Introduction to Mastercam

May 2016

Mastercam® 2017

Mastercam® 2017 Introduction to Mastercam

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Software: Mastercam 2017

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Be sure you have the latest information!

Information might have been changed or added since this document was published. The latest version of this document is installed with Mastercam or can be obtained from your local Reseller. A ReadMe file (`ReadMe.pdf`)—installed with each release—includes the latest information about Mastercam features and enhancements.

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Introduction

Welcome to the *Introduction to Mastercam* tutorial. This tutorial is geared to help you explore some of Mastercam's interface and to learn basic concepts of the software. The tutorial includes the following:

- A broad look at the Mastercam interface, including the ribbon interface, Quick Access Toolbar (QAT), Selection Bar, Quick Masks, Status Bar, and Managers.
- An introduction to Mastercam's File menu, also known as the Backstage, where you manage and print files, alter System Configuration, customize the interface using Options, and access Help, Tutorials, and other Mastercam Community resources.
- An overview of Mastercam's graphics window using viewing options, and introducing levels and planes.

Tutorial Goals

- Gain an understanding of some of Mastercam's functions.
- Set up a configuration file and customize Mastercam's interface to suit your working style.
- Manipulate Mastercam's graphics window, levels, and planes to view your part.

Estimated time to complete this tutorial: 5.00 hours

General Tutorial Requirements

All Mastercam tutorials have the following general requirements:

- You must be comfortable using the Windows® operating system.
- The tutorials cannot be used with Mastercam Demo/Home Learning Edition (HLE). The Demo/HLE file format (`emcam`) is different from the Mastercam file format (`mcam`), and basic Mastercam functions, such as file conversions and posting, are unavailable.
- Each lesson in the tutorial builds on the mastery of preceding lesson's skills. We recommend that you complete them in order.

- Additional files may accompany a tutorial. Unless the tutorial provides specific instructions on where to place these files, store them in a folder that can be accessed from the Mastercam workstation, either with the tutorial or in any location that you prefer.
- You will need an internet connection to view videos that are referenced in the tutorials. All videos can be found on our YouTube channel: www.youtube.com/user/MastercamTechDocs.
- All Mastercam tutorials require you to configure Mastercam to work in a default metric or English configuration. The tutorial provides instructions for loading the appropriate configuration file.

IMPORTANT: Screen colors in the tutorial pictures may have been modified to enhance image quality; they may not match your Mastercam settings or the tutorial results. Color difference do not affect the lessons.

LESSON 1
Mastercam Interface Overview

Mastercam's ribbon interface is based on standard Windows design guidelines. The ribbon is composed of familiar controls including a quick access toolbar (QAT), tabs, contextual tab groups, galleries, buttons, and the Backstage. It also features special on-screen controls, and movable, dockable Managers.

This section briefly touches on the elements that make up the Mastercam interface to give you a better understanding of how to use these elements to create and machine your parts.

Exploring Mastercam's Interface

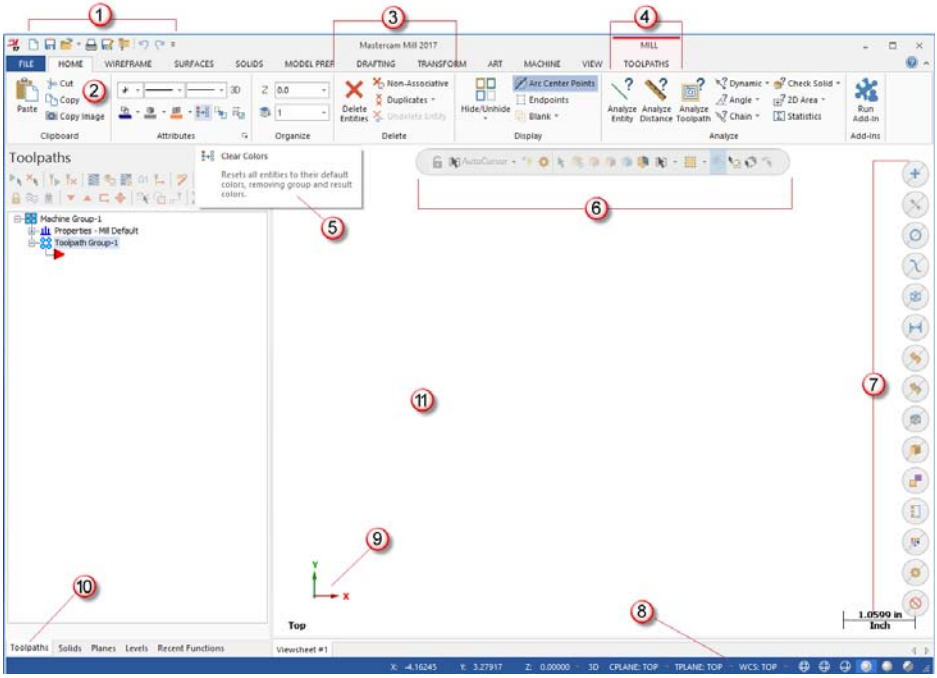
- Start Mastercam by either:
  - Double-clicking Mastercam's desktop icon.

  Or

  - Launching Mastercam from the Windows Start menu.

Take a few moments to explore Mastercam's interface.

The following image indicates the elements that make up the Mastercam interface. The corresponding sections provide brief descriptions of each element and its use.



1 **Quick Access Toolbar (QAT)** A customizable set of commonly used functions that are always available in the interface. The QAT can be located above or below the ribbon.

2 **Tab** Groupings of related controls. Tabs are organized in a simple-to-complex workflow from left to right.

3 **Tab Group** A region of the tab that contains a set of related controls.

4 **Contextual Tab** A tab that displays when you make a specific selection in Mastercam. A contextual tab presents relevant controls and commands to your current activity.

5 **Tooltip** A small window with descriptive text that automatically displays when you hover over a command or control.

6 **Selection Bar** A toolbar which combines AutoCursor controls and general selection tools used to select entities in the graphics window. There are two selection modes, Standard Selection and Solid Selection, which are activated based on the function you are using. AutoCursor controls allow you to detect

and snap to points as you move the cursor over geometry in the graphics window. AutoCursor becomes active whenever Mastercam prompts you to select a position in the graphics window.

Standard Selection

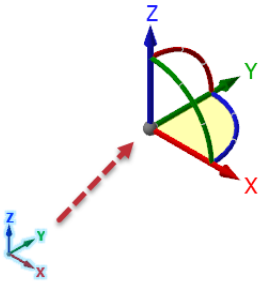
Solid Selection

7 **Quick Masks** A group of controls that helps you to select *all* entities of a certain type, or to select *only* entities of certain type. Most controls are divided in half. Clicking the left or right side of the control toggles between selection modes.

When a Quick Mask control is selected it lights to indicate the selection mask is on. You can toggle multiple Quick Masks at a time.

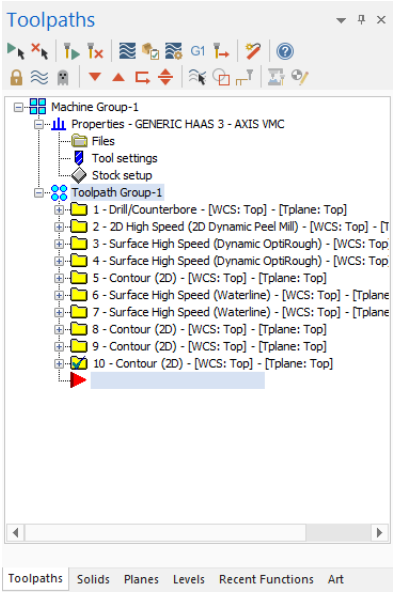
8 **Status Bar** A bar across the bottom of the workspace that shows the coordinate position of the cursor and provides quick access to modify the Cplane, Tplane, WCS, and Z Depth of geometry and toolpaths in the graphics window. The right side of the Status bar has Wireframe, Shaded, and Translucency controls that change the appearance of your part.

9 **Dynamic Gnomon** The on-screen gnomon allows you to manipulate geometry and planes interactively. The gnomon comprises three axes connected at the origin, with selection points that let you choose different types of transformations.

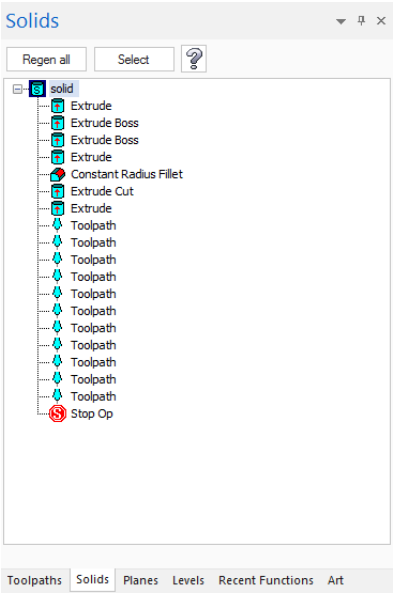


10 **Managers** Managers include controls for toolpaths, solids, planes, levels, recent functions, and Art. The Managers can be stacked, docked, or floating.

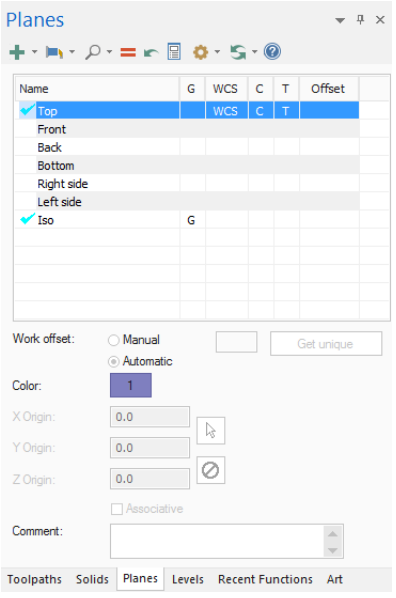
- **Toolpaths Manager:** Lists the toolpath groups and machine types for the current file. Use the Toolpaths Manager to generate, sort, edit, regenerate, and post operations.



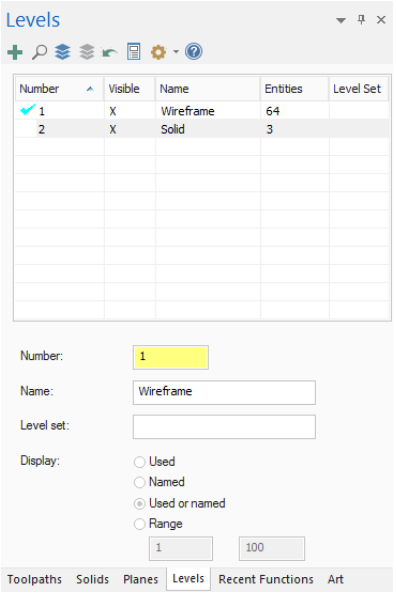
- **Solids Manager:** Lists each solid in the current file along with its operation history and associated toolpaths. Use the Solids Manager to edit solids and their operations.



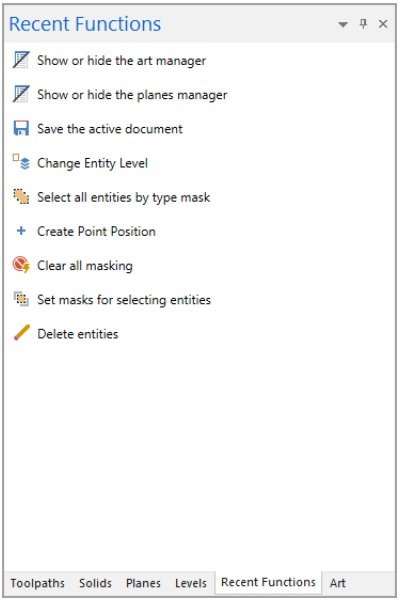
- **Planes Manager:** Shows the planes in the current file. Use the Planes Manager to display, create, edit, select, and manage planes and work offsets.



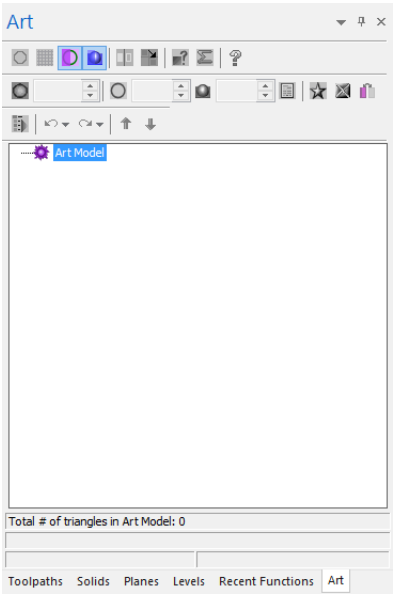
- **Levels Manager:** Shows the levels in the current file. Use the Levels Manager to create, select, hide or show levels, and set the active level.



- **Recent Functions:** Provides quick access to recently used functions.



- **Art Manager:** Manages the elements of the current Art model. (Only available if Mastercam Art is installed.)



11 **Graphics window** The workspace in which you view, create, and modify your parts. The graphics window also displays information about the current measurement system (inches or millimeters), and the coordinate axes for the current view or plane.

Common Interface Controls

The following table shows common controls used in the Mastercam interface. The icons may vary slightly depending on their location in Mastercam.

	OK and Create New		Cancel
	OK/Save		Help
	Apply		About Mastercam

Lesson Goals

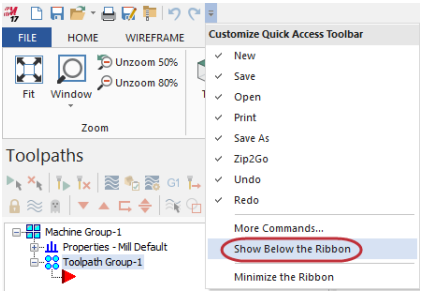
- Customize the Quick Access Toolbar.
- Explore the ribbon interface.
- Configure System Attributes.
- Understand Selection Bar, AutoCursor and Fast Point.
- Use Quick Masks.
- Explore the Status Bar.

Exercise 1-1: Customizing the Quick Access Toolbar

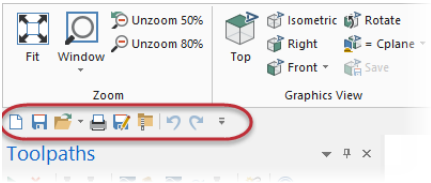
The Quick Access Toolbar (QAT) is a collection of frequently used functions. The QAT is always available and can be displayed above or below the ribbon. You can easily add or remove functions from the QAT.

In this exercise you will move and customize the QAT.

1 Click the QAT drop-down and select **Show Below the Ribbon**.

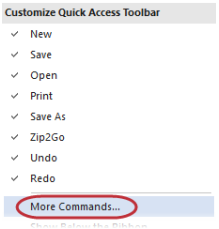


The QAT displays between the ribbon and the managers.

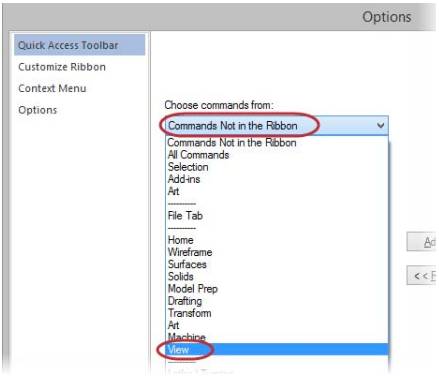


2 Click the QAT drop-down again and select **More Commands**.

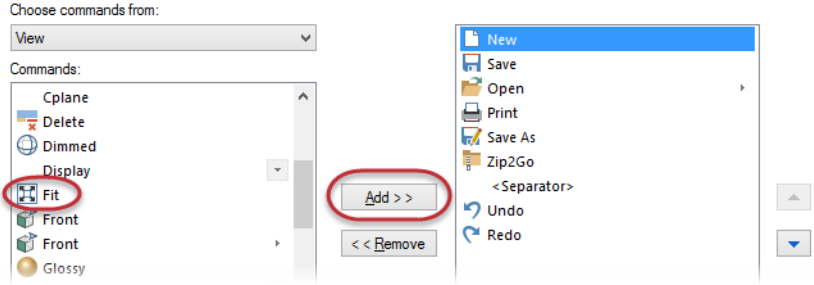
The Options dialog box opens.



3 On the Quick Access Toolbar page select **View** from the **Choose commands from** drop-down.

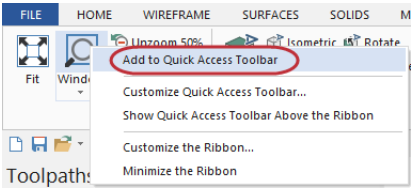


4 Select **Fit** in the **Commands** list and then click **Add**.



5 Click **OK** and the **Fit** command shows in the QAT.

6 Alternately, you can add any command in the ribbon to the QAT by right-clicking the command in the ribbon and selecting **Add to Quick Access Toolbar**.



7 Return the QAT to its placement above the ribbon.

Exercise 1-2: Exploring the Ribbon Interface

The ribbon interface consists of multiple tabs that group together related functions and controls. Tabs are typically organized in a simple-to-complex workflow from left to right. Some tabs are contextual and only display when needed in the workflow. For

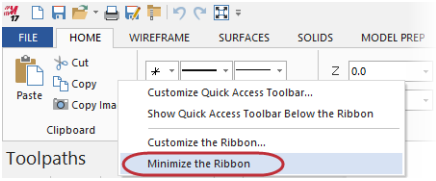
instance, you must select a machine before the contextual toolpath tab displays on the ribbon.

Click each tab to open it, or left click the ribbon and then use the scroll wheel on your mouse to move through the tabs.

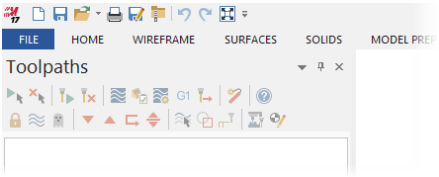
In this exercise you will manipulate the ribbon tabs.

1 Right-click the ribbon and select **Minimize the Ribbon**.

View the maximized workspace.

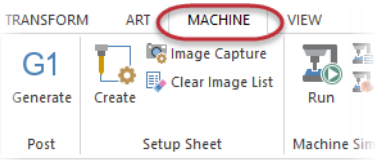


2 Click any tab to display it. Click in the graphics window to hide the tab again.

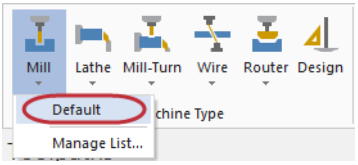


3 Right-click the ribbon and deselect **Minimize the Ribbon** to show the tabs again.

4 Click the **Machine** tab.

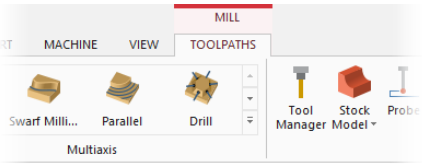


5 Choose **Mill**, **Default** to select your machine.

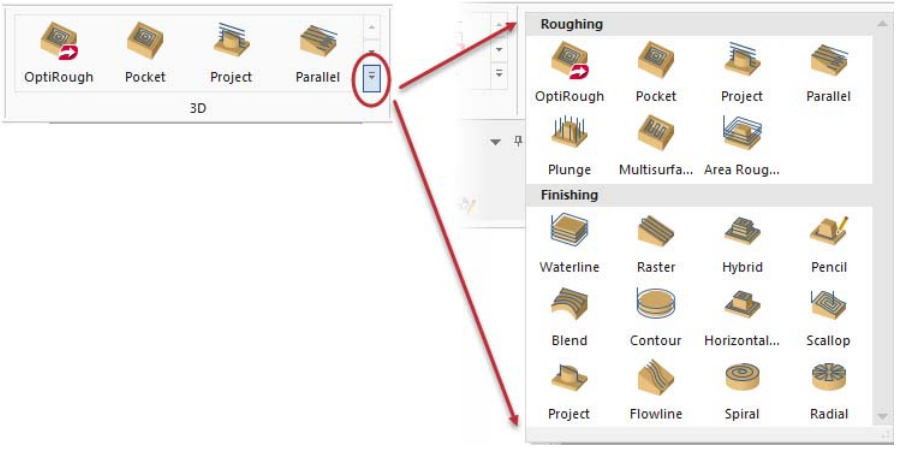


NOTE: Available machine types are based on your license and may vary from what is shown in this tutorial. If **Mill** is not available, select the default machine for a machine type licensed to you.

6 The **Mill Toolpaths** contextual tab displays.



7 Click the **Expand gallery** arrow in the **3D** group. The related toolpaths display.



8 Click the **Machine** tab again and select **Router**, **Default**. Explore the **Router Toolpath** contextual tab. If **Router** is not available, select a different machine type that is licensed to you.

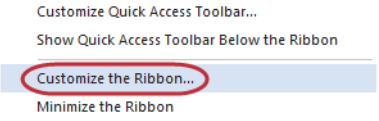
9 Continue to select different machines and view the related toolpaths tabs.

Exercise 1-3: Customizing the Ribbon

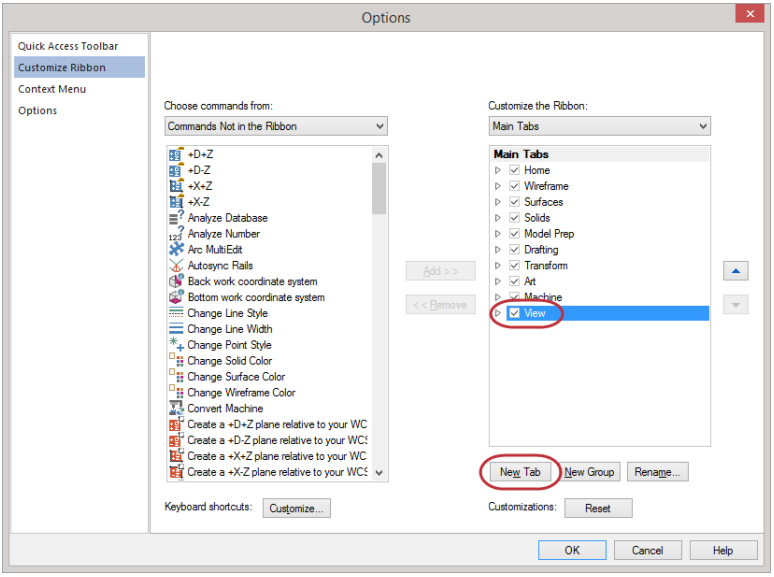
You can create a new ribbon tab and customize it with functions of your choice. In this exercise you will create a new tab, add several functions, and change the tab's position on the ribbon.

1 Right-click the ribbon and select **Customize the Ribbon**.

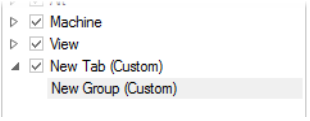
The Options dialog box opens.



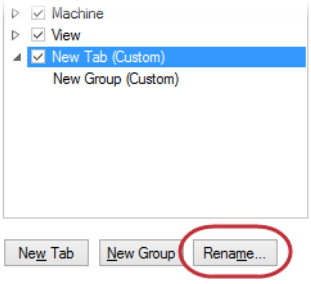
2 Select the **View** tab in the **Customize the Ribbon** list as shown in the following illustration.



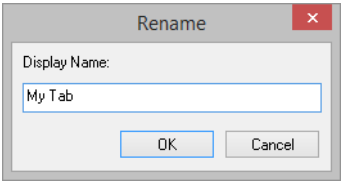
3 Click **New Tab**. The **New Tab (Custom)** and **New Group (Custom)** appear at the bottom of the **Main Tabs** list.



4 Select **New Tab (Custom)** and then click **Rename**. Alternately, you can right-click **New Tab** and select **Rename** from the context menu.

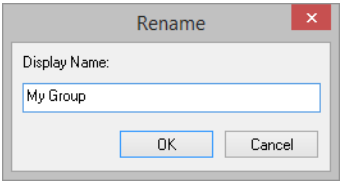


5 Enter **My Tab** for the **Display Name** and click **OK**.

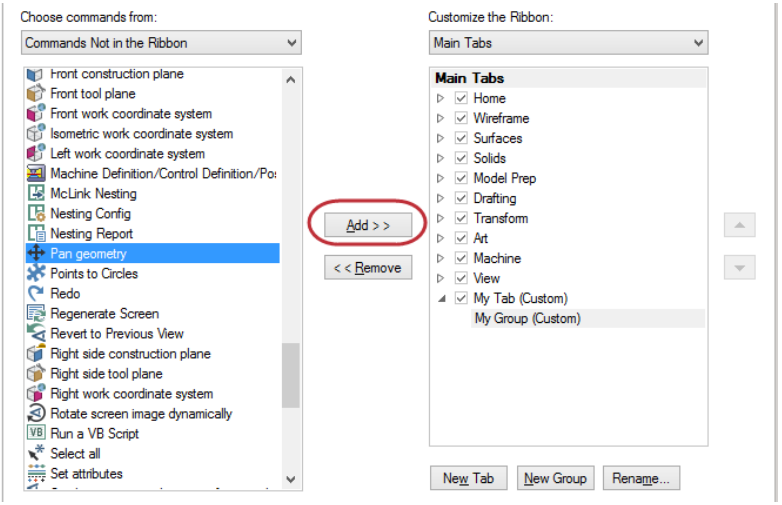


6 Select **New Group (Custom)** in the list of tabs and click **Rename**.

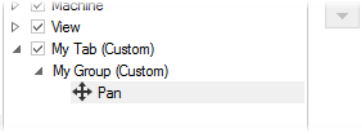
7 Enter **My Group** for the **Display Name** and click **OK**.



8 Select **Pan geometry** from the **Commands Not in the Ribbon** list and then click **Add**.

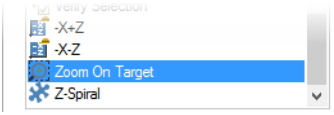


The command is added to **My Group (Custom)**.

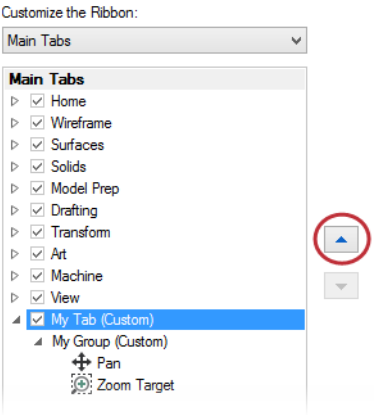


9 Select **Zoom On Target** from the **Commands Not in the Ribbon** list and then click **Add**.

The command is added to **My Group (Custom)**.

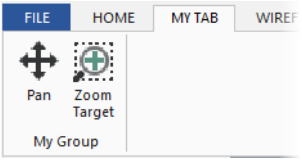


10 Select **My Tab (Custom)** and use the up arrow button to position the tab below the **Home** tab.



11 Click **OK** to close the Options dialog box.

12 Choose **My Tab** to view your customized tab with the **Pan** and **Zoom Target** commands.

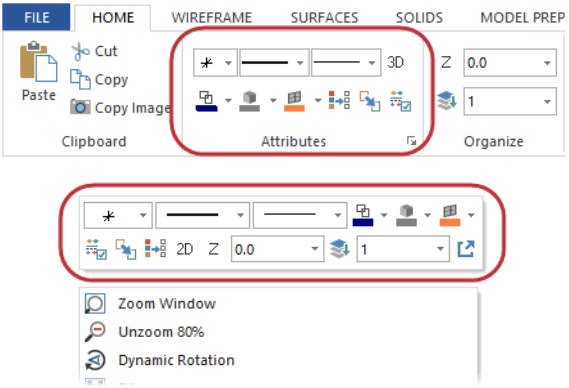


13 On your own, return to the Options dialog box to add more commands to your tab, or rearrange the order of the ribbon tabs.

Exercise 1-4: Setting System Attributes for the Current File

System attributes control point and line styles as well as colors associated with types of entities you create in Mastercam. You can change the attributes of selected entities

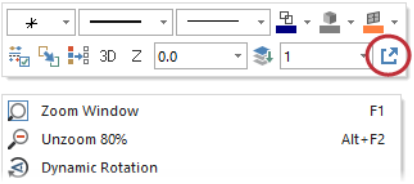
in the graphics window using the controls on the Home tab or from the right-click mini-toolbar (shown below).



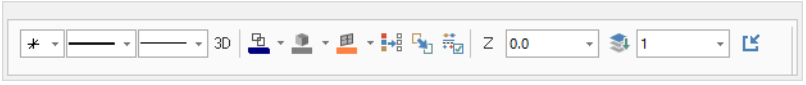
When nothing is selected in the graphics window, you can also set system attributes *for the current file* using these controls. Alternately, set system attributes that persist between sessions using the Color and CAD Settings pages of the System Configuration dialog box.

In this exercise you will use the attributes controls located on the mini-toolbar, which is accessed by right-clicking in the graphics window.

1 Right-click the graphics window to open the mini-toolbar and context menu.

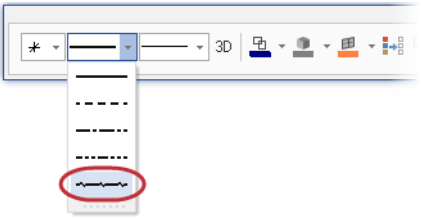


2 Click the last button (shown in the previous illustration), to pop off the mini-toolbar. You can resize and position the mini-toolbar anywhere in the graphics window.



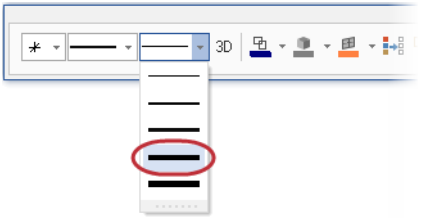
3 With nothing selected in the graphics window, click the **Line Style** drop-down and choose the style shown to the right.

New geometry you create will use the chosen line style.

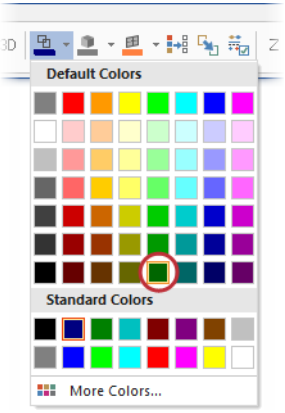


4 Select the **Line Width** shown to the right.

New geometry you create will use the chosen line width.

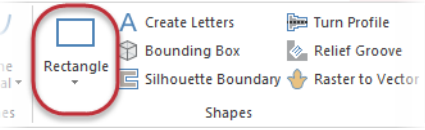


5 Click the **Wireframe Color** drop-down and select green as shown to the right.



6 On the **Wireframe** tab, choose **Rectangle**.

The Rectangle function panel opens.

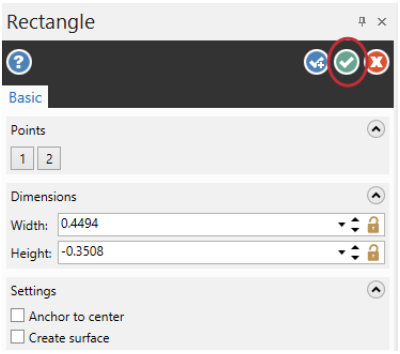


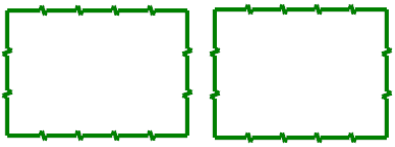
7 Click in the graphics window and draw two rectangles of any size. (Follow the prompts shown in the upper left corner of the graphics window.)

8 Click **OK** to close the Rectangle function panel.

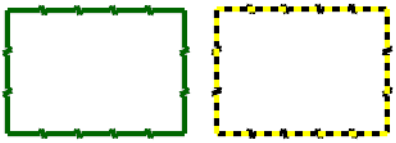
The rectangles are created using the line style, width, and color you previously selected in this procedure.

Your rectangles may vary from the examples shown to the right.

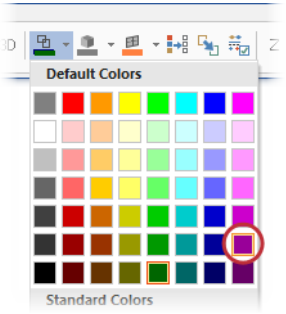




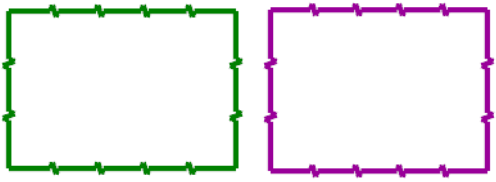
9 Window select one rectangle in the graphics window.



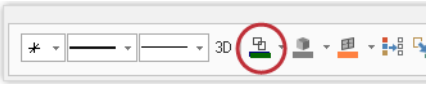
10 Click the **Wireframe Color** drop-down and select purple.



Only the rectangle you selected changes to purple as shown in the following illustration.

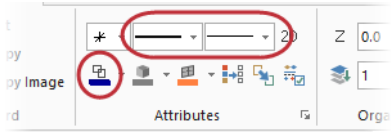


11 Notice that the default wireframe color has not changed on the mini-toolbar. Any new wireframe geometry you create will use the default color, green.



12 Click the last button on the mini-toolbar to close it.

13 With nothing selected in the graphics window, return the **Line Style** and **Line Width** to the options shown to the right.



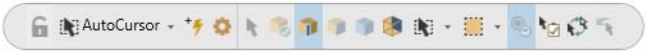
14 Return the **Wireframe Color** to standard blue shown to the right.

15 Click **File**, **Save**. Name your file `ATTRIBUTES.mcam` and save it in the same location as the other tutorial files.

TIP: To set default system attributes that persist from session to session, use the System Configuration dialog box and save the settings to the configuration file. See **Working with Configuration Files** for more information.

Exercise 1-5: Understanding the Selection Bar and AutoCursor

Selection Bar combines general selection tools used to select entities in the graphics window and AutoCursor controls. Selection Bar is located across the top of the graphics window. It has two modes, Standard Selection and Solid Selection, which are activated based on the function you are using.

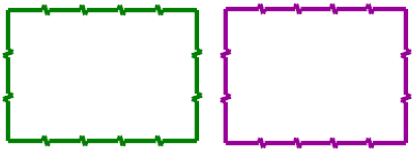


AutoCursor controls allow you to detect and snap to points as you move the cursor over geometry in the graphics window. AutoCursor becomes active whenever Mastercam prompts you to select a position in the graphics window.

In this exercise you will precisely locate points and lines using AutoCursor and Fast Point fields.

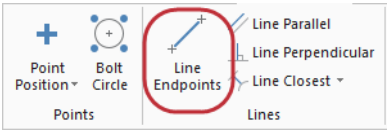
1. If necessary open the file, `ATTRIBUTES.mcam`, that you saved from the previous lesson.

   Your file may look slightly different than the one to the right.

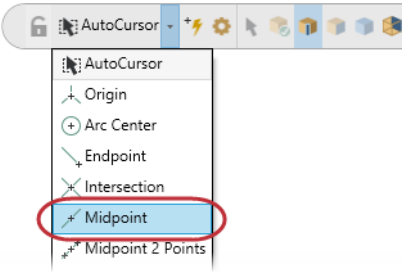


2. Select **Line Endpoints** on the **Wireframe** tab.

   The Line Endpoint function panel opens and Mastercam prompts you to specify the first endpoint.

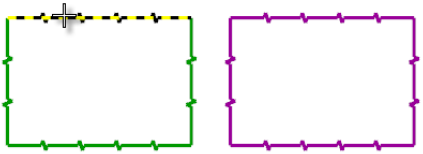


3 Click the **AutoCursor** drop-down and select **Midpoint**.



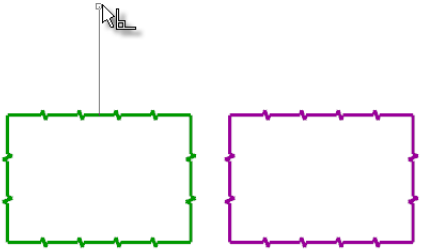
4 Click anywhere on the top line of one of your rectangles and drag up to draw a line.

Mastercam automatically uses the midpoint of the entity that you selected as the first endpoint.



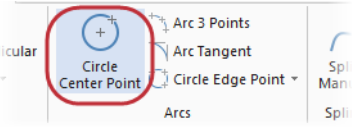
5 Click to set the second endpoint.

6 Choose **OK** in the Line Endpoints function panel.



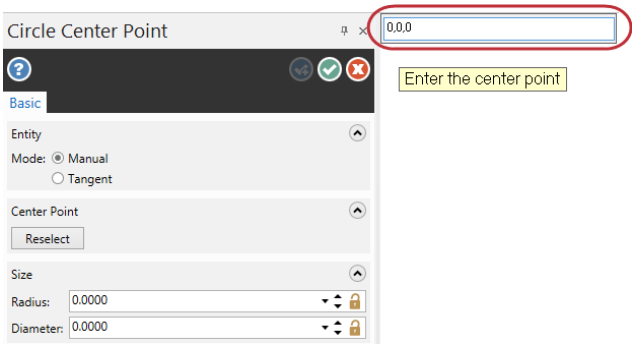
7 Select **Circle Center Point** on the **Wireframe** tab.

The Circle Center Point function panel opens and Mastercam prompts you to enter the center point.

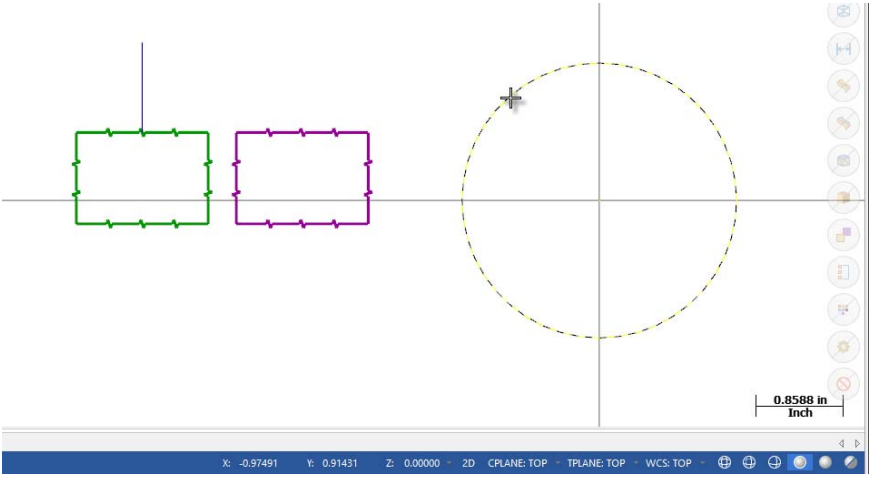


8 Select **AutoCursor Fast Point** on the Selection Bar, (or press the spacebar on your keyboard), to display the Fast Point field. You can enter numbers, formulas, or X,Y,Z coordinates.

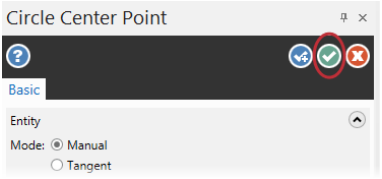
9 Type **0,0,0** to enter the coordinate location of the circle's center point, and then press [**Enter**].



10 Drag and click to set the radius of the circle. The center point of the circle is at 0,0,0.



11 Choose **OK** in the Circle Center Point function panel.



12 If the entities are outside of the graphics window, right-click and choose **Fit**.

13 Save your file.

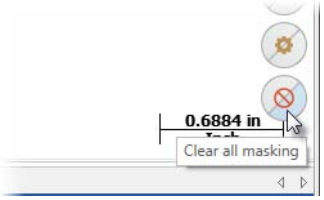
Exercise 1-6: Using Quick Masks

Mastercam's Quick Masks allow you to select all entities of a specific type, or to select only entities of specific type. Most controls are divided in half. Clicking the left or right side of the control toggles between all/only selection modes. You can select multiple Quick Masks.

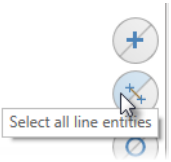
Hover over each control to view the tooltip describing its function.

In this exercise you will select entities using several Quick Mask functions.

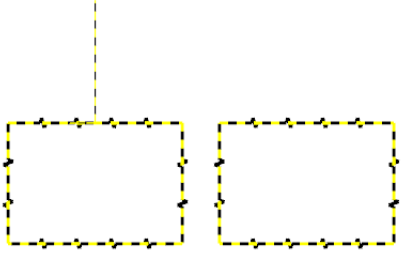
1. If necessary click **File**, **Open** and open `ATTRIBUTES.mcam`, which you saved in the previous lesson.
2. Before beginning this lesson, click **Clear all masking**.

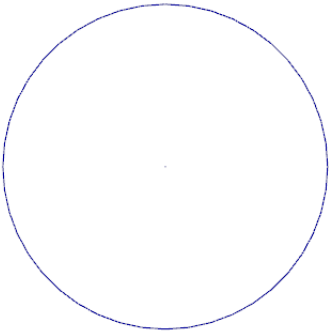


3. Click **Select all line entities**.

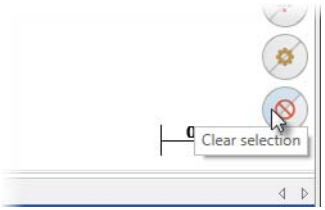


The rectangles and line that you drew in the previous exercise are selected in the graphics window. The circle is not selected as it is an arc.

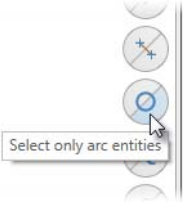




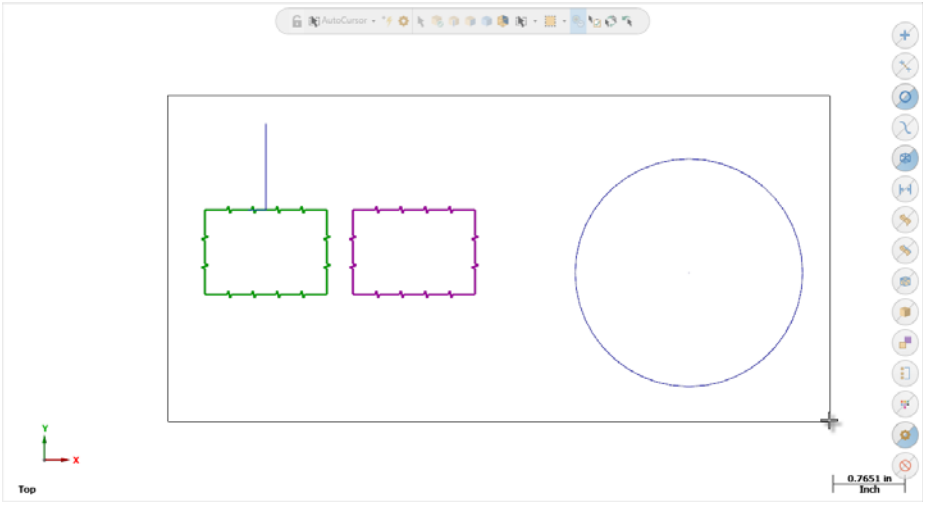
4 Click **Clear selection**.



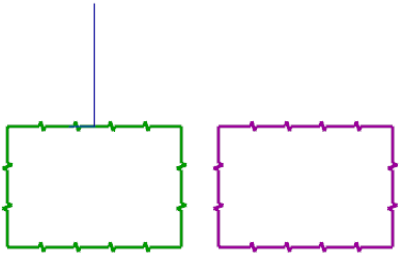
5 Choose **Select only arc entities**.

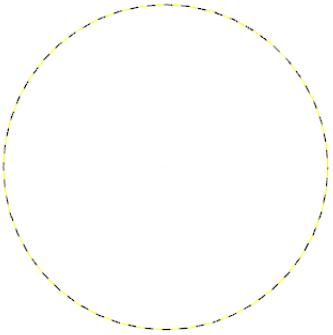


6 Click and drag to window select all entities in the workspace.

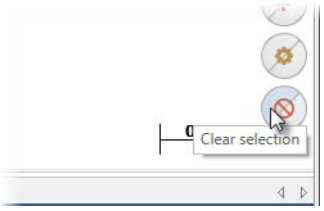


Only the circle is selected as shown in the following illustration.

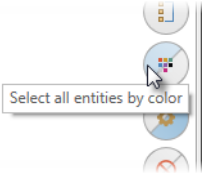




7 Click **Clear selection**.

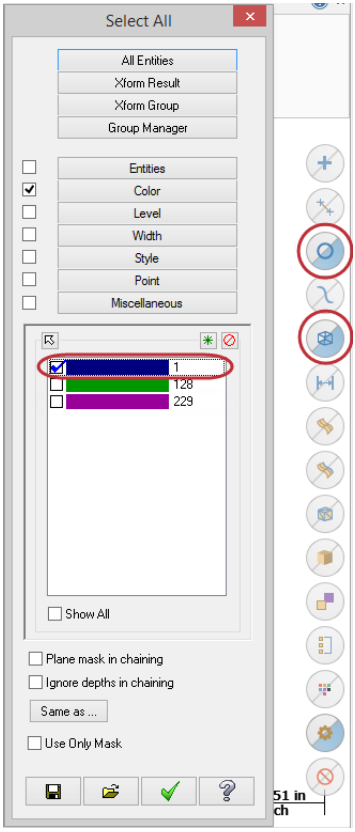


8 Choose **Select all entities by color** and the Select All dialog box opens.

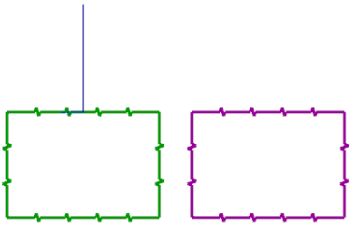


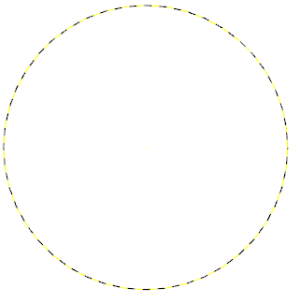
9 Select the blue checkbox and then click **OK**.

The Quick Masks, **Select only arc entities** and **Select only wireframe entities** remain selected from the previous steps and affect the outcome.



Only the circle is selected in the workspace as it is the only arc entity that is blue. The blue line is not selected as shown in the following illustration.





10 Select **Clear all masking** before proceeding with the next lesson.

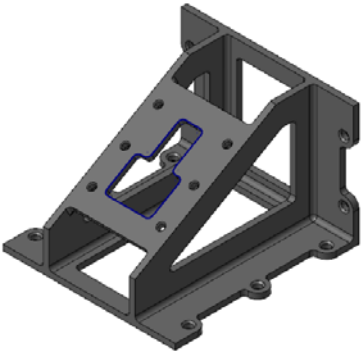
Exercise 1-7: Exploring the Status Bar

The Status Bar across the bottom of the workspace gives a visual indication of the position of the cursor on the workspace (X,Y,Z). It also provides quick access to the 2D/3D switch and lets you modify the Cplane, Tplane, WCS, and Z Depth of geometry and toolpaths in the graphics window. The right side of the Status Bar contains Wireframe, Shaded, and Translucency controls.

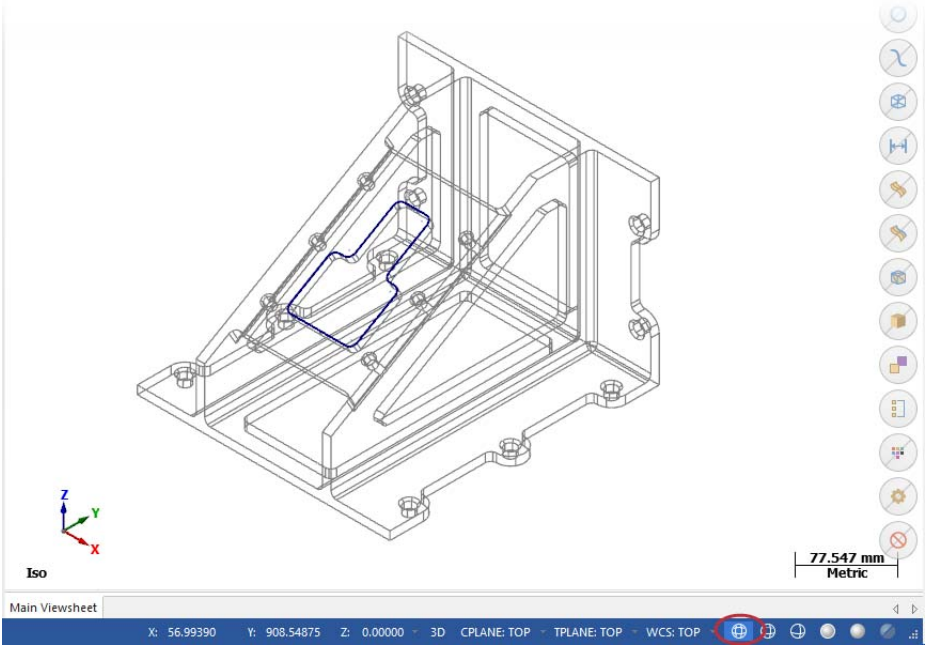
In this lesson you will use the wireframe, shaded, and translucency controls to change the appearance of a part. See Help for information on other Status Bar features.

1 Open `BRACE.mcam`, which was provided with the tutorial. Choose **Don't Save** when prompted to save your file from the previous lesson.

The part displays as a solid.

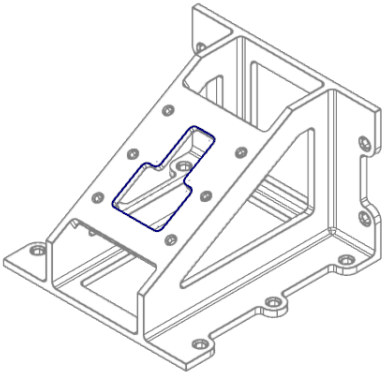


2 Choose **Wireframe** on the Status Bar.



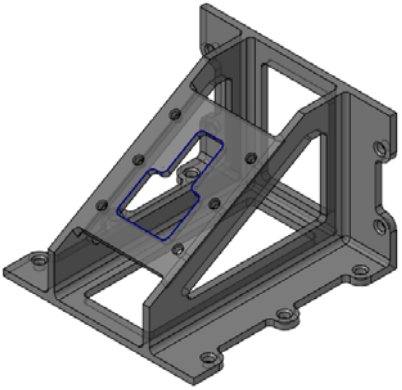
3 Choose **No Hidden** on the Status Bar.

The part displays only the wireframe that is visible in the current view.



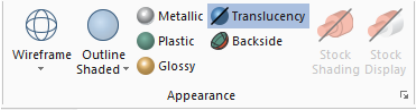
4 Choose **Outline Shaded** and **Translucency** on the Status Bar.

The part displays as a translucent solid.



5 Continue to experiment with the appearance controls.

TIP: You can also alter how a part displays using the **Appearance** controls located on the **View** tab.



6 Click **File**, **New**. Choose **Don't save** when prompted to save changes to the current file.

You have now completed Lesson 1 of the *Introduction to Mastercam* tutorial. In the next lesson, you learn more about the Mastercam managers.

LESSON 2
Working with the Managers

Mastercam has several movable, dockable managers that provide flexible access to frequently used functions including:

- Toolpaths
- Solids
- Planes
- Levels
- Recent Functions

You can toggle the display of the managers, as well as move one or more managers to a new location. Dock a manager to a fixed location on the interface, float it anywhere on the workspace, or even move it to another monitor. Mastercam remembers the settings even after you close the application.

In this exercise, you use different methods to move, hide, display, and customize a manager.

Lesson Goals

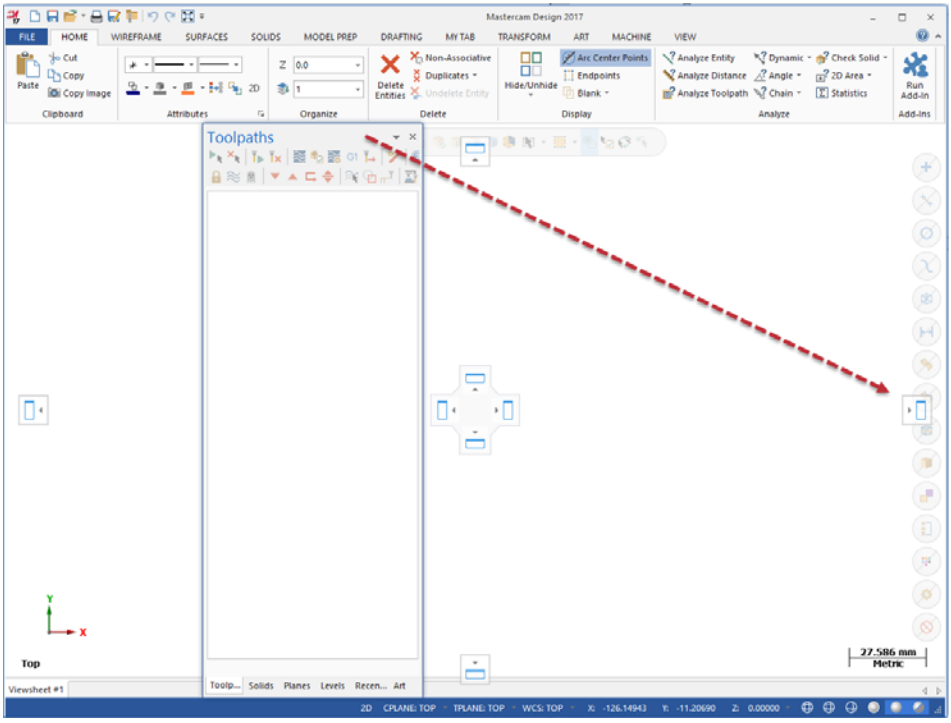
- Dock, undock, and move a manager.
- Hide and display a manager.
- Customize a manager.
- Explore the Recent Functions Manager.

Exercise 2-1: Moving and Docking Managers

In this exercise, you move and dock one or more managers.

1. Click the title bar of the top manager and drag the stack of managers into the graphics window. Drop the managers onto the blue docking icon on the right side of the interface.

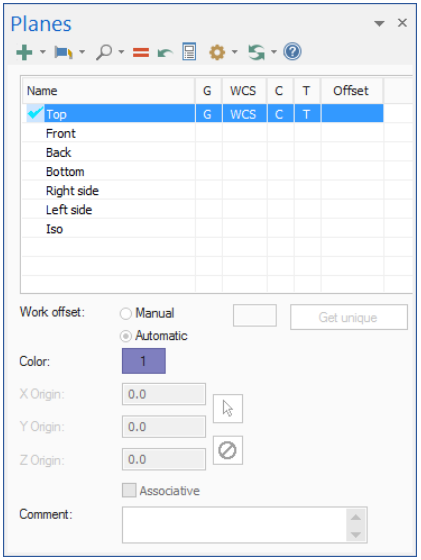
All of the managers are now docked in the new location.



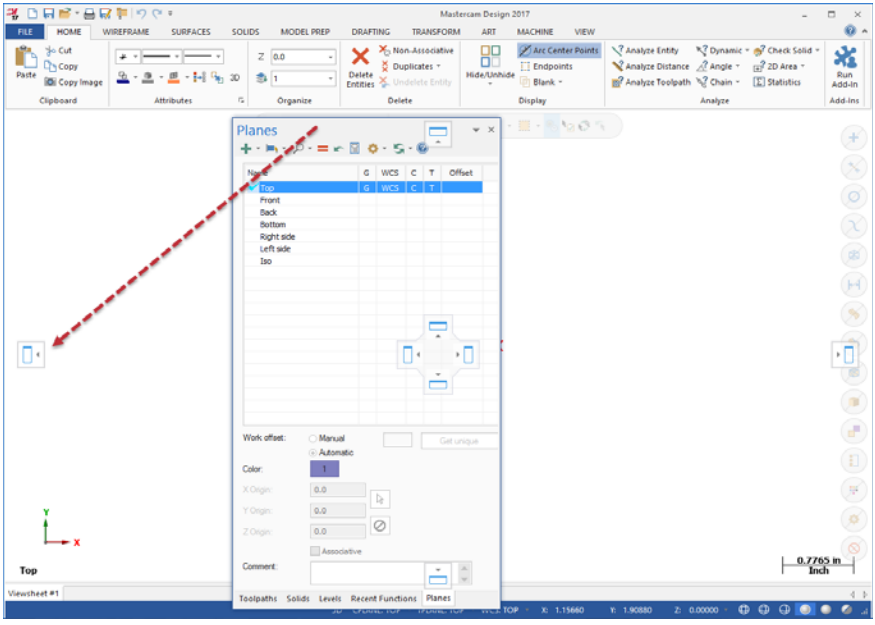
2 Click the **Planes** tab and drag and drop it anywhere on the workspace.

3 Resize the Planes Manager by clicking and dragging any of its edges.

4 Double-click the Planes Manager's title bar to redock it on top of the stack of managers.



5 Click the title bar of the stack of managers and drag it to the left side of the graphics window where it was docked at the beginning of this lesson.

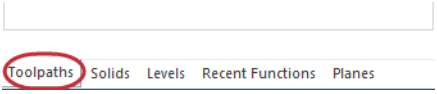


TIP: If you work with two monitors, position the managers onto the monitor that is not running Mastercam to free the entire graphics window for drawing.

Exercise 2-2: Hiding and Displaying a Manager

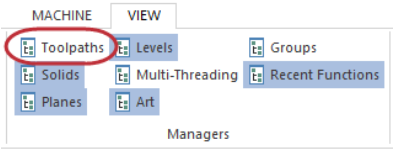
In this exercise, you hide and display the Toolpaths Manager.

1 Click the **Toolpaths** tab to bring it to the front of the stack of managers.



2 Hide the Toolpaths Manager by clicking the **Close** button in its upper right corner.

3 Re-display the Toolpaths Manager by choosing **Toolpaths** in the **Managers** group on the **View** tab.

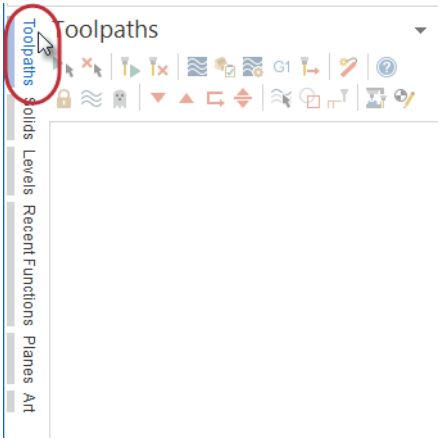


TIP: You can use the keyboard shortcut [**Alt+O**] to toggle the display of the Toolpaths Manager.

4 Hide the Toolpaths Manager by clicking the **Auto Hide** button in its upper right corner.

The Toolpaths Manager collapses against the left side of the graphics window. If you have other managers displayed, they will also collapse against the graphics window.

5 Hover over the **Toolpaths** tab to temporarily display the Toolpaths Manager.

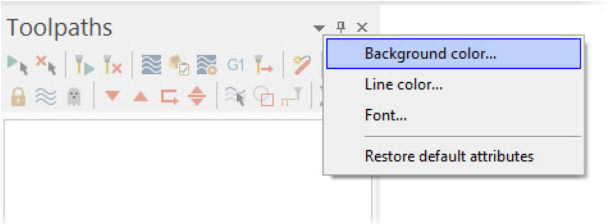


6 Click **Auto Hide** again to redock the Toolpaths Manager.

Exercise 2-3: Customizing a Manager Display

In this exercise, you learn how to customize the background color of the Toolpaths Manager. Some managers have different options that are not shown in this exercise.

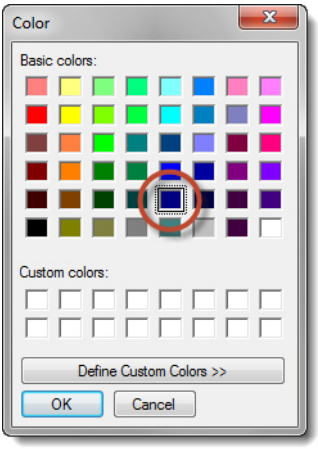
1 Select **Background color** from the **Options** drop-down menu in the upper right corner of the Toolpaths Manager.



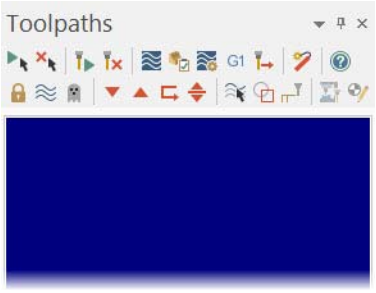
The Color dialog box opens.

2 Select the color shown to the right.

3 Click **OK**.



The background of the Toolpaths Manager is the chosen color.



TIP: You set the color for lines, as well as font attributes, using the Options drop-down menu.

4 Select **Options**, **Restore default attributes** to return the background color to its default setting for the remainder of this tutorial.

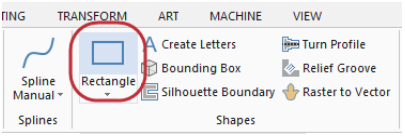
Exercise 2-4: Exploring the Recent Functions Manager

Recently used functions are recorded on the Recent Functions Manager. You can access one of these functions by selecting it in the list.

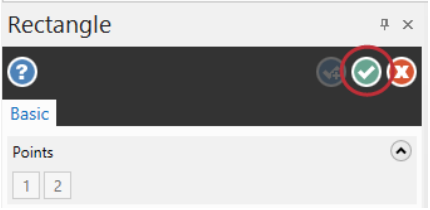
In this lesson you will build a recent functions list, resize and dock the Recent Functions Manager, and then access a previously used function.

1 On the **Wireframe** tab, click **Rectangle**.

The Rectangle function panel opens.

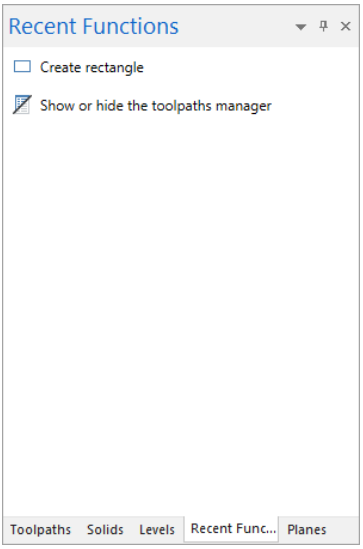


2 Follow the on-screen prompts and draw a rectangle of any size in the graphics window. Click **OK** when done.



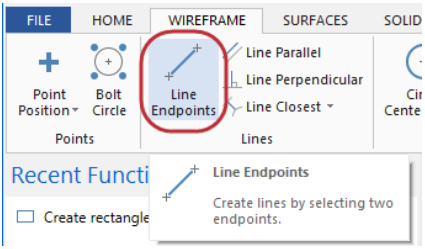
3 Click the **Recent Functions** tab to bring it to the front.

Note that **Create rectangle** has been added to the top of the list.

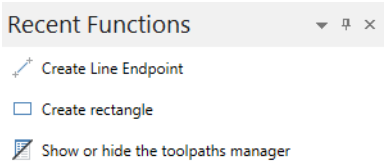


4 On the **Wireframe** tab, click **Line Endponts**.

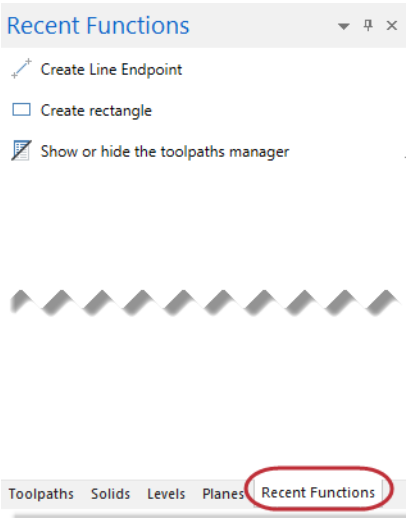
5 Follow the prompts and draw a line of any size in the graphics window. Click **OK** when done.



Note that **Create Line Endpoint** has been added to the list.



6 Click the **Recent Functions** tab and drag it onto the graphics window.

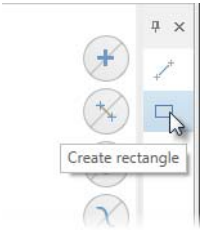


7 Resize the Recent Functions Manager until only the icons show. This keeps the recently used functions on screen while minimizing the space required.

8 Click the title bar of the Recent Functions Manager and drag it to any convenient location on the screen, or dock it on the right side of the graphics window as shown in the illustration.

9 Click the **Create rectangle** icon to quickly access that previously used function.

10 Follow the prompts to create another rectangle in the graphics window, and then click **OK** to close the **Rectangle** function panel.



11 Click and drag the Recent Functions Manager to the left side of the interface and dock it with the other managers.

You have now completed Lesson 2 of the *Introduction to Mastercam* tutorial. In the next lesson, you learn more about the Mastercam Backstage.

LESSON 3
Mastercam's Backstage Overview

The File menu in Mastercam is also known as the Backstage. The Backstage is the area where you open, save, convert, manage, or print files. You also access the File menu to open System Configuration and set default system parameters, or open Options to modify the user interface. In addition, the File menu provides access to Help, tutorials, software updates, and connects you with the Mastercam community.

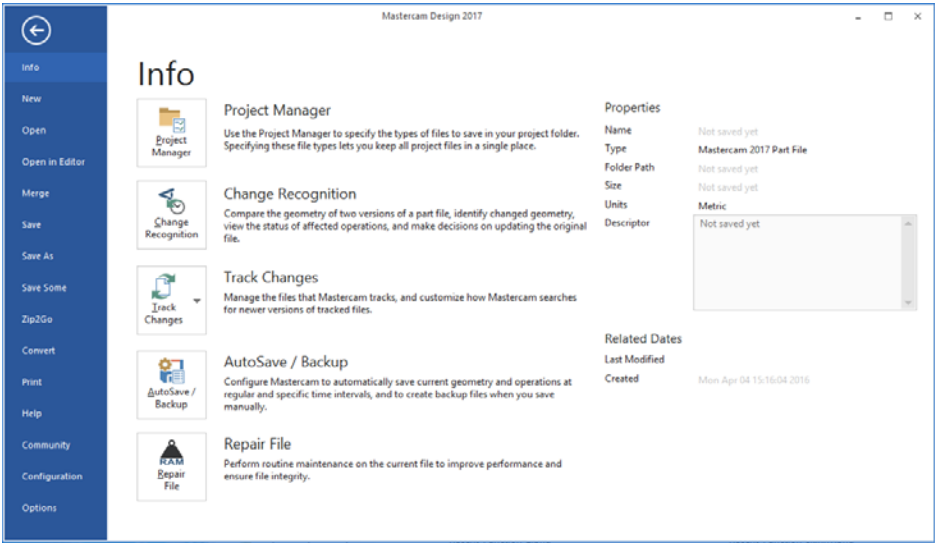
This section provides a brief overview of the Backstage and some of its functions.

Lesson Goals

- Open and review the Backstage pages.

Exercise 3-1: Exploring Mastercam's Backstage

Click **File** to open the Backstage view. The image below shows the Info page of the Backstage with links on the left side to other pages and functions.



The following section provides brief descriptions of the some of the functions and pages located in the Backstage. Click each page to explore the Backstage.

- **Info** Presents information and properties of the current Mastercam file. The Info page gives you access to functions that take action on the currently open file including, Project Manager, Change Recognition, Track Changes, AutoSave / Backup, and Repair File.
- **New** Opens a new file.
- **Open** Accesses the Open page where you can select a recent document or browse for a file to open. You can pin frequently used files or folders to the Recent Documents and Recent Folders sections.
- **Open in Editor** Opens a file using a file editor of your choice.
- **Merge** Imports and merges entities from an existing part file into the current file.
- **Save/Save As** Saves the current part file or saves the file with a new name. You can pin frequently used folders to the Recent Folders section of the Save As page.
- **Save Some** Saves only entities that you select in the graphics window.
- **Zip2Go** Creates a compressed .ZIP or .Z2G file of the current file that includes your Mastercam configuration, machine definition, post files, tool and material libraries and other necessary files. A Zip2Go file is helpful when sharing file information with other users or technical support.
- **Convert** Provides access to Import and Export functions, as well as the Migration Wizard so that you can update older Mastercam files to the latest version.
- **Print** Previews, configures, and prints the current Mastercam file.
- **Help** Presents information about Mastercam and licensing. Includes links to the What's New and ReadMe documents, tutorials, and the Help system. Visit this page to check for software updates. Some functions require an active internet connection.
- **Community** Links your account to Mastercam.com, the customer feedback program, and satisfaction surveys.
- **Configuration** Opens the System Configuration dialog box where you set system defaults for Mastercam.
- **Options** Opens the Options dialog box where you customize the Mastercam interface.

You have now completed Lesson 3 of the *Introduction to Mastercam* tutorial. In the next lesson, you will learn more about the Configuration files.

LESSON 4
Working with Configuration Files

The System Configuration dialog box defines and manages the configuration files that store Mastercam's settings. You can change your system configuration or create a new configuration at any time. It is easy to switch from one environment to another because each configuration is saved to a separate file.

In this lesson, you change options in the System Configuration dialog box to see the different kinds of settings that are stored within one configuration file.

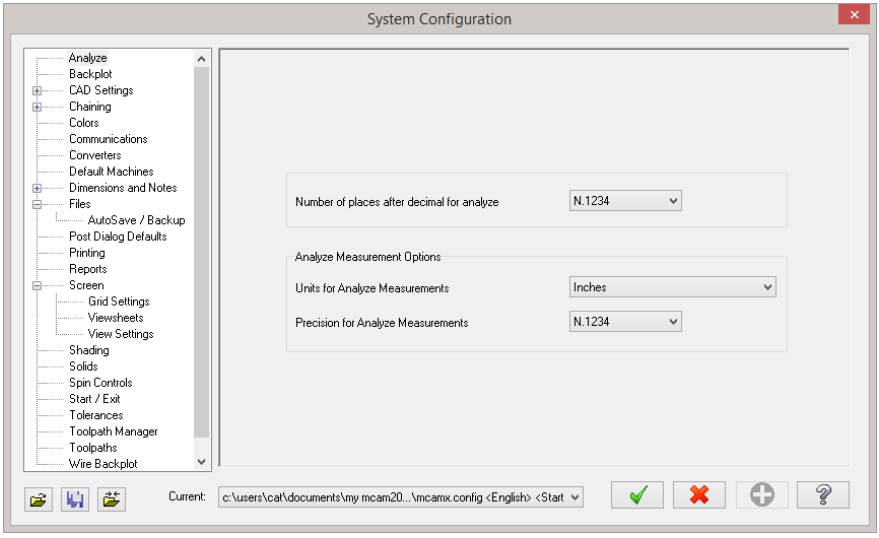
Lesson Goals

- Create a configuration file.
- Change system colors and CAD styles.
- Modify the size and opacity of on-screen controls.
- Set up AutoSave and Backup.

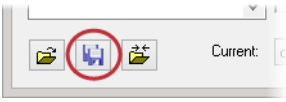
Exercise 4-1: Creating a Configuration File

In this exercise, you create a configuration file (`.config`).

1 Select **File**, **Configuration** to open the System Configuration dialog box.

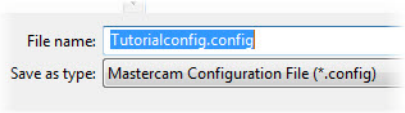


2 Click the **Save As** button in the lower left corner.



The Save As dialog box displays.

3 Enter **Tutorialconfig** for the **File name**.



4 Click **Save**.

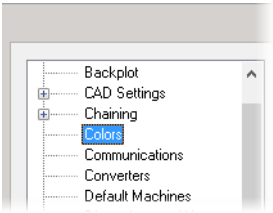
Mastercam creates a new `.config` file. You can create multiple `.config` files using the same method.

In the following exercises, you save system settings to this configuration file.

Exercise 4-2: Changing System Colors

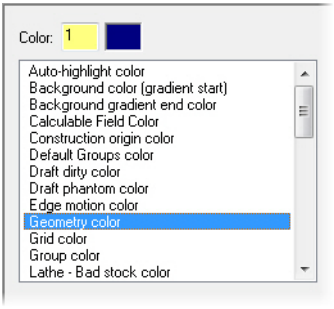
In this exercise, you change some default colors to customize Mastercam's interface and geometry colors.

1 In the System Configuration dialog box, select the **Colors** page from the list.



2 Select **Geometry color** from the list.

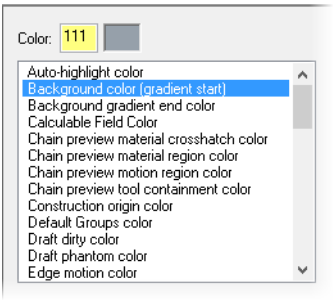
You can see that **Geometry color** is currently assigned to color **1**.



3 Type **163** for the **Color** value and press [**Enter**].

Wireframe geometry you create will now use this color.

4 Select **Background color (gradient start)** from the list.

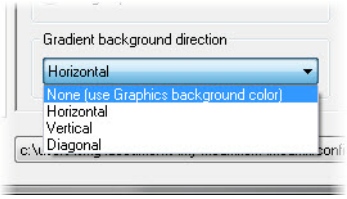


Color **111** is the current assignment.

5 Type **15** for the **Color** value and press [**Enter**].

The start of the gradient background is now white.

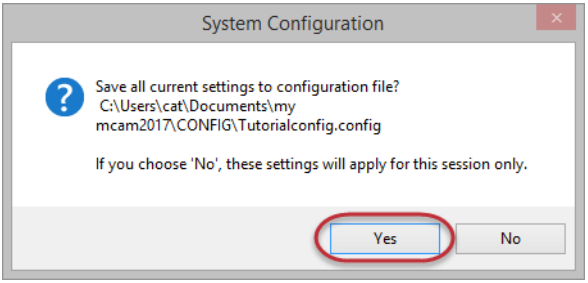
6 Select **None (Use Graphics background color)** from the Gradient background direction drop-down.



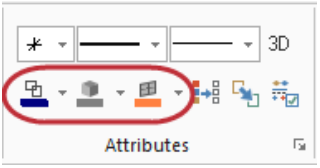
This uses only the Background color (gradient start), instead of creating a gradient background.

7 Click **Apply** to save the settings on this page.

8 Choose **Yes** to save all current settings to the `Tutorialconfig.config` file.



TIP: You can also change colors for Wireframe, Solids, and Surfaces of the current file by using the controls located in the Attributes group of the Home tab. See **Setting System Attributes for the Current File**.



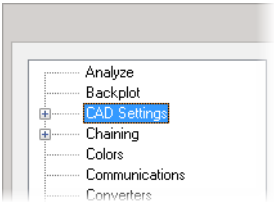
These are just some of the color changes that you can make to customize your Mastercam interface.

Exercise 4-3: Changing CAD Settings

In this exercise, you make changes to the CAD Settings page.

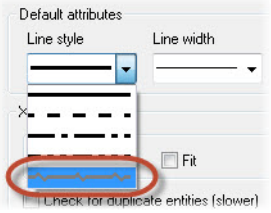
1 Select the **CAD Settings** page from the list.

You will use the CAD Settings page to specify design defaults, such as default line and spline attributes.



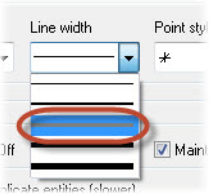
2 In the **Default attributes** section, select the **Line style** shown in the illustration to the right.

Wireframe geometry you create will now use this line style.



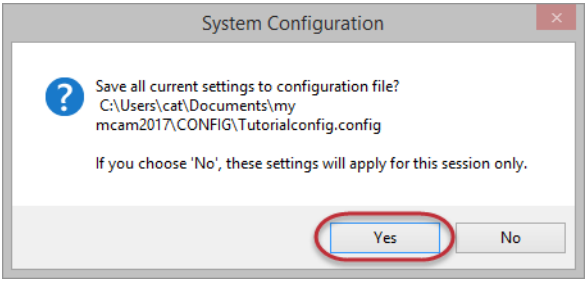
3 Select the **Line width** shown in the illustration to the right.

Wireframe geometry you create will now use the selected line width.



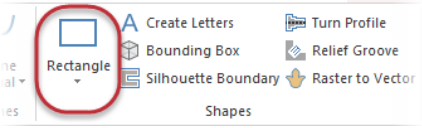
4 Click **OK** in the System Configuration dialog box.

5 Click **Yes** to save all current settings to the `Tutorialconfig.config` file.



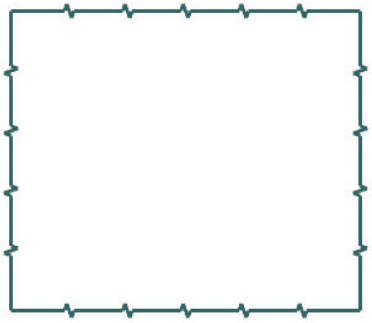
6 Choose **Rectangle** on the **Wireframe** tab.

The Rectangle function panel opens.



7 Follow the prompts to create a rectangle, and then click **OK** in the Rectangle function panel

The line style and width of the geometry matches the selections in the CAD Settings page of System Configuration, as well as the geometry color set in the Colors page.

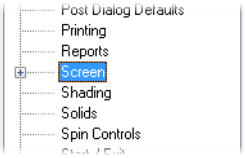


Exercise 4-4: Changing the Size and Opacity of On-screen Controls

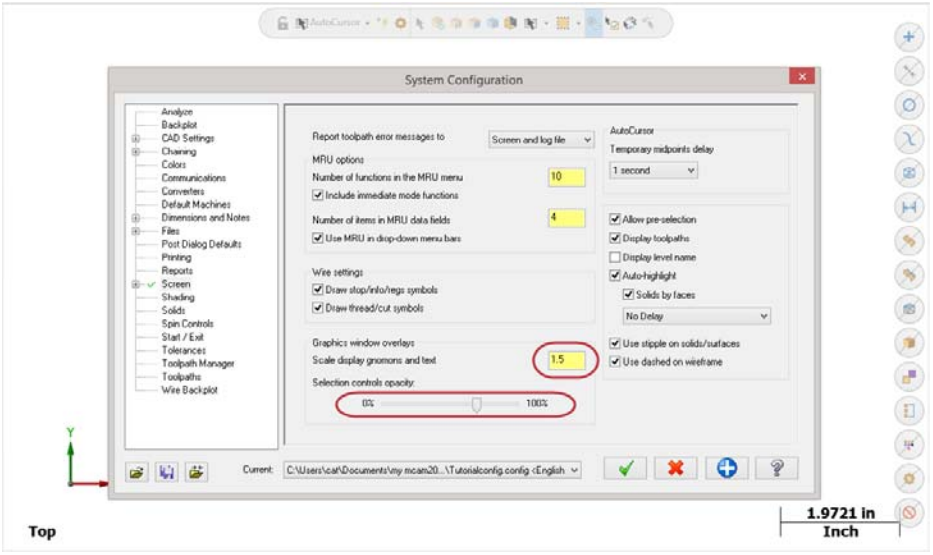
In this exercise you will set the size of the on-screen gnomons and text, and change the opacity of the Selection Bar and Quick Mask buttons.

1 Click **File**, **Configuration** to open the System Configuration dialog box.

2 Select the **Screen** page.



3 In the **Graphics window overlays** section type **1.5** for **Scale display gnomons and text** and press [**Enter**]. The size of the elements is immediately changed in the graphics window.



4 The slider control for **Selection controls opacity** adjusts the opacity of the Selection Bar and Quick Masks. The setting only affects the static display of the on-screen controls. The Selection Bar and Quick Mask controls will become opaque when you hover over them. Move the slider to the left to increase transparency and to the right to increase opacity. Choose any opacity setting you wish.

5 Click **Apply** to save the settings on this page.

6 Select **Yes** to save the settings to the configuration file.

Exercise 4-5: Setting up AutoSave and Backup

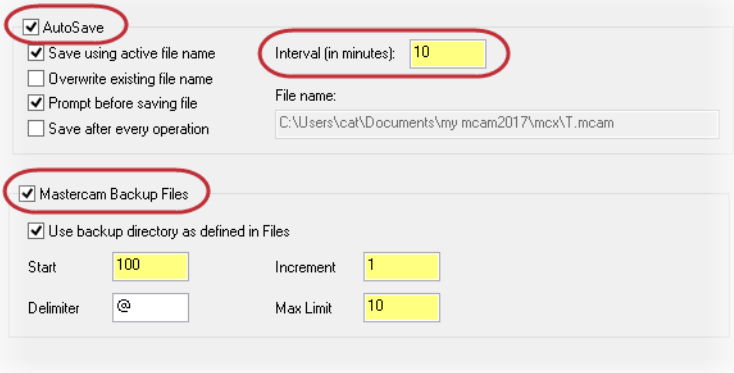
When you are working on a part, Mastercam can save your work automatically, at intervals that you specify. Mastercam can also save versions of your files as backups.

In this exercise, you set up these functions.

1 Expand the **Files** category and select the **AutoSave / Backup** page.

2 In the AutoSave / Backup page, do the following:

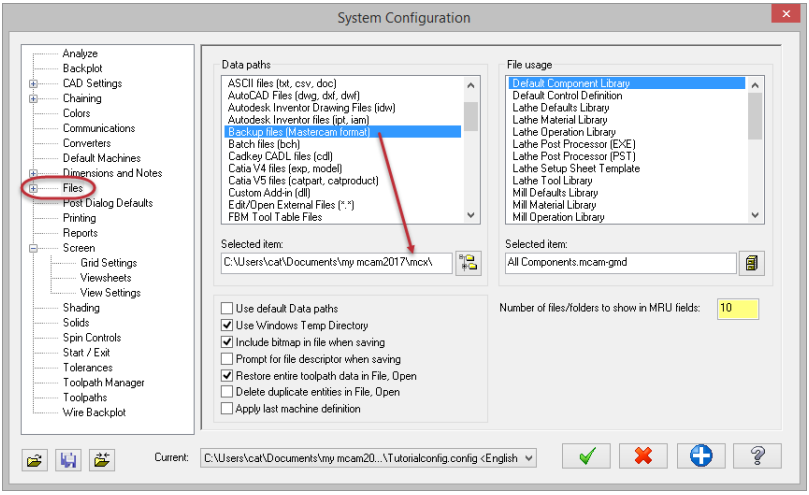
- Select the **AutoSave** checkbox to activate the AutoSave options.
- Enter **10** for **Interval (in minutes)**.
- Select the **Mastercam Backup Files** checkbox to activate the automatic backup feature.



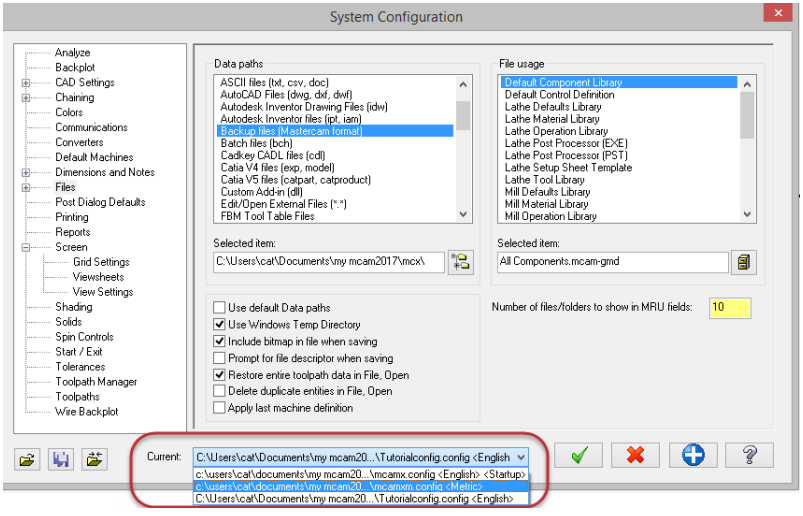
Mastercam will save your work automatically every 10 minutes and keep the 10 most recent versions of your file.

3 Select the **Files** page to view the location of your backup files.

4 Choose **Backup files (Mastercam format)** in the **Data paths** list. The path displays in the **Selected item** box as shown in the following illustration.



5 Select `mcamxm.config <Metric>` from the **Current** drop-down to enable the Metric configuration for the remainder of this tutorial.



6 Click **OK**.

NOTE: If you would like to learn more about the individual settings on any System Configuration page, click the Help button located in the lower right-hand corner of the dialog box.

You have now completed Lesson 4 of the *Introduction to Mastercam* tutorial. In the next lesson, you will learn more about the Customize dialog box.

LESSON 5
Customizing Mastercam

In this lesson, you learn more about the Options dialog box. Use the Options dialog box to customize your Mastercam workspace, including tab and interface options, the graphics window context menu, and keyboard shortcuts.

Lesson Goals

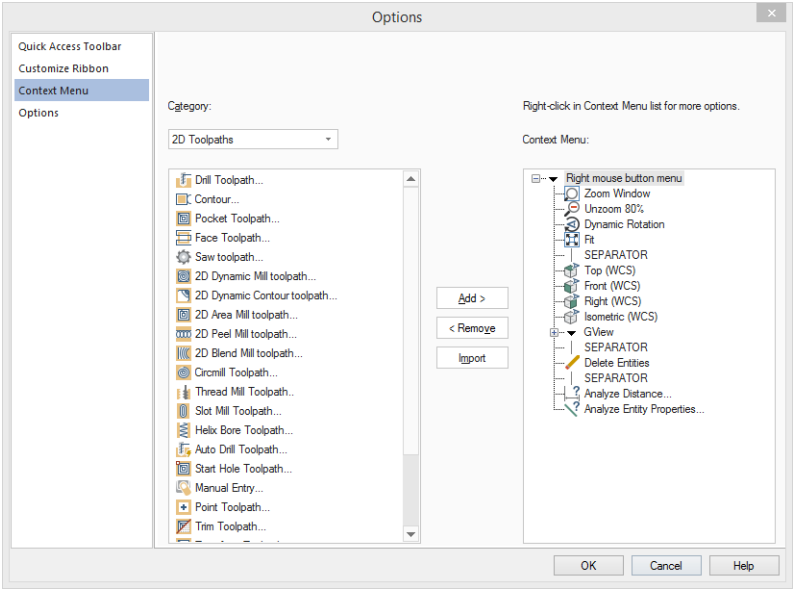
- Customize the graphics window context menu.
- Map Mastercam functions to keyboard shortcuts.
- Set display options for tabs and interface colors.

Exercise 5-1: Customizing the Graphics Window Context Menu

In this exercise, you customize the graphics window context menu that displays when you right-click anywhere in the graphics window. Customizing the context menu allows you quick access to your commonly used functions.

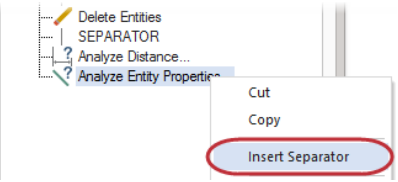
1 Click **File**, **Options** to open the Options dialog box.

2 Select the **Context Menu** page.

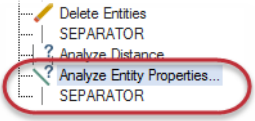


Categories of functions are displayed on the left side of the dialog box, while the right side contains the **Context Menu** list as shown in the previous illustration.

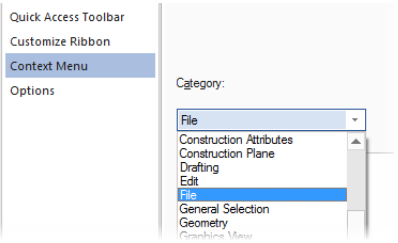
3 Right-click the last item in the **Context Menu** list and select **Insert Separator**.



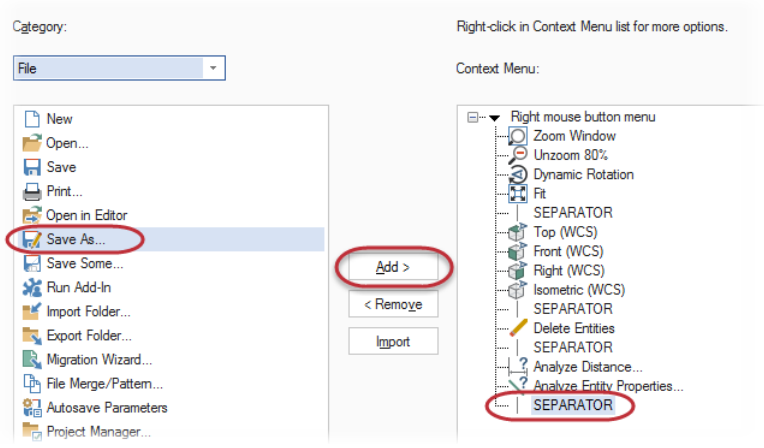
A separator line appears after the last item.



4 Select **File** from the **Category** drop-down list.



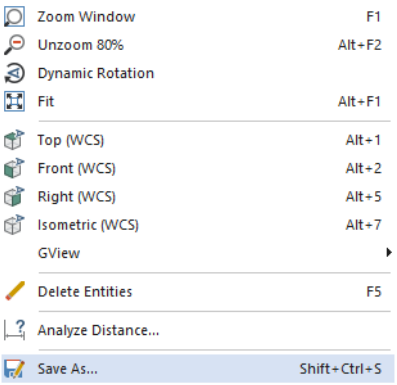
5 Select the **Save As** function in the **Category** list and **SEPARATOR** in the **Context Menu** list, and then click **Add**.



6 Click **OK** to save these changes to the right-click menu.

7 Right-click in the graphics window to see the updated context menu.

Save As has been added to the bottom of the menu.

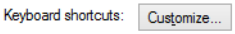


Exercise 5-2: Mapping Functions to Keyboard Shortcuts

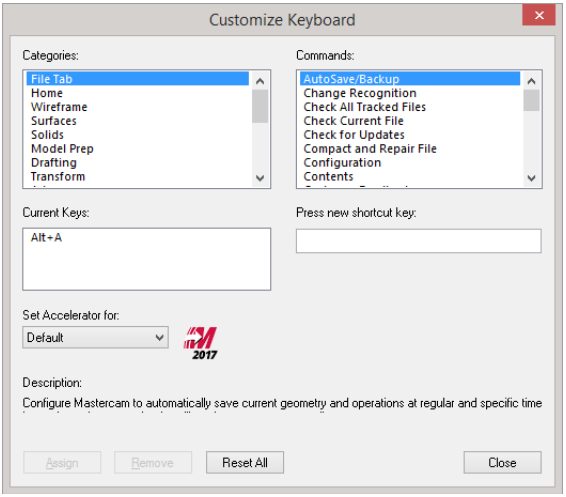
In this exercise, you map a Mastercam function to a shortcut key.

1 Click **File**, **Options** to open the Options dialog box.

2 Click **Customize** next to **Keyboard shortcuts** at the bottom of the Quick Access Toolbar page or Customize Ribbon page.

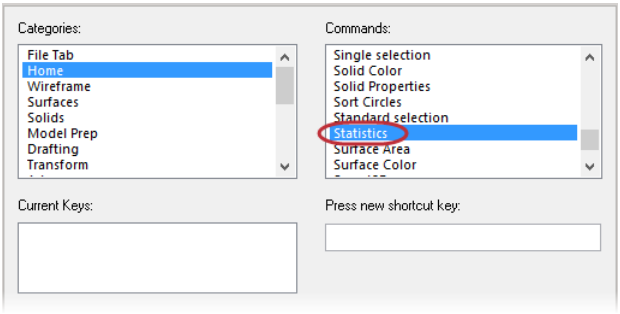


The Customize Keyboard dialog box opens.



3 Select **Home** from the **Categories** list.

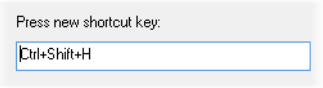
The **Commands** list populates with functions from the Home tab.



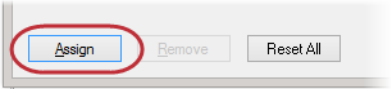
4 Select **Statistics** from the **Commands** list.

You will notice that the **Current Keys** list is blank. That is because there are no shortcut keys assigned to this function.

5 Click in **Press new shortcut key** and type [**Ctrl**+**Shift**+**H**] to create a new shortcut key.



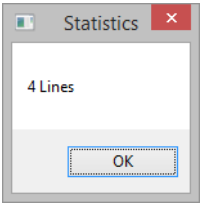
6 Click **Assign** to map this shortcut key to the **Statistics** function.



7 Click **Close** to exit the Customize Keyboard dialog box, and then **OK** to close the Options dialog box.

8 In the graphics window, press [**Ctrl**+**Shift**+**H**] to access the Statistics function.

The Statistics dialog box displays a summary of the entities in the current file, including total number of visible entities by type, and the number of operations and tools.



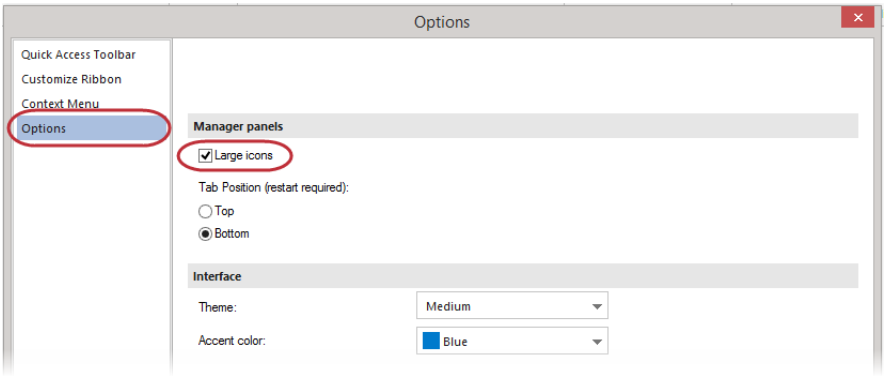
In this example, Statistics reports four lines because of the rectangle created in the previous lesson.

9 Click **OK** to close Statistics.

Exercise 5-3: Setting Mastercam Display Options

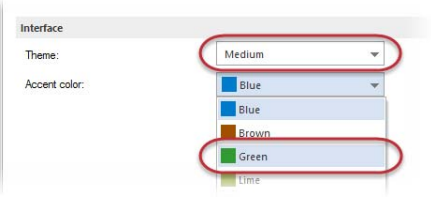
In this exercise, you set some of Mastercam's display options.

1. Select **File**, **Options** to open the Options dialog box.
2. Select the **Options** page.

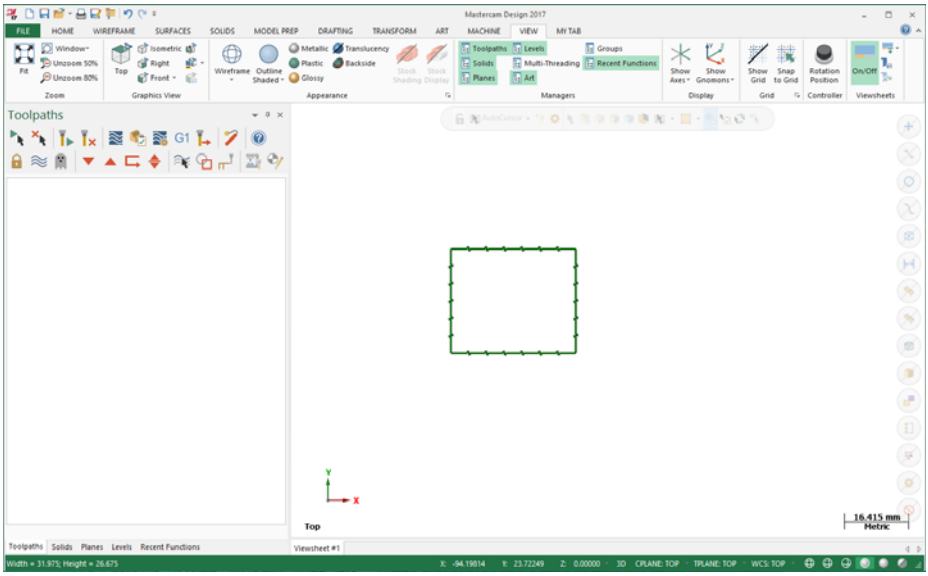


3. Under the **Manager panels** section, select **Large icons**.
4. Under **Interface**, select **Medium** for the **Theme** and set the **Accent color** to **Green**.

   The **Accent color** changes the color of the Status Bar, the active tab, and the highlight color of functions.



5 Click **OK** to close Options and view the Mastercam interface. The interface has larger icons and the selected green theme.



6 Click **File**, **Options** and return the settings to the original options or any other settings you choose.

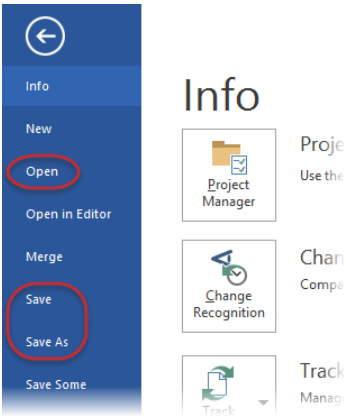
You have now completed Lesson 5 of the *Introduction to Mastercam* tutorial. In the next lesson, you learn more about working with files.

LESSON 6
Working with Files

Mastercam not only saves and loads its own file types, (.mcx-*, .mcam), but also many common file formats, including the following:

- SOLIDWORKS
- AutoCAD
- Parasolid
- Solid Edge
- Autodesk Inventor
- SpaceClaim
- CATIA
- IGES
- ProE/Creo
- Alibre
- Cadkey
- Rhino

Loading and saving native Mastercam files is as easy as selecting **Open**, **Save**, or **Save As** from the Backstage shown to the right. You can also choose one of these commands on the QAT.



You can also open files by:

- Dragging a Mastercam file or third-party compatible file from Windows Explorer and drop it in Mastercam's graphics window.
- Dragging and dropping a file onto the Mastercam desktop icon to open a new instance of Mastercam.

Lesson Goals

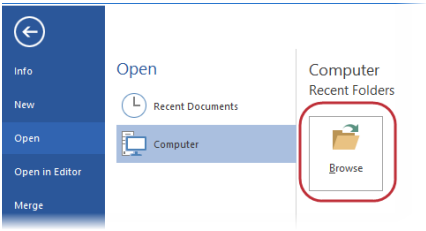
- Open a non-Mastercam file.
- Import multiple files.
- Save patterns (Save Some).
- Export one or more files.
- Use Zip2Go files.

Exercise 6-1: Opening Non-Mastercam Part Files

Importing files from other applications is similar to opening native Mastercam files. Depending on the file, you might need to specify how Mastercam imports elements of the file. In this exercise, you will convert a SOLIDWORKS (.sldprt) file to a Mastercam part.

1 Select **File**, **Open**. Click **Computer** and then **Browse**.

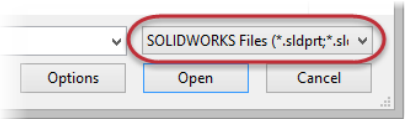
The Open dialog box displays.



NOTE: Click **Don't Save** if a dialog displays asking if you want to save changes to the current Mastercam file.

2 In the Open dialog box, select **SOLIDWORKS Files (*.sldprt; *sldasm)** from the drop-down.

The dialog now displays only SOLIDWORKS parts.

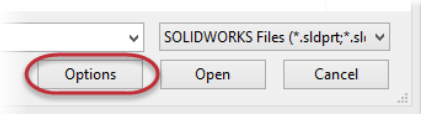


3 Navigate to `SW_Part.sldprt`, which was provided with this tutorial.

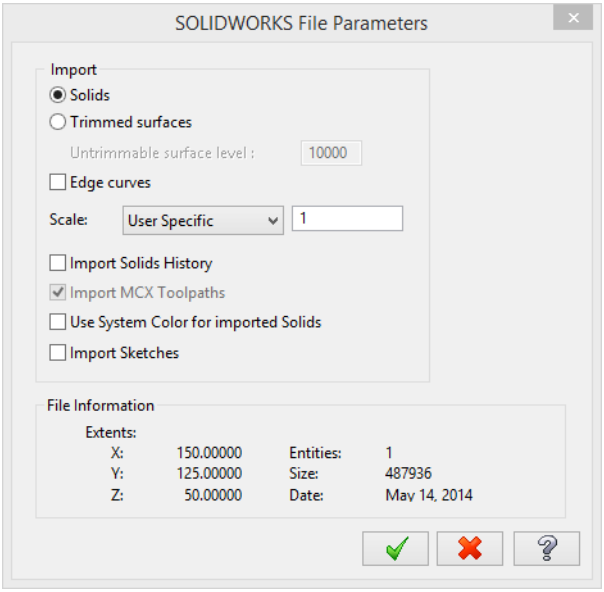
4 Select the file, but do *not* double-click it.

5 Click the **Options** button.

The SOLIDWORKS File Parameters dialog box opens.



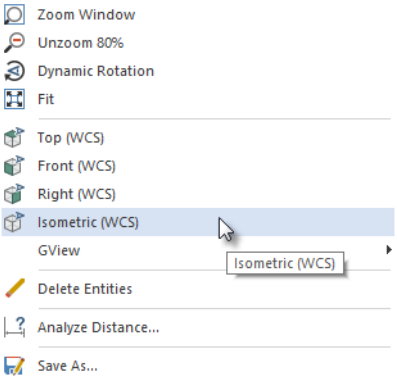
When importing a non-Mastercam file, you might need to change the options so that it can be read properly into Mastercam. Use these options to control how files are read into the Mastercam database.



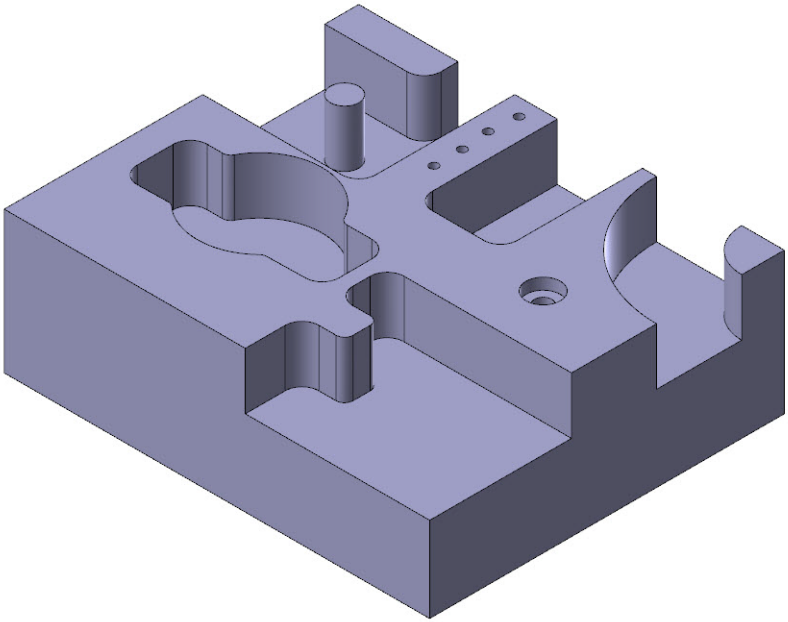
6 Click **OK** without changing anything.

7 Click **Open** in the Open dialog box. Mastercam converts and opens the part.

8 Right-click in the graphics window and select **Isometric (WCS)** from the menu.



See the following illustration of the imported SOLIDWORKS file.



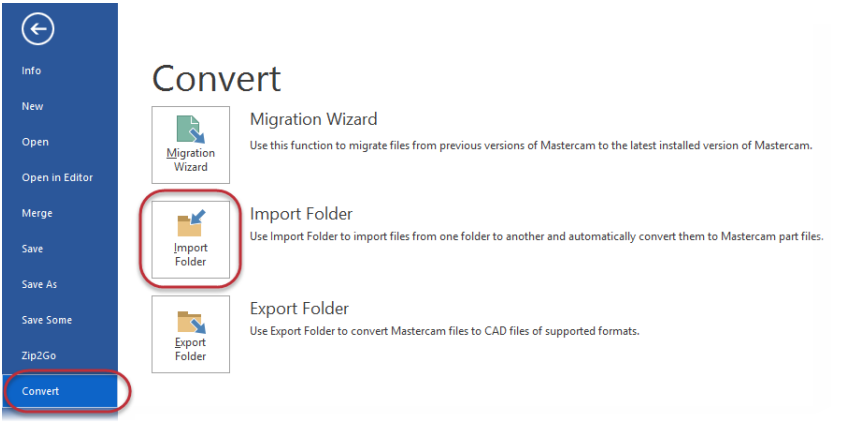
9 If necessary, click **Outline Shaded** to view the part as a solid.

You learn more about the graphics window and views in later sections of the tutorial. If you would like more information, you can also refer to the Mastercam Help.

Exercise 6-2: Importing Multiple Part Files

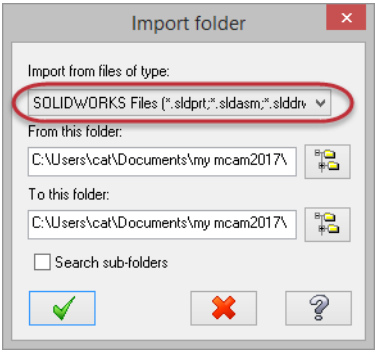
When you have many files to import into Mastercam, you can convert them all at once using the Import Folder command.

1 Select **File**, **Convert** and then click **Import Folder**.



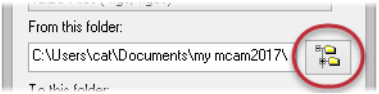
The Import folder dialog box opens.

2 Select **SOLIDWORKS Files (*.sldprt; *sldasm, *slddrw)** from the **Import from files of type** drop-down.

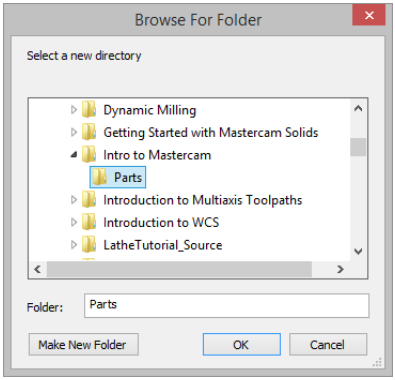


3 Click the **Browse** button to the right of the **From this folder** box.

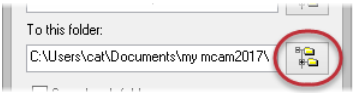
The Browse For Folder dialog box opens.



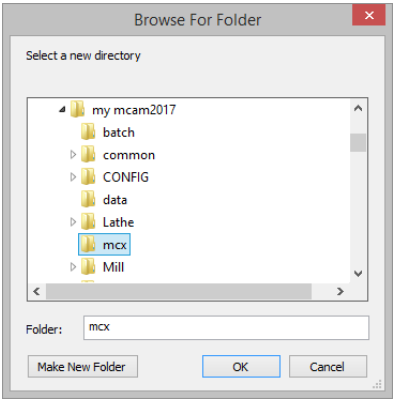
4 Select the location where you stored the tutorial files and then click **OK**.



5 Click the **Browse** button to the right of the **To this folder** box.

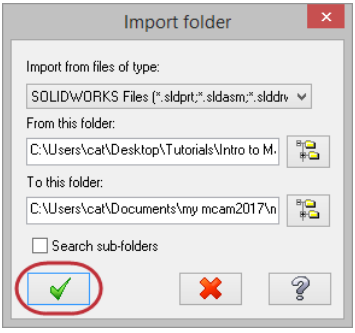


6 Browse to `\Documents\my mcam2017\mcx` and then click **OK**.



7 Click **OK** in the Import folder dialog box.

Mastercam converts all SOLIDWORKS files in the selected tutorial files directory, but does not display the converted files in the graphics window. In this instance, there is only one. You can find the resulting Mastercam file (`SW_Part.mcam`) in the `\mcx` folder.



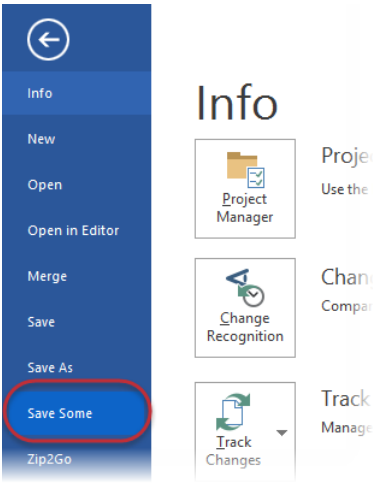
Exercise 6-3: Saving Patterns (Save Some)

A pattern is a set of reusable entities. For example, you may have a bolt that you use in many different parts. By saving that bolt as a pattern, you can merge it with your other parts as needed.

When you save a Mastercam part, you can choose to save the entire file or to save only selected entities. Saving a set of selected entities is one way to create a pattern from a part file. This exercise demonstrates the File, Save Some command, which lets you choose the entities to save.

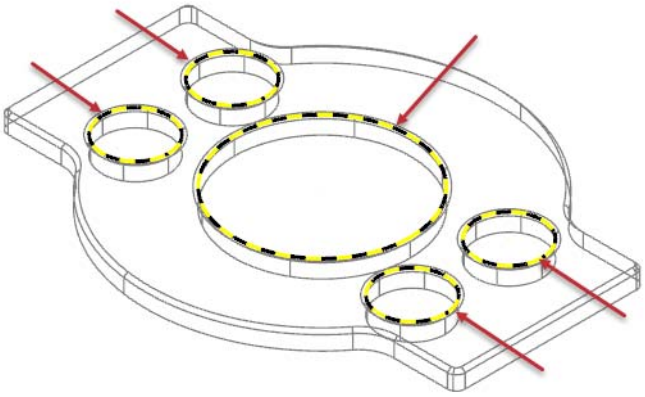
1. Open `2D_CHAMFER_MM.mcam`, which was provided with this tutorial. In the Open dialog box, you might need to change your file type to **Mastercam Files (*.mcam)**.

2. Select **File**, **Save Some**.



3. Choose **Wireframe** on the Status Bar to show the wireframe of the solid body making it easier to select the arcs.

4 Select the five arcs shown in the picture below. The arcs change color when they are selected.

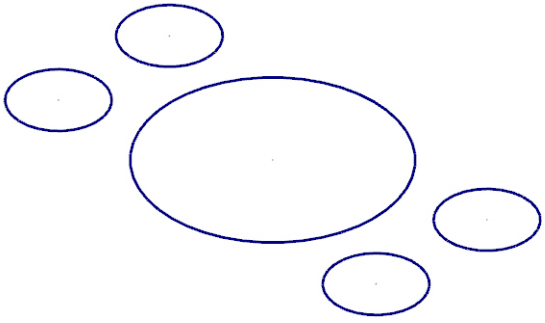


5 Press [**Enter**] to accept the selection. The Save As dialog box opens.

6 Type `2D_CHAMFER_ARCS.mcam` for the **File name**.

7 Click **Save** or press [**Enter**] to save the file. Mastercam saves only the selected arcs.

8 Open `2D_CHAMFER_ARCS.mcam`, and notice that it contains only the arcs that you selected.



Exercise 6-4: Exporting a Single File

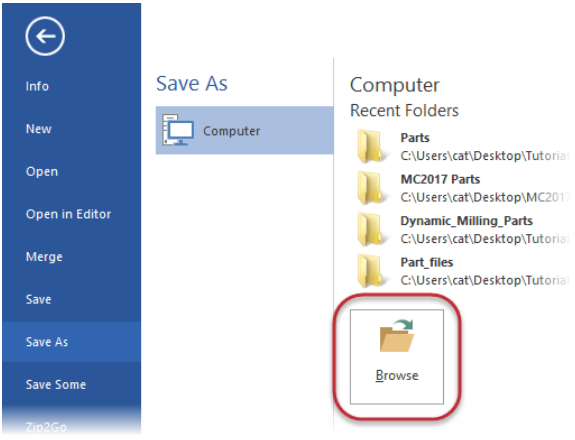
When exporting, you might need to set a few options so that you get the type of file you expect. In most cases, you need only select the software package to which you are

exporting the file. In this exercise, you learn to convert a single file from one format to another.

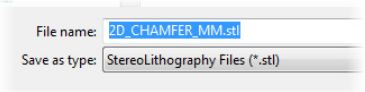
1 Open `2D_CHAMFER_MM.mcam`, which was provided with this tutorial.

2 Select **File**, **Save As** and then click **Browse**.

The Save As dialog box opens.



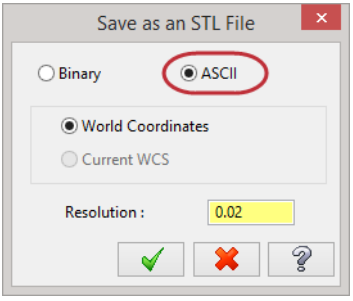
3 Select **StereoLithography Files (*.stl)** in the **Save as type** drop-down list.



4 Click **Options**.

The Save as an STL File dialog box opens.

5 Select the **ASCII** option.

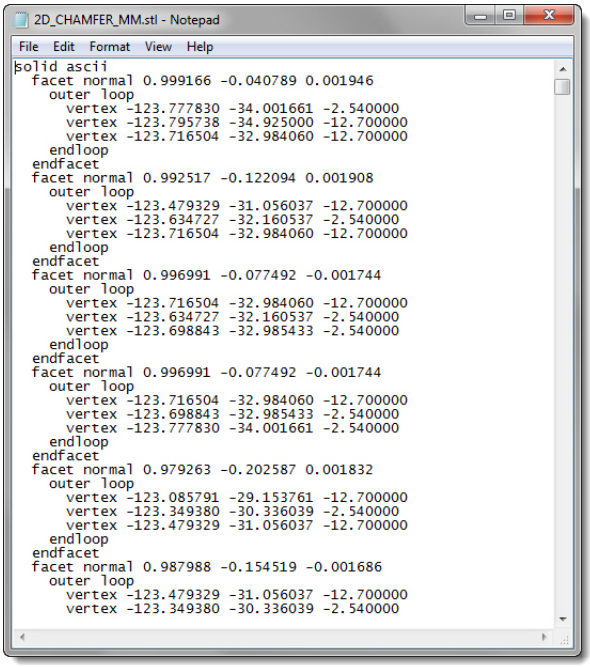


6 Click **OK** to close the Save as an STL File dialog box.

7 Click **Save** in the Save As dialog box.

Mastercam saves the file in ASCII StereoLithography format.

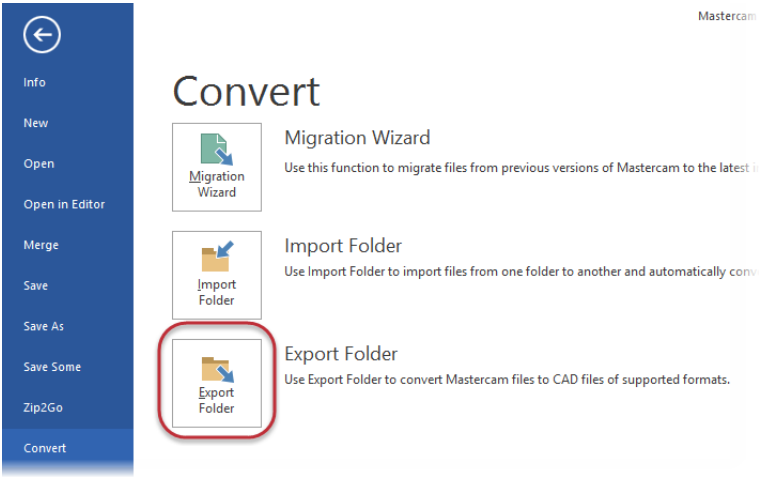
TIP: Because the StereoLithography file is ASCII, you can view it with any text editor, such as Notepad, as shown below.



Exercise 6-5: Exporting Multiple Files

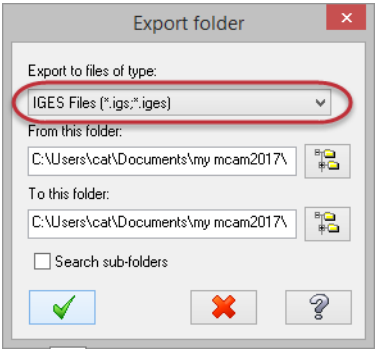
When you have many Mastercam files to export into a different format, you can convert them simultaneously using the **Export Folder** command. This exercise demonstrates how this function works.

1 Select **File**, **Convert** and then click **Export Folder**.



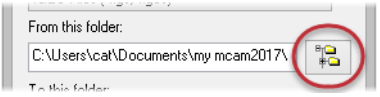
The Export folder dialog box opens.

2 Select **IGES Files (*.igs, *iges)** from the **Export to files of type** drop-down.

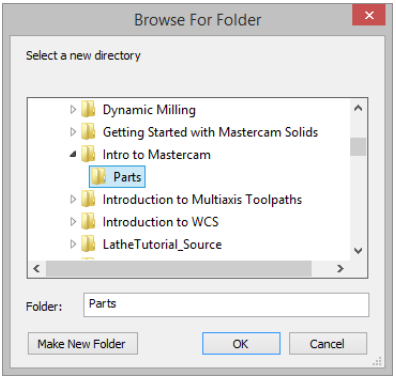


3 Click the **Browse** button to the right of the **From this folder** box.

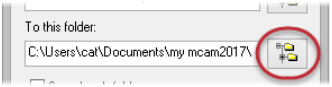
The Browse For Folder dialog box opens.



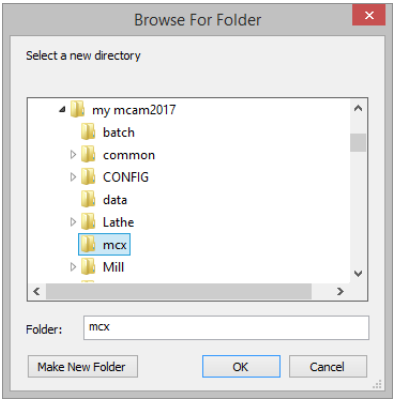
4 Select the directory where you stored the tutorial parts, and then click **OK**.



5 Click the **Browse** button to the right of the **To this folder** box.

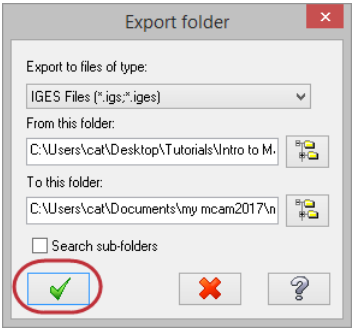


6 Browse to `\Documents\my mcam2017\mcx` and click **OK**.



7 Click **OK** in the Export folder dialog box.

Mastercam converts the files in the selected tutorial folder. You can find the resulting IGES files in your `\mcx` folder.



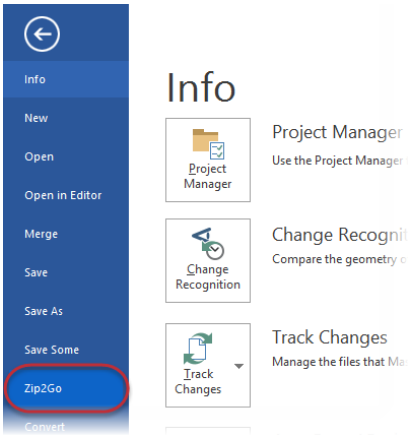
Exercise 6-6: Using Zip2Go

You use the Zip2Go utility to gather and compress the current open Mastercam part data into a .ZIP or .Z2G file. These files can then be opened and viewed with most zip/unzip programs. This is especially useful if you are trying to share information with other users or technical support.

Zip2Go scans the machine groups in your current file and captures certain information such as your Mastercam configuration, machine definition, post files, tool and material libraries, and other necessary files. In this exercise, you run Zip2Go to compress a file.

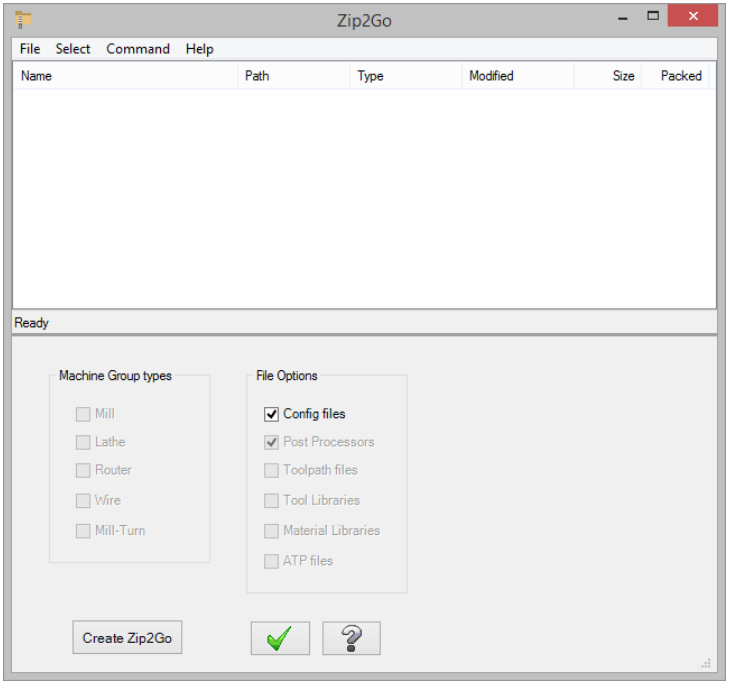
1. Open `Brace.mcam`, which was provided with this tutorial.
2. Select **File**, **Zip2Go**.

   The Zip2Go dialog box opens.



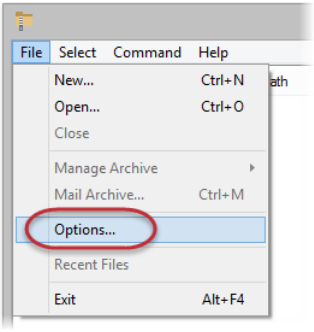
Use this dialog box to create and view Zip2Go files. The file list displays information about the files contained in the Zip2Go archive. You can also

select files that you want, and deselect files that you do not want to include in the Zip2Go file. For this tutorial, you keep the default settings.

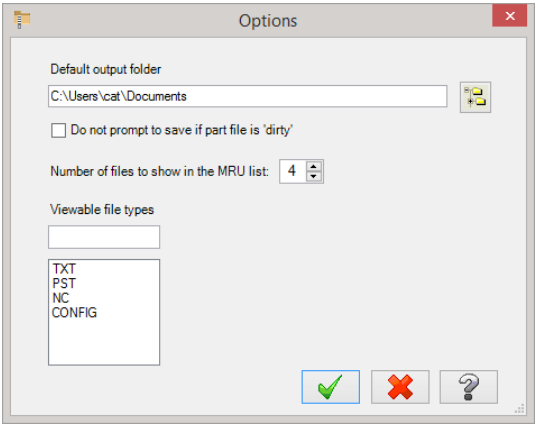


3 Select **File**, **Options** from the menu bar.

The Options dialog box opens.



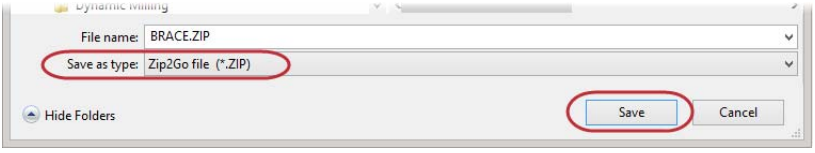
Use this dialog box to configure the default settings for Zip2Go. Make sure the current default output folder is your `\Documents` folder.



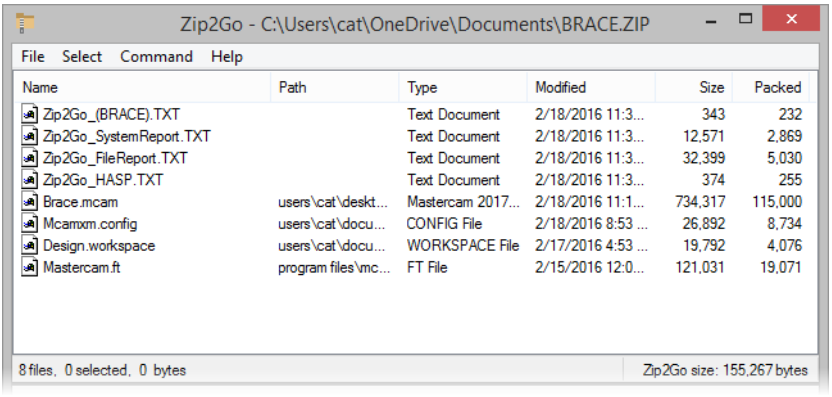
4 Click **OK** to close the Options dialog box.

5 Click **Create Zip2Go**.

The Save Zip2Go file dialog box opens. By default, Mastercam creates a zipped file with a .ZIP extension in the selected folder. You can change the file type to .Z2G in the **Save as type** drop-down.



6 Click **Save**. The Zip2Go file list is populated by files included in the Zip2Go file you created.



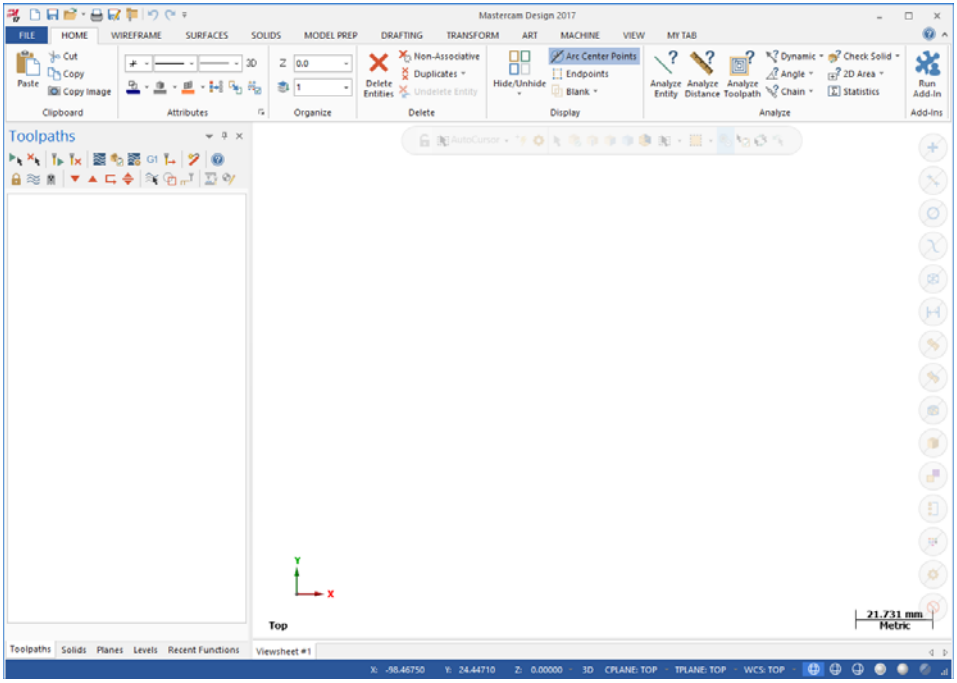
7 Click **OK** to close the Zip2Go dialog box.

NOTE: If the part file contains no toolpaths, Zip2Go will only package the configuration files.

You have now completed Lesson 6 of the *Introduction to Mastercam* tutorial. In the next section, you will learn more about the graphics window and related functions.

LESSON 7
Working With the Graphics Window

The graphics window is your workspace in the Mastercam interface.



Mastercam provides many tools you can use to change the graphics window display to suit your needs. This section introduces some of these tools, and teaches the basic skills you need to manage your Mastercam workspace.

Lesson Goals

- Customize on-screen prompts.
- Change standard views.

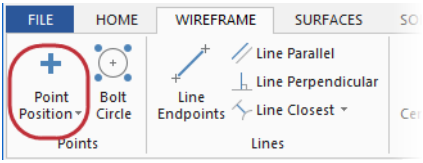
Exercise 7-1: Customizing Function Prompts

When you use a function that requires your input, such as selecting an entity, Mastercam provides brief directions in a prompt. You can customize these prompts to change their size, text color, background color, and position on the screen.

In this first lesson, you alter the size and appearance of the function prompts.

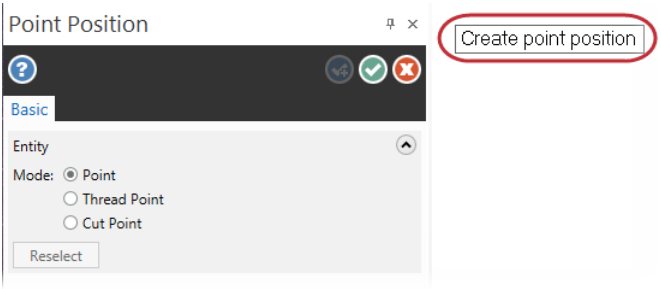
1 Click **File**, **New**.

2 On the **Wireframe** tab, select **Point Position**.

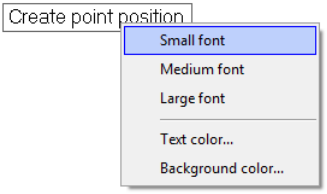


The Point Position function panel opens.

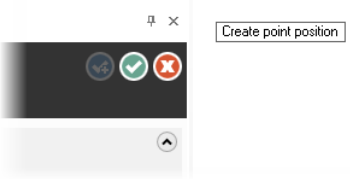
Notice the prompt displayed in the upper left corner of the graphics window.



3 Right-click the prompt and select **Small font**.

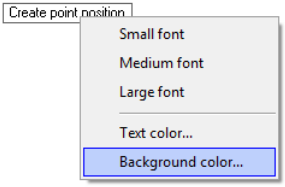


The prompt now displays smaller as shown in the illustration to the right.

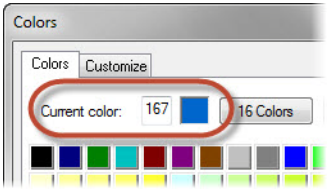


4 Right-click the prompt and select **Background color**.

The Colors dialog box opens.

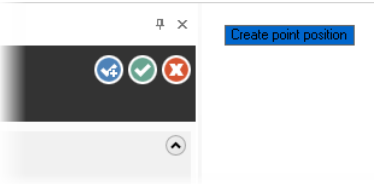


5 Enter **167** in the **Current color** attribute box.



6 Click **OK** to change the background color and exit the Colors dialog box.

The function prompt now displays with a blue background.



NOTE: If you try to make the prompt color the same as the background color, a warning displays.

7 Move the function prompt by clicking and dragging it to a new location on your screen.

8 Return the prompt to its default attributes for the remainder of this tutorial, by doing the following:

a Set the font size to **Large font**.

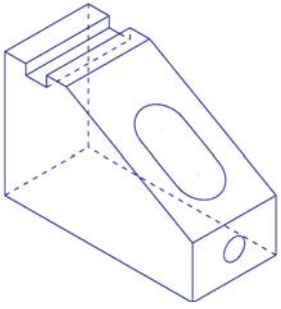
b Set the **Background color** to **15**.

9 Click **Cancel** to close the Point Position function panel.

Exercise 7-2: Changing Standard Views

In this exercise, you change your graphics view (Gview) using standard views.

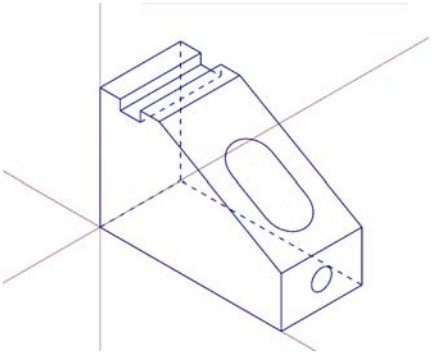
1 Open `ANGLEBLOCK-MM.mcam`, which was provided with this tutorial. The part opens in Isometric (WCS) view.



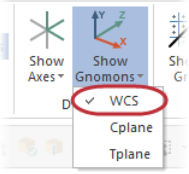
2 Click the **Show Axes** drop-down on the **View** tab and deselect **World**, **Cplane**, and **Tplane**, ensuring only **WCS** remains selected.

The coordinate axes show the origin and the part orientation to help you visualize the part in 3D space.

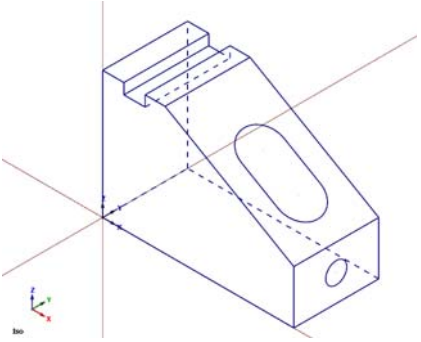
3 Click **Show Axes** on the **View** tab or press [**F9**] to toggle the display of the WCS axes.



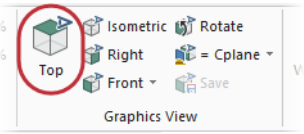
4 Click the **Show Gnomons** drop-down on the **View** tab and deselect **Cplane** and **Tplane**, ensuring only **WCS** is selected.



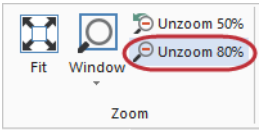
5 Click **Show Gnomons** or press [**Alt+F9**] to toggle the display of the on-screen gnomon.



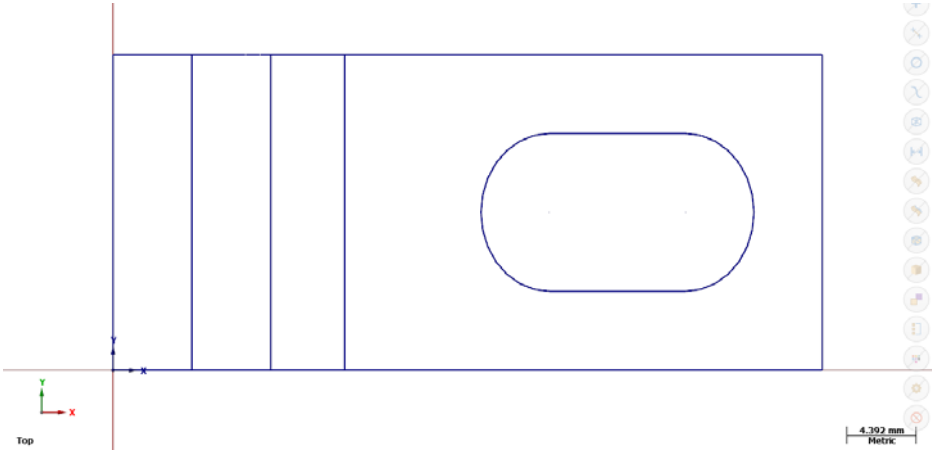
6 On the **View** tab, click **Top** in the **Graphics View** group.



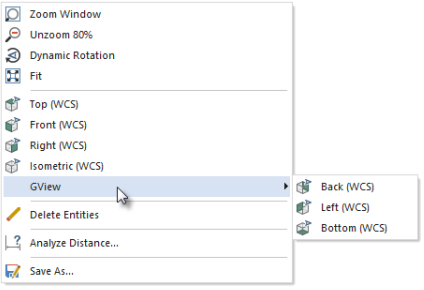
7 Click **Unzoom 80%** on the **View** tab to reduce the size of the part on the screen.



You are now viewing the part as if you were above it looking down.



8 You can also use the right-click menu to change the view. Practice switching to other views using this menu.



9 When finished, return the part to **Isometric** view for the next lesson.

10 Click **Show Gnomons** to turn off the display of gnomons in the graphics window.

You have now completed Lesson 7 of the *Introduction to Mastercam* tutorial. In the next lesson, you learn more about viewing your part.

LESSON 8
Viewing Your Part

Mastercam provides several tools and methods for changing the appearance of the geometry and toolpaths in the graphics window. In this lesson, you learn different ways of viewing your part, to hide portions of your part, and to create and use Viewsheets.

Lesson Goals

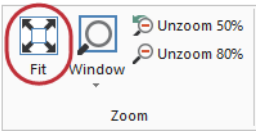
- Fit all entities in the graphics window.
- Use zoom functions to magnify your view of selected entities.
- Dynamically rotate and pan entities in the graphics window.
- Create a viewsheet.
- Blank and hide entities.

Exercise 8-1: Viewing All Entities

In this exercise, you set up your graphics window to view all entities in a Mastercam part file.

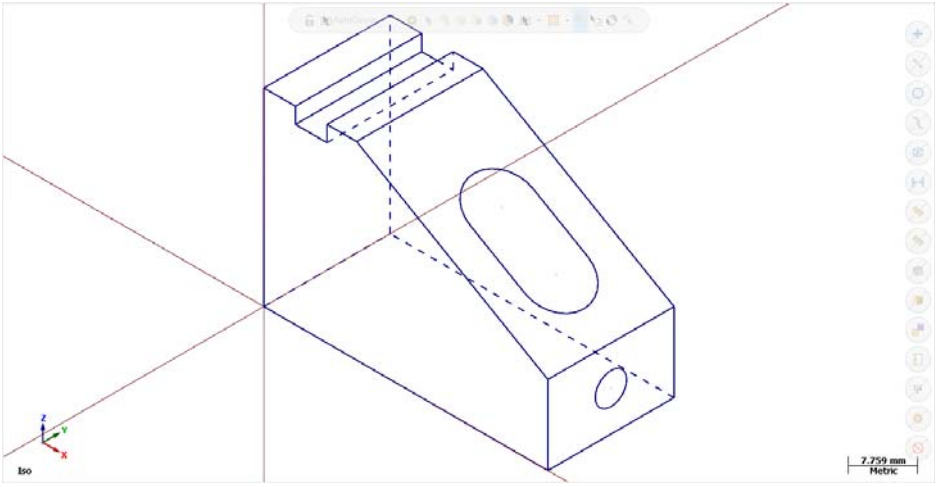
1 If necessary, open the tutorial part `ANGLEBLOCK-MM.mcam`. Change your view to **Isometric**, and press [**F9**] to show the axes.

2 Choose **Fit** on the **View** tab or press [**Alt+F1**].

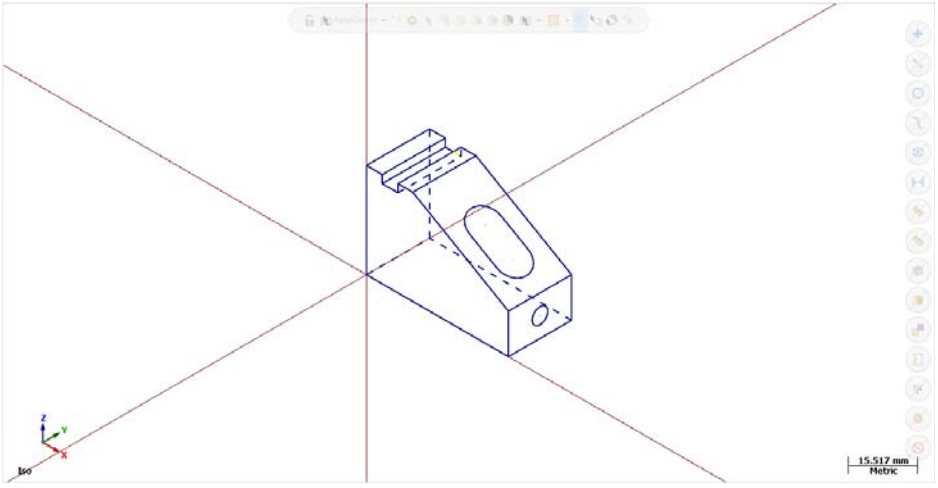


Fit and several other Zoom commands are also available in the right-click menu.

The part now fills the entire graphics window.



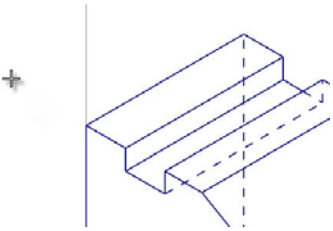
3 Choose **View**, **Unzoom 50%** to decrease the size of the display to 50%. This creates a border of free space around the part.



Exercise 8-2: Zooming In and Out

In this exercise, you practice different techniques for viewing specific areas of detail in a Mastercam part.

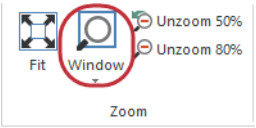
1 Place your cursor in the upper left quadrant of the graphics window.



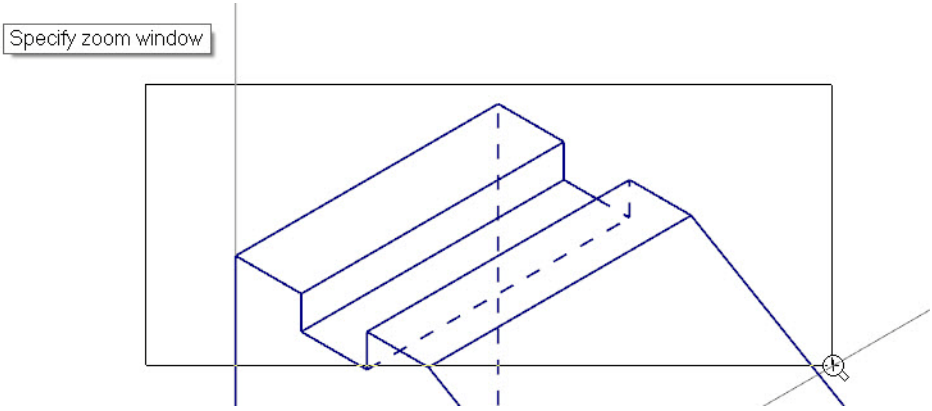
2 If your mouse has a middle mouse wheel, spin it back and forth to dynamically zoom in and out. You can also press the [**Page Up**] and [**Page Down**] keys on your keyboard to zoom in and out.

3 Click **Fit** or press [**Alt+F1**] to fit the part to the screen.

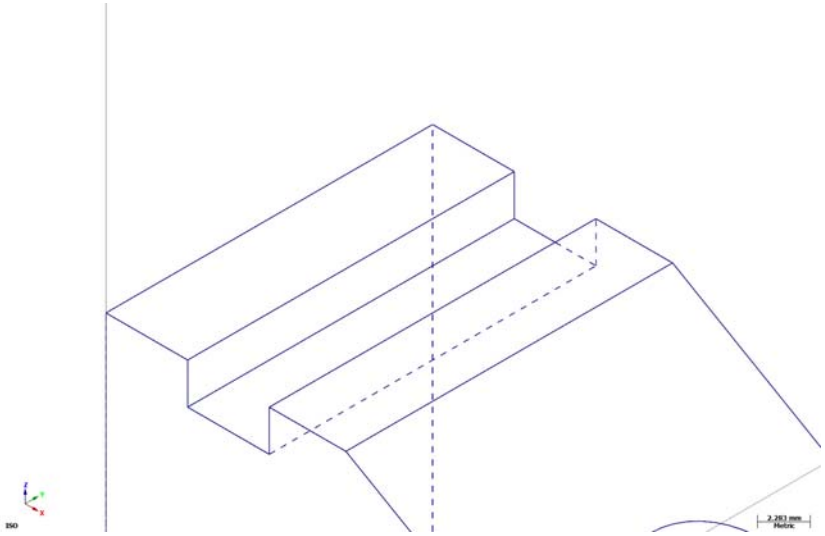
4 Choose **Window**.



5 Click and drag a diagonal window around the upper section of the part as shown below.

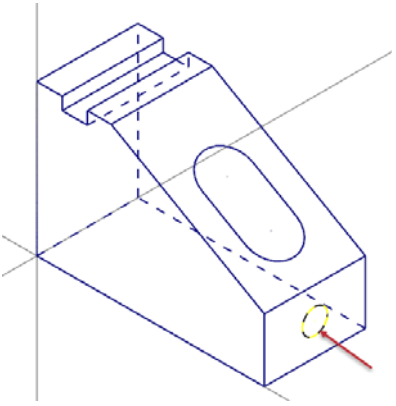


6 Click to set the zoom window. Mastercam scales the selected area to fit the entire graphics window.

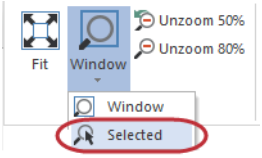


7 Right-click the graphics window and choose **Fit**.

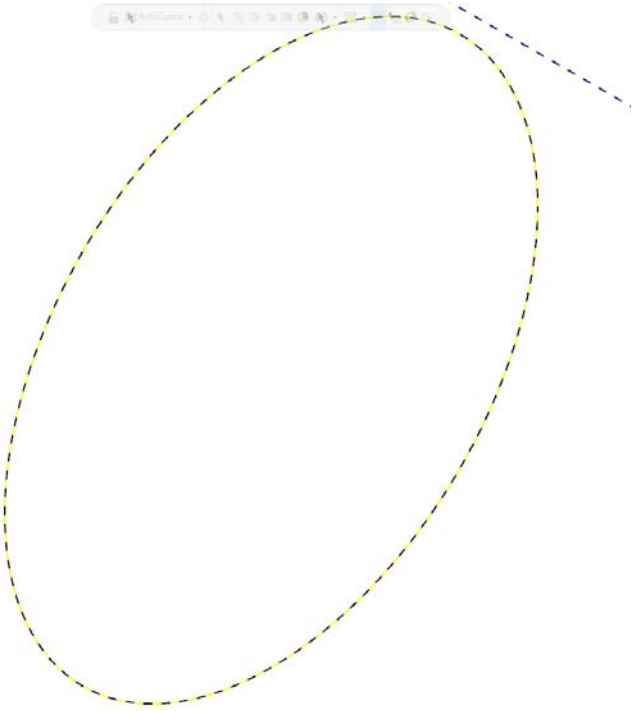
8 Select the circle on the front of the angle block as shown in the illustration.



9 Choose **Selected** from the **Window** drop-down on the **View** tab.



The selected entity is scaled to fit the graphics window.



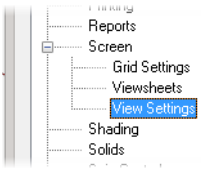
10 Press [**Esc**] to clear the selection.

Exercise 8-3: Rotating Your Part View

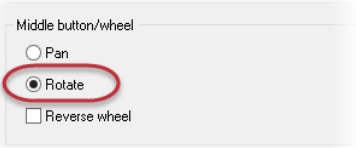
This exercise shows how to set the preference for the action your middle mouse button or wheel performs in the graphics window (rotate or pan). You also learn to dynamically rotate entities in the graphics window so that you can see them from any angle.

1 Select **File**, **Configuration** to open System Configuration.

2 Expand the **Screen** group and select **View Settings**.



3 If necessary, set **Middle button/ wheel** to **Rotate**.



By choosing **Rotate**, Mastercam sets dynamic rotation as the primary function when you click and hold the middle mouse button or mouse wheel.

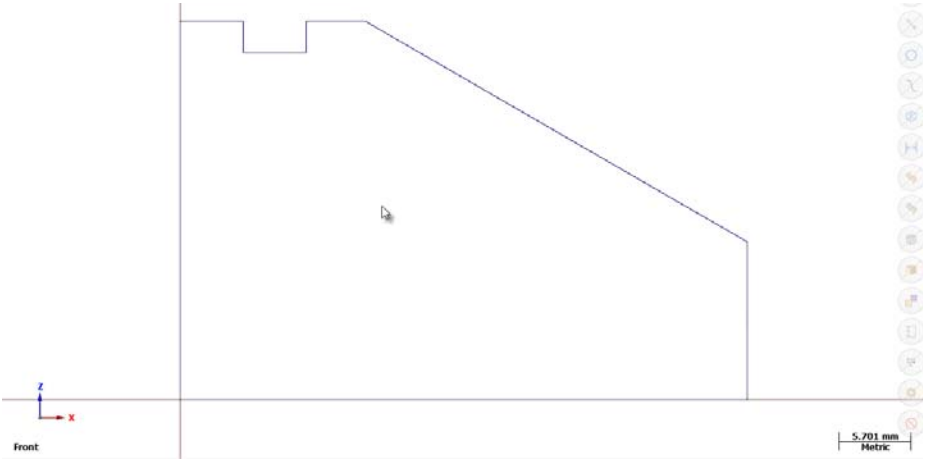
4 Click **OK** to close the System Configuration dialog box and then click **No**, to use these settings for this session only.

5 Set up the part in the graphics window, as follows:

a Set the Gview to **Front**.

b Click **Unzoom 80%**.

6 Middle-click in the graphics window where indicated below and continue to hold down the middle mouse button or wheel as you move the mouse slowly in a circular motion.



This action rotates the part in space about the selected position and lets you see it from any angle.

7 Let go of the middle mouse button/wheel to finish rotating the part.

The axes symbol (gnomon) in the graphics window changes as you rotate the part. The Gview name in the graphics window no longer displays because you are not in a standard view.

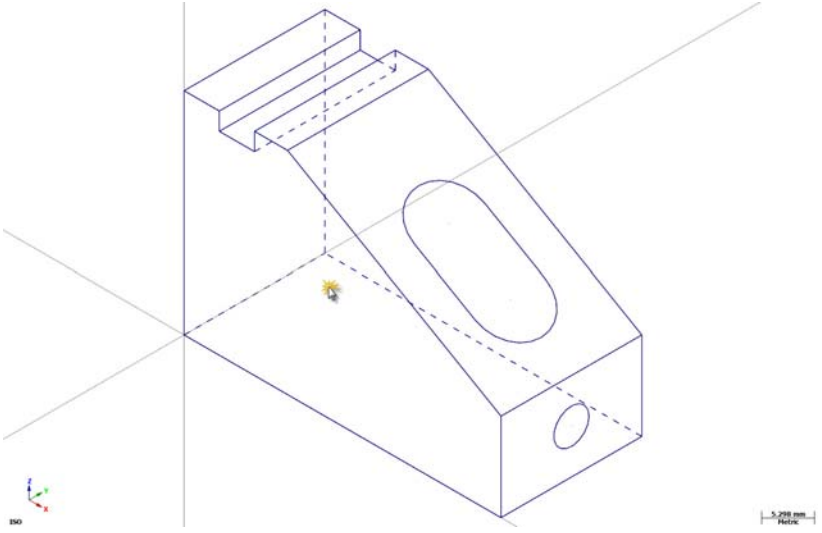
8 Return the view to **Isometric**, and fit the part to the screen.

TIP: You can also choose **Dynamic Rotation** from the right-click menu and follow the on-screen prompts to rotate the part.

Exercise 8-4: Panning You Part

In this exercise, you change your view in the graphics window as if you were moving a camera lens to the left or right, and up and down over the part.

1 Hold down the [**Shift**] key, middle-click in the graphics window where indicated, and continue to hold down the button/wheel while you move the mouse up, down, side to side, and around.



It appears that you have picked up the part and are moving it in the direction of the mouse. However, the entities are not physically moved in space, only the display changes. The Gview does not change as you pan the entities.

2 Release the [**Shift**] key while still holding down the middle mouse button/wheel and you can rotate the part. Press the [**Shift**] again to return to panning.

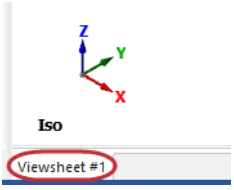
3 When you finish panning, release the [**Shift**] key and the middle mouse button/wheel at the same time to exit the function.

Exercise 8-5: Using Viewsheets

Mastercam allows you to view your part in different orientations by using viewsheets. Viewsheets make viewing a large part easier, as you can set up multiple viewsheets with different views. When you save your part file, Mastercam stores the viewsheet settings along with the part.

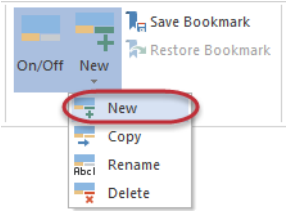
In this exercise, you create a viewsheet.

At the bottom of the graphics window, notice a tab named **Viewsheet #1**. This is the main view of your part and cannot be deleted.



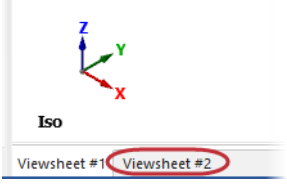
1 If necessary, fit the part to the graphics window and set the view to **Isometric**.

2 Choose **New** in the **Viewsheets** group on the **View** tab. Alternately, you can right-click **Viewsheet #1** and select **New Viewsheet** from the menu.

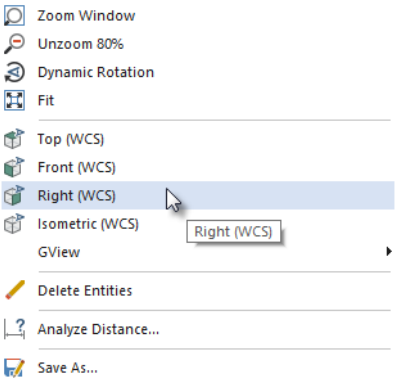


3 Press [**Enter**] to accept the default name.

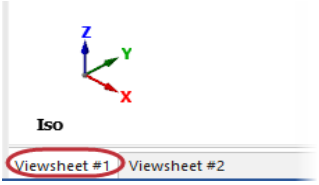
Viewsheet #2 is created and displayed next to **Viewsheet #1**.



4 Right-click in the graphics window and select **Right (WCS)** to view the part on its right side.

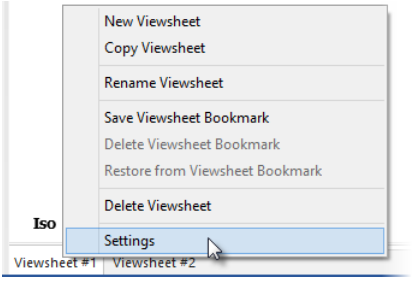


5 Select **Viewsheet #1** again.

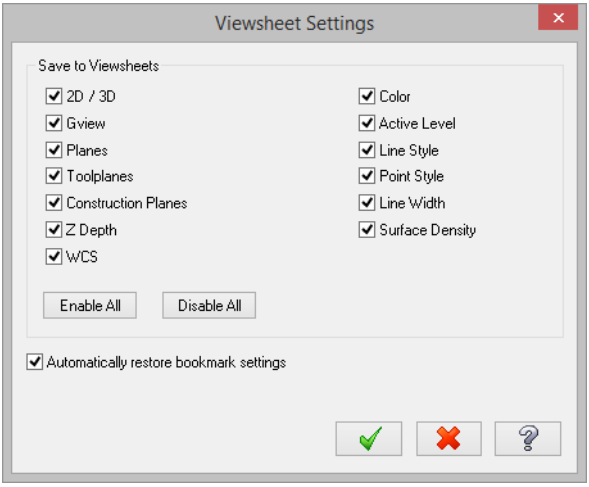


Notice that the view did not change on **Viewsheet #1**. Each viewsheet can contain different views and planes.

6 Right-click **Viewsheet #1** and select **Settings** from the menu.



The Viewsheet Settings dialog box opens.



You can use the Viewsheet Settings dialog box to indicate which settings to save to the viewsheets. These settings only apply to the selected viewsheet tab.

7 Click **OK** to exit the Viewsheet Settings dialog box without changing anything.

Exercise 8-6: Blanking and Hiding Entities

In larger and more complicated parts, it can be difficult to select geometry for toolpaths or geometry manipulation. Mastercam allows you to Blank entities, which *removes* selected entities (from any level) to reduce screen clutter.

Similar to Blank is Hide. With Hide, you select the entities that will *remain* in the graphics window; all unselected entities are *removed*. Both functions have their benefits, but consider these differences:

- You can save blanked entities; hidden entities are not saved.
- Choose **Hide/Unhide** to remove many entities from the display, or to quickly restore hidden entities.
- Choose **Blank** to selectively remove and restore a limited number of entities from the display. Choose **Unblank** to restore blanked entities.

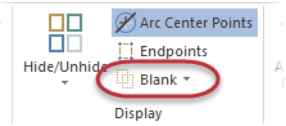
In this exercise, you first blank and unblank geometry, and then hide and unhide geometry.

1 Open `BLANK_PART.mcam`, which was provided with this tutorial.

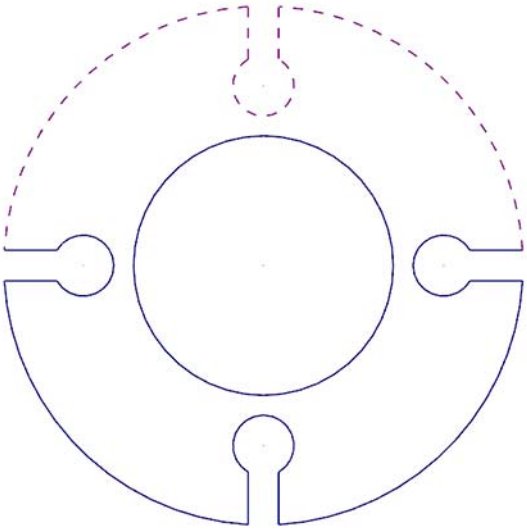
If prompted to save `ANGLEBLOCK-MM.mcam`, choose **Don't Save**.

2 On the **Home** tab, select **Blank**.

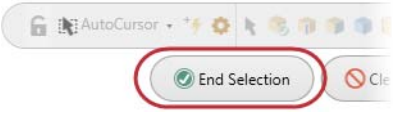
Mastercam then prompts you to select entities to blank.



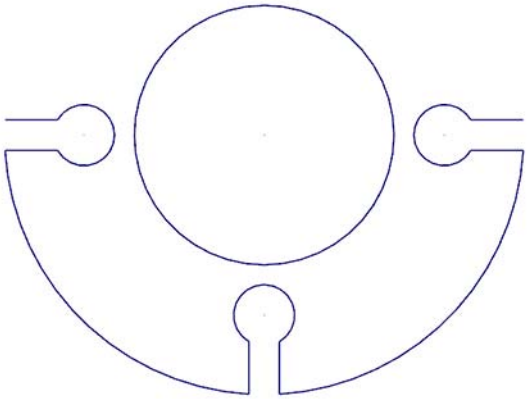
3 Select the geometry shown below:



4 Press [**Enter**] or choose **End Selection** located below the Selection Bar to accept the selections.

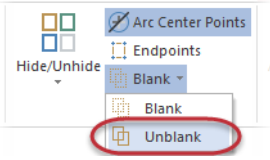


The selected geometry no longer displays in the graphics window.

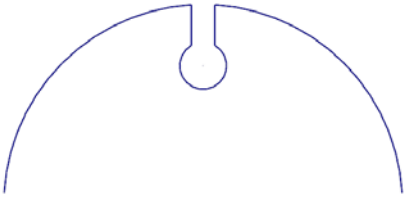


Now, you will unblank the geometry selected in the previous steps.

5 Select **Unblank** from the **Blank** drop-down.



The graphics window changes to display entities that have been blanked, so that you can select which ones to unblank and which ones to keep hidden.

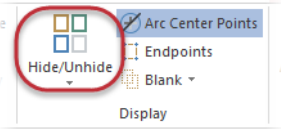


6 Select all of the blanked entities and press [**Enter**]. The part should be whole again.

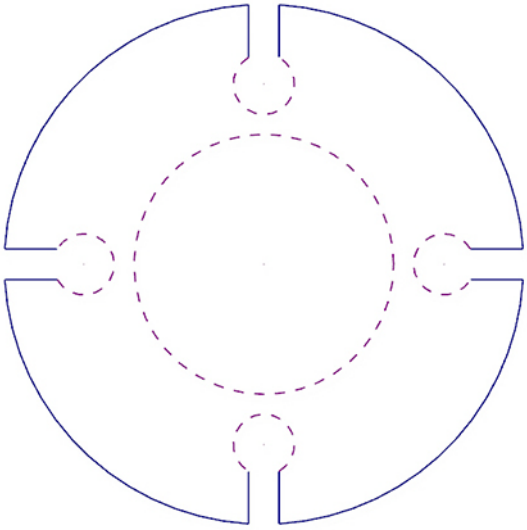
Next, you use the Hide/Unhide function.

7 Select **Hide/Unhide**.

Mastercam prompts you to select which entities to keep.

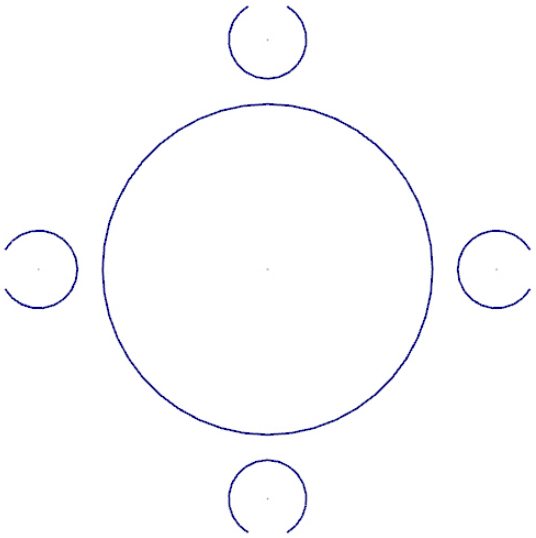


8 Select the geometry shown below:



9 Press [**Enter**] or choose **End Selection** to accept the selection.

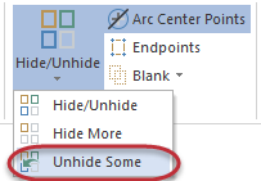
The graphics window hides the unselected geometry.



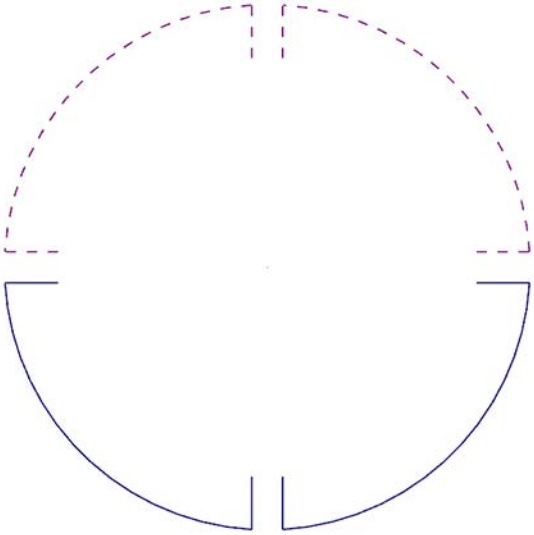
Next, you unhide the geometry using **Unhide Some**.

10 Select **Unhide Some**.

Mastercam then prompts you to select entities to keep on the screen.

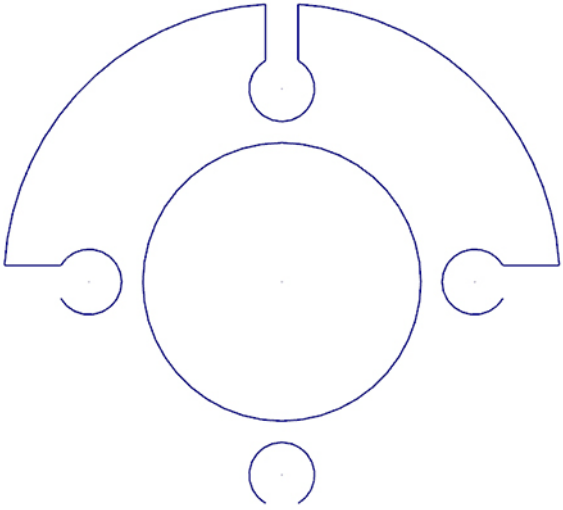


11 Select the geometry shown below:



12 Press [**Enter**] to accept the selections.

Mastercam unhides the selected geometry. Any geometry that was hidden and not selected remains hidden.

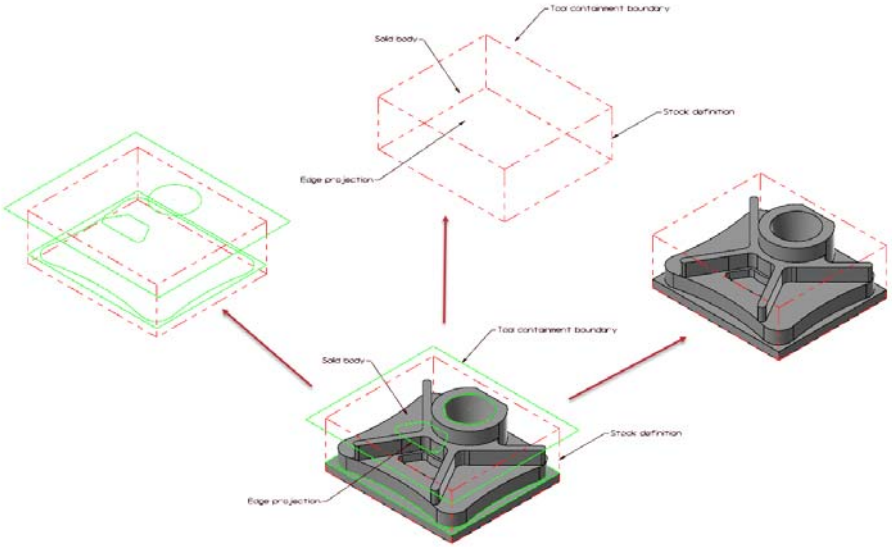


13 Click **Hide/Unhide** to show all entities.

You have now completed Lesson 8 of the *Introduction to Mastercam* tutorial. In the next lesson, you learn more about levels.

LESSON 9
Working With Levels

A Mastercam file can contain separate levels for wireframe, solids, surfaces, drafting entities, toolpaths, and other part data. Organizing your file data by levels lets you control the areas of the drawing that are visible and the entities you can select in the graphics window.



This control makes it easier to work with the file and helps prevent you from affecting areas of the drawing you do not want to change.

You can create and name up to two billion levels and set any one to be the active, current working level. For each level you create, you assign a unique number and, optionally, a name. Mastercam's Levels Manager provides a central location where you can view and create levels, and set their properties.

Lesson Goals

- Explore the Levels Manager.
- Modify the Levels Manager display options.
- Turn level displays off and on.

- Change the active level.
- Create a new level.
- Move selected entities to a different level.

Exercise 9-1: Exploring the Levels Manager

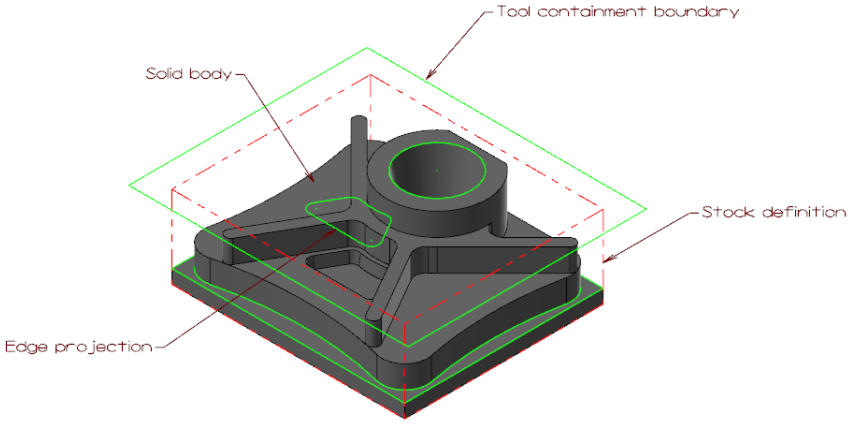
When first opening a Mastercam file, you may not be aware of all entities in the part because they may exist on levels that are not displayed in the graphics window. It is a good practice to first access the Levels Manager and view all of the levels in the file.

The Levels Manager is movable and dockable. You can dock it to a fixed location on the interface, float it anywhere on the workspace, or move it to another monitor. These settings are modal, which means that Mastercam remembers the settings even after you close the application.

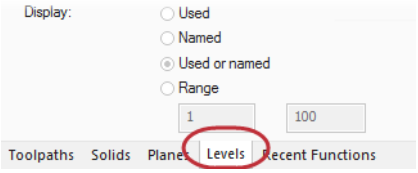
In this exercise, you explore the Levels Manager and modify some display options.

1 Open `LEVELS_PART.mcam`, which was provided with the tutorial and save it with a new name.

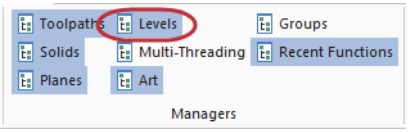
If prompted to save `BLANK_PART-MM.mcam`, choose **Don't Save**.



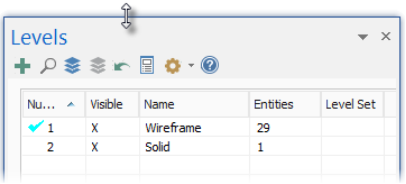
2 Click the **Levels** tab and drag and drop it anywhere on the workspace.



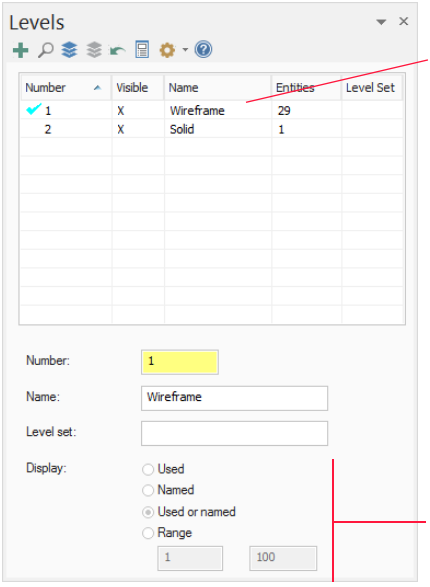
If the **Levels** tab does not show, select **Levels** in the **Managers** group of the **View** tab.



3 Resize the Levels Manager by clicking and dragging any of its edges.



The Levels Manager shows all levels that exist in the current part file, their display status, and the number of entities per level.



The checkmark in the Number column indicates the current active level.

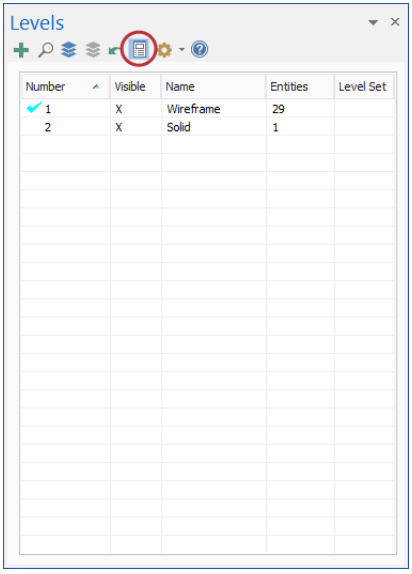
Use any column heading to sort the levels grid. To sort, click the column heading. To change the sort order (ascending or descending), click again.

Active level parameters display in this section.

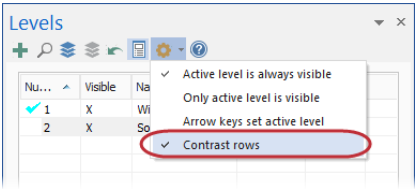
Use these options to filter the levels grid.

4 Click **Hide level properties** to hide the property controls in the lower section of the Levels Manager and maximize the space allotted to the levels grid.

5 Click **Hide level properties** again to show the controls at the bottom of the Levels Manager.



6 Click **Display options**, **Contrast rows** to apply shading to every other row used in the grid.



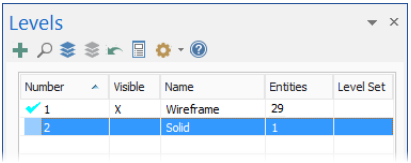
7 Dock or locate the Levels Manager in a convenient location.

In the next exercise, you learn to turn level displays on and off.

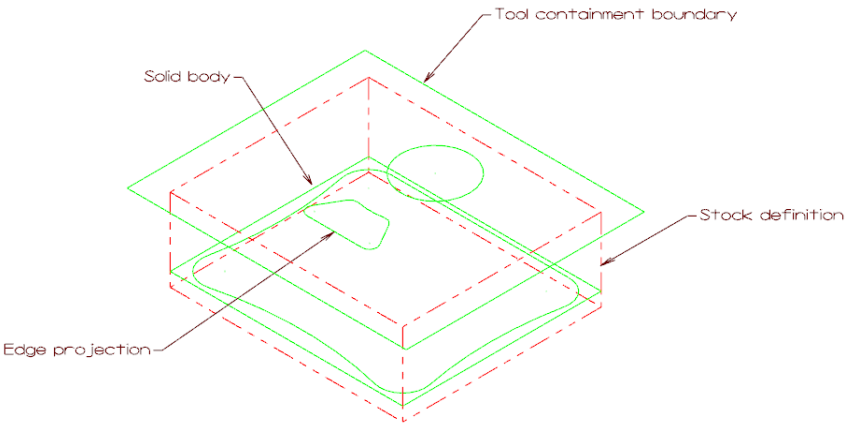
Exercise 9-2: Showing or Hiding Levels

In this exercise, you change the graphics window display by turning level display on and off. To select or otherwise work with an entity in the graphics window, its level must be visible.

1 In the **Visible** column for level **2:Solid**, click once to turn off the display of that level.



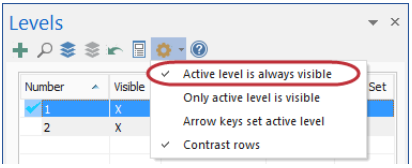
The change is immediate in the graphics window.



If necessary, drag the Levels Manager to a position that gives you a better view of the graphics window.

2 Click again in the **Visible** column for level **2:Solid** to toggle the level display on.

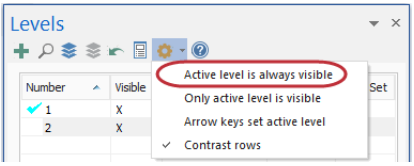
3 Try turning off the display of level **1:Wireframe**.



When **Active level is always visible** is selected in **Display options**, you cannot turn off the active level display in the graphics window.

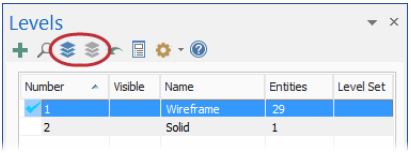
CAUTION: Turning off the display of the active level while you are working in that level is not recommended. However, it may occasionally be necessary.

4 Click **Display options** and deselect **Active level is always visible**.



5 Use **Turn all levels off** and **Turn all levels on** options to toggle the display of all levels on or off.

6 Select **Active level is always visible** again.

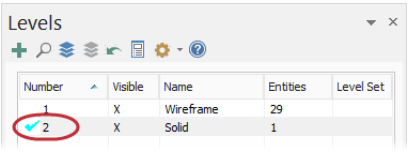


7 Make sure all levels are visible before continuing on to the next exercise.

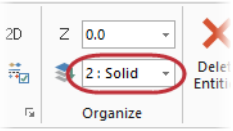
Exercise 9-3: Changing the Active Level

Any geometry that you create is always placed on the active level. There can only be one active level at a time, but you can change the active level as often as necessary to work with the part. In this exercise, you change the active level using several methods.

1 In the Levels Manager, click once in the **Number** column of level **2:Solid** to set it as the active level. A checkmark indicates that it is now the active level.

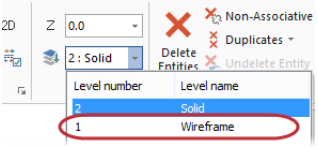


The level field located in the **Organize** group on the **Home** tab also shows that level **2:Solid** is the active level.



2 Select level number **1:Wireframe** from the levels drop-down to make it the active level.

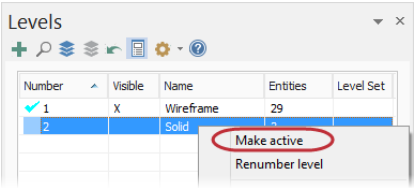
A checkmark appears in the **Number** column for level **1**.



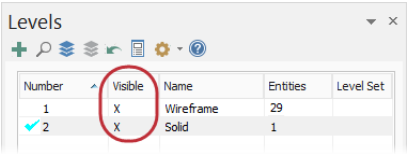
3 In the Levels Manager, turn off the visibility of level **2:Solids**.

4 Position the cursor anywhere in the row for level **2:Solids**, right-click and choose **Make active**.

A checkmark appears in the **Number** column for level **2**.



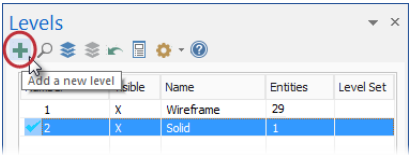
Level **2:Solids** is also visible because the Levels Manager display option, **Active level is always visible** is selected.



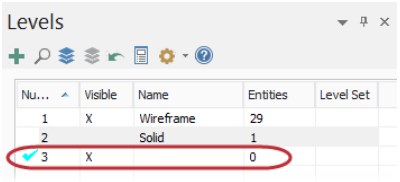
Exercise 9-4: Creating a Level and Assigning Entities

In this exercise, you create and name a level, and then assign entities to that level.

1 In the Levels Manager, click **Add a new level**.

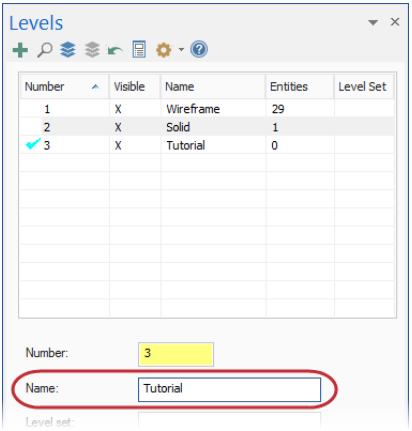


Mastercam adds a new level to the Levels Manager grid and sets it as the active level.



2 In the **Name** field, type **Tutorial**.

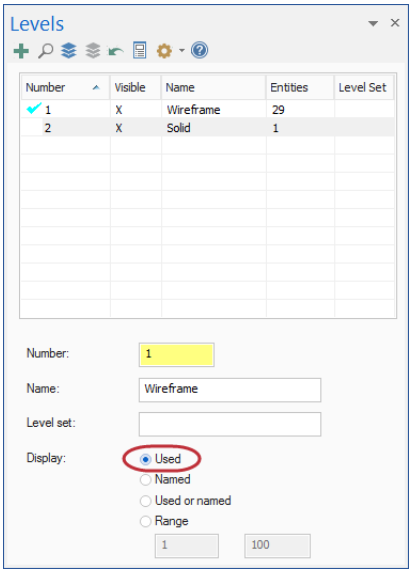
The Levels Manager grid updates to show the new name. Although level names are optional, descriptive names are helpful.



3 Make level **1:Wireframe** the active level.

4 Use the **Display** options in the lower section of the Levels Manager to control the visibility of levels. You can show only used levels (those assigned to entities), levels that are named, (regardless of whether they are used), either used or named levels, or limit the display to a range of level numbers.

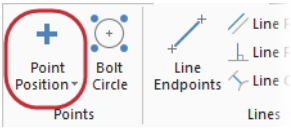
5 Click **Used** and notice that level **3:Tutorial** is no longer visible because there are no entities assigned to it.



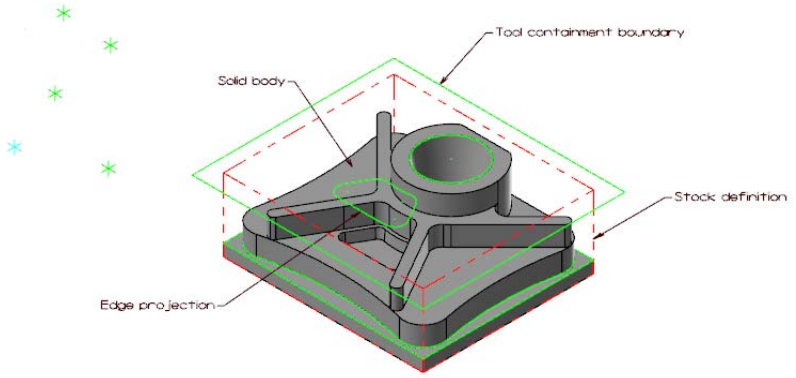
6 Click **Used or named** to restore visibility of all levels.

7 Make level **3:Tutorial** the active level.

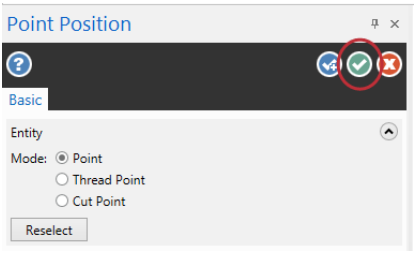
8 Select **Point Position** on the **Wireframe** menu.



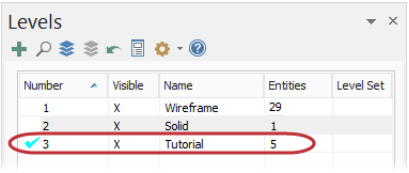
9 Click a few times in different places in the graphics window to create some points.



10 Click **OK** on the Point Position function panel to exit the function.



11 Verify that the new geometry was created on level **3:Tutorial**. In the Levels Manager the number of **Entities** is not **0**.



NOTE: Your number of points may be different than what is shown in the previous illustrations.

12 Practice turning level displays on and off and changing the main level.

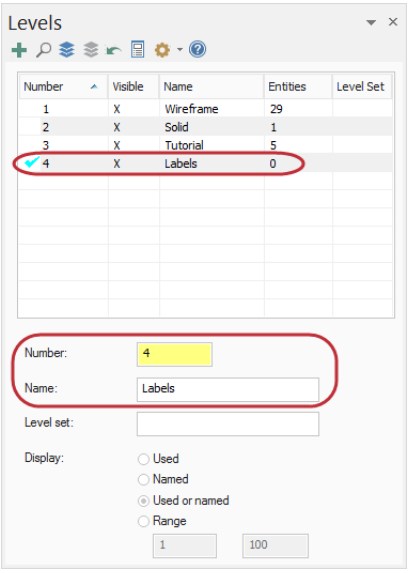
When you are ready, turn on the visibility for all levels and continue with the next exercise.

Exercise 9-5: Moving Entities to a Different Level

In this exercise, you create a new level using a different method and move entities from one level to another. You can use the same basic procedure to copy entities to a different level.

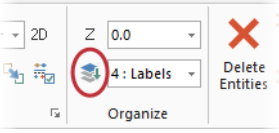
1 In the Levels Manager, enter **4** in the **Number** field, and then enter **Labels** for the level **Name**.

The new level, **4:Labels** becomes the active level.



2 Make level **1:Wireframe** the active level.

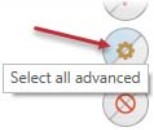
3 On the **Home** tab, click **Change Level**.



4 Mastercam prompts you to select entities. Use the following steps to select all labels located on level **1:Wireframe**.

a Choose the Quick Mask, **Select all advanced**.

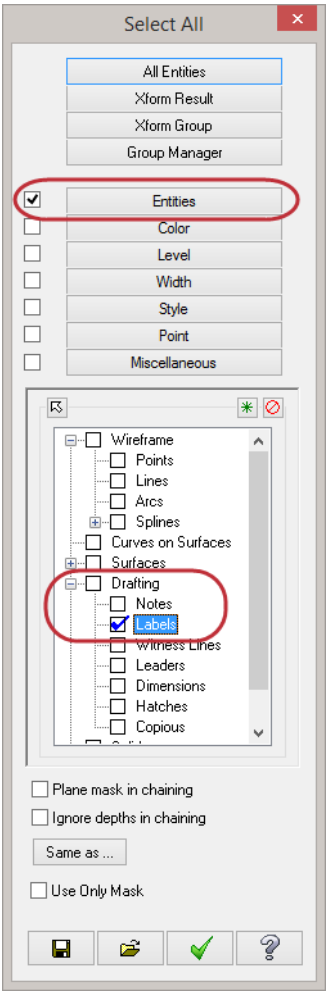
The Select All dialog box displays.



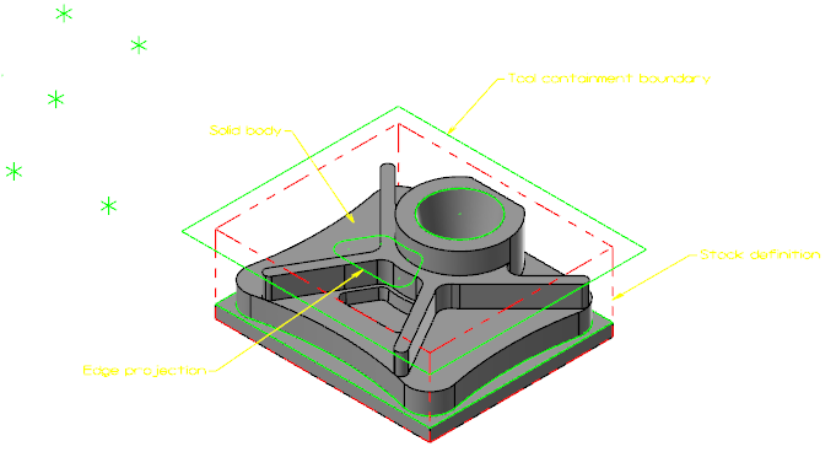
b In the Select All dialog box, create a selection mask for all of the label entities.

A selection mask is a defined set of criteria that you use to quickly select entities in the graphics window.

- Select the **Entities** checkbox.
- Expand the **Drafting** node and select **Labels** in the list.
- Click **OK**.



In the graphics window, Mastercam highlights all the notes, indicating that they are all selected.

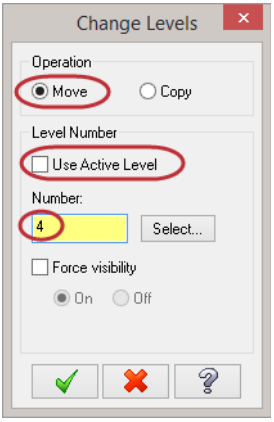


5 Press [**Enter**] or choose **End Selection** located below the Selection Bar.

6 The Change Levels dialog box displays.

TIP: You can also use general selection methods to pre-select entities before choosing the **Change Level** option. When you pre-select entities, Mastercam does not prompt you to select additional entities and you advance directly to the Change Levels dialog box.

7 In the Change Levels dialog box complete the following steps:



   a Choose **Move**.

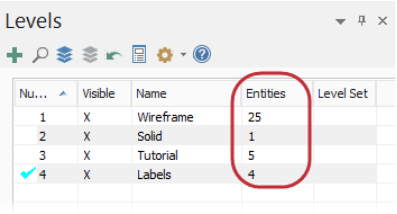
   b Deselect the **Use Active Level** checkbox.

   c Type **4** in **Number**.

   d Click **OK**.

8 In the Levels Manager, verify that level **4:Labels** now contains the four label entities that were on level **1**.

   Level **1:Wireframe** contains four fewer entities.



9 Save your part.

You have now completed Lesson 9 of the *Introduction to Mastercam* tutorial. In the next lesson, you will learn more about views and planes.

LESSON 10
Understanding Views and Planes

Mastercam uses a 3D Cartesian coordinate system to locate your work in three-dimensional space. This means that geometry and toolpath positions are expressed in terms of three coordinate axes: X, Y, and Z. Each axis is signed, which means it has a positive and negative direction.

In previous lessons, you learned about standard views and planes. In this lesson, you learn more about creating your own planes and using them for geometry creation.

Lesson Goals

- Understand views and planes.
- Customize the Planes Manager.
- Adjust follow rules.
- Create a custom plane.
- Use a custom plane for geometry creation.
- Create a new plane using the dynamic gnomon.

Exercise 10-1: Exploring the Planes Manager

You use views and planes in Mastercam for many drawing and machining purposes.

A *plane* is any two-dimensional slice of a 3D coordinate system. Examples of planes include the XY plane in a 3D coordinate system, or a face of your part, no matter its angle.

A *view* is a plane with an origin and orientation. For example, the Left side view and Right side view are both aligned with the same plane; but a clockwise arc in one view is the opposite of a clockwise arc in the other view.

Mastercam includes a number of pre-defined views, which you explored in Lesson 7. These include Top, Front, Right, Isometric, and others.

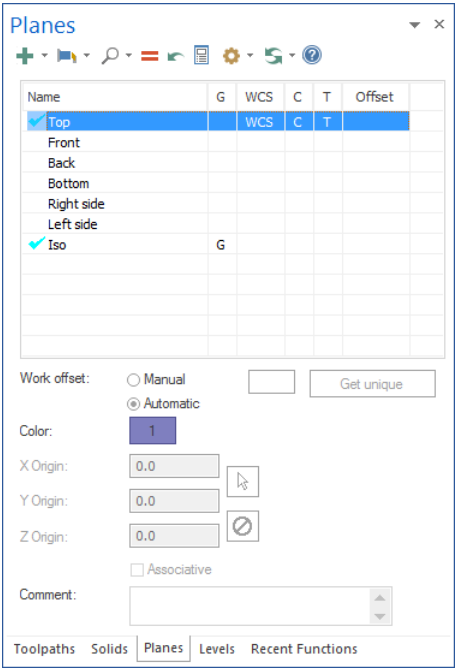
The work coordinate system (WCS) refers to the alignment of the coordinate system itself. You can choose to align the coordinate system axes with any plane you wish. When this happens, you map the XY plane to the plane of the view. The origin of the view becomes your new (0,0,0) point. The view becomes the Top plane in the new working coordinate system.

NOTE: If you would like to learn more about the work coordinate system, try the *Introduction to the Work Coordinate System* tutorial located on our website.

This section introduces some ways planes are used and some ways to access them. You can use views and planes for three main functions:

- **Graphic views (Gviews)**— A Gview determines the angle from which you are looking at the part in the graphics window.
- **Construction planes (Cplanes)**—When you draw geometry, the Cplane is the plane in which the geometry is created. This does not have to be the same as the Gview. For example, you can look at your part in Isometric Gview, while drawing geometry in the Front Cplane.
- **Tool planes (Tplanes)**— This is the plane that is typically normal to the tool axis. Tplanes are only used when creating toolpaths. Tool planes determine the tool orientation. In almost all cases, your Cplane will be the same as your Tplane (the most common exceptions are mill/turn operations).

You use Planes Manager to select, edit, create, and manage planes.



Some of the functions of the Planes Manager include:

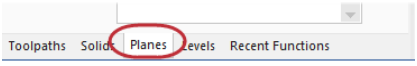
- Creating new planes
- Setting Cplanes, Tplanes, and WCS to selected planes
- Setting or changing the origin of planes
- Assigning work offsets to planes

In this exercise you will open the Planes Manager and experiment with display options and follow rules.

1. Open `BRACE.mcam`, which was provided with the tutorial. Save the file with a new name.

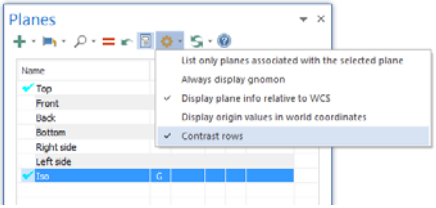
2. If necessary, click **Outline Shaded** on the Status Bar to show the part as a solid.

3. Select the **Planes** tab to bring the Planes Manager to the front. If the Planes tab is not displayed, select **Planes** on the **View** tab.



4. Click **Display options**, **Always display gnomon.**

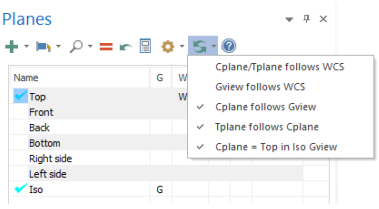
   The gnomon for the currently selected plane displays in the graphics window whether or not the Planes Manager has focus.



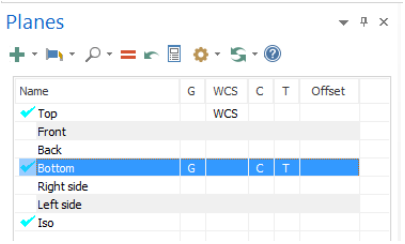
5. Choose **Display options**, **Contrast Rows** to customize the planes grid by shading every other used row.

6. Click the **Follow rules** drop-down to view the current settings as shown in the illustration. With the current settings, when you change the Gview of a plane, the Cplane and Tplane will follow.

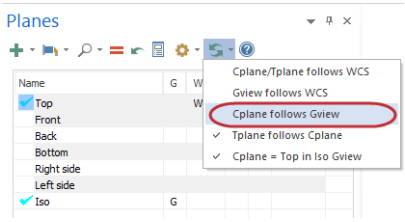
   Do not alter any settings.



7 Click in the **G** column of the **Bottom** plane to set the Gview to bottom. Note that Cplane and Tplane follow the Gview as directed by the follow rules.

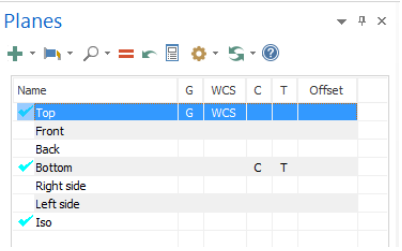


8 Choose the **Follow rules** drop-down and deselect **Cplane follows Gview**.

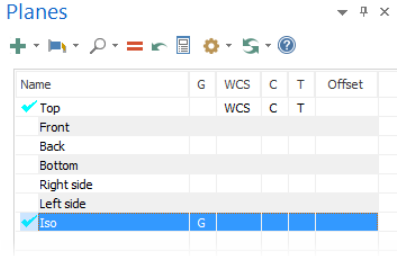


9 Click in the **G** column of the **Top** plane to set the Gview to top. Note that Cplane and Tplane no longer follow the Gview as directed by the new follow rules.

10 Click the **Follow rules** drop-down and reselect **Cplane follows Gview**.



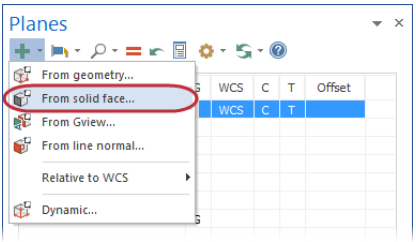
11 Click in the **G** column of the **Iso** plane to return the Gview to isometric. Note that Cplane and Tplane remain in the Top plane as the follow rule, **Cplane = Top in Iso Gview** is selected.



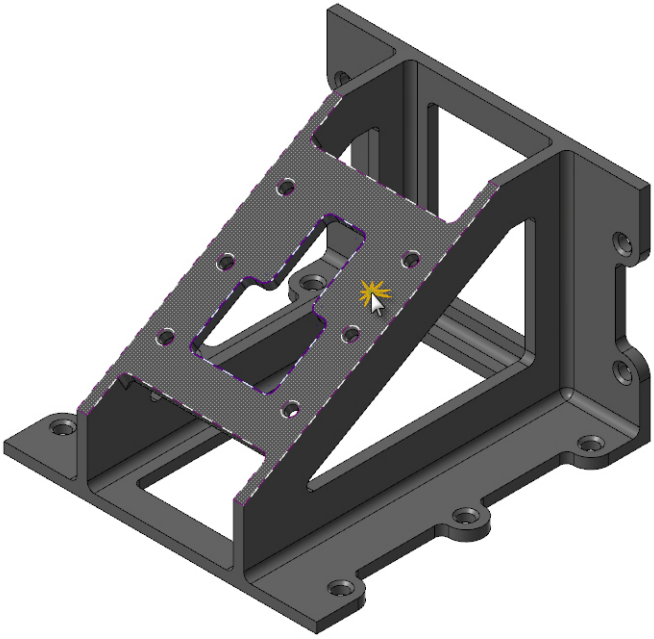
Exercise 10-2: Creating a Custom Plane

In this exercise, you create a custom plane aligned with the slanted face of the part and add it to the list of system planes.

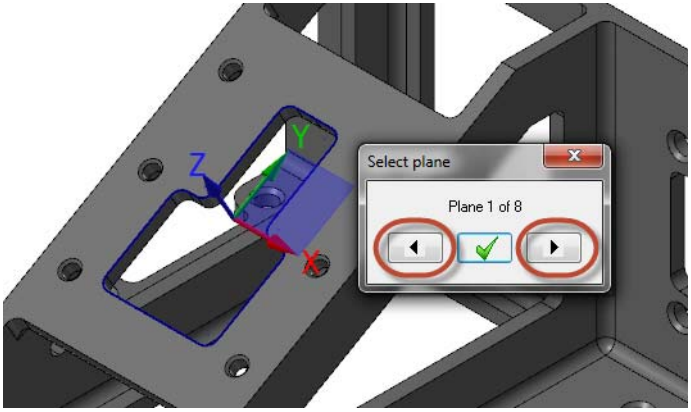
1 Select **From solid face** in the **Create a new plane** drop-down.



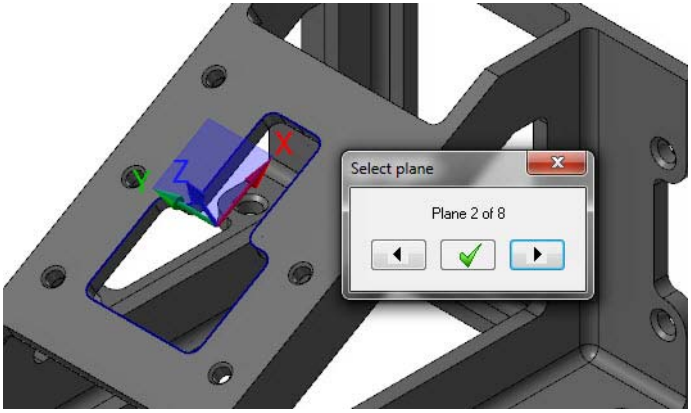
2 Select the slanted face of the part, shown below:



3 In the Select plane dialog box, click the arrows to cycle through the possible views. For most applications, it make sense to have +Z pointing away from the part.



4 Cycle to the view shown in the following illustration.



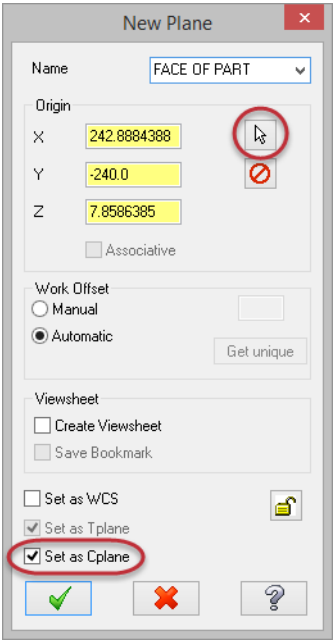
5 Click **OK** in the Select plane dialog box.

The New Plane dialog box opens.

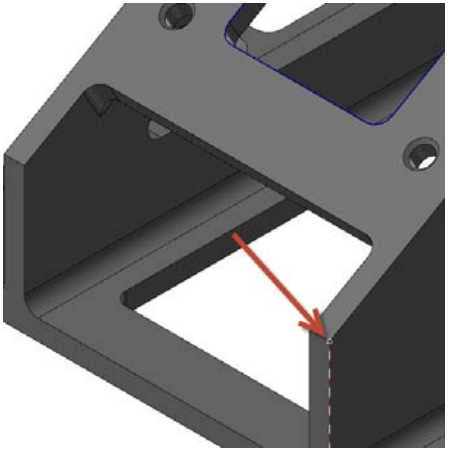
6 Enter **FACE OF PART** as the **Name** of the new plane.

7 Select **Set as Cplane**.

8 Click **Select** to choose a new point for the origin.

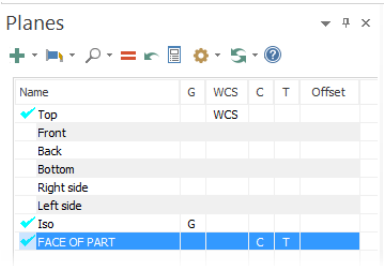


9 Select the point at the lower-right corner of the face.



10 Click **OK** to close the New Plane dialog box.

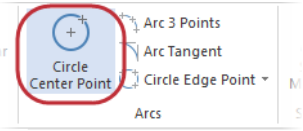
Your new plane, **FACE OF PART** displays in the planes grid.



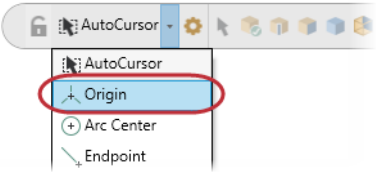
Exercise 10-3: Using a Custom Plane for Drawing Geometry

In this exercise, you create geometry using the new Cplane. You see that the new plane determines the orientation of the geometry. You then set the Gview to the new plane.

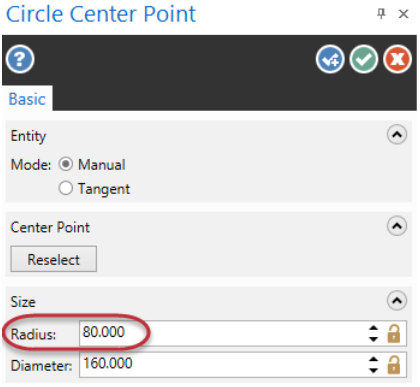
1 Select **Circle Center Point** from the **Wireframe** tab.



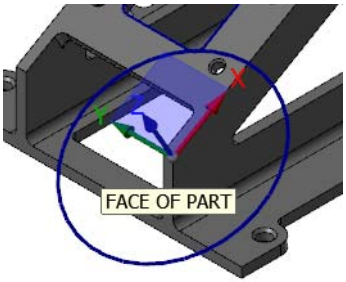
2 Select **Origin** from the **AutoCursor** drop-down on the Selection Bar.



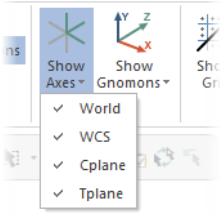
3 In the Circle Center Point function panel, enter a Radius of **80.0** and then click **OK**.



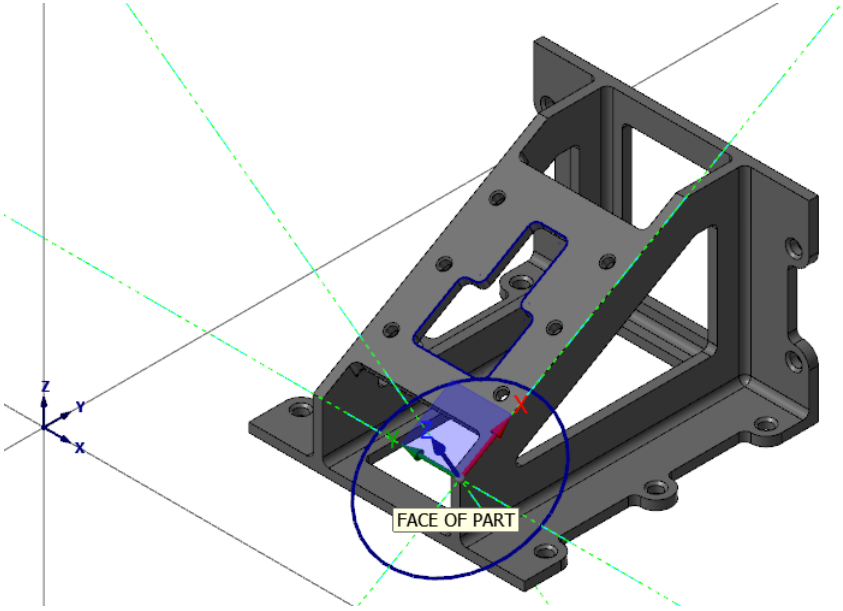
Mastercam creates a circle that is aligned with the face of the part. It is centered on the origin on the custom plane not the system origin.



4 Click **View**, **Show Axes** and turn on all the axes.

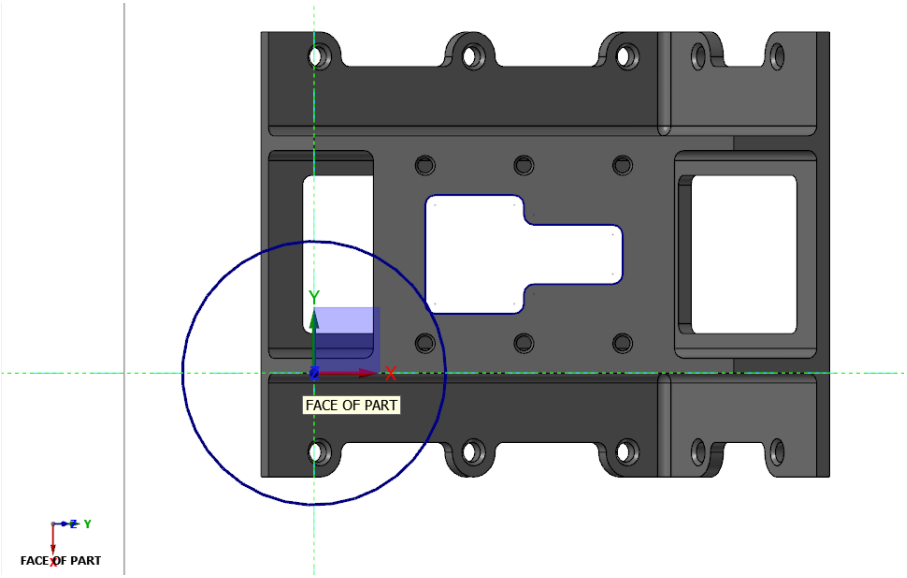


5 If necessary, press [**F9**] to display the XYZ axes. Each axes type displays in a different color. Since Cplane and Tplane are the same, the axes display as dotted lines. Experiment by turning individual axes on and off.



6 In the Planes Manager, click in the **G** column of the **FACE OF PART** plane to set the Gview.

You are now looking straight down into the face of the part. The Gview is aligned with the custom plane that you just created.



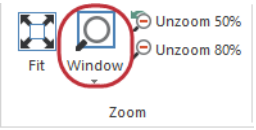
7 Save your part.

Exercise 10-4: Creating a New Plane Using the Dynamic Gnomon

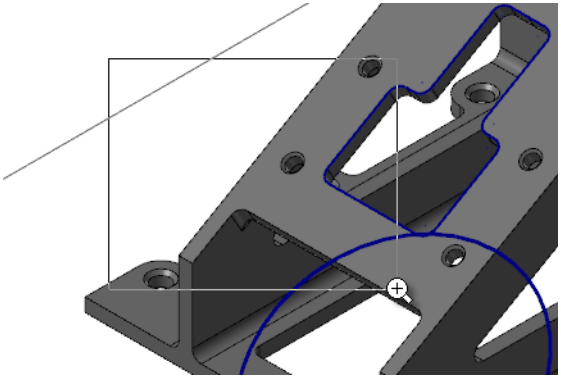
In this exercise you will create a new plane using the on-screen dynamic gnomon. When creating a new plane using this method, the gnomon is initially oriented to the current Gview.

1 In Planes Manager, click the **G** column in the **Iso** row to return the part to isometric view.

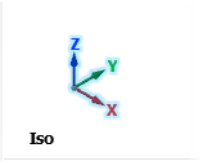
2 Click **Window** on the **View** tab.



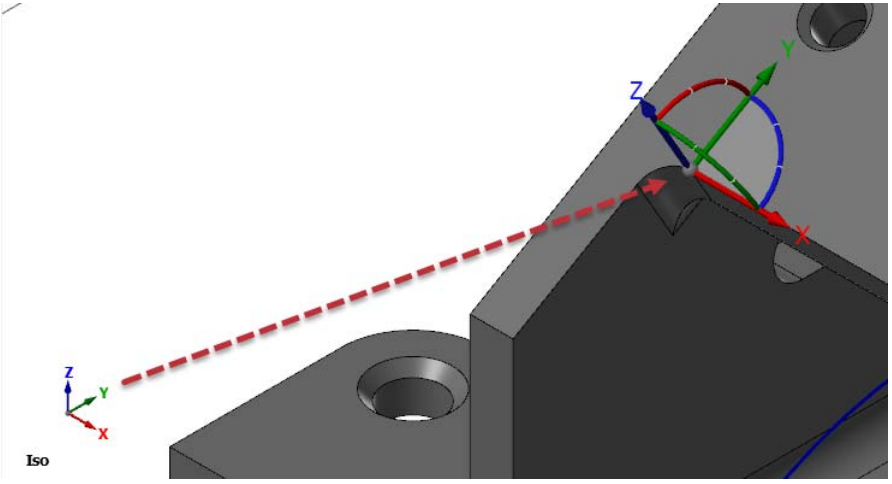
3 Draw a box around the area of the part shown in the following illustration to zoom in.



4 Hover over the on-screen, dynamic gnomon until it glows.



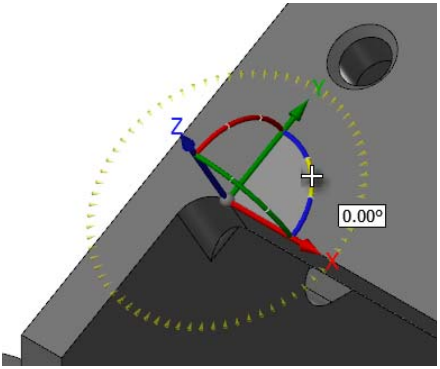
5 Click and drag the gnomon to the position shown in the following illustration. Click to set the position.



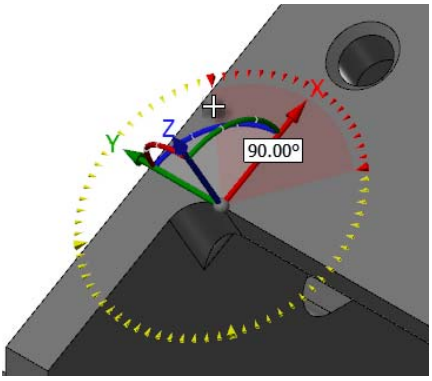
The Dynamic Plane dialog box opens.

The gnomon is initially oriented to the current Iso Gview.

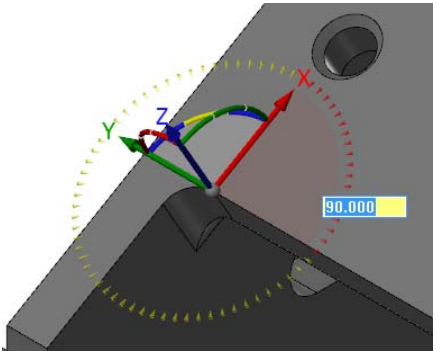
6 To change the orientation of the dynamic gnomon, hover over the blue arc until the rotational compass appears.



7 Click the blue arc and rotate the gnomon from within the compass until it is at 90 degrees. Click to set the location. (Rotating within the compass snaps in angular increments.)

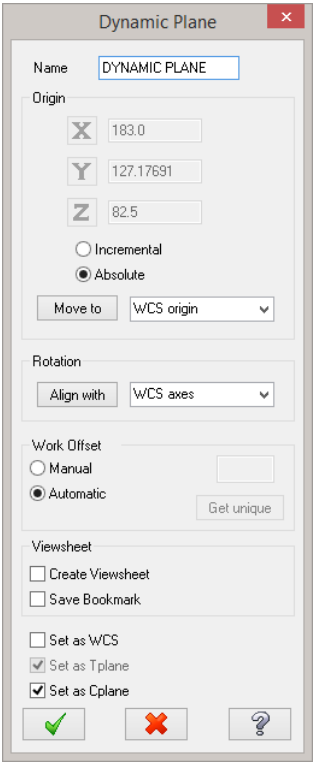


Alternately you can enter **90.00** in the on-screen edit field and press [**Enter**] twice.

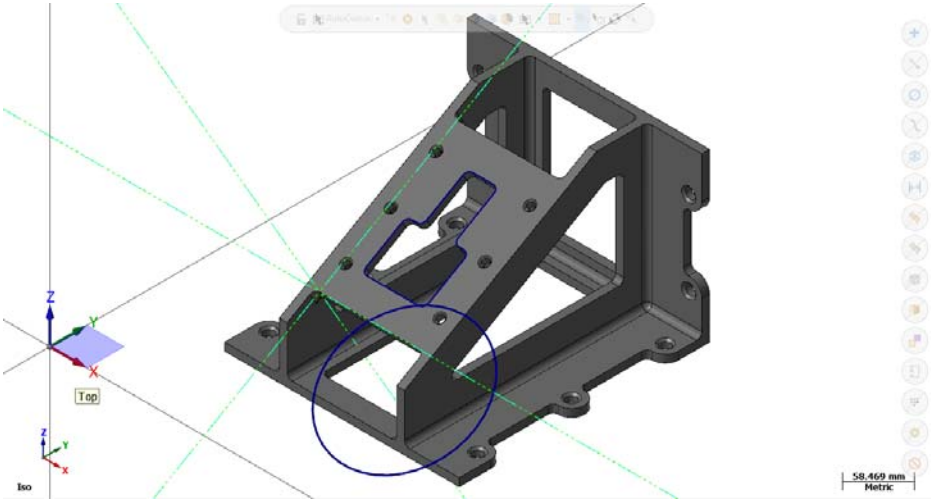


8 In the Dynamic Plane dialog box, type **DYNAMIC PLANE** as the **Name** of the plane.

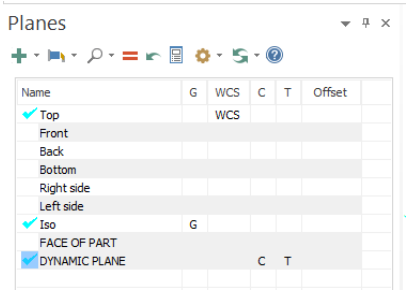
9 Click **OK** to close the Dynamic Plane dialog box.



The Cplane and Tplane axes indicate the location of the new plane origin as shown in the following illustration.



10 **DYNAMIC PLANE** appears in the Planes Manager designated as the Cplane and Tplane.



Conclusion

Congratulations! You have completed the *Introduction to Mastercam* tutorial. Now that you have mastered the skills in this tutorial, explore Mastercam's other features and functions.

You may be interested in other tutorials that we offer. The Mastercam tutorial series is in continual development, and we will add modules as we complete them. Visit our website, or select **Help, Tutorials** from the **File** tab to see the latest publications.

Mastercam Resources

Enhance your Mastercam experience by using the following resources:

- *Mastercam Help*—Access Mastercam Help by selecting **Help, Contents** from Mastercam's **File** tab or by pressing [**Alt+H**] on your keyboard. Also, most dialog boxes, function panels, and ribbon bars feature a Help button that opens Mastercam Help directly to related information.
- *Mastercam Reseller*—Your local Mastercam Reseller can help with most questions about Mastercam.
- *Technical Support*—CNC Software's Technical Support department (860-875-5006 or support@mastercam.com) is open Monday through Friday from 8:00 a.m. to 5:30 p.m. USA Eastern Standard Time.
- *Mastercam Tutorials*—CNC offers a series of tutorials to help registered users become familiar with basic Mastercam features and functions. The Mastercam tutorial series is in continual development, with new modules added as we complete them. Visit our website, or select **Tutorials** from the **Help** menu to see the latest publications.
- *Mastercam University*—CNC Software sponsors Mastercam University, an affordable online learning platform that gives you 24/7 access to Mastercam training materials. Take advantage of more than 180 videos to master your skills at your own pace and help prepare yourself for Mastercam Certification. For more information on Mastercam University, please contact your Authorized Mastercam Reseller, visit www.mastercamu.com, or email training@mastercam.com.
- *Online communities*— You can find a wealth of information, including many videos, at www.mastercam.com. For tech tips and the latest Mastercam news, follow us on Facebook (www.facebook.com/mastercam), Twitter (www.twitter.com/mastercam), or Google+ (plus.google.com/+mastercam). Visit our YouTube channel to see Mastercam in action (www.youtube.com/user/MastercamCadCam)!

  Registered users can search for information or ask questions on the Mastercam Web forum, forum.mastercam.com, or use the knowledge base at kb.mastercam.com.

  To register, select **Community**, **Link Account** from the **File** tab, and follow the instructions.

Mastercam Documentation

Mastercam installs the following documents in the `\Documentation` folder of your Mastercam installation:

- *What's New in Mastercam 2017*
- *Mastercam 2017 Installation Guide*
- *Mastercam 2017 Administrator Guide*
- *Mastercam 2017 Transition Guide*
- *Mastercam 2017 Quick Reference Card*
- *Mastercam 2017 ReadMe*

Contact Us

For questions about this or other Mastercam documentation, contact the Technical Documentation department by email at techdocs@mastercam.com.

Attention! Updates may be available.
Go to Mastercam.com/Support for the latest downloads.

cnc software, inc.

671 Old Post Road
Tolland, CT 06084 USA
www.mastercam.com