Feature List.
   Measure toolbar > Done button

Gauge circle between two arcs

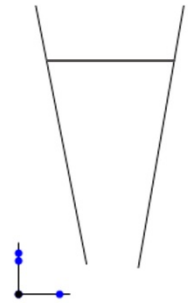
To construct a gauge circle between two arcs:



1. Create a circle of the desired diameter (creating features is discussed immediately after this section). The diameter of the created circle must be larger than the distance between the two arc perimeters.
2. Press the Measure Circle button.
   Measure toolbar > Measure Circle button
3. Select the desired two parent arcs and the created circle from the Feature List.
4. Press the Done button to complete the construction. Gauge circle 1 will be shown between the two parent arcs in the Part View and will be added to the Feature List. Press the Change Feature Type button to alternate between Gauge circle 1 and Gauge circle 2.
   Measure toolbar > Done button

Gauge line between two lines

To construct a gauge line between two lines:



1 Create a line of the desired length (creating features is discussed immediately after this section). The length of the created line must be longer than the minimum distance between the two parent lines and must be horizontal or vertical.

2 Press the Measure Line button.
   Measure toolbar > Measure Line button

3 Select the desired two parent lines and the created line from the Feature List.

4 Press the Done button to complete the construction. The gauge line will be shown between the two parent lines in the Part View and will be added to the Feature List.
   Measure toolbar > Done button

Construction Procedures for all Other Features

All feature constructions (except for gauge circles and gauge lines described earlier) use the following procedure:

1. Press the Measure Feature button of the feature type that you wish to construct.
   Measure toolbar > Measure Feature button
2. Select (highlight) the required parent features from the Feature List.
3. Press the Done button to complete the construction. The constructed feature will be shown in the Part View and entered into the Feature List.
   Measure toolbar > Done button

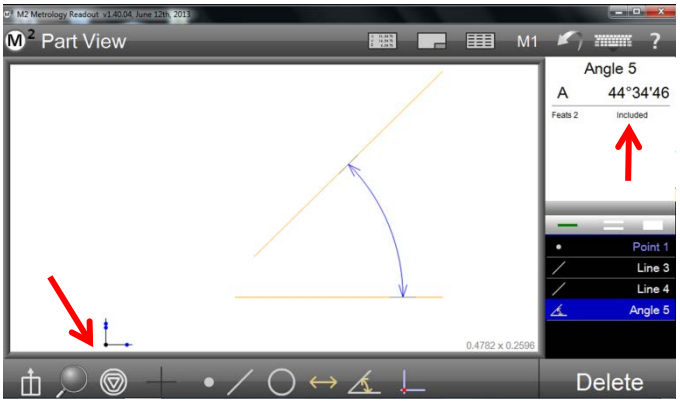
Changing Constructed Feature Type

Many constructed features can have more than one feature type. For example, an angle constructed between two lines can be any one of 4 types: included, 180-, 180+ and 360-. To change the feature type:

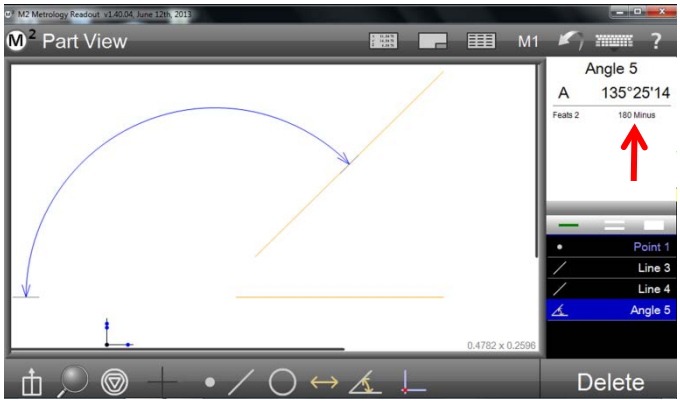
1. Select the constructed feature in the Part View or from the Feature List.
2. Press the Change Type button and note the feature type description shown in the Feature Detail viewport.
   Measure toolbar > Change Feature Type button

NOTE

The Change Feature Type button is shown in the Measure toolbar when feature type alternatives exist. If the button is not present in the Measure toolbar, only one type of feature exists for the selected construction.

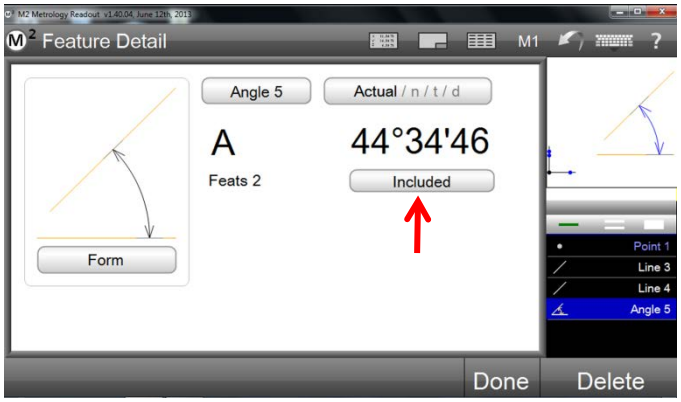


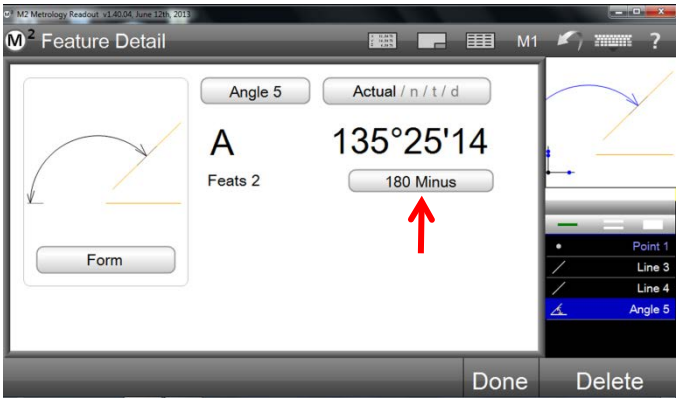
Note the feature type, then press the Change Feature Type button



The feature type will change

3. The feature type can also be changed in the Feature Detail screen. Press in the small Feature Detail viewport to display the Feature Detail viewport.
4. Press the Feature Type button to change the feature type. Pressing the Feature Type button repeatedly will cycle through all of the available feature types.





Creating Features

Features can be created by entering the desired position size and other parameters that describe the feature. The M2 system supports the creation of the following features:

- Points
- Lines
- Circles
- Arcs
- Distances
- Angles

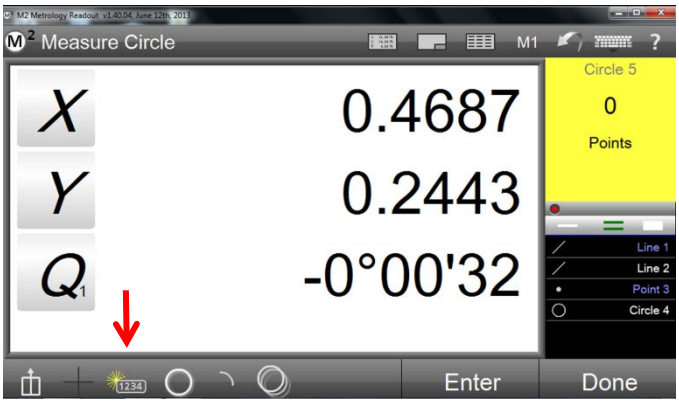
The basic procedure for creating features is identical for all feature types, only the required feature parameters change depending on the feature type being created. To create a feature:

1. Press the Measure Feature button of the feature that you wish to create. The Measure Feature submenu will be displayed. In this example, a circle will be created.

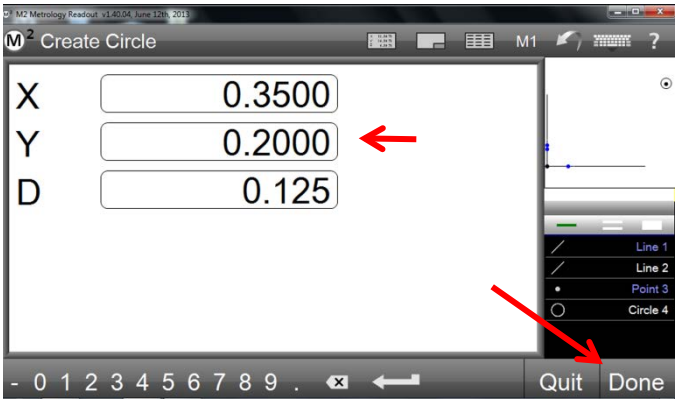
   Measure toolbar > Measure Feature button

2. Press the Create Feature button. Data fields will be displayed for entering the required feature parameters.
3. Enter the required feature parameters and then press the Done button to complete the creation. The new feature will be shown in the Part View and added to the Feature List.

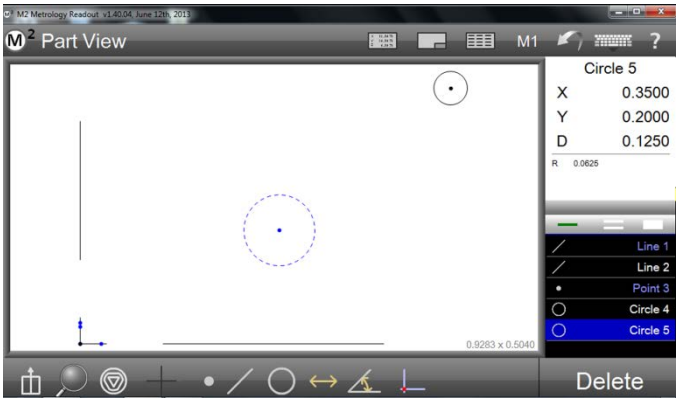
   Measure toolbar > Done button



Press the Create Feature button



Enter the required feature data and then press Done



The new feature will be created

Section 5: Feature List, Feature Detail and Part View Functions

The Feature List, Feature Detail and Part View are the primary means of viewing and manipulating features that have been measured, constructed or created in the M2 software. The Feature List facilitates feature construction, provides access to the Feature Detail views and provides a means of selecting and deleting features.

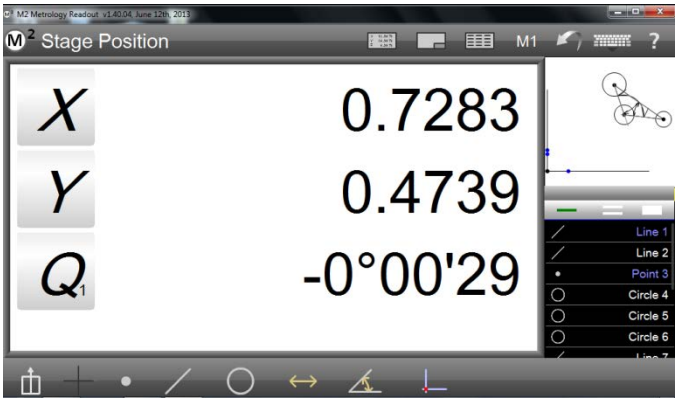
The Feature Detail screens display all dimension, position, form and tolerance information for features selected in the Feature List or in the Part View. A feature graphic is also displayed that shows the data cloud of probed points. The Feature Detail also provides the means to change data fit and feature type.

The Part View is a graphical display of all measured, constructed or created features in the current reference frame. The Part View supports feature selection for constructions using the same simple method as the Feature List. A simple set of tools are provided for zooming and panning in the Part View. For touch screen enabled systems, pinch zooming and two finger panning are also supported.

The Feature List

The Feature List always appears at the right side of the screen and changes slightly to support the current user activities. The primary functions of the Feature List include:

- Displaying features
- Selecting features
- Deleting features
- Displaying program steps in the programming mode



Feature List on the right side of the screen

Displaying Features

All features that have been measured, constructed or created are displayed in the Feature List with their tolerance status indicated by color. Features that have passed tolerance tests are shown in white and features that have failed tolerance test are shown in red. Datum features such as skews and datum points are shown in blue. These color representations of tolerance status and datum features are also shown in the Part View.

Scrolling the Feature List

When the Feature List contains too many features to be displayed simultaneously on the screen, press and drag the Feature List up or down to display features that are beyond the field of view.

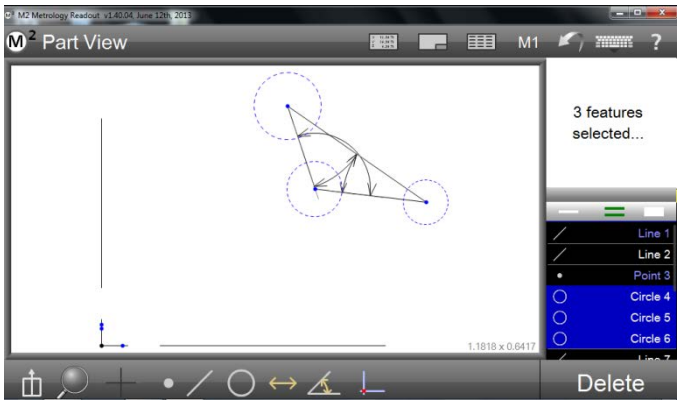
Selecting features

Features are selected and deselected individually or in groups by pressing or clicking features. The Feature Selection tool located at the top of the Feature List determines the number of features that can be selected either sequentially or simultaneously as follows:

- Press the narrow single bar for individual feature selection or de-selection
- Press the double bar for multiple feature selection or de-selection in sequence
- Press the wide single bar for group feature selection as a range. In addition, the wide single bar allows all features to be selected simultaneously.

Feature Selection tool

When features are selected, they are highlighted in blue in the Feature List and are highlighted in blue in the Part View.

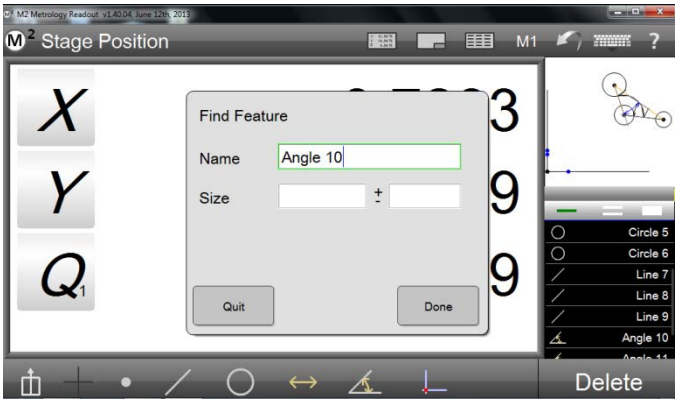


Selected features are highlighted in blue

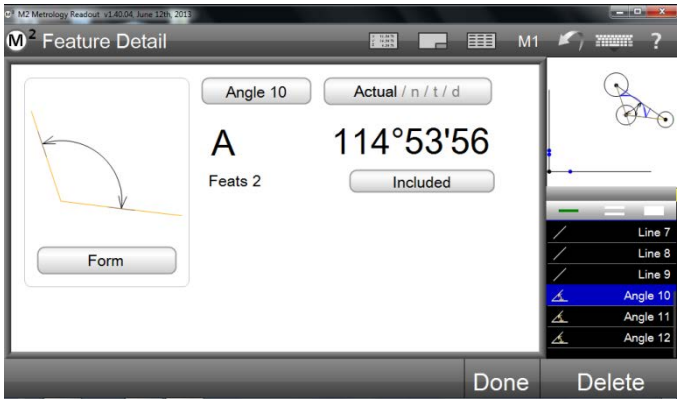
Feature Finder

The Feature Finder is a special application of the Feature Selection tool. The Feature Finder is used to find and select specific features by name, groups of features with similar names or groups of like features that meet certain minimum dimensional criteria. To use the Feature Finder:

1. Long press the Feature Selection tool to display the Find Feature dialog
2. To find a single specific feature, enter the full feature name into the Name field and then press Done. The specified feature will be highlighted in the Feature List and shown in the Feature Detail screen.

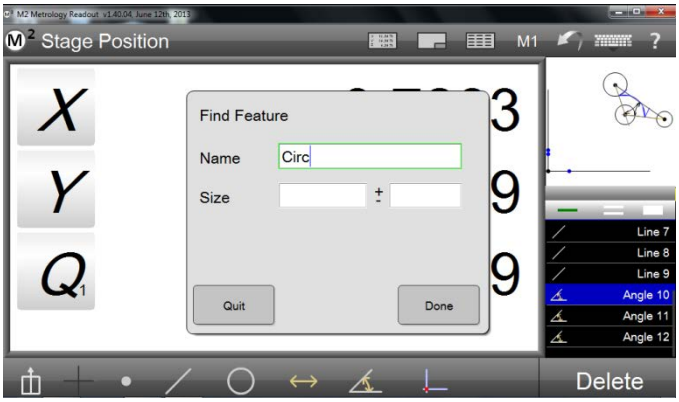


Enter the full name of a specific feature

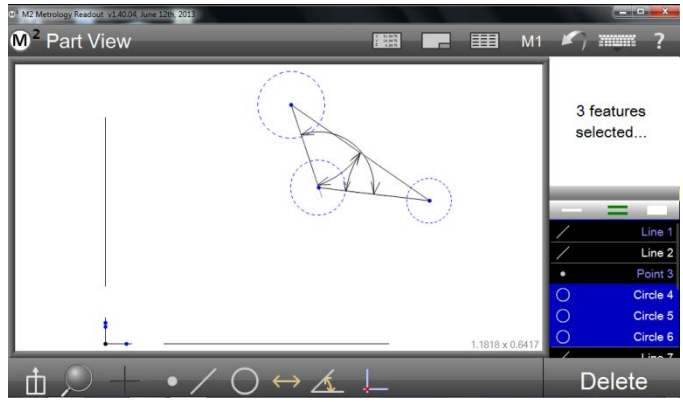


The specified feature will be highlighted in the Feature List

3 To find a group of features with similar names, enter the first part of a feature type name into the Name field and then press done. The specified group of features will be highlighted in the Feature List and shown in the Part View.



Enter the first part of a feature type name

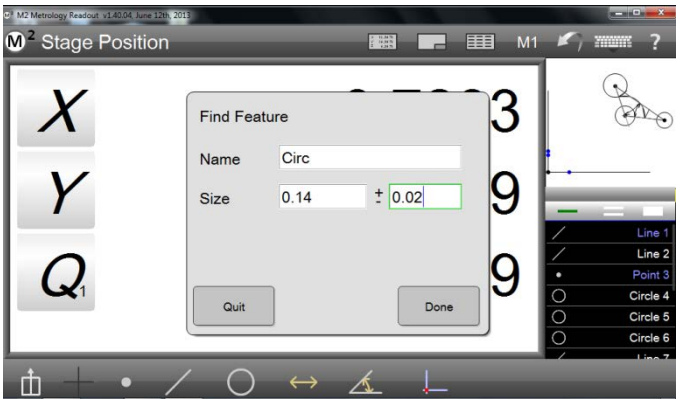


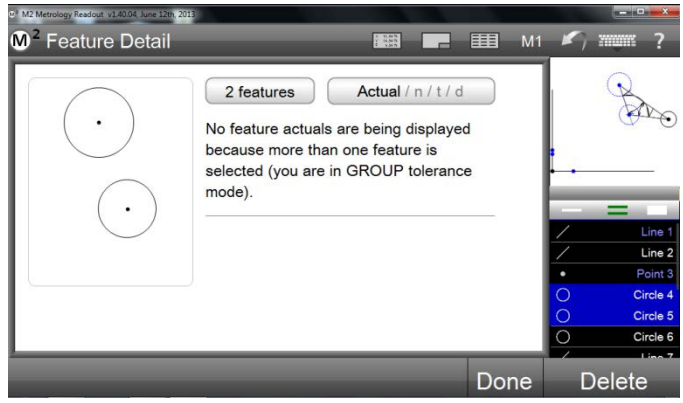
The specified group will be highlighted in the Feature List

4 To find a group of like features that meet certain dimensional criteria, enter the feature type name into the Name field and then enter the size and variation criteria into the Size and ± fields. Size and variation criteria apply to circles, arcs, lines and distances as follows:

- Circles: size refers to diameter
- Arcs: size refers to radius
- Lines: size refers to length
- Distances: size refers to length

5 Press done to complete the find operation. In this example, the system was asked to find circles having a size (diameter) of 0.14 ± 0.02. Only two of the circles in the Feature List met this criterion and those circles are highlighted.





Deleting Features from the Feature List

When one or more features are selected and highlighted in the Feature List, a Delete button is shown in the Measure toolbar. To delete one or more highlighted features:

1 Press the Delete button. The delete key on the keyboard may also be used.

To delete all the features of the Feature List:

1 Press and hold the Delete button.

NOTE

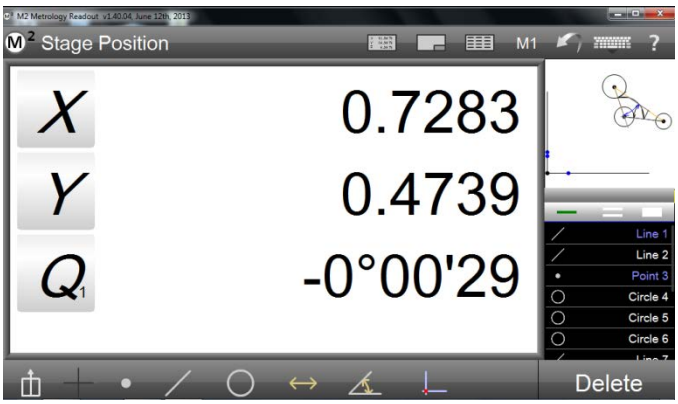
Features that have been deleted can be restored by pressing the Undo button in the System toolbar.

Feature Detail screen

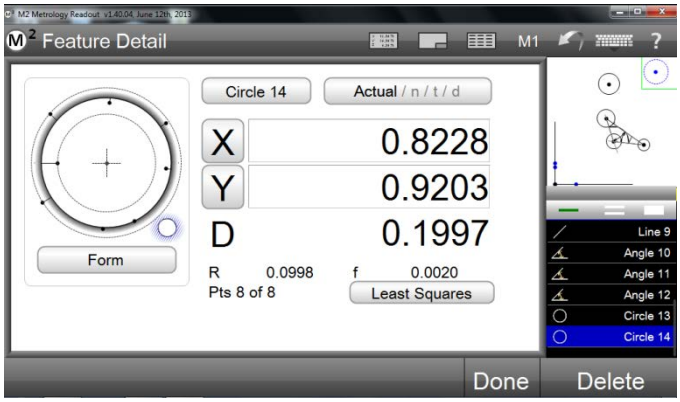
The Feature Detail screen displays the measurement results for the feature selected in the Feature List or in the Part View. A graphic view of the feature is displayed that shows the data cloud of probed points. The Feature Detail screen also provides access to tolerancing functions and the means to change data fit and feature type. Tolerancing is discussed in detail in Section 7: Tolerancing.

To access the Feature Detail screen:

1 Select the desired feature from the Feature List. The Feature Detail screen will be shown in the main viewport.



Select a feature in the Feature List



The Feature Detail screen will be displayed

As shown in the example of a Feature Detail screen for a circle, feature parameters are shown that includes:

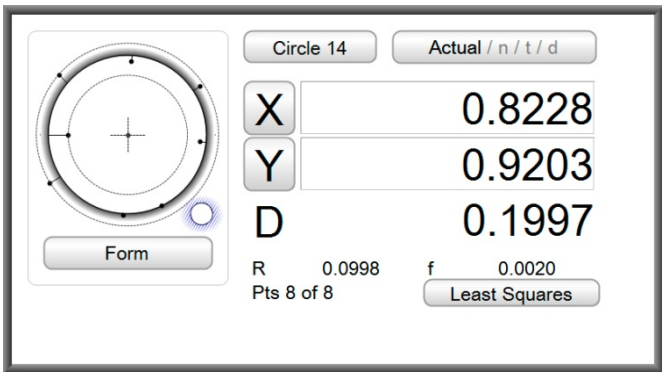
- Feature name
- Position (X and Y)
- Dimension: diameter and radius for this circle
- Form
- Number of points in the data cloud
- Graphic of feature data cloud
- Data cloud fit
- Access to tolerance screens

The data cloud fit can be changed when other fits are available by pressing the data cloud fit button (labeled Least Squares for this circle). When the data cloud fit is changed, the graphic of the feature and other feature parameters will change in response.

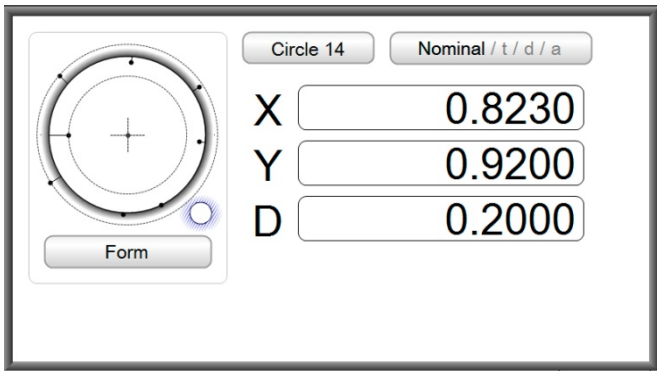
Pressing the Tolerance buttons (Actual, Nominal, Tolerance and Deviation) provides access to the tolerance screens for this feature. Tolerance screens include:

- Actual
- Nominal
- Tolerance
- Deviation

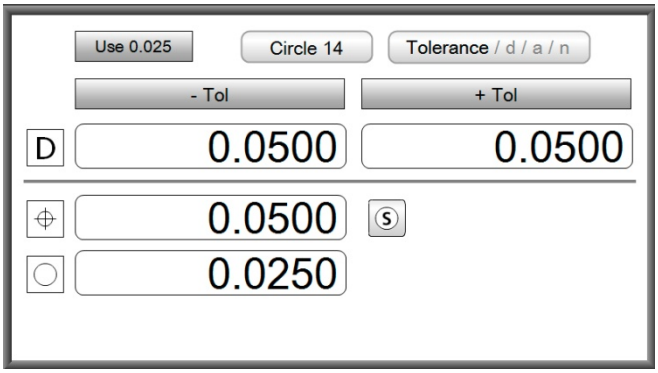
Repeatedly pressing the Tolerance button cycles through all of the tolerance screens.



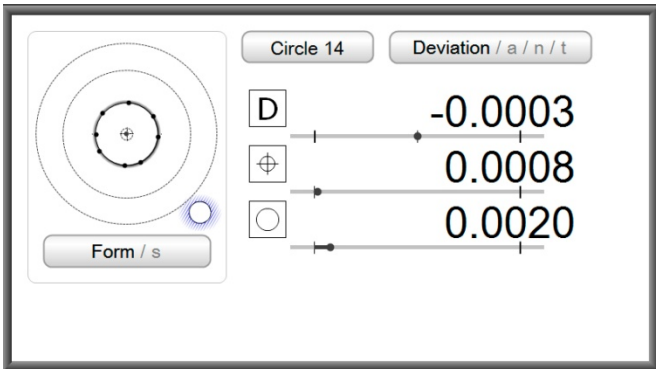
Pressing Actual displays the Nominal screen



Pressing Nominal displays the Tolerance screen



Pressing Tolerance displays the Deviation screen



Pressing Deviation displays the Actual screen

NOTE
The tolerance screens are discussed in detail in Section 7: Tolerancing

Part View screen

The Part View screen is a graphical display of all measured, constructed or created features for the current measurement session. Features can be selected for constructions using the same method as the Feature List. Tools are provided for zooming and panning in the Part View. For touch screen enabled systems, pinch zooming and two finger panning are also supported.

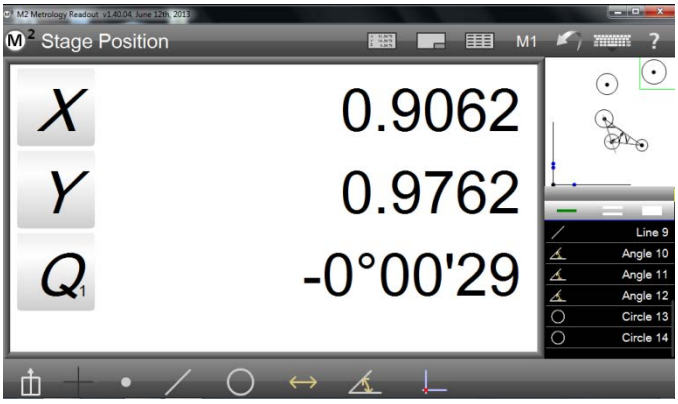
Part View functions include:

- Selecting features
- Panning and zooming features

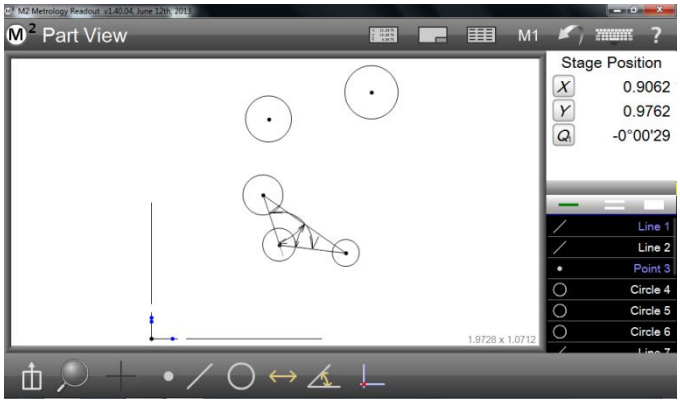
Accessing the Part View screen

To access the Part View screen:

1. Press the Part View button in the System toolbar or the small Part View viewport. The Part View screen will be presented in the main viewport.



Press the small Part View viewport



The Part View screen will be presented in the main viewport

Selecting Features in the Part View screen

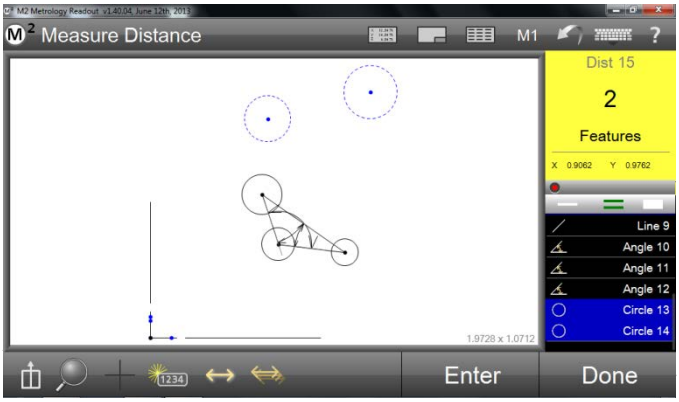
Features are selected in the Part View screen to perform operations including:

- Constructions
- Feature deletions

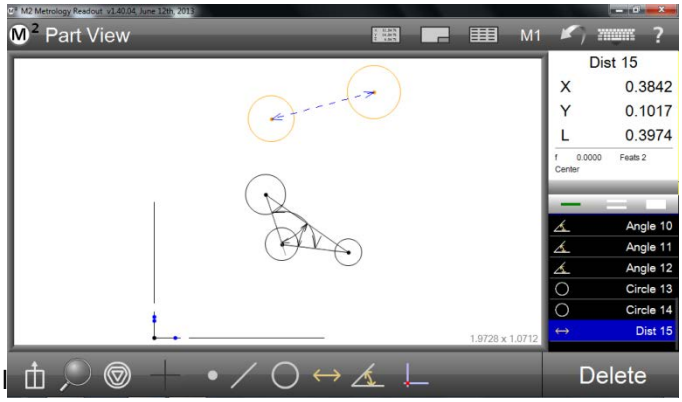
To select features in the Part View screen:

1. Press the desired features in the Part View screen. Selected features will appear as blue dashed lines. The features are selected as if they had been selected in the Feature List and will be highlighted in the Feature List.

In this example, two circles were selected in order to create a distance construction between them. When a construction is completed, the constructed feature is shown as a blue dashed line and the parent features are shown as solid orange lines.



Press or click features to select them



A construction between two circles is shown

wil

level features may extend beyond the viewable area of the Part View. Features that extend beyond the Part View

eve

in the Measure toolbar. Pinch-zooming can also be performed in systems with touch screen support. Panning allows the user to move the Part View in any direction using fingertips or the mouse cursor.

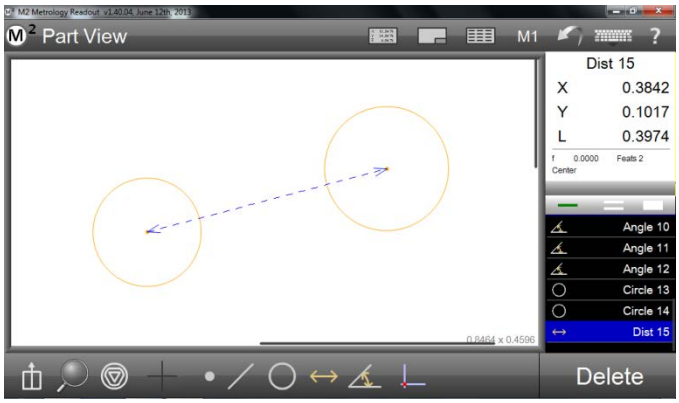
To zoom in or out:

1. Select the desired Zoom function from the zoom menu.
   Measure toolbar > Zoom button > Zoom function
2. Or alternatively in multitouch systems, press two fingers to the screen and expand or pinch to zoom out or in.

To pan the Part View:

1. Right-click the mouse cursor in the Part View and drag the Part View image in any direction.
2. Or alternatively in touch screen systems, press two fingers to the screen and drag the image in any direction.

In this example, the Part View was zoomed and panned to show the two circles and constructed distance shown earlier in greater detail.



Displaying Feature Numbers

Feature numbers can be displayed in the Part View screen to simplify analysis, feature selection from the Part View and construction creation.

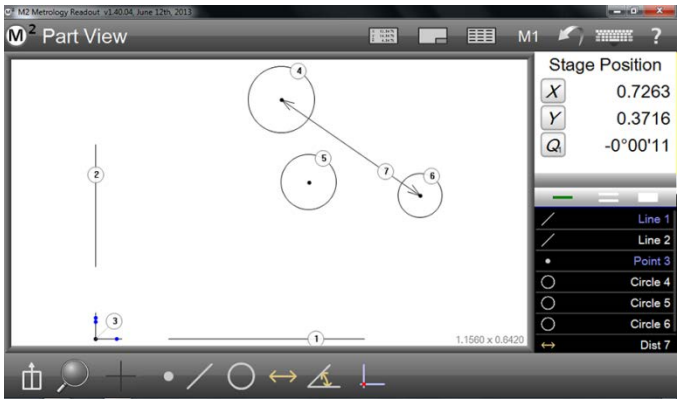
To display feature numbers in the Part View screen:

1. Set the Display Feature Numbers field of the Part View Settings screen to Yes or Both.

   Measure toolbar > System menu > Settings > Display > Display Feature Numbers > Yes/Both

   When set to Both, the feature numbers will also be displayed on printouts.
2. Press Done to exit settings.

   Measure toolbar > Done



Feature numbers are displayed in the Part View

Displaying a Grid

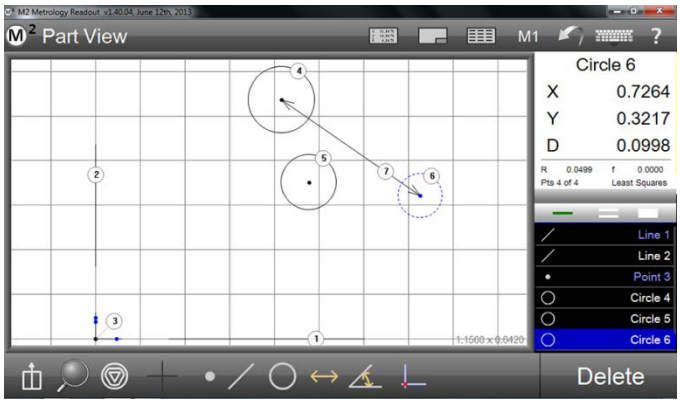
A grid can be displayed in the Part View screen to simplify analysis of feature location.

To display a grid in the Part View screen:

1. Set the Display Grid field of the Part View Settings screen to Yes.

   Measure toolbar > System menu > Settings > Display > Display Grid > Yes
2. Set the Grid Spacing field to the desired value in current units of measure.
3. Press Done to exit settings

   Measure toolbar > Done



A grid is displayed in the Part View at 0.1 spacing

Section 6: Reference Frames

Establishing a reference frame and datuming is accomplished using any of a variety of alignment operations. These operations may be used individually or in combination, and will be based upon the capability of the measuring machine as well as the particular alignment requirements of the application.

Datuming operations can be performed in the form of explicit datum feature measurements, by modifying the individual coefficient values of previously measured features or by constructing datums from existing features.

The M2 reference frame is established by performing, a part skew alignment and then a datum point which is the origin of the XY coordinate system.

When measuring a datum-dependent part, establish a datum or skew alignment first, and then measure the features associated with that datum.

The skew can be offset by the user when the skew line position is located where it cannot be measured directly by the system. This offset skew position is identified by values from other measured or constructed features. The skew alignment can also be rotated to specified angular values by the user to facilitate measurements based on angular secondary alignments.

Establishing a Reference Frame

The M2 measurement reference frame consists of:

- Skew alignment
- Part Datuming (measurement coordinate system origin)

Skew alignment

When a part is misaligned (twisted) in the XY plane, small cosine errors can be generated during the measurement process. These errors can be eliminated by creating a skew alignment for the part. The skew alignment performs a precise measurement of the part of misalignment in the XY plane. Once the misalignment is known to the system, subsequent feature measurements are automatically compensated to eliminate cosine errors. Measurement data in the Feature Detail screen and DRO viewports will reflect measurements of a perfectly aligned part.

To create a skew alignment:

1 Select the desired probe from the probe menu.
Measure toolbar > Probe menu > Desired probe

2 Press the Skew button of the Datum menu.
Measure toolbar > Datum menu > Skew button

3 Probe a minimum of two points well distributed along the entire length of the desired part reference edge.

4 Press the Done button to complete the measurement and enter the skew line into the Feature List.
Measure toolbar > Done button

NOTE
Previously measured or constructed features can also be used to perform a skew alignment by manually zeroing the theta angle coefficient and the X or Y axis coefficient. Pressing the label buttons to the left of these coefficients in either the Feature Detail screen or the DRO viewport will set the corresponding values to zero.

Part Datuming

Creating the part datum point (origin) is the final step in establishing a valid reference frame for subsequent measurements. The part datum can be created by:

- Probing a single point
- Constructing a point from one or more parent features
- Manually zeroing the X and Y coefficients of a feature

Probing a Part Datum Point

The part datum can be created directly by probing a point. To probe a part datum point:

1. Select the desired crosshair probe from the probe menu.
   Measure toolbar > Probe menu > Simple or optical crosshair probe
2. Press the Datum button.
   Measure toolbar > Datum button
3. Probe the desired point.
4. Press the Done button if necessary to complete the measurement and enter the part datum point into the Feature List.
   Measure toolbar > Done button

Constructing a Part Datum Point from one or more Parent Features

The part datum can be constructed from one or more parent features when simply probing the desired point is not convenient or possible. Supported point constructions are specified in Section 4: Measuring, Constructing and Creating Features. To construct a datum point from a single feature:

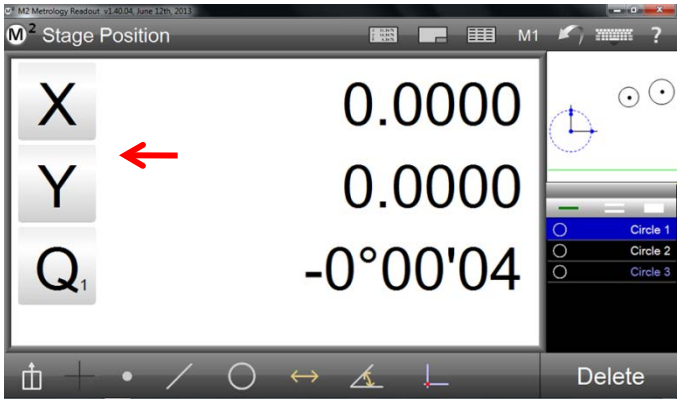
1. Press the Datum button.
   Measure toolbar > Datum button
2. Select (highlight) the desired parent feature or features in the Feature List or Part View.
3. Press the Done button to complete the construction and enter the part datum point into the Feature List.
   Measure toolbar > Done butto

Creating a Datum by Manually Zeroing the X and Y Coefficients of a Feature

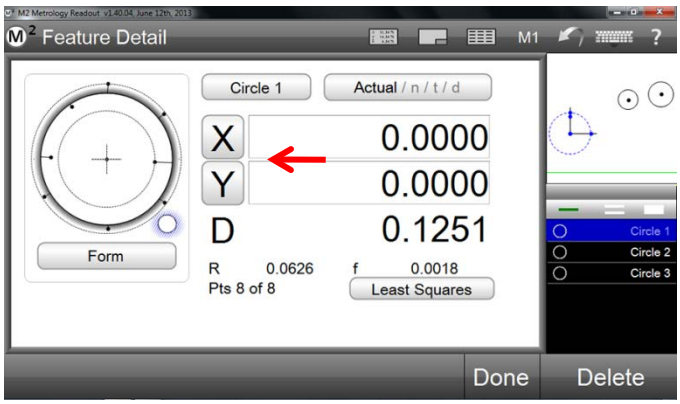
Positional features can be used as a part datum by zeroing the X and Y feature coefficients in the DRO screen or in the Feature Detail screen. To zero the X and Y coefficients of a feature:

1. Select the desired feature in the Feature List.
2. Press the X coefficient button and then the Y coefficient button in the DRO screen or in the Feature Detail screen. The X and Y values will become zero establishing the geometric center point of the feature as the part datum point.

In this example, the geometric center point of circle 1 was set to zero and will serve as the part datum point.



X and Y set to zero in the DRO viewport



X and Y set to zero in the Feature Detail screen

Rotating and Offsetting a Reference Frame

The M2 reference frame can be rotated and offset to accommodate custom measurement applications.

Rotating the Measurement Reference Frame

The measurement reference frame can be rotated about the part datum in clockwise or counterclockwise directions and in angular increments as small as one second or 1/1000 of a degree depending on a unit of measure being used. To rotate the measurement reference frame:

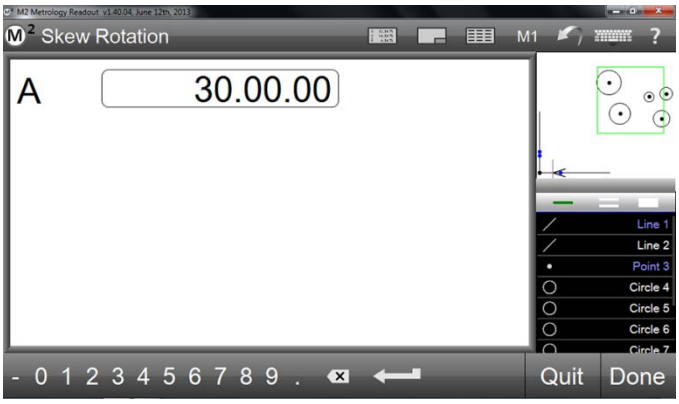
1 Press the Rotate Coordinates button of the Datum menu

Measure toolbar > Datum menu > Rotate coordinates button

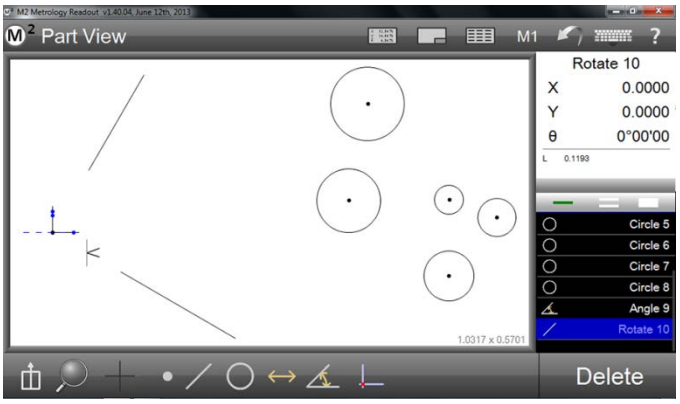
2 Enter the desired angular rotation value into the Angle field. Clockwise angles are positive, and counterclockwise angles are negative.

3 Press the done button to complete the reference frame rotation. A rotation feature will be added to the Feature List.

Measure toolbar > Done button



Enter the desired rotation angle and press Done



Reference frame rotated

To reset the reference frame to the original rotation:

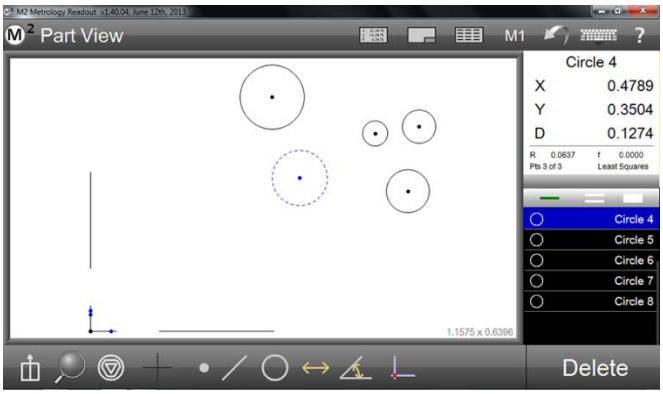
1 Delete the rotation feature from the Feature List.

2 Repeat the process described above but enter a skew rotation equal in value but opposite in polarity to the initial Skew Rotation value.

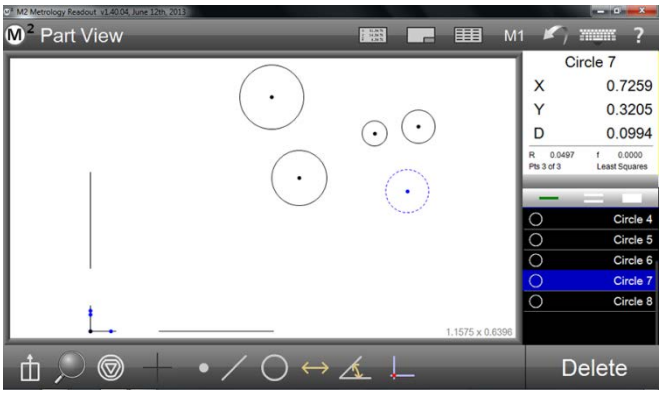
Offsetting the Skew Alignment

The skew alignment can be offset in increments as small as one micron or 1/10,000 of an inch depending on the unit of measure being used. To offset the part skew alignment:

1 Select two positional features in the Feature List that will determine the skew offset. Make a note of the X and Y values of each feature. These features will be referred to as Feature #1 and Feature #2 in this procedure. During the procedure, the user will specify offsets from these two features to the skew axis. The system will then construct a line between the two features which will be used as the new part skew alignment.



Select feature #1 for offset alignment



Select feature #2 for offset alignment

2 Press the Offset Skew button of the Datum menu

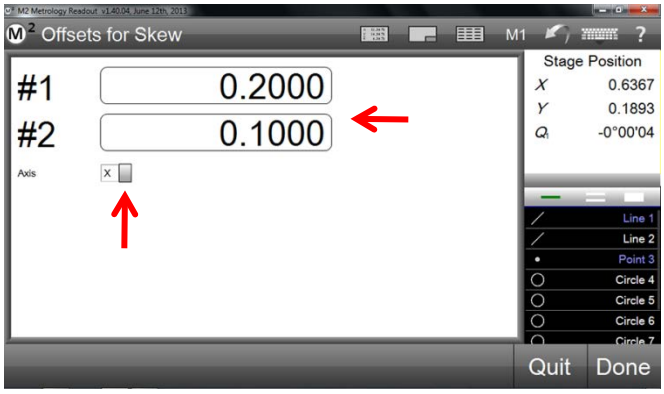
Measure toolbar > Datum menu > Offset Skew button

3 Select an alignment axis from the Axis drop-down list. In the next step, offsets will be specified extending from the two features previously selected to this axis. In this example the X axis was selected.

4 Enter the desired skew offsets from Feature #1 and Feature #2 to the selected axis in the same order in which the features were selected. These offsets are the distances from the geometric centers of the features to the selected skew alignment axis. In this example, the X alignment axis was selected and the desired Y axis offset values would be entered into the Feature #1 and Feature #2 offset fields.

5 Press the Done button to complete the skew offset value entry. The system will proceed to the measure mode.

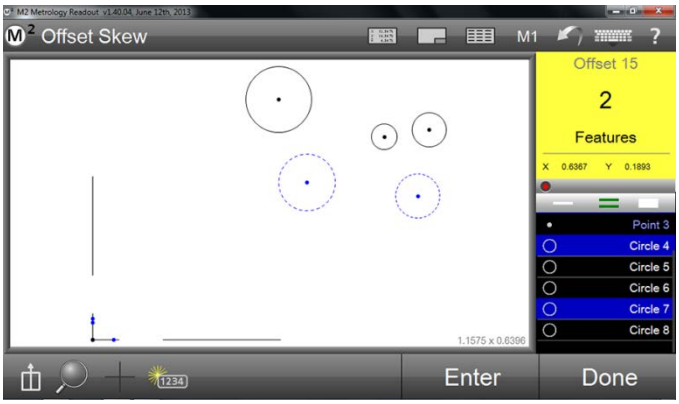
Measure toolbar > Done button



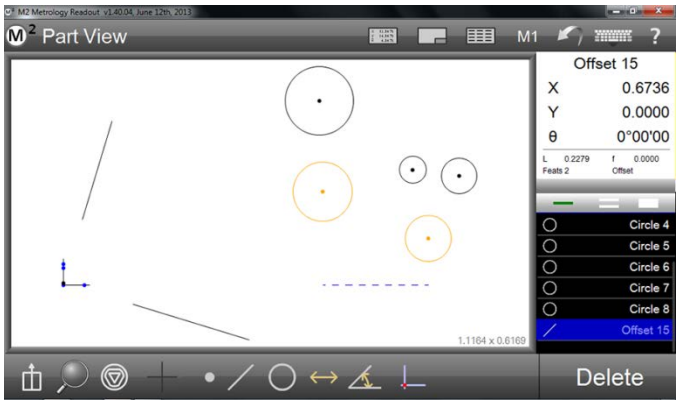
Enter offset values from the skew axis

6 Select Feature #1 and Feature #2 in the Feature List in the same order in which they were selected earlier and then press the Done button. The offsets entered in the previous steps will be applied to the features and a new offset part skew will be created by the system. An offset feature will also be added to the Feature List.

Measure toolbar > Done button



Select a skew axis and enter offsets



The skew alignment will be offset

To reset the part skew to its original version:

1 Delete the offset feature from the Feature List.

2 Repeat the process described above but enter the original X or Y value offset of Feature #1 and Feature #2 noted from step 1.

Section 7: Tolerancing

Tolerances are applied to the feature measurements in the Feature Detail screen. While some tolerances are independent of a reference frame, typically tolerances are applied after a valid reference frame has been established. Tolerances can be applied to measured and constructed features. Each feature type has a specific set of tolerances that can be applied. Tolerances can be applied to features interactively or as part of program editing and are included in part programs for playback later. Tolerance status is indicated by color in the Feature List, Part View, Feature Detail screen and in the Report screen. Tolerance failures are displayed in red.

Tolerances can be applied to single features or to a group of like features. Nominal values for tolerances can be entered by the user or imported from DXF drawing files in CNC enabled systems. Tolerances can be applied on a feature to feature basis, or by using the place tolerancing system. Engineering drawings might indicate that all features reported to two significant digits will receive one tolerance value while other features reported to three significant digits will receive another. The M2 software supports the application of universal tolerance values according to these tolerance groupings.

Supported Tolerances

Tolerances supported by the M2 system are shown in the table below.

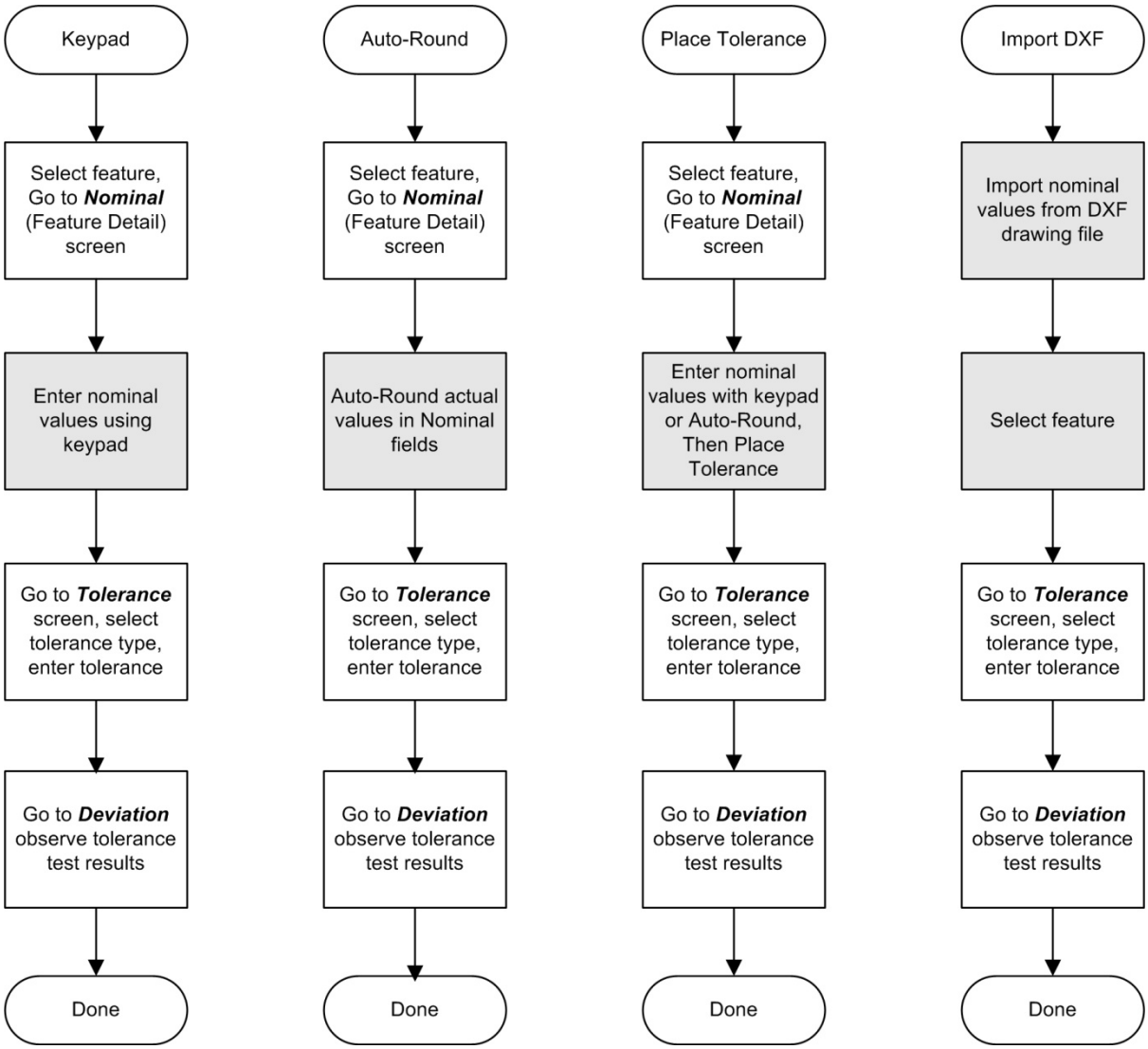
Angle (theta)	∠	Angle, Line
Angularity	∠	Angle
Concentricity	◎	Circle
Diameter	D	Arc, Circle
Length	L	Distance
Parallelism	//	Line
Perpendicularity	⊥	Line
Radius	R	Arc
Roundness	○	Circle
Runout	↗	Circle
Straightness	—	Line
Symmetry	⌯	Line
True position	⌖	Arc, Circle, Point
XY position	X Y	Arc, Circle, Point

Applying Tolerances to a Single Feature

The process of applying tolerances to features is nearly identical for all feature types, only the tolerance type and the entry of nominal values are different. The four methods of entering nominal values and applying tolerances include:

- Enter nominal values using keypad
- Auto round actual values
- Enter values with keypad or auto round and then use place tolerancing
- Import nominal values from a DXF drawing file (CNC enabled systems)

The four methods are diagrammed here. The differences between these methods are shown in shaded blocks. The contents of each block will be explained in detail. The blocks that are common to all processes will be explained as part of an example of tolerancing a circle. The blocks that are unique in each process will be explained separately.



Four methods of entering nominal values and applying tolerances

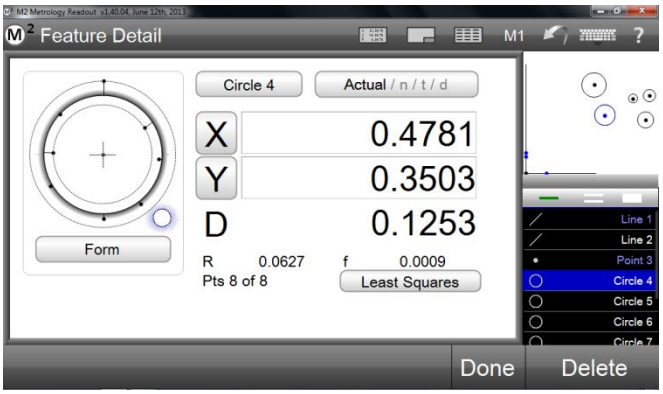
Keypad Entry of Nominal Values

In all cases the first step of the tolerancing process is navigating to the Nominal Feature Detail screen and will only be shown once. This example shows nominal values entered using the keypad and tolerances being applied to a circle.

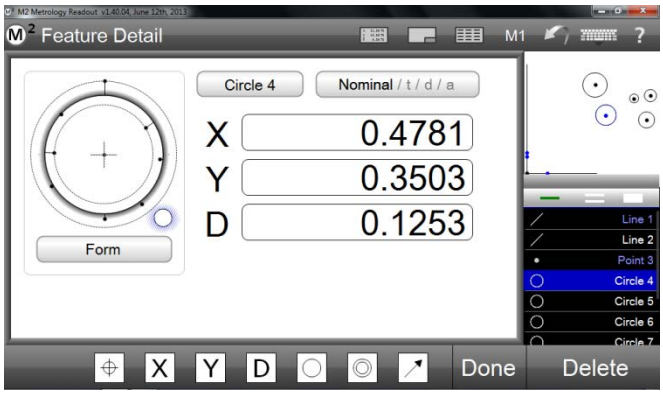
Select Feature and go to the Nominal Feature Detail screen

To select a feature and go to the Nominal screen:

1. Select the desired feature from the Feature List to display the Feature Detail screen in the main viewport. Actual feature measurement values will be shown.
2. Press the Actual button to go to the Nominal screen.



Press the Actual button

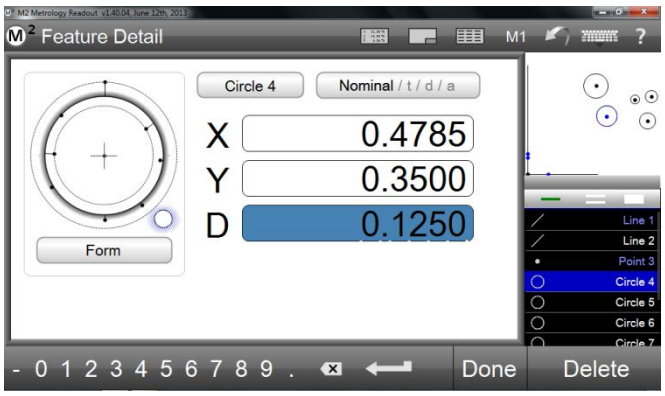


The Nominal screen is displayed

Enter Nominal Values using the Keypad

To enter nominal values:

1. Press in a nominal value field. The field will become blue and the keypad will appear. Enter the nominal values for each field.



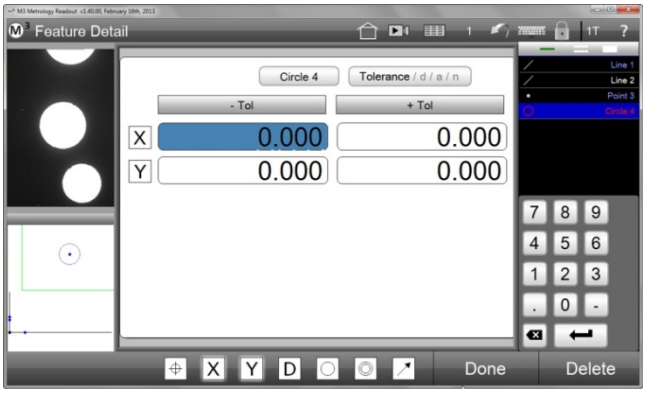
Enter nominal values using the keypad

Go to the Tolerance Screen, Select and Enter Tolerance

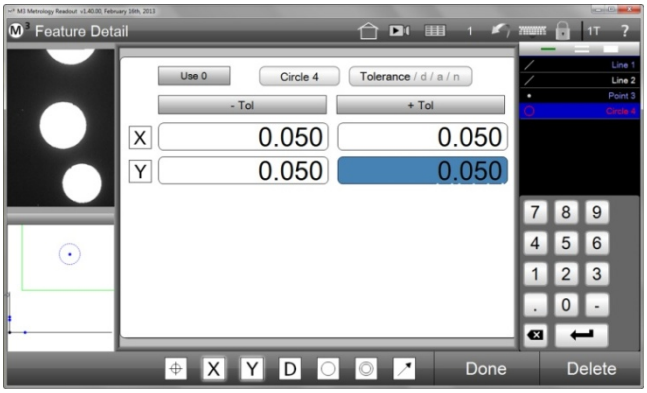
To select and enter tolerances:

1. Press the Nominal button of the Nominal Feature Detail screen to display the Tolerance screen.
2. Select the desired tolerance type.

   Measure toolbar > Desired tolerance button
3. Press in a tolerance field. The field will become blue and the keypad will appear. Enter the desired tolerance values into the tolerance fields.



Select a tolerance type and press a data field



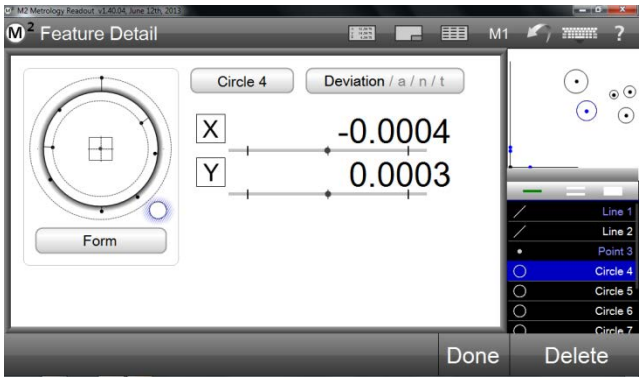
Enter tolerance values using the keypad

Go to the Deviation Screen to Observe Results

To observe the results of tolerance tests:

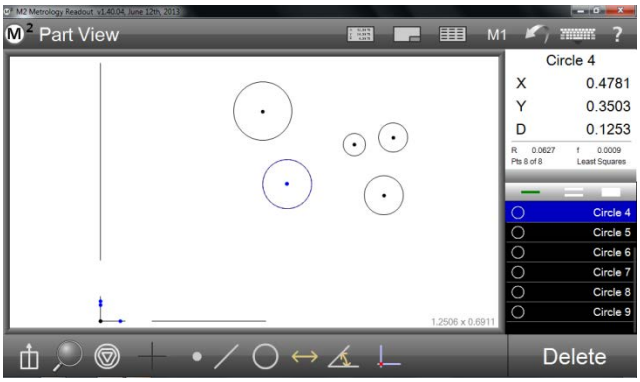
1. Press the Tolerance button of the Tolerance Feature Detail screen to display the Deviation screen. Tolerance results and the applied tolerances will be displayed numerically and graphically.
2. Press the Done button to return to the Home view.

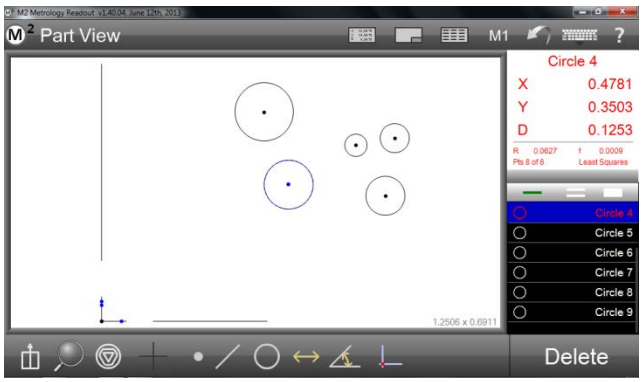
   Measure toolbar > Done button



Tolerance results are shown on the Deviation screen

Passed tolerances are shown in white and failed tolerances will be shown in red in the Feature List, Part Detail screen and on the Report screen.

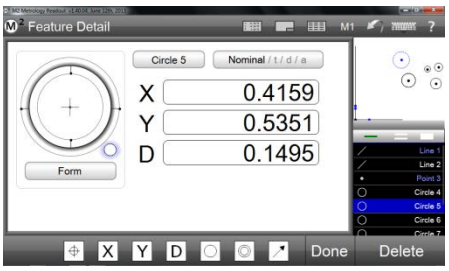




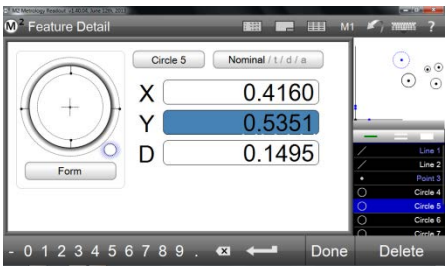
Entering Nominal Values using Auto-Round

Auto-rounding can often save time when repetitively entering nominal feature data. Often measured values are close to blueprint nominal values. Using Auto-rounding, the nominal values for each coefficient of a feature can quickly be rounded up or down to match the nominal values on engineering drawings. To enter nominal values using Auto-rounding:

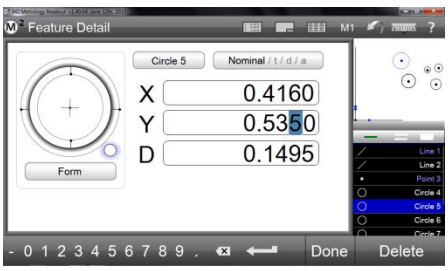
1. Once a feature has been selected in the Feature List, navigate to the Nominal Feature Detail screen as described earlier.
2. Press in a nominal field. The field will become blue and the keypad will appear.
3. Press the digit that you would like to round. In this example, the second digit to the right of the decimal point was pressed which rounded the last two digits from 51 to 50. The digit selected will cause rounding either up or down based on the value of the digit to its immediate right.



Navigate to the Nominal screen



Press in a nominal value field



Press and hold the digit to round

4. To make adjustments up or down to any rounded digit, press and hold it down and then slide your finger or mouse pointer downward off the digit. Do not release your finger or the mouse cursor. This will select the digit place to be incremented or decremented.
5. Slide your finger or mouse pointer to the left to increase the value or to the right to decrease the value, and then release your finger or mouse cursor.

Entering Nominal and Tolerance Values using Place Tolerancing

The place tolerancing method uses tolerance information found in the detail block of an engineering drawing. The detail block specifies tolerance values to be used for drawing features based on the number of decimal places reported for the feature. This example shows how a detailed block might appear on a drawing.

.X	+/-	0.1”
.XX	+/-	0.01”
.XXX	+/-	0.001”

The example indicates that if a feature coefficient includes two decimal places, a tolerance of ± 0.01 should be applied.

The M2 system provides a place table for the user to include decimal place information from drawing detail blocks. This table is used in the place tolerancing method to apply detail block tolerances automatically to features measured by the M2 system.

To perform place tolerancing:

1. Confirm that the Enable Tolerance Places field in the Measure Settings screen is set to Yes.
   System toolbar > System menu > Measure settings screen > Place Tolerancing > Yes

NOTE

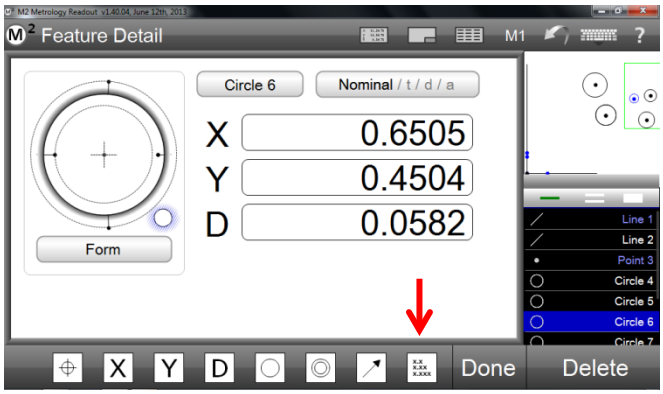
If you wish to apply the same decimal place information to all new M2 measurement sessions, confirm that the Tolerance Places Data on New Part is set to Keep in the Measure settings screen.

System toolbar > System menu > Measure settings screen > Tolerance Places Data on New > Keep

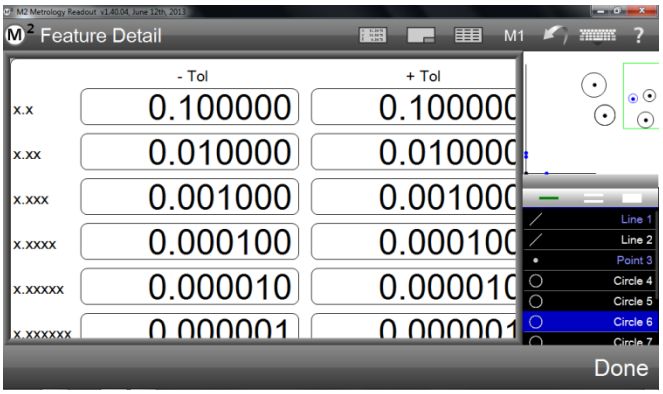
2 Navigate to the Nominal Feature Detail screen as described earlier.

3 Press the Place Table button to display the Place Table.

Measure toolbar > Place Table button



Press the Place Table button



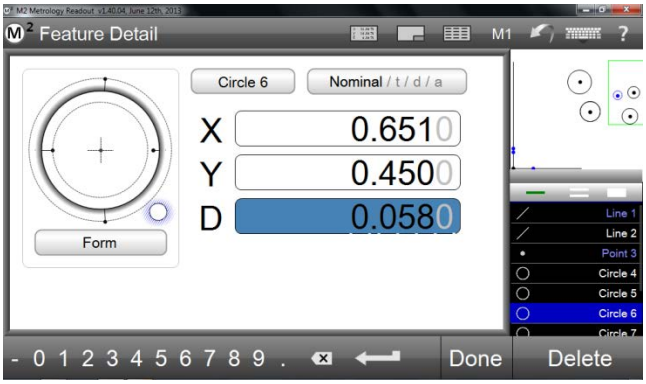
Place table values

4 Modify the values of the place table to represent the values found in the detail block of your engineering drawing if required, then press the Done button to return to the Feature Detail screen.

Measure toolbar > Done button

5 Navigate back to the Nominal Feature Detail screen if necessary, and enter the nominal values using one of the methods described earlier. Press the non-significant digits in each field to apply the Place Table values. Non-significant digits will become gray to indicate that the values have been applied. Press the Done button to conclude this process.

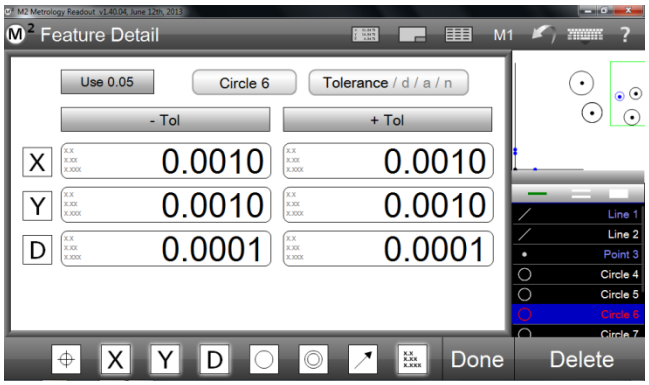
Measure toolbar > Done button



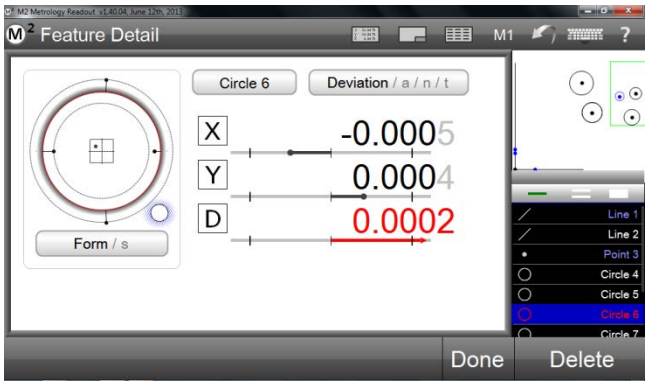
Press non-significant digits

6 Press the Nominal button to go to the Tolerance Feature Detail screen. Tolerances from the Place Tolerance table will have been applied.

7 Press the Tolerance button to go to the Deviation Feature Detail screen and observe the results of the tolerance tests.



Place Table tolerances applied



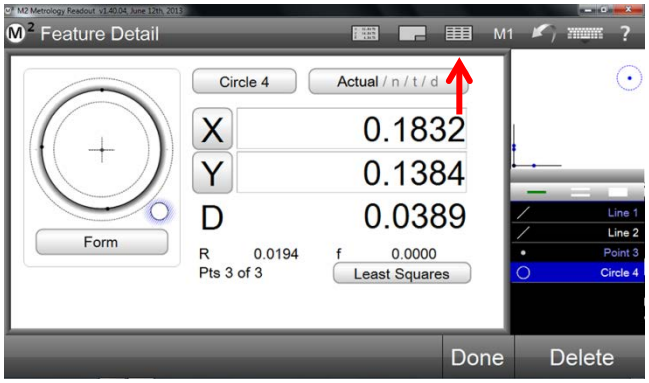
Tolerance results

Importing Nominal Values From a DXF Drawing File (CNC systems)

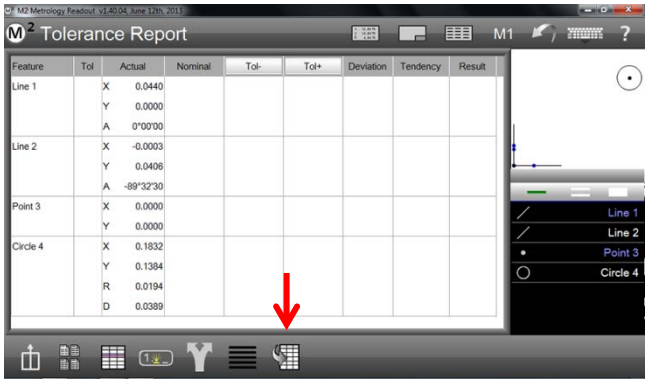
Nominal values for part features can be imported directly into the nominal data fields from a DXF drawing file, eliminating the need to do manual nominal data entry. Nominal values can be imported for single feature or group feature tolerancing. To import nominal values from a DXF file:

1 Press the Report button to display the Report screen and Report toolbar.

System toolbar > Report button



Press the Report button

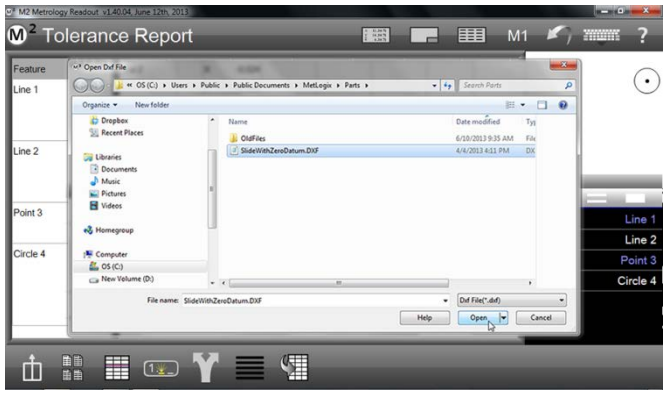


Press the Import DXF button

2 Press the Import DXF button to display the DXF Import dialog.

Report toolbar > Import DXF button

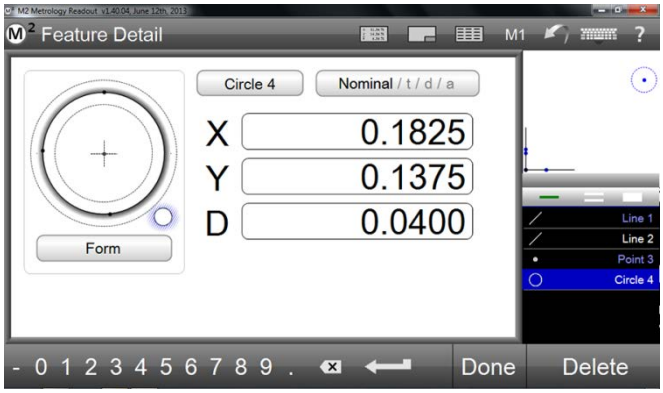
3 Select and open the desired DXF part drawing file. Nominal values will be shown for part features in the Report screen.



Open the DXF drawing file

Nominal values will be imported

4 Select a feature from the Feature List and navigate to the Nominal Feature Detail screen to confirm the presence of nominal values.



Nominals are present

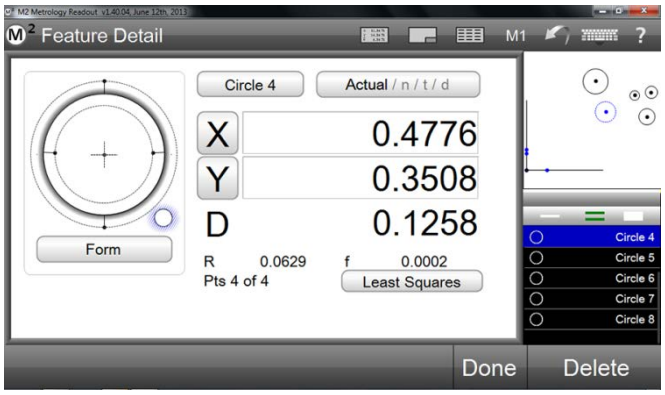
5 Proceed to the Tolerance Feature Detail screen to enter tolerance values.

Applying Tolerances to a Group of Features

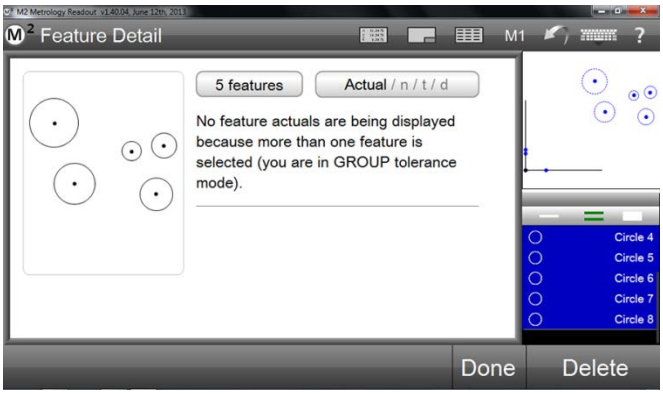
Only a group of like features can be toleranced as a group. This example demonstrates applying a tolerance to a group of circles. To tolerance a group of like features:

1 Select the first of the desired group of like features in the Feature List. The Feature Detail screen will be displayed.

2 Select the remaining features in the desired group of like features.



Select the first feature of the group

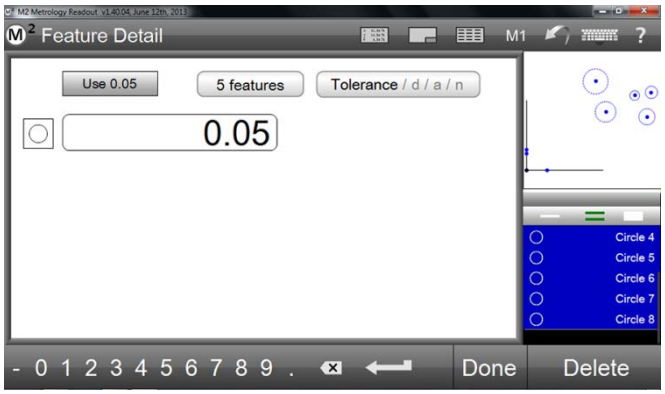


Select all members of the group

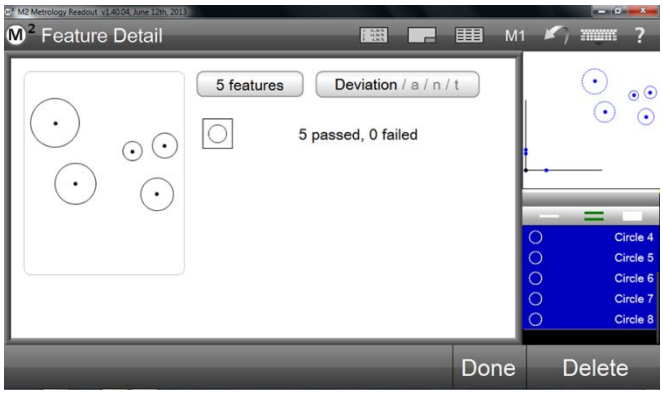
3 Navigate to the Tolerance screen and select the desired tolerance type. Circularity is selected in this example.

4 Enter the tolerance value and press the Done button. Group tolerance results will be shown in the Deviation screen.

Measure toolbar > Done button



Select a tolerance type and enter the value



Group results are shown in the Deviation screen

Section 8: Reporting Data

Feature measurement results can be reported in any one of five standard report formats and can be reviewed within the Report screen. By default, all features contained in the Feature List will appear in the first four report formats listed below. The European 2 format only shows features that have been toleranced. Report styles range from simple, including only feature numbers and actual measured values, to complex, including graphic representations of the results and tolerance data.

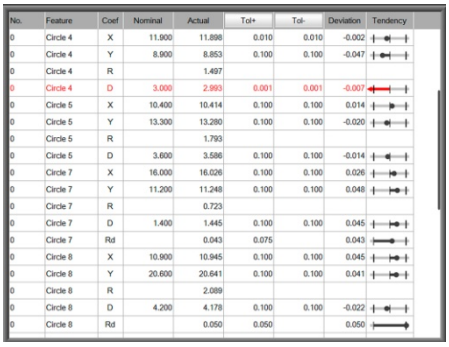
Reports are made up of rows and columns of data. Individual data cells within a Report View can be edited to make changes to feature names, feature numbers and tolerance values. The report editing mode can be enabled or disabled quickly using the Edit Report button. Individual rows of feature data can be hidden from any report format to create fully customized reports for printing or exporting. The data format, report header information and header/footer graphics can be customized by the user. Part View graphics, time and date stamp and operator information can be included in any report format.

Reports can be viewed on screen, printed or exported at the conclusion of a single part measurement or included in a part program to support repetitive and automated measurement and reporting. Reports can be printed as hardcopies to standard Windows-compatible printers or exported as data files in popular file formats.

Selecting a Report Format

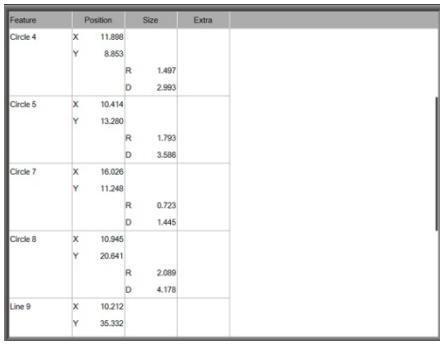
Any one of five report formats can be selected:

- European
- Standard
- CSV
- Tolerance Report
- European 2



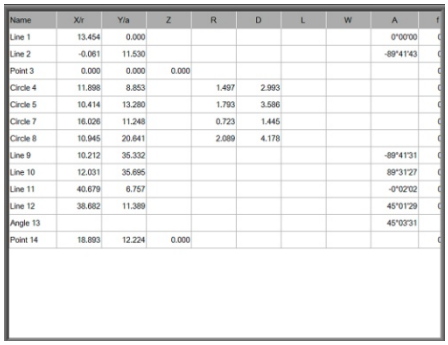
No.	Feature	Coef	Nominal	Actual	Tol+	Tol-	Deviation	Tendency
0	Circle 4	X	11.900	11.898	0.010	0.010	-0.002	
0	Circle 4	Y	8.900	8.853	0.100	0.100	-0.047	
0	Circle 4	R		1.497				
0	Circle 4	D	3.000	2.993	0.001	0.001	-0.007	
0	Circle 5	X	10.400	10.414	0.100	0.100	0.014	
0	Circle 5	Y	13.300	13.280	0.100	0.100	-0.020	
0	Circle 5	R		1.793				
0	Circle 5	D	3.600	3.586	0.100	0.100	-0.014	
0	Circle 7	X	16.000	16.026	0.100	0.100	0.026	
0	Circle 7	Y	11.200	11.248	0.100	0.100	0.048	
0	Circle 7	R		0.723				
0	Circle 7	D	1.400	1.445	0.100	0.100	0.045	
0	Circle 7	Rd		0.043	0.075		0.043	
0	Circle 8	X	10.900	10.945	0.100	0.100	0.045	
0	Circle 8	Y	20.600	20.641	0.100	0.100	0.041	
0	Circle 8	R		2.089				
0	Circle 8	D	4.200	4.178	0.100	0.100	-0.022	
0	Circle 8	Rd		0.050	0.050		0.050	

European



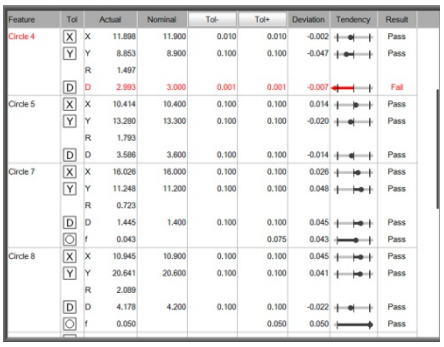
Feature	Position		Size	Extra
Circle 4	X	11.898		
	Y	8.853		
		R	1.497	
		D	2.993	
Circle 5	X	10.414		
	Y	13.280		
		R	1.793	
		D	3.586	
Circle 7	X	16.026		
	Y	11.248		
		R	0.723	
		D	1.445	
Circle 8	X	10.945		
	Y	20.641		
		R	2.089	
		D	4.178	
Line 9	X	10.212		
	Y	35.332		

Standard



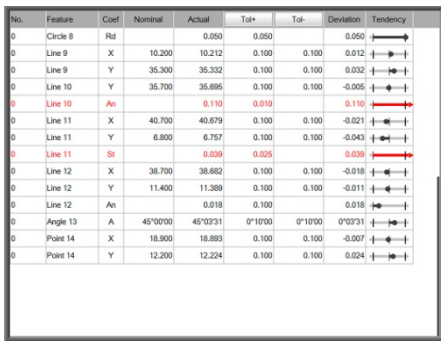
Name	X/r	Y/a	Z	R	D	L	W	A	f
Line 1	13.454	0.000						0°00'00	0
Line 2	-0.081	11.530						-89°41'43	0
Point 3	0.000	0.000	0.000						0
Circle 4	11.898	8.853		1.497	2.993				0
Circle 5	10.414	13.280		1.793	3.586				0
Circle 7	16.026	11.248		0.723	1.445				0
Circle 8	10.945	20.641		2.089	4.178				0
Line 9	10.212	35.332						-89°41'31	0
Line 10	12.031	35.695						89°31'27	0
Line 11	40.679	6.757						-0°02'02	0
Line 12	38.682	11.389						45°01'29	0
Angle 13								45°03'31	
Point 14	18.893	12.224	0.000						0

CSV



Feature	Tol		Actual	Nominal	Tol-	Tol+	Deviation	Tendency	Result
Circle 4	X	X	11.898	11.900	0.010	0.010	-0.002		Pass
	Y	Y	8.853	8.900	0.100	0.100	-0.047		Pass
		R	1.497						
	D	D	2.993	3.000	0.001	0.001	-0.007		Fail
Circle 5	X	X	10.414	10.400	0.100	0.100	0.014		Pass
	Y	Y	13.280	13.300	0.100	0.100	-0.020		Pass
		R	1.793						
	D	D	3.586	3.600	0.100	0.100	-0.014		Pass
Circle 7	X	X	16.026	16.000	0.100	0.100	0.026		Pass
	Y	Y	11.248	11.200	0.100	0.100	0.048		Pass
		R	0.723						
	D	D	1.445	1.400	0.100	0.100	0.045		Pass
		f	0.043			0.075	0.043		Pass
Circle 8	X	X	10.945	10.900	0.100	0.100	0.045		Pass
	Y	Y	20.641	20.600	0.100	0.100	0.041		Pass
		R	2.089						
	D	D	4.178	4.200	0.100	0.100	-0.022		Pass
		f	0.050			0.050	0.050		Pass

Tolerance Report



No.	Feature	Coef	Nominal	Actual	Tol+	Tol-	Deviation	Tendency
0	Circle 8	Rd		0.050	0.050		0.050	
0	Line 9	X	10.200	10.212	0.100	0.100	0.012	
0	Line 9	Y	35.300	35.332	0.100	0.100	0.032	
0	Line 10	Y	35.700	35.695	0.100	0.100	-0.005	
0	Line 10	An		0.110	0.010		0.110	
0	Line 11	X	40.700	40.679	0.100	0.100	-0.021	
0	Line 11	Y	6.800	6.757	0.100	0.100	-0.043	
0	Line 11	St		0.039	0.025		0.039	
0	Line 12	X	38.700	38.682	0.100	0.100	-0.018	
0	Line 12	Y	11.400	11.389	0.100	0.100	-0.011	
0	Line 12	An		0.018	0.100		0.018	
0	Angle 13	A	45°00'00	45°03'31	0°10'00	0°10'00	0°03'31	
0	Point 14	X	18.900	18.893	0.100	0.100	-0.007	
0	Point 14	Y	12.200	12.224	0.100	0.100	0.024	

European 2

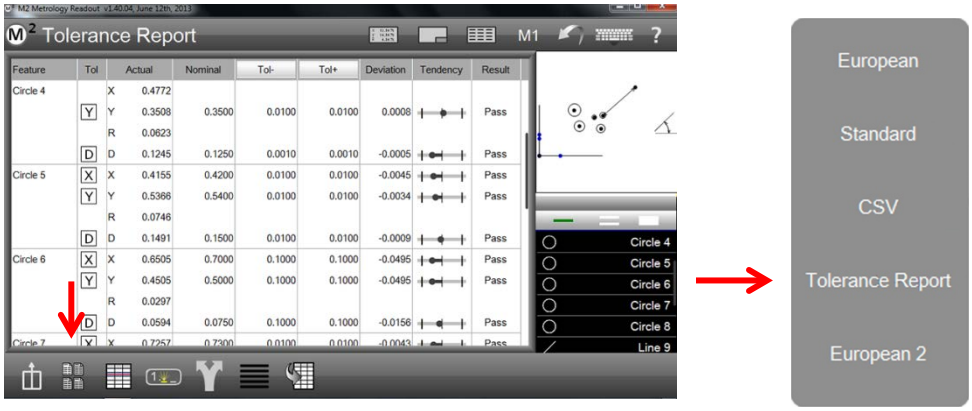
To select a report format:

1 Press the Report button to display the Report screen in the center viewport.

System toolbar > Report button

2 Select the desired report format from the Report Format menu.

Report toolbar > Report Format button



Press the Report Format button

The selected format will be displayed with the report name in the upper left corner of the Report screen.

Editing Report Cells

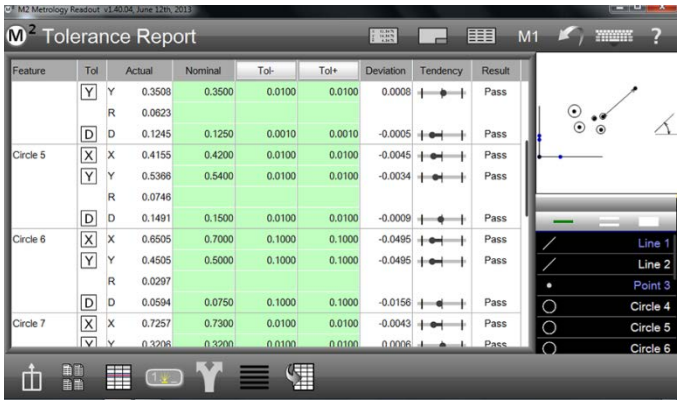
Feature names, feature numbers and tolerance values can be edited in the Report screen. To edit report cells:

1 Press the Report button to display the Report screen in the center viewport.

System toolbar > Report button

2 Press the edit cell button to enable editing. Data fields that can be edited will be shaded light green.

Report toolbar > Edit Cell button



Cells shaded green can be edited

3 Report data that extends beyond the field of view can be moved up or down by pressing and dragging on the screen.

4 Edit feature names, feature numbers or tolerance values. Tolerance nominal and limit values can be edited.

5 Press the Edit Cell button again to leave the edit mode.

Report toolbar > Edit Cell button

Hiding Report Data

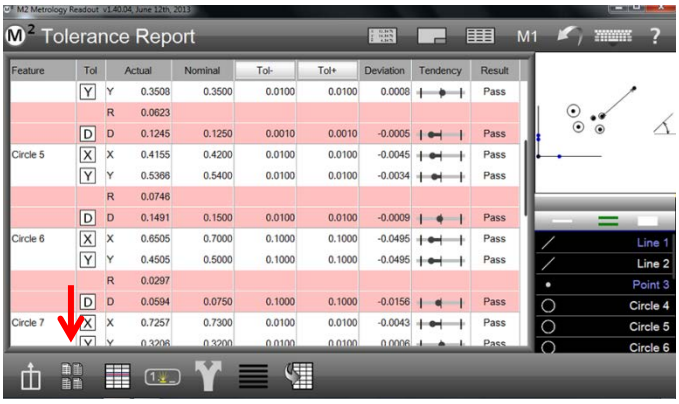
Specific data rows can be hidden from printed or exported reports. To hide one or more rows of data:

1 Press the Report button to display the Report screen in the center viewport.

System toolbar > Report button

2 Select individual rows by pressing on them. Selected rows will be shaded pink. Select multiple rows by pressing the double bar of the feature selection tool and then pressing on the desired rows.

3 Report data that extends beyond the field of view can be moved up or down by pressing and dragging on the screen.



Press the Hide Data button to hide shaded rows
Long-press the button to hide all but the shaded rows

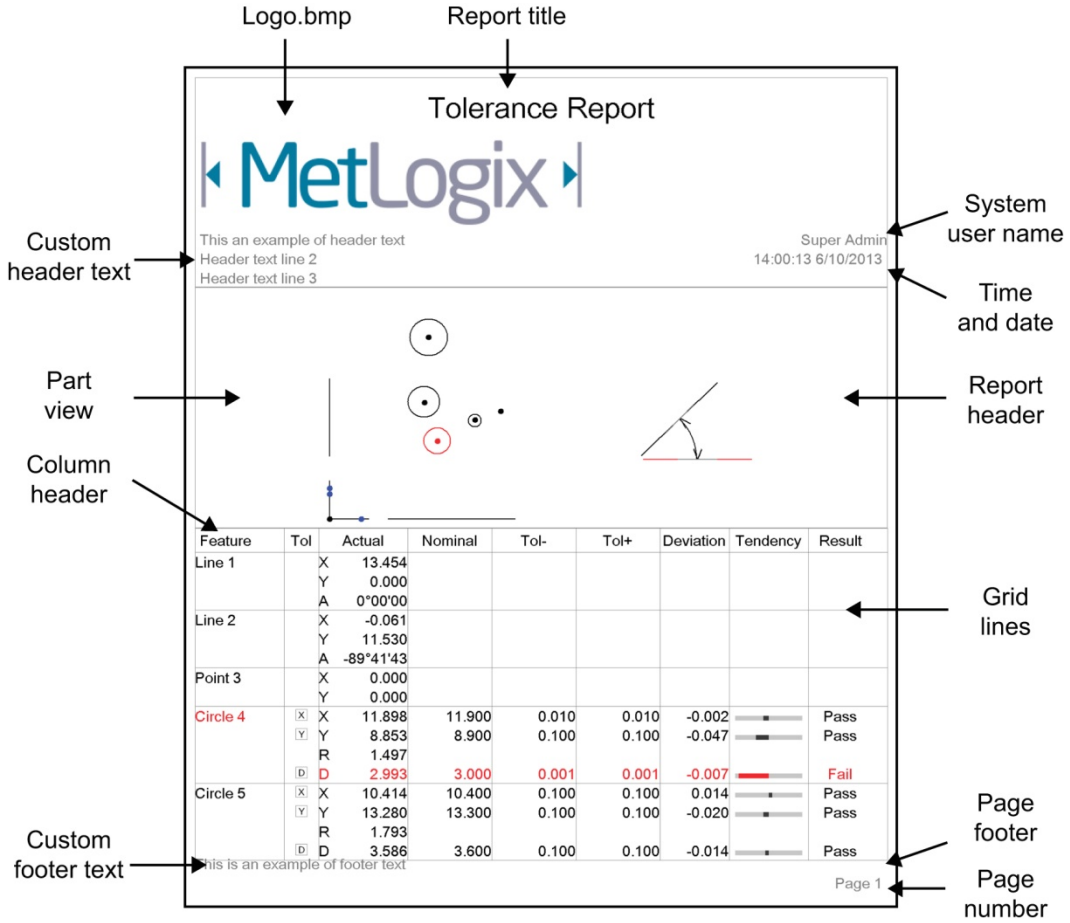
4 Press the Hide Data button to hide the shaded rows from printed reports and exported files. Long-press the Hide Data button to hide all rows except the shaded rows from printed reports and exported files.

Report toolbar > Hide Data button

5 To restore hidden data for a given feature, press the Hide Data button when the feature is selected.

Customizing Report Templates

Report template parameters are shared with all report formats and are customized by specifying the printout settings. A graphic representation of report template printout categories is shown below.



Specifying Printout Settings

The printer settings are found in the Printouts Settings screen. To specify printer settings:

1 Display the Printout Settings screen.

System toolbar > System menu > Printouts button

2 Set the desired parameters in the Printout Settings screen. Printout settings are show below.

Print Report Header

Set this field to Yes to include the report header.

Print Column Header

Set this field to Yes to include column headers. The column header labels the report columns by category.

Print Grid to Lines

Set this field to Yes to include grid lines.

Print Bitmap in Header

Set this field to Left, Center or Right to include a custom bitmap image in the specified location of the report header. Set this field to No to omit a custom bitmap. Place the custom bitmap image with the file name *HeaderLogo.bmp* into: *C:\users\public\public documents\Metlogix\logosandbitmaps*. The size of the custom bitmap should be 397 by 98 pixels.

Print Bitmap in Footer
Set this field to Left, Center or Right to include a custom bitmap image in the specified location of the report header. Set this field to No to omit a custom bitmap. Place the custom bitmap image with the file name *FooterLogo.bmp* into: *C:\users\public\public documents\Metlogix\logos and bitmaps*. The size of the custom bitmap should be 397 by 98 pixels.

Print User Name in Header
Set this field to Left, Center or Right to include the currently logged-in user name in the desired location of the header. Set this field to No to omit the username from the header.

Print Date/Time in Header
Set this field to Left, Center or Right to include the system date and time in the desired location of the header. Set this field to No to omit the date and time.

Print Part View with Data
Set this field to Top, Bottom or Watermark to include the image of the current Part View in the desired location. Setting the field to Watermark will print an alpha-blended Part View image underneath the report data. Set this field to No to omit the Part View image.

Print Page Number in Footer
Set this item to Yes to include a page number in the footer.

Printed Part View Height
Set this item to the desired size of the Part View to be included with the report. This item can be set to 25%, 50%, 75% or 100% of the native size of the Part View image.

Print Custom Text in Header
Enter custom alphanumeric information into these fields to be displayed in the header. Custom text entered into these fields will always be aligned left and bottom in the header.

Print Custom Text in Footer
Enter custom alphanumeric information into this field to be displayed in the footer. Custom text entered into this field will always be aligned left and bottom in the footer.

Prompt for Custom Text
Set this field to Yes to prompt the user to enter the custom text that will be included in the header and footer when header or footer text was specified. When this field is set to Yes, a dialog box will be displayed each time the user requests a printed report. Custom text can be entered directly into this dialog box and will be included on the printed report.

Displaying Feature Numbers on Printed Reports

Feature numbers can be displayed in the Part View portion of printed reports to simplify analysis.

To display feature numbers in the Part View portion of printed reports:

1. Set the Display Feature Numbers field of the Part View Settings screen to Yes or Both.
   Measure toolbar > System menu > Settings > Display > Display Feature Numbers > Yes/Both
   When set to Both, the feature numbers will also be displayed on the Part View screen
2. Press Done to exit settings.
   Measure toolbar > Done

Section 9: Exporting Data

Feature measurement data can be exported to a file on your computer from the Report screen. Data can be exported in the following standard formats:

- .CSV
- .TSV
- .TXT
- .DXF (CNC enabled systems)

The format of the exported data file will conform to the current report template parameters described in Section 8: Reporting Data. The exported data file will contain any modifications made to the report, including hidden or modified data cells.

The basic parameters and destination of exported data file are configured in the File Locations settings screen. Data can be exported to a folder, a fixed drive location or a network location. Data file exports can have custom file names and can be configured to append to an existing file, overwrite an existing file or be added as a new file with an auto-number applied.

Data export steps that are part of a saved part program can be edited to change the report format type

Specifying Export Settings

To specify the basic export settings for feature measurement data files:

1. Confirm that the report template settings are appropriate for your data export file. Report template settings are described in detail in Section 8: Reporting Data.
2. Display the Export Settings screen.
   System toolbar > System menu > Export button
3. Set the desired export parameters in the Export Settings screen. Settings are show below.

File Name
Configure the desired filename for the file exports.

Include Column Headers
Set this field to Yes to include column headers in the file export. The column header labels the columns by category.

Target File Type
Set this field to Append to append the exported file to an existing target file, set the field to Overwrite to overwrite the target file with the exported file and set the field to Auto Number to create a new file on each export that increments starting with the Auto Number name specified in the Auto Number File Name field.

Auto Number File Name
Set this field to the desired export Auto Number. The file number will automatically increment when the target file type is set to Auto Number.

Prompt for Settings on Each Export
The export options can be configured as global settings from within the Export Settings screen or can be configured on an export by export basis by enabling the Prompt for Settings on each Export from within the Export settings screen. To configure the software to prompt for Export settings at each file export command, configure the Prompt for Settings on each Export to Yes.

Append to Each Export
Enter text into this data field to append a message to each exported file.

Exporting a Data File

To export a data file:

1. Press the Report button to display the Report screen in the center viewport.
   System toolbar > Report button
2. Select the desired report format from the Report Format menu.
   Report toolbar > Report Format button
3. Press the Export Data button to display the Export Data menu
   Report toolbar > Export Data button
4. The exported data file will be written to the location designated in the File Locations Settings screen and a message will appear indicating a successful export of data.

Section 10: Programming

The M2 system records all of the measurement activities that occur during a part inspection session. These activities can be saved at the end of the session as a part program to be played back later. All measurement activities are recorded and include:

- Selecting a magnification
- Measuring, constructing and creating features
- Applying tolerances
- Preparing and printing reports
- exporting data

When part program files are loaded, all existing features are cleared from the Feature List making room for new features from the part program file and preparing the M2 software to repeat the sequence of recorded measurement steps.

.

The M2 software can be in one of three operating modes:

- Interactive
- Program playback
- Program edit

Interactive mode

The interactive mode is the default measurement mode of the M2 software prior to loading a saved part program and is typically used for part program creation or for performing quick nonrecurring part measurements.

Program playback mode

The program playback mode is initiated after a previously saved part program file has been loaded. The playback mode is used to perform repeated measurements of part features on identical parts. Once a part program file has been loaded, it can be executed or edited. A visual indication is provided of the current part program step and of the next step in the measurement routine.

On-screen guidance is provided during playback that helps the user move from one feature to the next in non-CNC systems.

At the completion of program playback, a program options dialog will be displayed that provides a convenient mechanism for replaying the part program, starting a new part, or evaluating or editing the current program.

Program edit mode

The program edit mode is used to modify steps of a previously saved or recently created part program file. In the edit mode, program steps can be modified, deleted or added to an existing part program. Functions such as re-measuring features, appending new measurement steps and changing system parameters such as magnification selection can be performed.

Part program storage

Part program files are saved in the location:
C:\Users\Public\Public Documents\Metlogix\Parts

Part program file names are in the form: *filename.mlxpart*.

Part Fixturing Modes

The M2 system supports three part fixturing modes:

- No part fixturing: Manual and CNC systems
- Temporary part fixturing: Manual and CNC systems
- Permanent part fixturing: CNC systems

No Part Fixturing

When no part fixturing is used, a measurement reference frame must be created by the user each time measurements are performed on a part. This mode is used primarily for quick inspections of one to a few parts in manual and CNC systems.

Temporary Part Fixturing

When temporary part fixturing is used, a measurement reference frame must be created by the user the first time a part is measured. The system will then perform reference frame measurements automatically for subsequent like parts.

In manual systems, the user is guided to perform the reference frame measurements by colored dot that appears in the Part View. In CNC systems, the reference frame measurements are performed automatically.

This mode is typically used to measure many identical parts using a manual system, or to measure many parts using the CNC system and a part fixture that will not be permanently attached to the machine.

Permanent Part Fixturing

Permanent part fixturing is used only on CNC systems and must be specified prior to saving a program. When permanent part fixturing is used, the part fixture is permanently attached to the system stage and the measurement reference frame is retained as part of the part program. Reference frame measurements are performed automatically by the system each time the part program is loaded and requires no intervention by the user. This mode is typically used to measure a high volume of identical parts.

NOTE

The use of permanent fixturing relies on a repeatable machine zero based on encoder reference marks. The part program can only be run after the system has performed a home operation that sets the machine zero. Encoder and other changes that might affect the position of the system's machine zero will invalidate the part registration of previously recorded programs.

Creating and Saving a Part Program

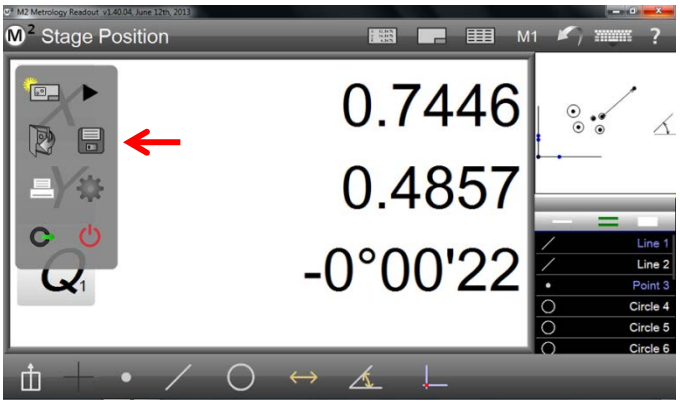
Part programs are created automatically as measurements and other operations are performed. However, part programs must be saved at the conclusion of a measurement session in order to be recalled and used later. Part programs can be saved with temporary or no part fixturing or with permanent fixturing. Part programs that include permanent fixturing are only used by CNC systems.

Temporary or no Part Fixturing

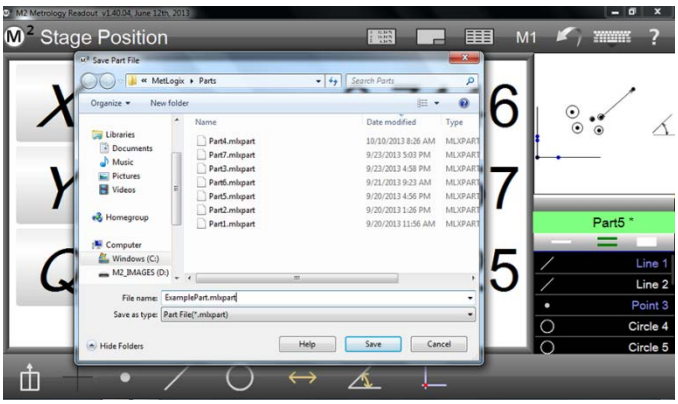
To save a part program with temporary or no part fixturing:

1 Press the Save button to display the Save Part File dialog.

System toolbar > System menu > Save button

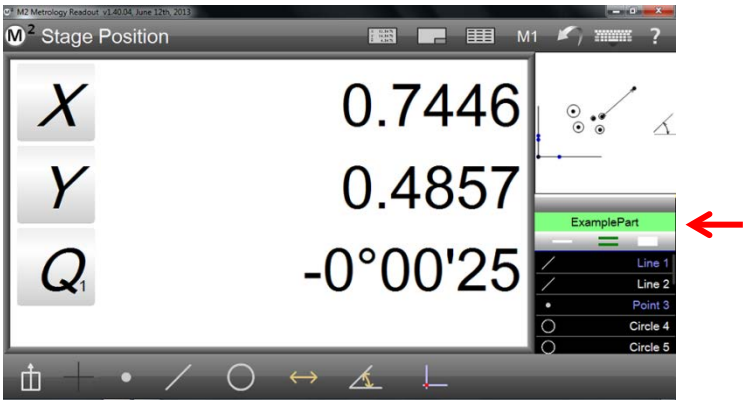


Press the Save button



Enter the filename and press Save

2 Enter the file name into the File name field of the Save Part File dialog and press the Save button. The part program file will be saved and the part program file name will be shown in a green bar at the top of the Feature List.



The file name is shown above the Feature List

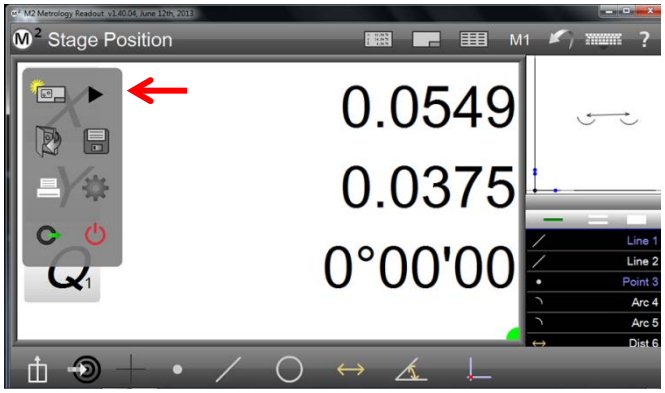
Permanent Part Fixturing (CNC only)

Part programs that include permanent fixturing for CNC systems must be edited to specify the fixturing type before they are saved. To save a part program with permanent fixturing:

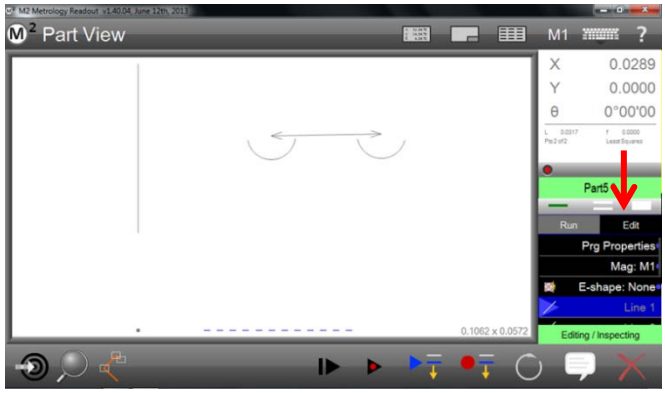
1 Upon completion of all measurement activities to be included as part of a program, press the play button to initiate the run and edit modes.

System toolbar > System menu > Play button

2 Press the Edit tab to display all program steps in the Feature List.



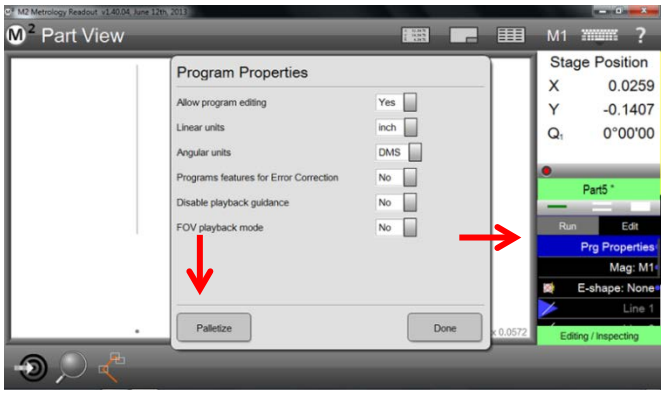
Press the Play button to enable run and edit modes



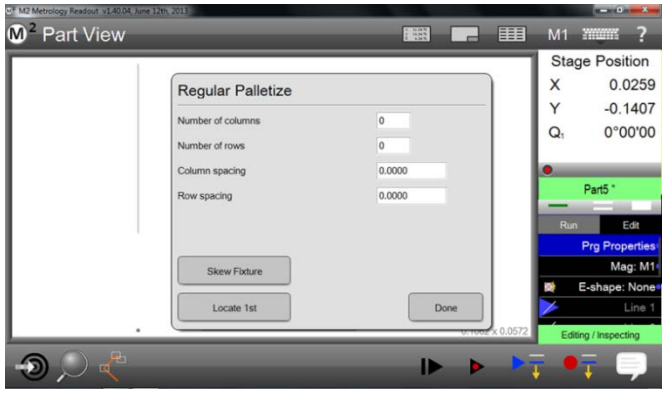
Press the Edit tab to show all program steps

3 Press the Prg Properties program step to display the Program Properties dialog.

4 Press the Palletize button to display the Regular Palletize dialog.



Press the Prg Properties program step and then press Palletize

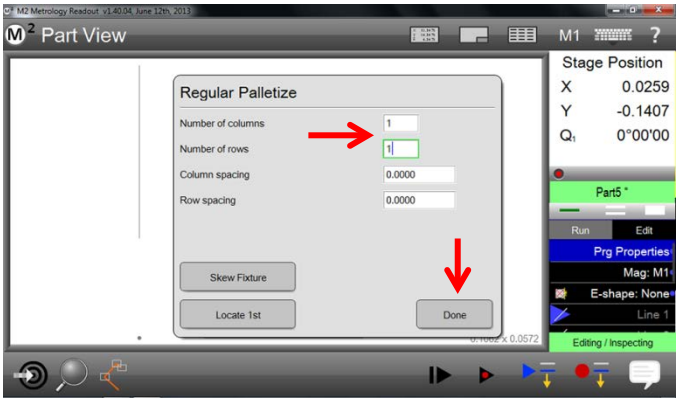


The Regular Palletize dialog is displayed

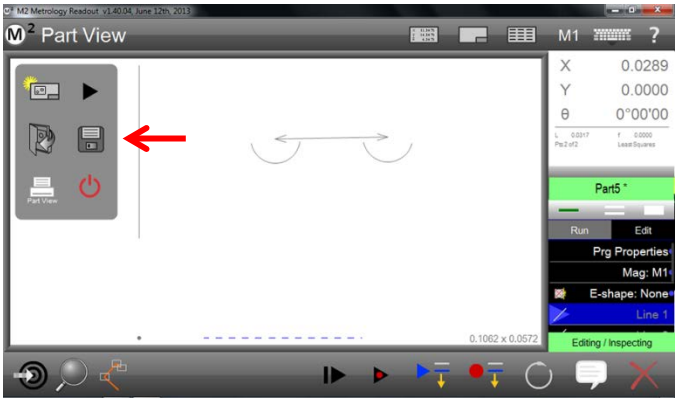
5 Enter 1 into each of the Number of columns and Number of rows data fields and then press the Done button. This step specifies permanent fixturing for this program.

6 Press the Save button to display the Save Part File dialog.

System toolbar > System menu > Save button



Enter 1s into Number of columns and Number of rows



Press the Save button

7 Enter the file name into the File name field of the Save Part File dialog and press the Save button. The part program file will be saved and the part program file name will be shown in a green bar at the top of the Feature List.

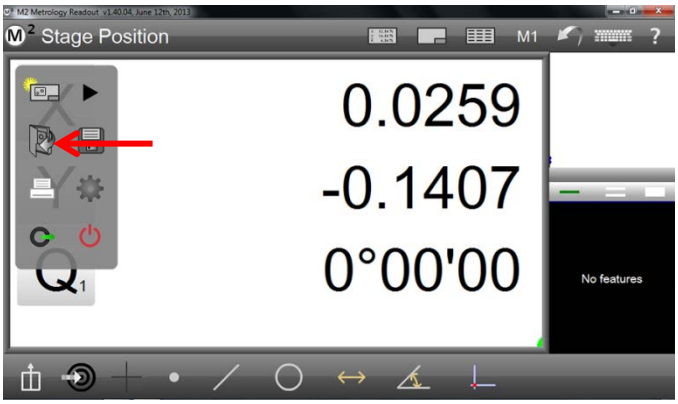
Playing a Program

Programs, in the form of groups of measured and constructed features and other software operations are played as a sequence of program steps. When a saved part is opened, the Feature List will become populated with shaded (gray) feature items. The gray color indicates that the features are not yet measured, or not yet played back. The feature data for a freshly opened part will reflect the last recorded actual values prior to saving the part program. As the program playback proceeds, measured features will display in white (pass or no tolerance) or red (fail tolerance) and reflect freshly acquired measurement data.

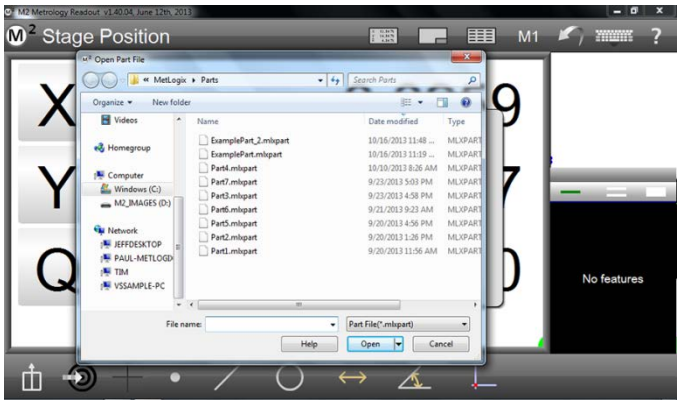
Loading a Program for Playback

The process of loading a program for playback is identical for all systems and fixturing types. To load a program for playback:

1. Press the Open File button to display the Open Part File dialog.
   System toolbar > System menu > Open File button
2. Select the desired part file and press Open to load the file.

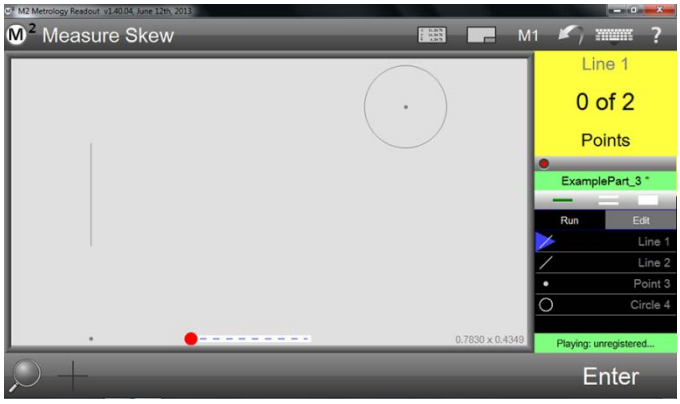


Press the Open File button



Select the desired file and press Open

In CNC systems, if the part program file contains permanent fixturing, the program will be loaded and executed immediately as described on the next page. In manual or CNC systems, if the part program file contains no fixturing or temporary fixturing, the program will be loaded, the program name will be shown at the top of the Feature List, the program status at the bottom of the Feature List will indicate that the program is playing unregistered and the system will wait for the user to establish a reference frame (part registration). A flashing red dot will be displayed to guide the user during registration.

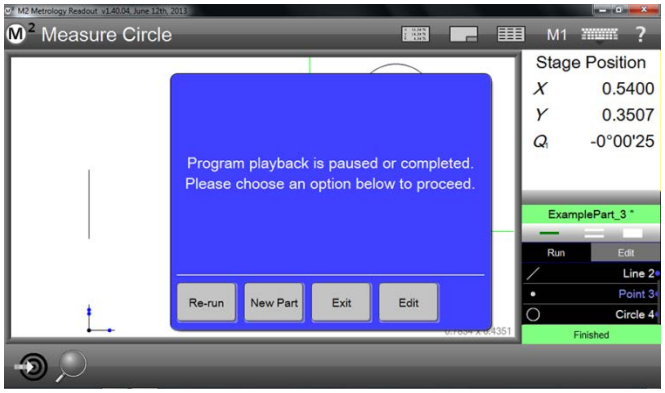


Programs without permanent fixturing will wait for part registration

Playing Programs with Permanent Fixtures (CNC only)

When programs are loaded with permanent fixturing to a CNC system, the program will execute immediately and fill the Feature List with fresh measurement data. It is not necessary to ask the system to play the program back after loading the program. Upon program completion, the status indicator at the bottom of the Feature List shows that the program is finished, and the blue program options screen will appear. At this point the user may choose to:

- Re-run the program on the new part
- Clear all feature data and begin a new measurement session with a new part
- Exit the program playback mode and display the measurement results
- Edit the current part program file



When the user re-runs the program on a new part, the system prompts the user to determine if the same part registration can be used again. If the part will be in the same location, the system will run the program without requiring a new part registration. If the part location is different, the system will require a new registration.

Playing Programs with Temporary or no Fixtures

The difference between playing a program with no fixturing and playing a program with temporary fixturing is:

- No fixturing: The user must register each part before measuring
- Temporary fixturing: The user must register the first part. After that, the system retains the part registration. In CNC systems, the system will register and measure automatically. In manual systems, the user will be guided through registration and measurements.

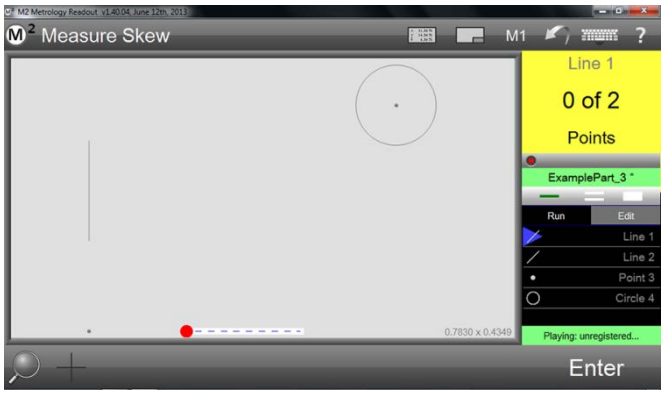
To play a part program:

1. Load the part as explained earlier if necessary.
2. Press the Play button to initiate program playback

   System toolbar > System menu > Play button

   A default name will appear at the top of the Feature List if the program was not previously saved.

   The Blue Pin in the Feature List will indicate the current step in the program playback. A program status bar will also be displayed at the bottom of the Feature List. The status will either be *Playing* or *Paused/Inspecting*. This playback state can be toggled by pressing or clicking on the status indicator.

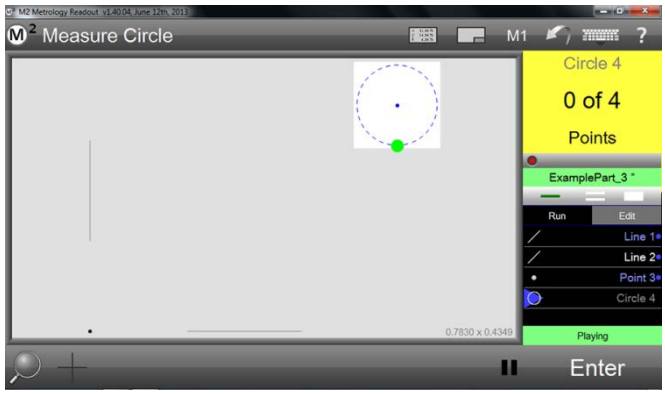


A red dot will guide the user to register the part

3 Establish a reference frame by probing the feature indicated by blinking red dot in the Part View. Once the part is a registered, the red dot will reappear on the screen at the first target location.

4 Move the stage to position the probe near the target location.

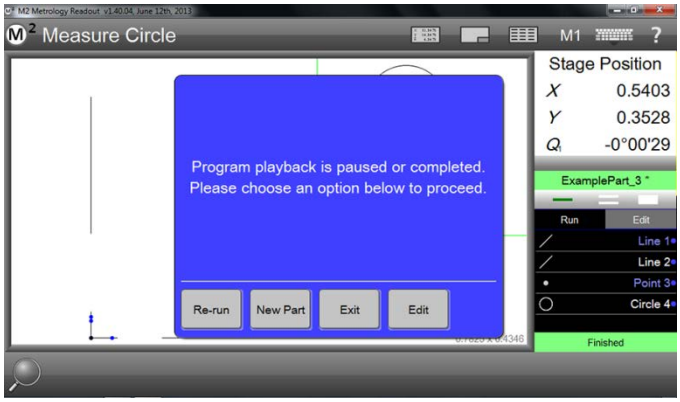
5 When the probe reaches the target circle, the dot will become green, permitting the execution of measurement steps. Probe the indicated data points on the feature and proceed to the next target feature.



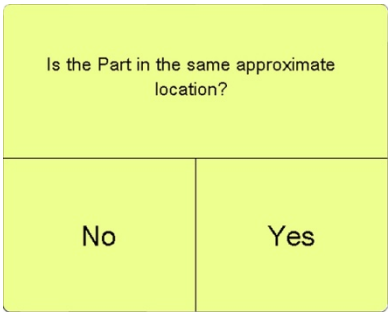
A green dot guides the user to probe features

6 When program playback is finished, the status indicator at the bottom of the Feature List will display *Finished* and the blue program options screen will appear. The part program can then be:

- Replayed
- Cleared for new part creation
- Display the current measurement results
- Edited



When the user re-runs the program on a new part, the system prompts the user to determine if the same part registration can be used again. If the part will be in the same location, the system will run the program without requiring a new part registration. If the part location is different, the system will require a new registration.



For features with tolerances applied, the feature name in the Run mode of the Feature List, the Part View graphic, and the corresponding detailed view will display in either red for tolerance failures or in white.

Other software functions may also execute during playback. Data exports, report printouts, user messages, magnification changes are some examples.

Editing programs

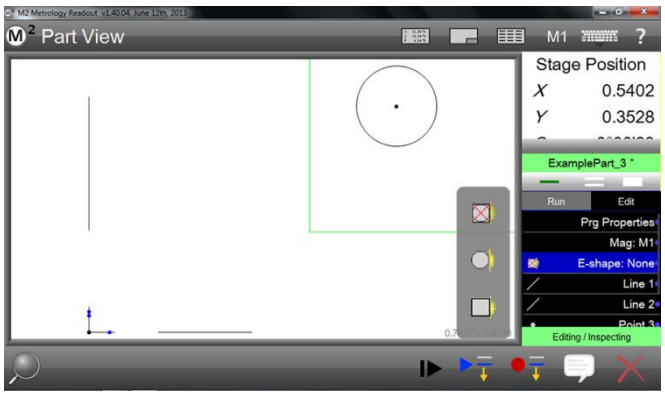
All new part programs can be edited. Program editing will not be possible for previously saved part files that the program author locked in the Allow Program Editing settings of the Program Properties step.

> ***NOTE***
> ***Program Edit copies should always be saved before locking programs, because locking a program in the Allow Program Editing setting is permanent. The second edit copy will be needed to perform any future edits.***

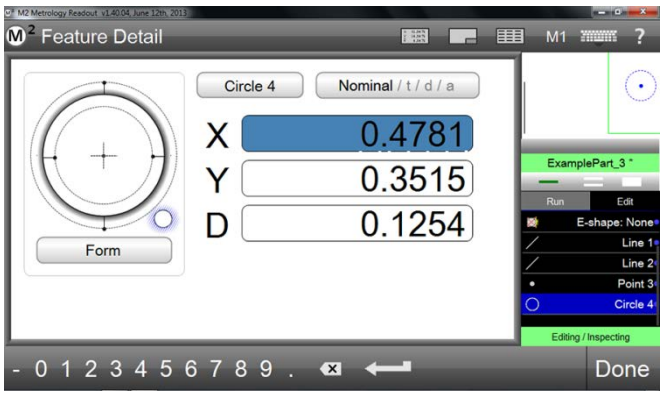
Changes made to an existing program will be reflected in subsequent program runs for the current program file session. If the file is reloaded, changes will only be reflected if the program file was saved.

To edit a part program:

1. Load the program file as explained earlier if necessary.
2. Press Play to display the Run and Edit tabs at the top of the Feature List. The Edit tab will always be visible for new or unlocked programs.
   System toolbar > System menu > Play button
3. Press the Edit tab. Program steps will be listed in the Edit view. Select a program step to make changes to recorded Feature Detail, tolerance values, data exporting and printing commands.
4. Use the Feature Detail screens to make changes to tolerance and feature data for a selected program step. Use the toolbar controls to make changes to data export, print and magnification steps.



Edit system parameters



Edit feature parameters such as tolerances

5. When edits are complete, save the program file using the Save button in the M2 system menu.

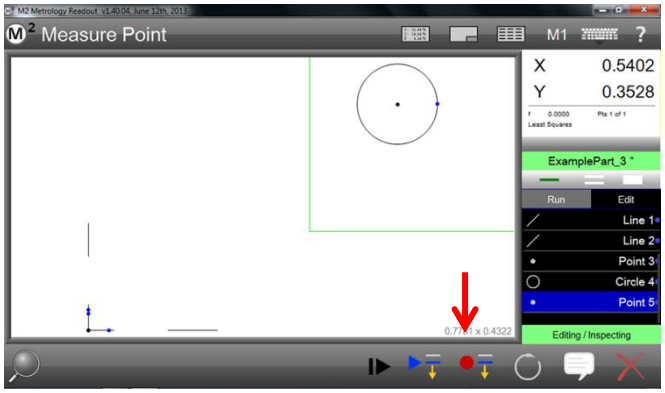
Adding Program Steps

New program steps can be added to existing programs. To add a program step:

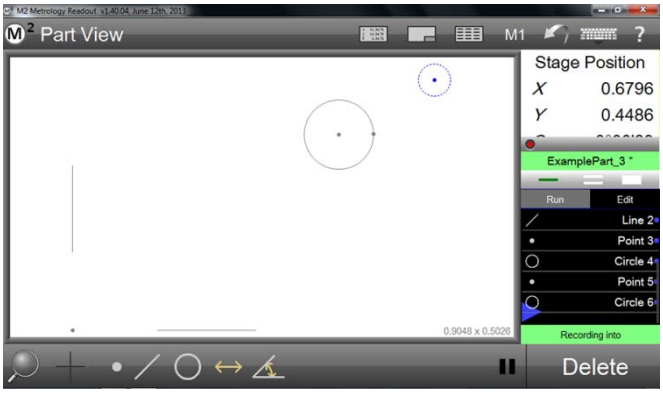
1. Press the Edit tab to display all the program steps.
2. Select the program step where you would like your new program operations to be added. These new program operations will be inserted after the selected program step. In this example, steps will be appended to the end of the program.
3. Press the Record Into button.

   Edit toolbar > Record Into button

A blue Edit Pin will be positioned between the currently selected program step and the following step indicating the current Record Into position. In this example, steps will be appended to the program.



Select program step and press the Record Into button



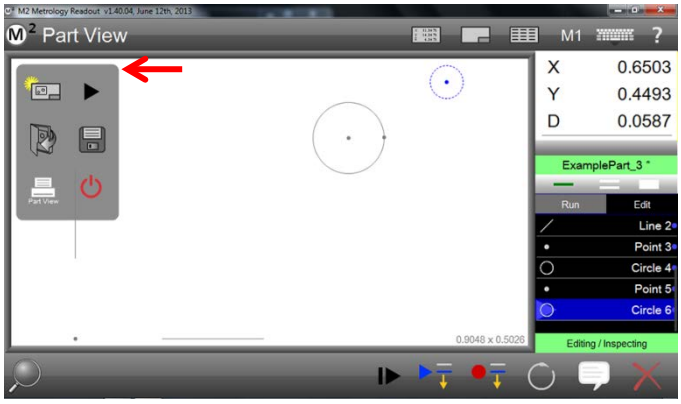
The system will prepare to append new program steps

NOTE

When editing a program that has already been played back, the context generation will occur automatically, filling in context dependent program steps automatically from the previously acquired program data. For programs that have not yet been played back, the software will prompt the operator to manually measure all context dependent features prior to completing the context generation.

4. Once the Record Into edit command has been initiated, the user can measure or construct new features or insert export or print command steps according to the standard software procedures discussed earlier.
5. When the step or steps have been added, press the Edit tab to leave the Record Into mode. The added program steps will be shown in the current program edit list.
6. Press the save button to save the program with the new steps included.

   System toolbar > System menu > Save button

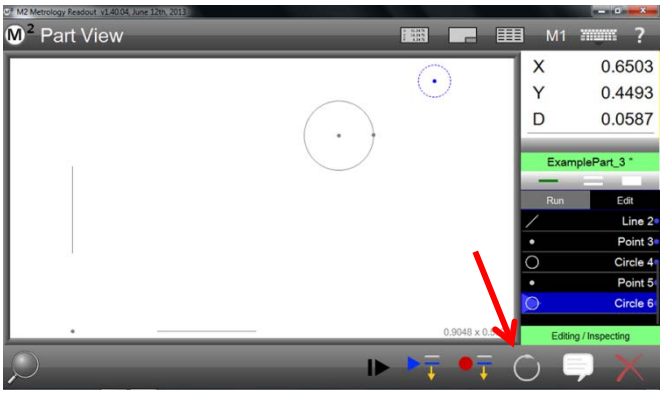


A circle feature was added

Re-measuring Feature Steps

Program feature steps can be re-measured in the Edit mode. To re-measure a step:

1. Press the Edit tab to display all the program steps.
2. Select the program step of the feature that you would like to re-measure.
3. Press the Re-measure Feature edit button.
   Edit toolbar > Re-measure Feature button
4. The user will be prompted to re-measure the selected feature. Re-measure the feature and then press Done when finished. The fresh feature data will replace the existing data within the program.



NOTE

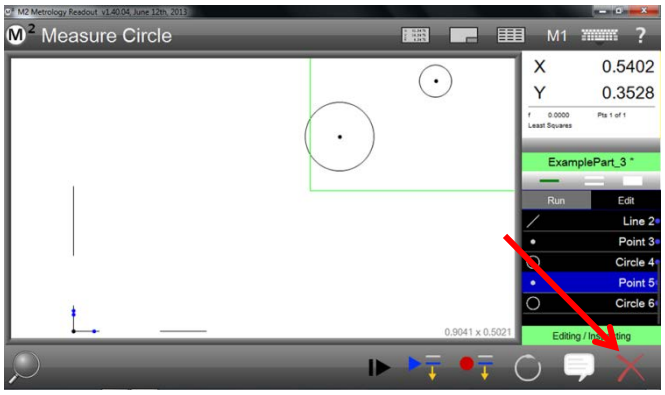
The Re-measure edit command is commonly used to record new environment variables along with the feature measurement for a given step within the program. The new feature program step will contain all program variable information that exists at the time that the Re-measure command was executed. Information such as point spacing will be changed to reflect the context of the new measurement.

5. Press save to save the revised program steps to the currently loaded program.
   System toolbar > System menu > Save button

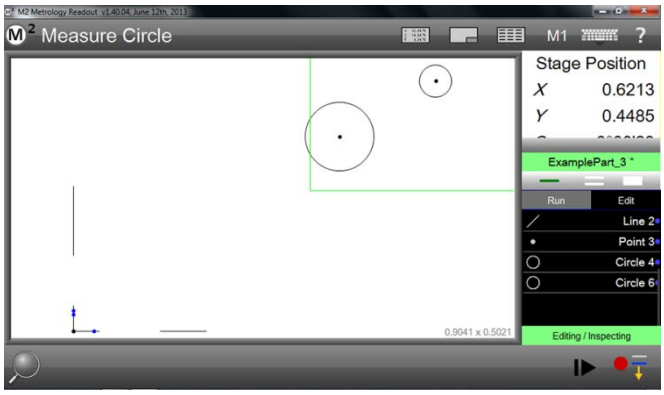
Deleting Program Steps

Program steps can be deleted in the edit mode. To delete a step:

1. Press the Edit tab to display all the program steps.
2. Select the program step that you would like to delete.
3. Press the Delete Program Step button. The selected program step will be deleted.
   Edit toolbar > Delete Program Step button



Select the feature to be deleted and press the Delete Program Step button



The feature will be deleted from the Program Steps

4. The step is deleted from the current program playback session. Press the Save button to permanently apply the deletion to the part program.
   System toolbar > System menu > Save button

Playing from a Selected Step

Program playback can begin at a specified program step. When playing from a selected step, the software will determine the requirements for generating feature context. If context dependent features have already been measured, the system will advance immediately to the selected step. If it is determined that additional context information is required, the operator will be prompted to measure the feature or features required to do so.

To play from a selected step:

1. Press the Edit tab to display all the program steps.
2. Select the program step that you would like to begin playing the program from.
3. Press the Play from Selected Step button

   Edit toolbar > Play from Selected Step button

As mentioned earlier, context dependent steps will be executed automatically or prompted for manually and then playback will begin from the selected step.

Single-stepping program execution (CNC systems)

Program playback can be single-stepped from the beginning or from the current step. Each single-step executes an individual program line. For example, if a circle is measured by probing four points, single-stepping through the Circle measurement will require four steps. The current step indicator follows the single-step execution in the Feature List as the program in single-stepped.

To single-step program execution:

1. Press the Edit tab to display all the program steps.
2. Select the program step that you would like to begin playing the program from.
3. Press the Single-step button

   Edit toolbar > Single-Step button

Adding a User Message

User messages can be added for program playback. To add a user message:

1. Press the Edit tab to display all the program steps.
2. Select the program step where you would like the user message displayed in program playback. The message will be played after the selected step.
3. Press the User Message button.

   Edit toolbar > User Message

4. The User Message dialog will appear. Enter the desired message and press Done to complete the message. The message will be played as part of playback.
5. Press the Save button to save the program change.

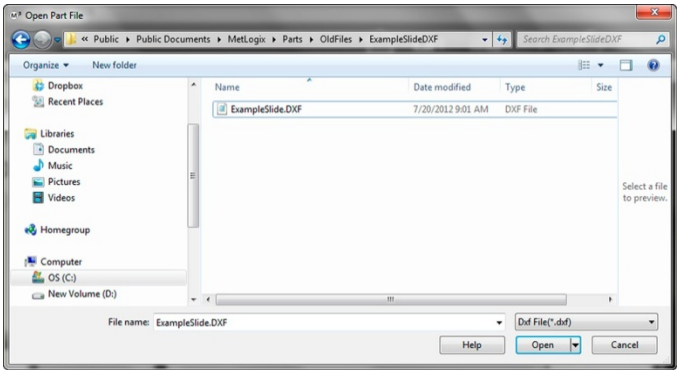
   System toolbar > System menu > Save button

DXF Import and Auto Programming (CNC enabled systems)

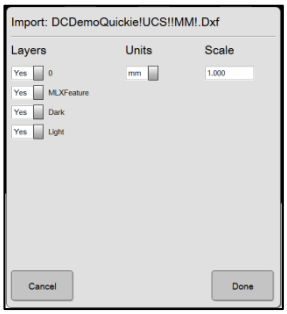
The CNC enabled M2 system will convert DXF part drawing files into part programs using the DXF import and Auto Program module. To convert a DXF drawing file into a part program:

1 While the M2 program is in the interactive mode, press the Open Part button to display the Open Part dialog.
System toolbar > System menu > Open Part button

2 Select DXF from the File Type menu, select the desired file and press Open. The import DXF Dialog will be displayed.



Import DXF part file



Choose DXF parameters

3 Choose the desired layers for import, the unit type for import, and specify the desired scale factor to be used for import and then press “Done” to continue. The DXF features will be added to the Feature List with DXF tags,

4 Trim (delete) features from the imported DXF file that you do not want to be part of the resulting auto-program.

5 Specify registration (datum) features to be used for the auto program registration by performing datum operations directly on the DXF features using reference frame operations described earlier in Section 6: Reference Frames. The specified registration features will be moved to the top of the Feature List.

6 Press the Play Button to display the Auto Program dialog and initiate the auto program process.
System toolbar > System menu > Play button

7 Specify the desired number of points per feature to be programmed, the desired FOV size to be used at each stage location, and the indent margin to be used for positioning point clouds from the DXF element feature ends, and then press Done to continue.

Specify auto program parameters

8 The auto program path will be generated by the system and program playback will be initiated. Probe the registration features specified on the DXF part image. Program playback will proceed once registration is complete.

9 Press the Single Step button to initiate single step playback.
Edit toolbar > Single Step button

10 In the single step mode, use the left and right step buttons, or keyboard arrow buttons to advance or rewind the program, one step at a time.

11 Perform program edit commands as needed to complete the playback of the auto programmed part.

12 Press the Save button to save changes when the program is complete to store changes made to the program.
System toolbar > System menu > Save button

Product Warranty

This product is warranted against defects in workmanship, material and design for two (2) years from date of delivery to the extent that METLOGIX will, at its sole option, repair or replace the product or any part thereof which is defective, provided, however, that this warranty shall not apply to products subjected to tampering or, abuse, or exposed to highly corrosive conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED AND METLOGIX HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. METLOGIX SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, ANY ANTICIPATED OR LOST PROFITS.

This warranty is voidable if the purchaser fails to follow any and all instructions, warnings or cautions in the product's Instruction Manual.

If a manufacturing defect is found, METLOGIX will replace or repair the product or replace any defective part thereof without charge; however, METLOGIX's obligation hereunder does not include the cost of transportation which must be borne by the customer. METLOGIX assumes no responsibility for damage in transit, and any claims for such damage should be presented to the carrier by the purchaser.

SOFTWARE LICENSE AGREEMENT

NOTICE TO USER: PLEASE READ THIS AGREEMENT CAREFULLY. BY COPYING, INSTALLING, OR USING ALL OR ANY PORTION OF THE SOFTWARE, YOU ACCEPT ALL TERMS AND CONDITIONS OF THIS AGREEMENT, INCLUDING, IN PARTICULAR THE PROVISIONS ON: TRANSFERABILITY IN SECTION 4; WARRANTY IN SECTIONS 6 AND 7; AND LIABILITY IN SECTION 8. YOU AGREE THAT THIS AGREEMENT IS LIKE ANY WRITTEN NEGOTIATED AGREEMENT SIGNED BY YOU. THIS AGREEMENT IS ENFORCEABLE AGAINST YOU AND ANY LEGAL ENTITY THAT OBTAINED THE SOFTWARE AND ON WHOSE BEHALF IT IS USED; FOR EXAMPLE, IF APPLICABLE, YOUR EMPLOYER. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT USE THIS SOFTWARE.

METLOGIX AND ITS SUPPLIERS OWN ALL INTELLECTUAL PROPERTY IN THE SOFTWARE. THE SOFTWARE IS LICENSED, NOT SOLD. METLOGIX PERMITS YOU TO COPY, DOWNLOAD, INSTALL, USE, OR OTHERWISE BENEFIT FROM THE FUNCTIONALITY OR INTELLECTUAL PROPERTY OF THE SOFTWARE ONLY IN ACCORDANCE WITH THE TERMS OF THIS AGREEMENT. USE OF SOME METLOGIX AND SOME NON-METLOGIX MATERIALS AND SERVICES INCLUDED IN OR ACCESSED THROUGH THE SOFTWARE MAY BE SUBJECT TO OTHER TERMS AND CONDITIONS TYPICALLY FOUND IN A SEPARATE LICENSE AGREEMENT, TERM OF USE OR “READ ME” FILE LOCATED WITHIN OR NEAR SUCH MATERIALS AND SERVICES.

THE SOFTWARE MAY INCLUDE TECHNOLOGY DESIGNED TO PREVENT UNAUTHORIZED USE AND COPYING. THIS TECHNOLOGY MAY CAUSE YOUR COMPUTER TO CONNECT TO THE INTERNET WITHOUT NOTICE ON INSTALL, LAUNCH, AND ON AN INTERMITTENT OR REGULAR BASIS THEREAFTER. ONCE CONNECTED, THE SOFTWARE WILL TRANSMIT INFORMATION TO METLOGIX VIA AN INTERNET CONNECTION. METLOGIX MAY USE THE TRANSMITTED INFORMATION, AS WELL AS OTHER INFORMATION YOU OUR THIRD PARTIES MAY PROVIDE TO US, TO DETECT OR PREVENT USE OF METLOGIX SOFTWARE THIS IS FRAUDULENT, NOT VALIDLY LICENSED, OR NOT USED IN ACCORDANCE WITH A VALID LICENSE. SOFTWARE THAT FAILS TO CONNECTO TO METLOGIX AND SOFTWARE THAT CONNECTS TO METLOGIX WHOSE USE IS FOUND TO NOT TO BE PERMITTED MAY OFFER ONLY LIMITED FUNCTIONALITY OR MAY NOT OPERATE AT ALL.

1. Definitions

“MetLogix” means MetLogix, Incorporated, a Delaware corporation, 175 Canal Street, Manchester, New Hampshire 03101.

“MetLogix Runtime(s)” means MetLogix M2, MetLogix M2, MetLogix M1, MetLogix L3, MetLogix L2, MetLogix L1, MetLogix Test Builder, or MetLogix CFR21.

“Computer” means a virtual or physical computer device that accepts information in digital or similar form and manipulates it for a specific result based on a sequence of instructions.

“Internal Network” means a private, proprietary network resource accessible only by employees and individual contractors (i.e., temporary employees) or a specific corporation or similar business entity. Internal Network does not include portions of the Internet or any other network community open to the public, such as membership or subscription driven groups, associations, and similar organizations.

“Output File” means an output file you created with the Software.

“Permitted Number” means one (1) unless otherwise indicated under a valid license (e.g., volume license) granted by MetLogix.

“Software” means (a) all of the information with which this agreement is provided, including but not limited to: (i) all software files and other computer information.

2. Software License

If you obtained the Software and any required serial number(s) from MetLogix or one of its authorized licensees (resellers) and as long as you comply with the terms of this Agreement, MetLogix grants you a non-exclusive license to install and use the Software in a manner consistent with its design and Documentation and as further set forth below.

2.1 Limited Use

2.1.1

The Software, or portions of the Software, may allow installation and use without a serial number. If so, you may install but not use such non-serialized Software on any number of Computers as part of an organizational deployment plan. Further, you may install and use such non-serialized Software on any number of Computers for demonstration, evaluation, and training purposes only and only if any Output Files or other material produced through such use are used only for internal, non-commercial, and non-production purposes. You may not use such non-serialized Software after any applicable timeout period has ended, unless you input a valid serial number. ACCESS TO AND USE OF ANY OUTPUT FILES CREATED WITH SUCH NON-SERIALIZED SOFTWARE IS ENTIRELY AT YOUR OWN RISK.

2.1.2

The Software, or portions of the Software, that are provided with a serial number designated for “evaluation purposes” or other similar designation (such as Software or a serial number supplied as “EVAL” under a separate ordering document) and that includes an expiration date (“Evaluation Software”) may only be installed and used on Computers for demonstration, evaluation, and training purposes only and only if Output Files or other materials produced through such use are used only for internal, non-commercial, and non-production purposes. The Evaluation Software will automatically time out with or without prior notice. You may not use such Evaluation Software after any applicable time-out period has ended, unless you input a valid serial number. USE OF ANY OUTPUT FILES CREATED WITH SUCH NON-SERIALIZED SOFTWARE IS ENTIRELY AT YOUR OWN RISK.

2.1.3 General Use

Except as described otherwise herein, you may install and use one (1) copy of the Software in accordance with the Documentation only on the Permitted Number of your compatible Computers into which you enter a valid serial number.

2.1.4 Distribution from a Server

The Software may not be distributed from a Server or an Internal Network.

2.1.5 Dual Boot Platform

The Software is licensed for use on a specific operating system platform. You must purchase a separate license for use of the Software on each operating system platform.

2.1.6 Documentation

You may make copies of the Documentation for your own internal use in connection with use of the Software in accordance with this Agreement but no more than the amount reasonably necessary. Any permitted copy of the Documentation that you make must contain the same copyright and other proprietary notices that appear on or in the Documentation.

3. Intellectual Property Ownership

The Software and any authorized copies that you make are the intellectual property of and are owned by MetLogix Incorporated. The structure, organization, and source code of the Software are the valuable trade secrets and confidential information of MetLogix Incorporated. The Software is protected by law, including but not limited to the copyright laws of the United States and other countries, and by international treaty provisions. Except as expressly stated herein, this Agreement does not grant you any intellectual property rights in the Software and all rights not expressly granted are reserved by MetLogix Incorporated.

4. Restrictions and Requirements

4.1 Notices

Any permitted copy of the Software that you make must contain the same copyright and other proprietary notices that appear on or in the Software.

4.2 Use Obligations

You agree that you will not use the Software other than as permitted by this Agreement and that you will not use the Software in a manner inconsistent with its design or Documentation.

4.3 No Modifications

You may not modify, port, adapt, or translate the Software.

4.4 No Reverse Engineering

You will not reverse engineer, decompile, disassemble, or otherwise attempt to discover the source code of the Software.

4.5 No Unbundling

The Software may include various applications, utilities, and components, may support multiple platforms and languages, and may be provided to you on multiple media or in multiple copies. Nonetheless, the Software is designed and provided to you as a single product to be used as a single produce on Computers permitted by Section 2. You are not required to install all component parts of the Software, but you may not unbundle the component parts of the Software for use on different Computers. You may not unbundle or repackage Software for distribution, transfer, or resale.

4.6 No Transfer

YOU WILL NOT RENT, LEASE, SELL, SUBLICENSE, ASSIGN OR TRANSFER YOUR RIGHTS IN THE SOFTWARE, OR AUTHORIZE ANY PORTION OF THE SOFTWARE TO BE COPIED ONTO ANOTHER INDIVIDUAL OR LEGAL ENTITY'S COMPUTER EXCEPT AS MAY BE EXPRESSLY PERMITTED HEREIN. You may, however, permanently transfer all your rights to use the Software to another individual or legal entity provided that: (a) you also transfer (i) this agreement, (ii) the serial number(s), the Software affixed to medial provided by MetLogix or its authorized distributor, and all other software or hardware bundled, packaged, or pre-installed with the Software, including all copies, Updates, and Prior Versions (as defined in Section 5); (b) you retain no Updates, Prior Versions, or copies, including backups and copies stored on a Computer; and (c) the receiving party accepts the terms and conditions of this agreement and any other terms and conditions under which you purchased a valid license to the Software. NOTWITHSTANDING THE FOREGOING, YOU MAY NOT TRANSFER EDUCATION, PRE-RELEASE, EVALUATION SOFTWARE, OR NOT FOR RESALE COPIES OF THE SOFTWARE OR SOFTWARE OBTAINS UNDER A METLOGIX VOLUME LICENSE PROGRAM EXCEPT AS MAY BE EXPRESSLY PERMITTED BY METLOGIX WITH THE TERMS OF A VOLUME LICENSE PROGRAM.

4.7 No Service Bureau

You will not use or offer the Software on a service bureau basis.

4.8 MetLogix M Series Restrictions

You may not use MetLogix M Series software on any non-PC device or with any embedded or device version of any operating system.

5. Updates

If the Software is an Update to a prior version of MetLogix software (the “Prior Version”), the following apply:

Your use of this Update is conditional upon your retention of the Prior Version. Therefore, if you validly transfer this Update pursuant to Section 4.6, you must transfer the Prior Version along with it. If you wish to use this Update in addition to the Prior Version, you may only do so on the same computer on which you have installed and are using the Prior Version. Any obligation that MetLogix may have to support Prior Versions may end upon the availability of this Update. No other use of the Update is permitted. Additional Updates may be licensed to you by MetLogix with additional or different items.

6. Limited Warranty

MetLogix warrants to the individual or entity that first purchases a license for the Software for use pursuant to the terms of this agreement that the Software will perform substantially in accordance with the Documentation for the ninety (90) day period following receipt of the Software when used on the recommended operating system and hardware configuration. Non-substantial variation of performance from the Documentation does not establish a warranty right. This limited warranty does not apply to the following which are made available “AS-IS” and without warranty from MetLogix: patches, font software; pre-release (beta), trial, starter, evaluation, product sampler, and not for resale (NFR) copies of the Software including but not limited to Evaluation Software. All warranty claims must be made, along with proof of purchase, to MetLogix within such ninety (90) day period. If the Software does not perform substantially in accordance with the Documentation, the entire liability of MetLogix and its affiliates and your exclusive remedy will be limited to either, at MetLogix’ option, replacement of the Software or refund of the license fee you paid for the Software (if any). THE LIMITED WARRANTY SET FORTH IN THIS SECTION GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE ADDITIONAL RIGHTS UNDER LAW WHICH VARY FROM JURISDICTION TO JURISDICTION. METLOGIX DOES NOT SEEK TO LIMIT YOUR WARRANTY RIGHTS TO ANY EXTENT NOT PERMITTED BY LAW.

7. Disclaimer

THE LIMITED WARRANTY IN SECTION 6 IS THE ONLY WARRANTY OFFERED BY METLOGIX, ITS AFFILIATES, AND SUPPLIERS AND IT STATES THE SOLE AND EXCLUSIVE REMEDIES FOR METLOGIX’, ITS AFFILIATES’, OR SUPPLIERS’ BREACH OF THAT OFFERED WARRANTY. THE LIMITED WARRANTY IN SECTION 6 AND ANY STATUTORY WARRANTY AND REMEDY THAT CANNOT BE EXCLUDED OR LIMITED UNDER LAW ARE THE ONLY WARRANTIES APPLICBLE TO THE SOFTWARE. OTHER THAN THOSE OFFERED AND STATUTORY WARRANTIES APPLICABLE TO THE SOFTWARE, METLOGIX, ITS AFFILIATES, SUPPLIERS, AND CERTIFICATE AUTHORITIES DISCLAIM ALL WARRANTIES, CONDITIONS, REPRESENTATIONS, AND TERMS, EXPRESSED OR IMPLIED, WHETHER BY STATUTE, COMMON LAW, CUSTOM, USAGE, OR OTHERWISE AS TO ANY MATTER, INCLUDING BUT NOT LIMITED TO PERFORMANCE, SECURITY, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, INTEGRATION, MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR ANY PARTICULAR PURPOSE. OTHER THAN SUCH OFFERED AND STATUTORY WARRANTIES AND REMEDIES, METLOGIX, ITS AFFILIATES, SUPPLIERS, AND CERTIFICATE AUTHORITIES PROVIDE THE SOFTWARE AND ACCESS TO ANY WEBSITES, METLOGIX OR THIRD PARTY ONLINE SERVICES, AND CERTIFICATE AUTHORITY SERVICES AS-IS AND WITH ALL FAULTS. THIS DISCLAIMER OF WARRANTY MAY NOT BE VALID IN SOME JURISDICTIONS. YOU MAY HAVE ADDITIONAL WARRANTY RIGHTS UNDER LAW WHICH MAY NOT BE WAIVED OR DISCLAIMED. METLOGIX DOES NOT SEEK TO LIMIT YOUR WARRANTY RIGHTS TO ANY EXTENT NOT PERMITTED BY LAW.

8. Limitation of Liability

EXCEPT FOR THE EXCLUSIVE REMEDY OFFERED BY METLOGIX ABOVE AND ANY REMEDIES THAT CANNOT BE EXLCUDED OR LIMITED UNDER LAW, METLOGIX, ITS AFFILIATES, SUPPLIERS AND CERTIFICATE AUTHORITIES WILL NOT BE LIABLE TO YOU FOR ANY LOSS, DAMAGES, CLAIMS, OR COSTS WHATSOEVER INCLUDING ANY CONSEQUENTIAL, INDIRECT OR INCIDENTAL DAMAGES, ANY LOST PROFITS OR LOST SAVINGS, ANY DAMAGES RESULTING FROM BUSINESS INTERRUPTION, PERSONAL

INJURY OR FAILURE TO MEET ANY DUTY OF CARE, OR CLAIMS BY THIRD PARTY, EVEN IF ANY METLOGIX REPRESENTATIVE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSS, DAMAGES, CLAIMS, OR COSTS. IN ANY EVENT, METLOGIX' AGGREGATE LIABILITY AND THAT OF ITS AFFILIATES, SUPPLIERS, AND CERTIFICATE AUTHORITIES UNDER OR IN CONNECTION WITH THIS AGREEMENT WILL BE LIMITED TO THE AMOUNT PAID FOR THE SOFTWARE, IF ANY. THIS LIMITATION WILL APPLY EVENT IN THE EVENT OF A FUNDAMENTAL OR MATERIAL BREACH OR A BREACH OF THE FUNDAMENTAL OR MATERIAL TERMS OF THIS AGREEMENT

THE FORECOING LIMITATIONS AND EXCLUSIONS APPLY TO THE EXTENT PERMITTED BY APPLICABLE LAW IN YOUR JURISDICTION. THIS LIMITATION OF LIABILITY MAY NOT BE VALID IN SOME JURISDICTIONS. YOU MAY HAVE RIGHTS THAT CANNOT BE WAIVED UNDER CONSUMER PROTECTION AND OTHER LAWS. METLOGIX DOES NOT SEEK TO LIMIT YHOUR WARRANTY OR REMEDIES TO ANY EXTENT NOT PERMITTED BY LAW.

9. Export Rules

You acknowledge that the Software is subject to the U.S. Export Administration Regulations and other export laws, restrictions, and regulations (collectively the "Export Laws") and that you will comply with the Export Laws. You will not ship, transfer, export, or re-export the Software, directly or indirectly, to: (a) any countries that are subject to US export restrictions (currently including, but not necessarily limited to, Cuba, Iran, North Korea, Sudan, and Syria) (each, an "Embargoed Country"), (b) any end user who you know or have reason to know will utilize them in design, development or production of nuclear, chemical or biological weapons, or rocket systems, space launch vehicles, and sounding rockets, or unmanned air vehicle systems (each, a "Prohibited Use"), or (c) any end user who has been prohibited from participating in U.S. export transactions by any federal agency of the U.S. government (each, a "Sanctioned Party"). In addition, you are responsible for complying with any local laws in your jurisdiction which may impact your right to import, export or use the Software. You represent and warranty that (i) you are not a citizen of, or located within, an Embargoed Country, (ii) you will not use the Software for a Prohibited Use, and (iii) you are not a Sanctioned Party. All rights to use the Software are granted on condition that such rights are forfeited if you fail to comply with the terms of this agreement.

10. General Provisions

If any part of this Agreement is found void and unenforceable, it will not affect the validity of the balance of this Agreement, which will remain valid and enforceable according to its terms. This Agreement may only be modified in writing, signed by an officer of MetLogix, Inc. The English version of this Agreement will be the version used when interpreting or construing this Agreement. This is the entire Agreement between MetLogix and you relating to the Software and it supersedes any prior representations, discussion, undertakings, communications, or advertising relating to the Software.

11. Notice to U.S. Government End Users

For U.S. Government End Users, MetLogix agrees to comply with all applicable equal opportunity laws including, if appropriate, the provisions of Executive Order 11246, as amended, Section 402 of the Vietnam Era Veterans Readjustment Assistance Act of 1974 (38 USC 4212), and Section 503 of the Rehabilitation Act of 1973, as amended, and the regulations at 41 CFR Parts 60-1 through 60-60, 60-250, and 60-741. The affirmative action clause and regulations contained in the preceding sentence will be incorporated by reference in this Agreement.

12. Compliance with Licenses

If you are a business, company, or organization, you agree that, in addition to any license compliance checking performed by the Software, MetLogix or its authorized representative have the right, no more than once every twelve (12) months, upon ten (10) days' prior notice to you, to inspect your records, systems, and facilities to verify that your use of any and all MetLogix software is in conformity with your valid licenses from MetLogix. For example, MetLogix has the right to those of your records useful to determine whether installations of the Software have, or have not, been serialized, and you shall provide such records to MetLogix promptly upon request by MetLogix. Additionally,

you shall provide MetLogix with all records and information requested by MetLogix in order to verify that your use of any and all MetLogix software is in conformity with your valid licenses from MetLogix within thirty (30) days of MetLogix' request.

13. Peer to Peer Communications

The Software may use your connection to a local area network, without additional notice, automatically connect to other MetLogix software and, in doing so, may indicate on the local area network that it is available for communication with other MetLogix software. These connections may transmit the IP Address of your connection to the local network but no personally identifiable information is ever transmitted or received through such network connections (except to the extent that IP addresses my be considered personally identifiable in some jurisdictions).

Automation and Metrology International, LLC
1-888-354-2525
auto-met.com