



# Introduction to Mastercam

**March 2015**

***Mastercam***® ***X***<sup>9</sup>

## **Mastercam® X9 Introduction to Mastercam**

Date: March 2015

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Software: Mastercam X9

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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 learn and explore some of Mastercam's interface and basic concepts. The tutorial is split into two sections:

- **Mastercam Overview**— Section 1 gives you a broad look at Mastercam, including System Configuration, Customization, and Mastercam's interface.
- **Mastercam's Graphics Window**— Section 2 explores Mastercam's graphics window, using viewing options, and using levels.

## *Tutorial Goals*

- Gain an understanding of some of Mastercam's functions.
- Set up a configuration file and a workspace file.
- Manipulate Mastercam's graphics window to view your part.



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**IMPORTANT:** Screen colors in the tutorial pictures were modified to enhance image quality; they may not match your Mastercam settings or the tutorial results. These color differences do not affect the lesson or the exercise results.

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## 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 (EMCX-9) is different from Mastercam (MCX-9), 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.

## **2** MASTERCAM X9/ *Introduction*

- 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](http://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.



## Section 1

# Mastercam Overview



# The Mastercam Interface

Mastercam's interface consists of standard elements, including toolbars, a status bar, and a work area. It also features special elements, such as ribbon bars and the Managers.

This section briefly touches on the elements that make up the Mastercam interface to give you a better understanding of how Mastercam works.

## *Exploring Mastercam's Interface*

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

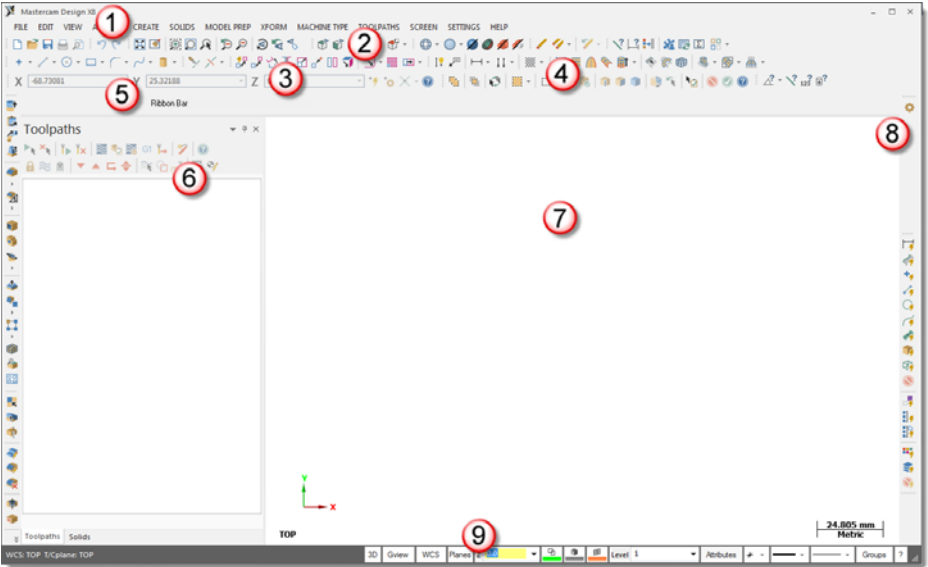
Or

- Launching Mastercam from the Windows Start menu.

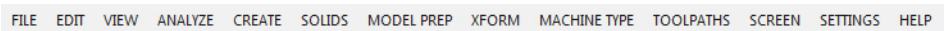


First, you explore Mastercam's interface. Mastercam's interface consists of many distinct elements that are vital to creating and machining your parts.

The image below marks the elements that make up the Mastercam interface. Each section corresponds with a number and is described in further detail below.



**1 Menu bar** Contains menus that let you access all Mastercam features and functions. Click or hover over the menu name to view its commands.



**2 Toolbars** Groupings of buttons with related functions.

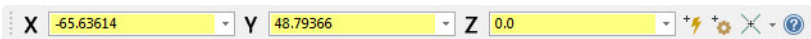
*File*



*Utilities*



**3 AutoCursor toolbar** Allows you to manually enter X, Y, and Z coordinates or 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.



**4 General Selection toolbar** For most Mastercam functions, use this toolbar to select entities in the graphics window. General Selection is active any time you

are not already in a function such as Sketcher, Analyze, or View Manipulation. It is also active during functions that prompt you to select entities, as in toolpath creation functions.

*Standard Selection*

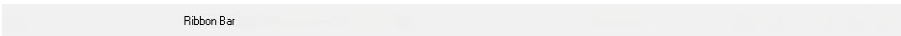


*Solid Selection*

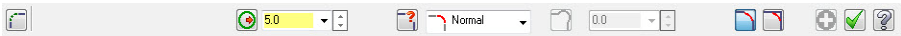


- 5 **Ribbon bars** Use Mastercam's ribbon bars to create and edit geometry. Ribbon bars function somewhat like dialog boxes but look similar to toolbars. You cannot undock or move ribbon bars.

*Default state*

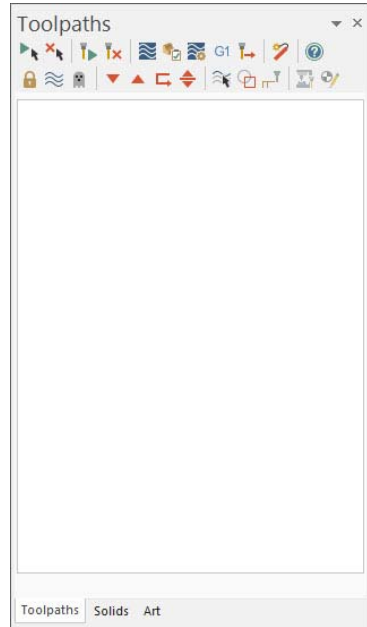


*In-use state*



## 6 Managers

- **Toolpaths Manager:** Lists the toolpath groups and machine types for the current file. Use the Toolpaths Manager to generate, sort, edit, regenerate, and post any operation.
- **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.
- **Art Manager:** Manages the elements of the current Art model.



- 7 Graphics window** The graphics window is 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), the views and planes in which you are working (Gview, Cplane, Tplane, and WCS), and the coordinate axes for the current view or plane.

## 8 Most Recently Used toolbar (MRU)

Use the MRU toolbar to quickly access Mastercam functions that you have used previously. The MRU toolbar is vertically docked to the right of your graphics window by default.

The buttons in the MRU toolbar automatically update as you use Mastercam functions.



- 9 **Status bar** Provides quick access to functions that let you modify attributes, levels, groups, and orientation (views and planes) of geometry and toolpaths in the graphics window. The left side of the Status bar displays information about the current planes.



In the first lesson, you learn more about the Toolpaths Manager and its display settings.

# LESSON 1

## Working with the Toolpaths Manager

You use the Toolpaths Manager to generate, edit, regenerate, verify, backplot, and post any operation. It organizes toolpath information in machine and toolpath groups. You can toggle the display of the Toolpaths, Solids, or Art Manager, as well as move it to a new location. These settings are modal, which means that Mastercam remembers the settings even after you close the application.

In this exercise, you use different methods to move, hide, display, and customize the Toolpaths Manager.

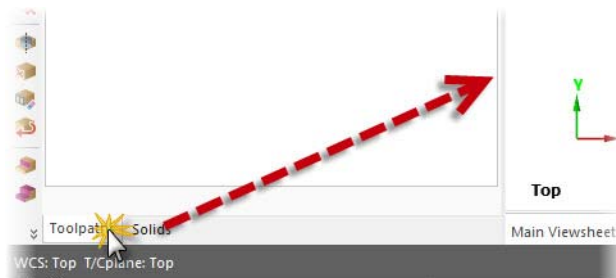
### *Lesson Goals*

- Dock and undock the Toolpaths Manager.
- Hide and display the Toolpaths Manager.
- Customize the Toolpaths Manager.

### *Exercise 1: Moving and Docking the Toolpaths Manager*

In this exercise, you move and dock the Toolpaths Manager.

- 1 Drag and drop the Toolpaths Manager into the graphics window by left-clicking and dragging it by its tab.



Like an undocked toolbar, the Toolpaths Manager can freely move (float) anywhere. If the Solids Manager or Art Manager is active, they will still continue to be docked.



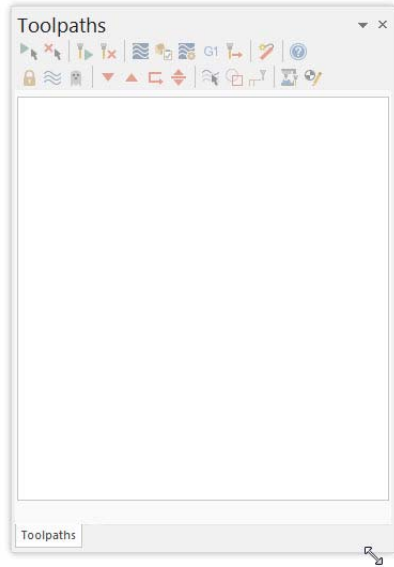
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**TIP:** You can double-click the Manager's title bar or tab to undock or redock it.

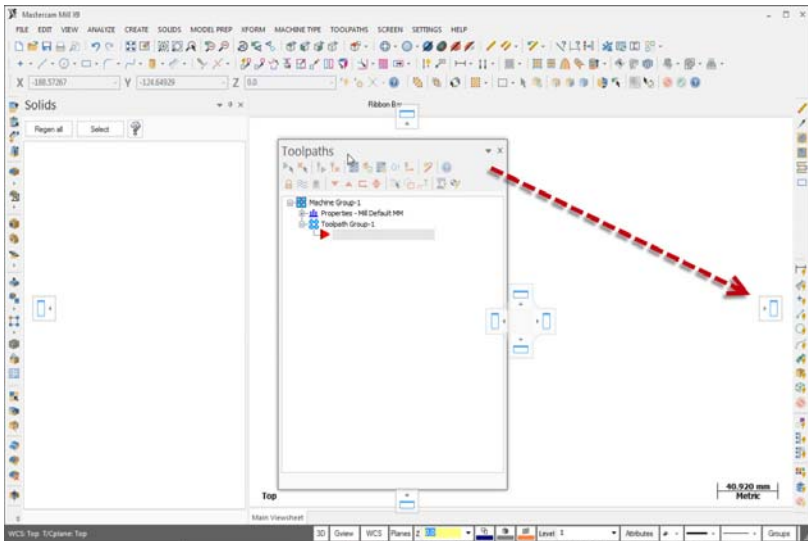
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## 10 MASTERCAM X9/ Working with the Toolpaths Manager

- 2 Resize the Toolpaths Manager by clicking and dragging any of its edges.



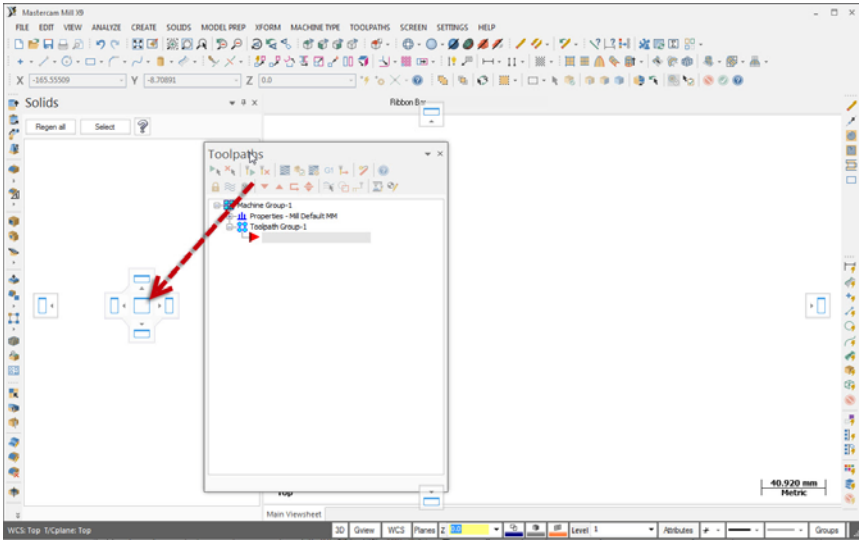
- 3 Drag and drop the Toolpaths Manager onto the guide diamond on the right side of the screen.



The Toolpaths Manager snaps into place as it docks.



- 4 Dock the Toolpaths Manager onto the left side of the graphics window or onto the Solids Manager, where it was docked by default.

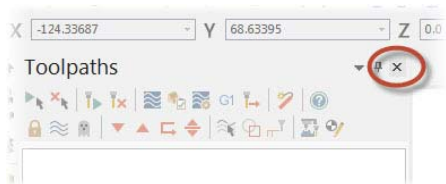


**TIP:** If you work with two monitors, drag and drop the Toolpaths Manager onto the monitor that is not running Mastercam to free the entire graphics window for drawing.

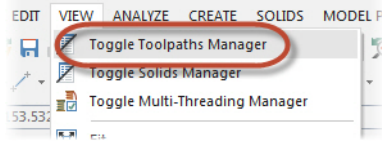
## Exercise 2: Hiding and Displaying the Toolpaths Manager

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

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



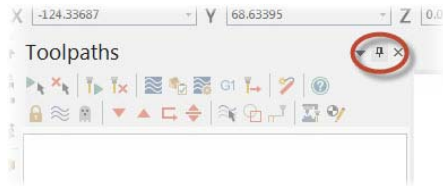
- 2 Re-display the Toolpaths Manager by choosing **View, Toggle Toolpaths Manager**.



**TIPS:**

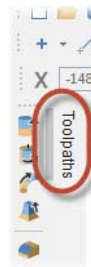
- You can use the keyboard shortcut [**Alt+O**] to toggle the display of the Toolpaths Manager.
- If the Solids Manager and Art Manager are active, the Toolpaths Manager will not display on top of them. You must select the Toolpaths Manager tab at the bottom of the panel to display it.

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



The Toolpaths Manager is now collapsed against the left side of the graphics window.

Hovering over the text will display the Toolpaths Manager again.



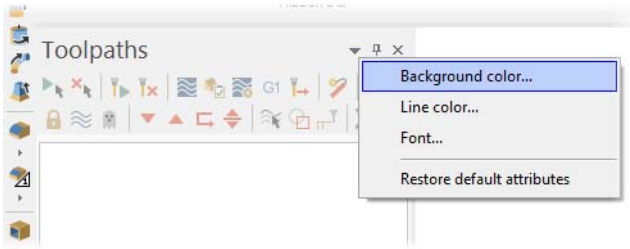
**NOTE:** If you have the Solids Manager and Art Manager displayed, they will also collapse against the graphics window.

- 4 Click the **Auto Hide** button again to display the Toolpaths Manager.

### *Exercise 3: Customizing the Toolpaths Manager Display*

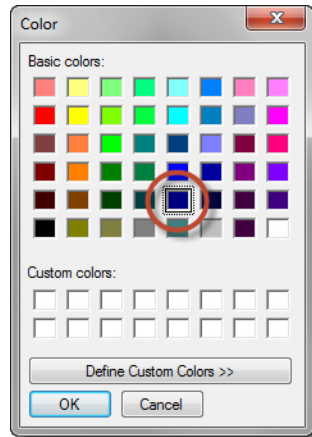
In this exercise, you learn how to customize the display of the Toolpaths Manager, including background color and font style.

- 1 Select **Background color** from the **Options** drop-down menu in the upper right corner. This option allows you to change the background color of the active manager.

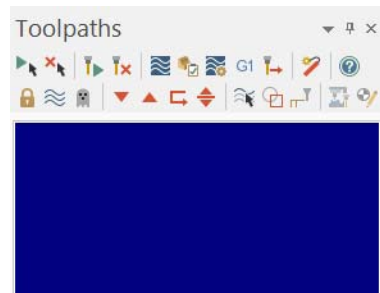


The Color dialog box displays.

- 2 Select the color shown to the right.
- 3 Click **OK**.



The background of the Toolpaths Manager is now blue.





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**TIP:** You set the color for lines, as well as font attributes, in the same drop-down menu.

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- 4 Select **Restore default attributes** to return the settings to their default colors for the remainder of this tutorial.



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

## LESSON 2

# Setting the System Configuration

The System Configuration dialog box defines and manages the configuration files that store Mastercam's settings. With Mastercam, you can change your system configuration or create a new one at any time. It's 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 options that are stored within one config file.

### *Lesson Goals*

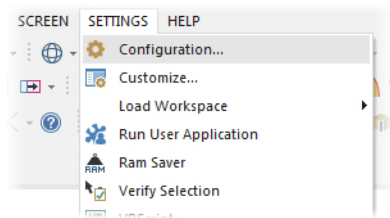
- Create a configuration file.
- Change your configuration settings.
- Set up AutoSave and Backup.

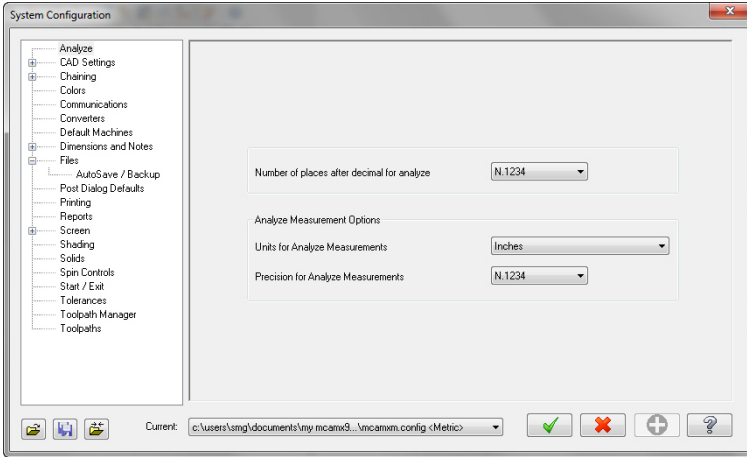
### *Exercise 1: Creating a Configuration File*

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

- 1 Select **Settings, Configuration** from the Mastercam menu.

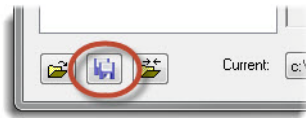
The System Configuration dialog box displays.



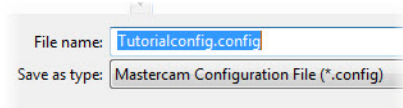


- 2 Click the **Save As** button in the lower left corner.

The Save As dialog box displays.



- 3 Enter **Tutorialconfig** for the file name.



- 4 Click the **Save** button.

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



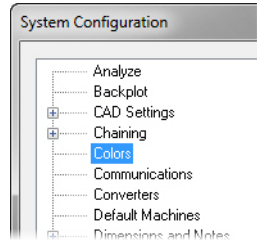
In the following exercises, you save the settings to this configuration file.

### *Exercise 2: Changing System Colors*

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

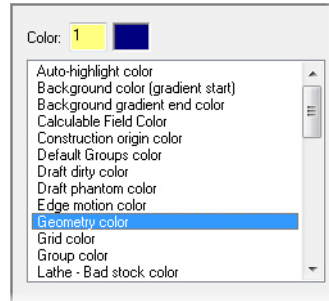
- 1 Select the **Colors** page from the list.

You use the Colors page to customize Mastercam's appearance by setting default colors for the Mastercam interface and geometry.



- 2 Select **Geometry color** from the list in the Colors page.

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



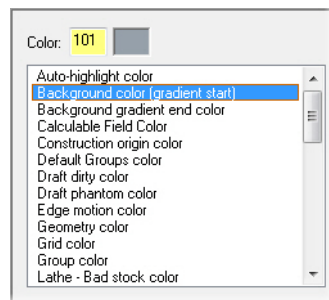
- 3 Enter **163** for the **Color** value and press [Enter].

Wireframe geometry you create will now use this color.



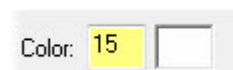
- 4 Select **Background color (gradient start)** from the list.

Color **101** is the current assignment.



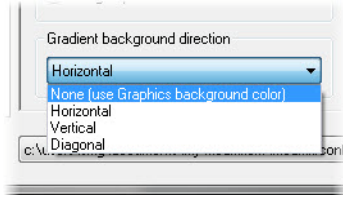
- 5 Enter **15** for the **Color** value and press [Enter].

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



**TIP:** You can also change colors for Geometry, Solids, and Surfaces by using three buttons located on the Status bar.



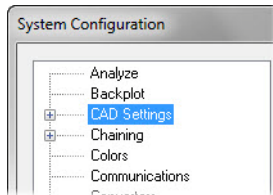
These are just some of the color changes that you can make to customize your Mastercam interface.

### *Exercise 3: Changing CAD Settings*

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

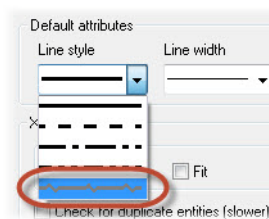
- 1 Select the **CAD Settings** page from the list.

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



- 2 Select the **Line style** shown to the right from the Default attributes section.

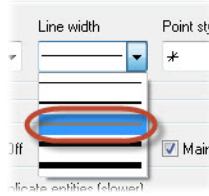
The geometry you create will now use the selected line style.





- 3 Select the **Line width** shown to the right.

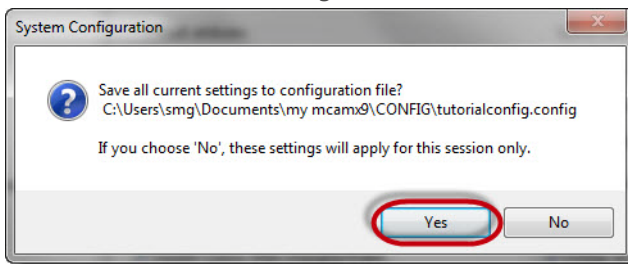
The geometry you create will now use the selected line width.



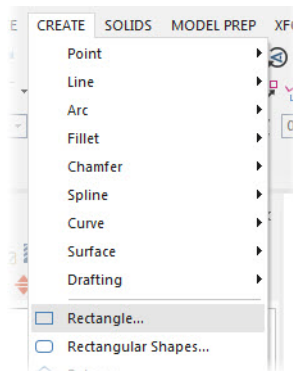
- 4 Click **OK** in the System Configuration dialog box.



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

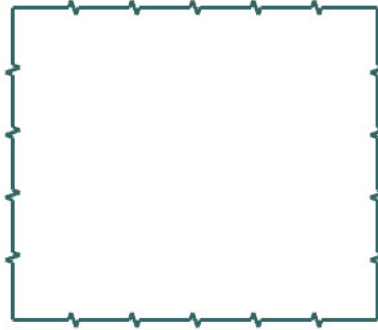


- 6 Select **Create, Rectangle** from the Mastercam menu bar.



- 7 Follow the prompts shown in the upper left corner of the graphics window to create a rectangle.

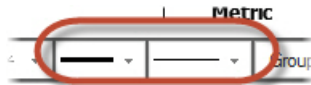
8 Click **OK** in the Ribbon bar.



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



**TIP:** You can also change the line style and width of geometry by using buttons located on the Status bar.

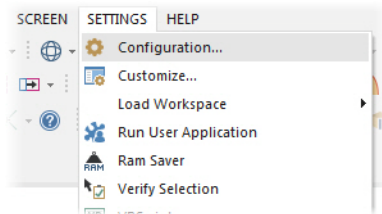


### *Exercise 4: Setting up Autosave and Backup*

When working on a part, you might forget to save the file periodically. Luckily, Mastercam can save your work for you, at intervals that you specify. Mastercam can even save different versions of your files as backups. In this exercise, you learn to set up these functions.

1 Select **Settings, Configuration** from the Mastercam menu.

The System Configuration dialog box displays.



- 2 Expand the **Files** category in the System Configuration dialog box, and select the **AutoSave/Backup** subentry.



- 3 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 **MCX Backup Files** checkbox to activate the automatic backup feature.

You have now set up Mastercam as follows:

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

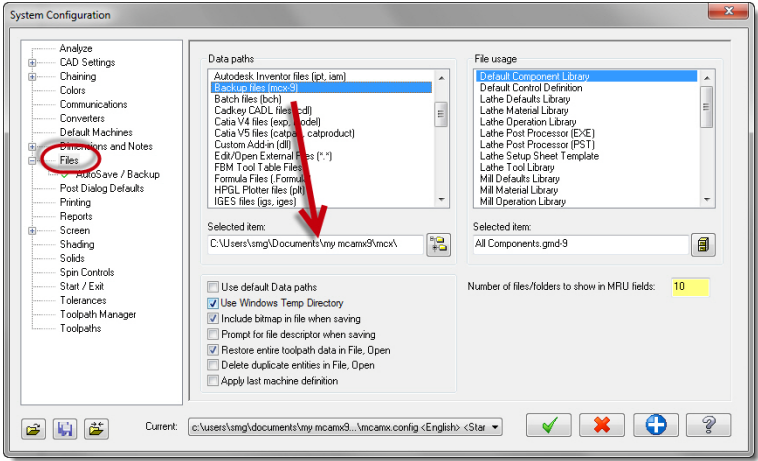
Mastercam will use the new AutoSave and Backup settings for all sessions that use this configuration file.



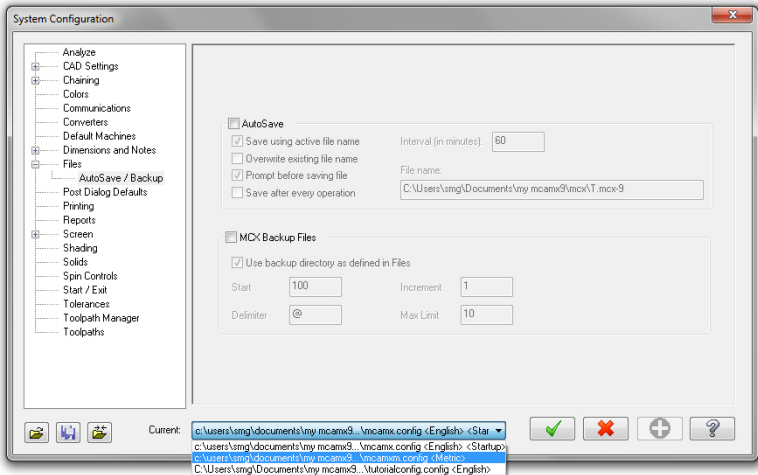
**NOTE:** If you would like to learn more about the individual settings on these pages, or any other System Configuration page click the Help button located in the lower right-hand corner of the dialog box.



**TIP:** You can find your backup files in the folder specified on the Files page of the System Configuration dialog box, as shown below. Click the data path to see the path displayed in the Selected item box.



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



- 5 Click **OK** to accept the changes and exit the System Configuration dialog box.

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



## LESSON 3

# Customizing Your Workspace

In this lesson, you learn more about the Customize dialog box. You use the Customize dialog box to customize your Mastercam workspace, including toolbar layouts, the graphics window context menu, and keyboard shortcuts.

### Lesson Goals

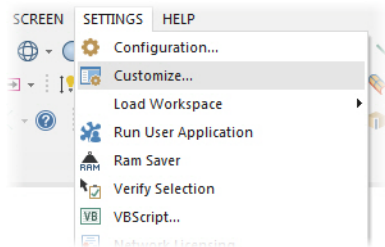
- Create a Workspace file.
- Create, delete, and customize toolbars.
- Hide and display toolbars.
- Customize the graphics window context menu.
- Map Mastercam functions to keyboard shortcuts.
- Set display options for toolbars, menus, tabs, and interface colors.

### Exercise 1: Creating a Workspace File

In this exercise, you create a Workspace (.WORKSPACE) file, which contains your customized Mastercam environment.

- 1 Select **Settings, Customize** from the Mastercam menu.

The Customize dialog box displays.



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**TIP:** You can also right-click in the graphics window or Toolbars area and select **Customize** from the menu to display the Customize dialog box.

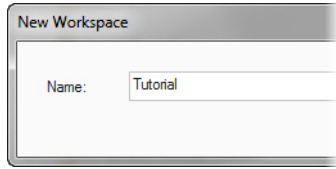
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- 2 Select **New** at the top of the dialog box.

The New Workspace dialog box displays.



- 3 Enter **Tutorial** for the new workspace name.



- 4 Click **OK**. Mastercam creates a new workspace file.

You can use the other options to rename, copy, delete, or reset the workspace file.

In the next exercise, you customize the Mastercam toolbars under the new workspace file.

## Exercise 2: Customizing Toolbars

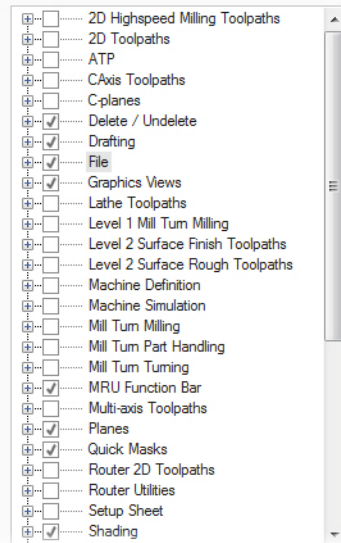
Mastercam's toolbars make accessing functions as easy as a mouse click. However, you might find that you do not use some toolbars or that a toolbar that you need is not displayed. In this exercise, you use the Toolbars tab to hide and display toolbars, as well as create a new one.

- 1 View the list of Toolbars on the right side of the Customize dialog box.

Checked items are currently displayed in Mastercam.

Right-click in Toolbars list for more options.

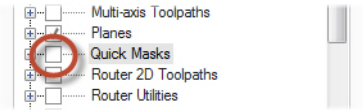
Toolbars:





- 2 Select the checkbox next to **Quick Masks** in the Toolbars list.

The Quick Masks toolbar is located under the MRU toolbar on the right-side of the Mastercam window. By unchecking it, you will notice that the toolbar no longer displays.

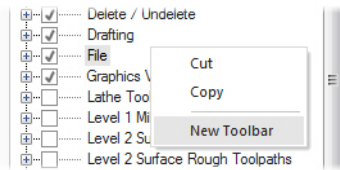


- 3 Select the **Quick Masks** checkbox again to display the toolbar.

You can use these options to hide toolbars that you do not use or need, and to display only the toolbars you use most often. Next, you create a new toolbar.

- 4 Right-click in the Toolbars list and select **New Toolbar** from the menu.

A new toolbar displays, floating in the graphics window. It also displays in the Toolbars list.



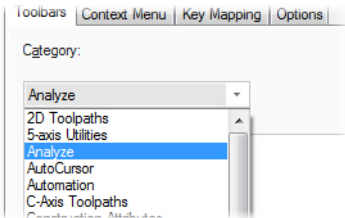
- 5 Enter **Tutorial** for the name and press [Enter]. The Tutorial toolbar displays at the top of the list with an asterisk before it. The asterisk means that the toolbar is a custom toolbar. Next, you populate the toolbar.



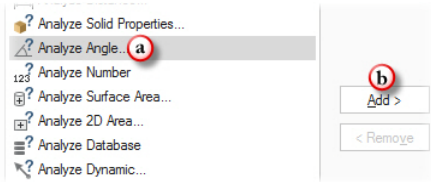
**NOTE:** Right-click on a user created toolbar and select **Rename Toolbar** to change the name.

- 6 Select **Analyze** from the Category drop-down list.

The Category list is now populated by Analyze functions.

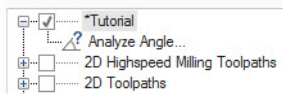


- 7 To add a function to the Tutorial toolbar, do the following:
  - a Select **Analyze Angle** from the list.
  - b Click the **Add** button to add the function to your new toolbar.



**NOTE:** Be sure that **\*Tutorial** is selected in the Toolbar list.

Mastercam adds the Analyze Angle function to the **Tutorial** toolbar.



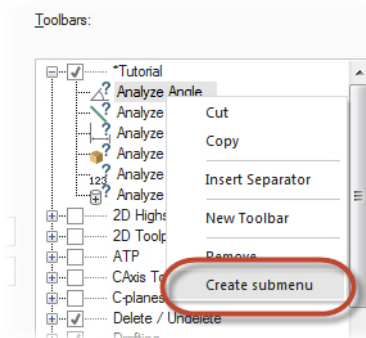
- 8 Repeat Step 7 to add five more Analyze functions to the toolbar.

The toolbar will look similar to the image on the right. The toolbar is displayed horizontally.

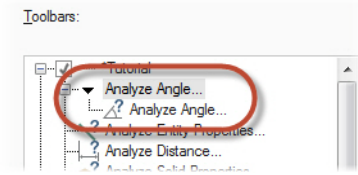


**TIP:** You can make the toolbars vertical by selecting the left edge of the toolbar and dragging the cursor to the right.

- 9 Expand the **Tutorial** toolbar, right-click on **Analyze Angle** and select **Create submenu** from the menu.

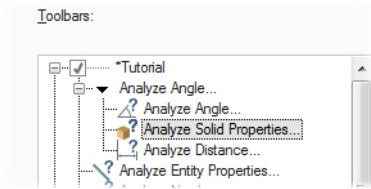


Mastercam creates a submenu underneath **Analyze Angle**. You can add similar functions under one menu for your convenience.



- 10 Drag and drop two functions you added to the Tutorial toolbar to the **Analyze Angle** submenu to add them.

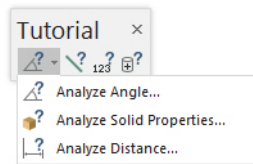
The submenu should look similar to the one shown on the right. Note that some of the functions might be different based on what you chose to add in the previous steps.



**NOTE:** The submenu name may change if you add functions by dragging and dropping them onto the other functions instead of the submenu.

- 11 Click **OK** in the Customize dialog box.
- 12 Select the drop-down next to the Analyze Angle function in the Tutorial toolbar.

Submenus allow you to group similar functions and make your toolbars feel less cluttered.



By creating your own toolbars, you can quickly access functions that you use frequently. You can also customize Mastercam’s default toolbars to fit your needs.

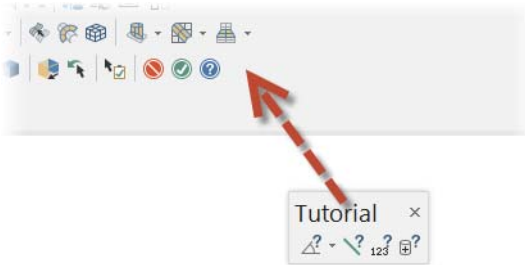
### Exercise 3: Undocking and Docking Toolbars

With Mastercam, you can arrange your toolbars according to your needs. In this exercise, you practice moving the **Tutorial** toolbar created in the previous exercise. Currently, the toolbar is “floating” in the graphics window. You can move floating toolbars anywhere in the graphics window.

- 1 Select the **Tutorial** toolbar by left-clicking and holding the name of the toolbar.



- 2 Drag and drop the **Tutorial** toolbar near the other horizontally docked toolbars.



The toolbar snaps into place.

- 3 Select the left side of the **Tutorial** toolbar and drag it to the graphics window to undock the toolbar.

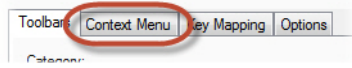


- 4 Select **Settings, Customize**. The Customize dialog box displays.
- 5 Deselect the checkbox next to the **Tutorial** toolbar in the Toolbar list to hide the toolbar for the remainder of the lesson.

### *Exercise 4: Customizing the Graphics Window Context Menu*

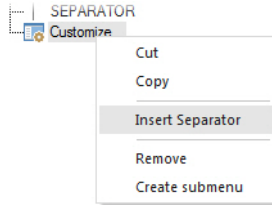
In this exercise, you customize the graphics window context menu that displays when you right-click anywhere in the graphics window.

- 1 Select the **Context Menu** tab.

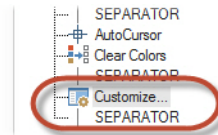


Similar to the Toolbars tab, the categories of functions are displayed on the left side of the dialog box, while the right side contains the Context Menu list.

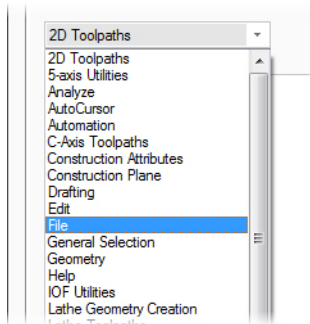
- 2 Right-click on **Customize** in the Context Menu list and select **Insert Separator**.



A separator line appears after **Customize**.

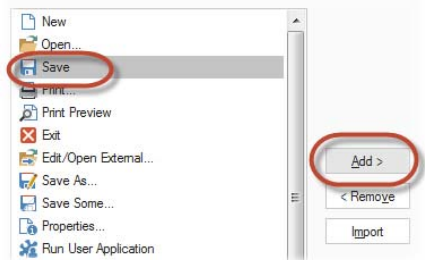


- 3 Select **File** from the Category drop-down list.

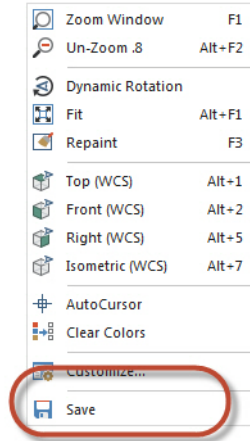


- 4 With **SEPARATOR** selected, select the **Save** function and click **Add**.

The **Save** function is now part of the context menu.



- 5 Click **Apply** to save these changes to the right-click menu.
- 6 Right-click in the graphics window to see the updated context menu.



- 7 Press [F3] to repaint the graphics window to clear the right-click widow.  
Customizing the context menu allows you quick access to commonly used functions.

### *Exercise 5: Mapping Functions to Keyboard Shortcuts*

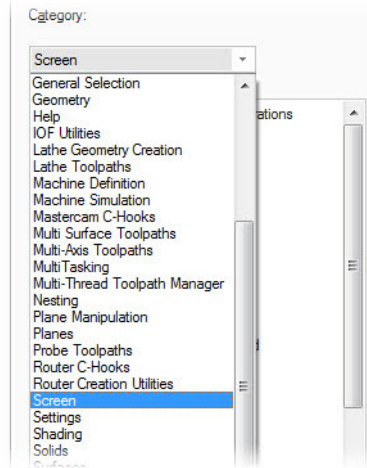
In this exercise, you set a shortcut key to a Mastercam function.

- 1 Select the **Key Mapping** tab.



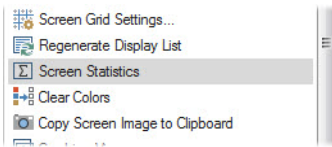
- 2 Select **Screen** from the Category drop-down menu.

The list populates with functions from the Screen menu.

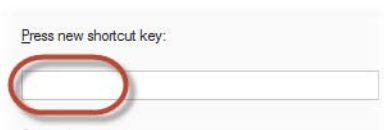


- 3 Select **Screen Statistics** from the list.

On the right side of the page, you will notice that the Current keys list is blank. That is because this function has no shortcut keys assigned to it.



- 4 Select the **Press new shortcut key** field.



- 5 Press **[Shift+Ctrl+H]** to create a new shortcut key.



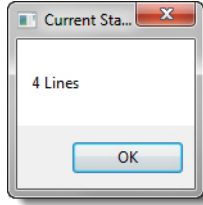
- 6 Click the **Assign** button to assign this shortcut key to the **Screen Statistics** function.



- 7 Click **OK** to exit the Customize dialog box.

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

The Current Statics 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.



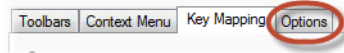
In this case, there are four lines in the graphics window because of the rectangle created in the previous lesson.

- 9 Click **OK**.

### Exercise 6: Setting Mastercam Display Options

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

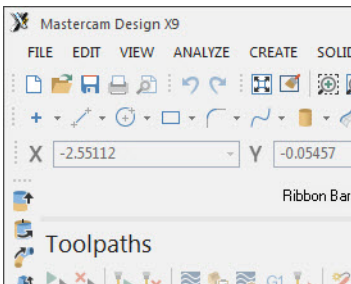
- 1 Select **Settings, Customize** from the Mastercam menu to open the Customize dialog box
- 2 Select the **Options** tab.



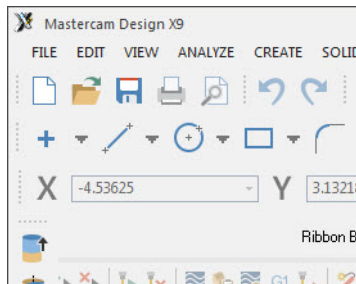
- 3 Under the Toolbars section, check the **Large icons** option.

You will immediately notice a difference, as the toolbar images have been replaced with larger ones.

*Default icons*



*Large icons*





- 4 Under Interface at the bottom of the page, set the **Accent Color** to **Blue**.



The **Accent Color** changes the color of the Status bar, as well as the highlight color of menus.

- 5 Select **Design** from the Workspace drop-down to return to the default workspace for the remainder of this tutorial.
- 6 Click **No** when asked to save changes to the workspace file.
- 7 Click **OK** to change the Workspace to Design and exit the Customize dialog box.

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



# LESSON 4

## Working with Files

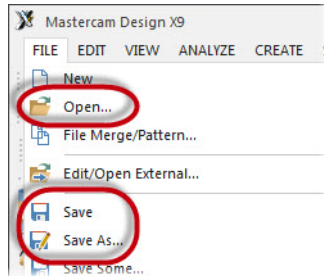
A core function of most software packages is the ability to save and load files. Mastercam not only saves and loads its own file types, but also many other common file formats, including the following:

- 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 one of the file commands, shown to the right. Opening and saving other types of files, although the files must be converted, is almost as easy.

You can also open files by:

- Dragging a Mastercam file or 3rd party compatible file from Windows Explorer and drop it in Mastercam's graphics window.
- Dragging and dropping a file onto the Mastercam X9 desktop icon to open a new instance of Mastercam.



### Lesson Goals

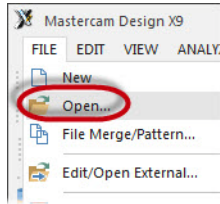
- Open a non-Mastercam file.
- Save selected geometry to a file.
- Import and export files.
- Save as Zip2Go files.

## Exercise 1: Opening Non-Mastercam Part Files

Importing files from other applications such as SOLIDWORKS is similar to opening native Mastercam files. You might, however, need to specify how Mastercam imports elements of the file. In this exercise, you learn how file importing works, as you convert a PTC Creo file to a Mastercam part.

- 1 Select **File, Open** from the Mastercam menu bar.

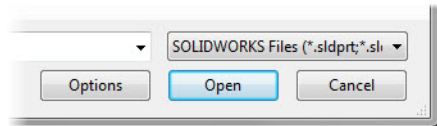
The Open dialog box displays.



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

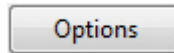
- 2 In the Open dialog box, select **SOLIDWORKS files (\*.sldprt; \*sldasm)** from the drop-down.

The dialog now displays only SOLIDWORKS parts.



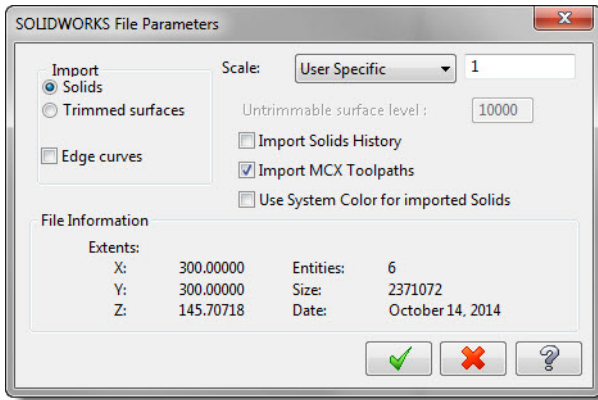
- 3 Navigate to `SW_Part.sldprt`, which was provided with this tutorial.
- 4 Select the file, but do *not* double-click it.
- 5 Click the **Options** button.

The SOLIDWORKS File Parameters dialog box displays.



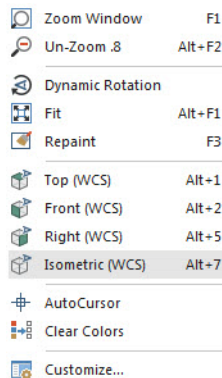
When importing a non-Mastercam file, you might need to change the options so that it can be read properly into Mastercam. Use these options to control how files are read into the database.

- 6 Click **OK** without changing anything.



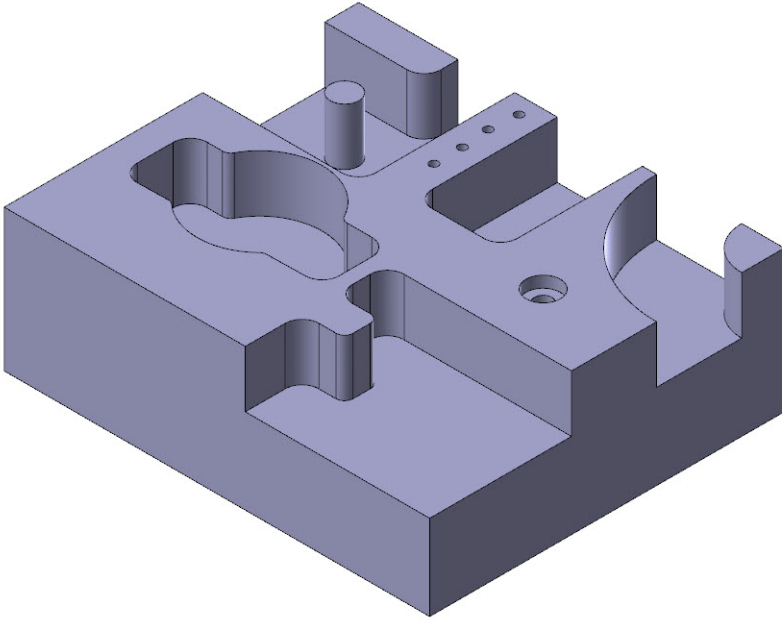
- 7 Click **Open** in the Open dialog box. Mastercam converts and opens the part.

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



- 9 Click the **Fit** button to see the entire part in Mastercam's graphics window.





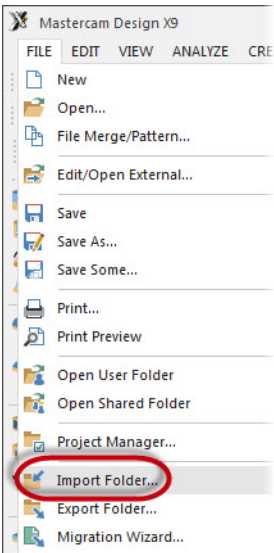
You learn more about the graphics window and views in later sections of the tutorial. If you would like more information, you can also refer to the Mastercam Help.

### ***Exercise 2: Importing Multiple Part Files***

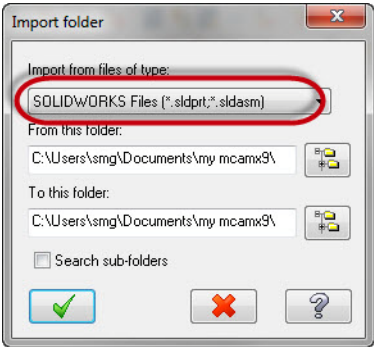
When you have many files to import into Mastercam, you can convert them all at once using the Import Folder command.

1 Select **File, Import Folder** from the Mastercam menu.

The Import folder dialog box displays.

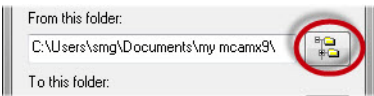


2 In the Import folder dialog box, select **SOLIDWORKS Files (\*.SLDPRT;\*.SLDASM)** from the **Import from files of type** dropdown.

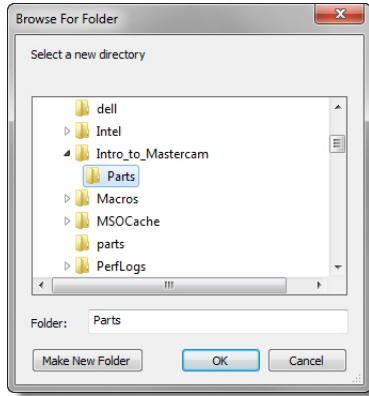


3 Click the **Browse** button to the right of the **From this folder** box.

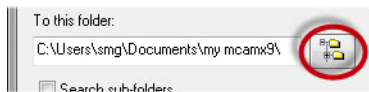
The Browse For Folder dialog box displays.



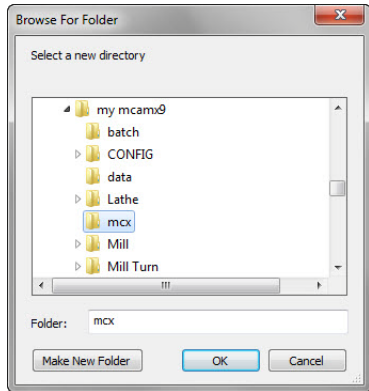
- 4 Select the location where you stored the tutorial file, and click **OK**.



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



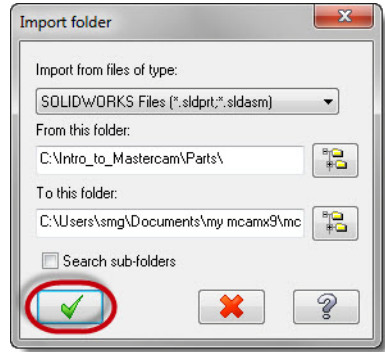
- 6 Select \My Documents\my mcamx9\mcx and click **OK**.





- 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 in the \mcx folder.



### Exercise 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.

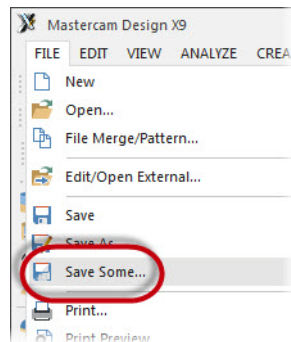
When you save a Mastercam part, you can choose to save the entire file or to save only selected entities. Saving a set of selected entities is one way to create a pattern from a part file. This exercise demonstrates the **File, Save Some** command, which lets you choose the entities to save.

- Open 2D\_CHAMFER\_MM\_.MCX-9, which was provided with the tutorial.

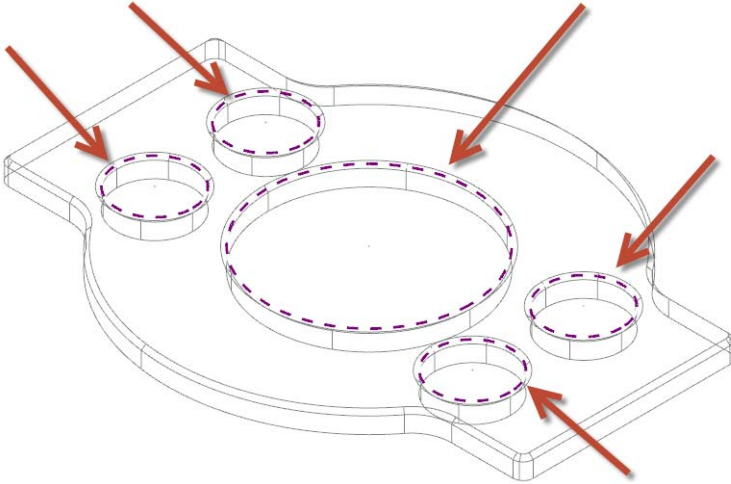


**NOTE:** In the Open dialog box, you might first need to change your **Files of type** setting back to **All Mastercam X Files (\*.mcx\*)**.

- Select **File, Save Some** from the Mastercam menu bar.



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

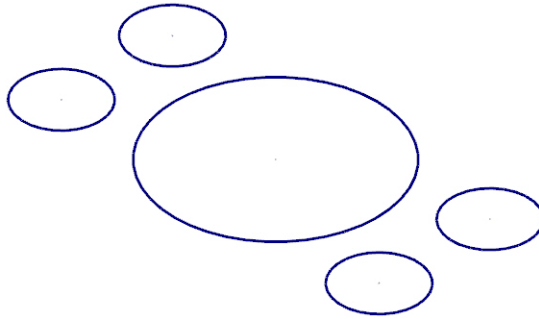


**TIP:** Select the Wireframe button to show the wireframe of the solid body so that it is easier to select the arcs.



- 4 Press **[Enter]** to accept the selection. The Save As dialog box displays.
- 5 Enter `2D_CHAMFER_ARCS.MCX-9` for the **File** name.
- 6 Click **Save** or press **[Enter]** to save the file. Mastercam saves only the selected arcs.

- 7 Open `2D_CHAMFER_ARCS.MCX-9`, and notice that it contains only the arcs that you selected.




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**NOTE:** If you are prompted to save changes to the `2D_CHAMFER_MM.MCX-9` file, choose **Don't Save**.

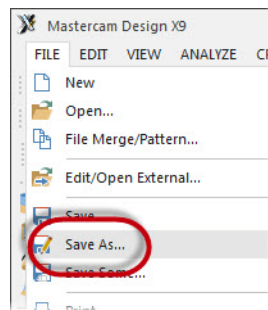
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### *Exercise 4: Exporting a Single File*

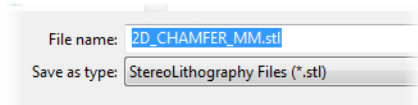
When exporting, you might need to set a few options so that you get the type of file you expect. In most cases, you need only select the software package to which you are exporting the file. In this exercise, you learn to convert a single file from one format to another.

- 1 Open `2D_CHAMFER_MM.MCX-9`, which was provided with this tutorial.
- 2 Select **File, Save As** from the Mastercam menu.

The Save As dialog box displays.



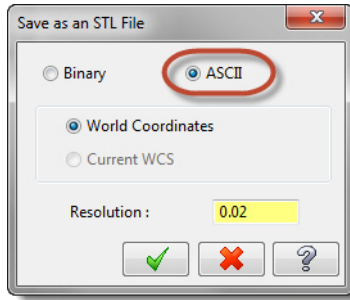
- 3 Select **StereoLithography Files (\*.stl)** in the **Save as type** drop-down list.



- 4 Click the **Options** button.  
The Save as an STL File dialog box displays.



- 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 seen below.

```

2D_CHAMFER_MM.stl - Notepad
File Edit Format View Help
solid ascii
facet normal 0.999166 -0.040789 0.001946
  outer loop
    vertex -123.777830 -34.001661 -2.540000
    vertex -123.795738 -34.925000 -12.700000
    vertex -123.716504 -32.984060 -12.700000
  endloop
endfacet
facet normal 0.992517 -0.122094 0.001908
  outer loop
    vertex -123.479329 -31.056037 -12.700000
    vertex -123.634727 -32.160537 -2.540000
    vertex -123.716504 -32.984060 -12.700000
  endloop
endfacet
facet normal 0.996991 -0.077492 -0.001744
  outer loop
    vertex -123.716504 -32.984060 -12.700000
    vertex -123.634727 -32.160537 -2.540000
    vertex -123.698843 -32.985433 -2.540000
  endloop
endfacet
facet normal 0.996991 -0.077492 -0.001744
  outer loop
    vertex -123.716504 -32.984060 -12.700000
    vertex -123.698843 -32.985433 -2.540000
    vertex -123.777830 -34.001661 -2.540000
  endloop
endfacet
facet normal 0.979263 -0.202587 0.001832
  outer loop
    vertex -123.085791 -29.153761 -12.700000
    vertex -123.349380 -30.336039 -2.540000
    vertex -123.479329 -31.056037 -12.700000
  endloop
endfacet
facet normal 0.987988 -0.154519 -0.001686
  outer loop
    vertex -123.479329 -31.056037 -12.700000
    vertex -123.349380 -30.336039 -2.540000
  endloop
endfacet

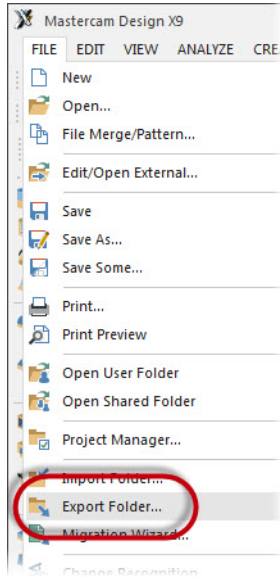
```

## Exercise 5: Exporting Multiple Files

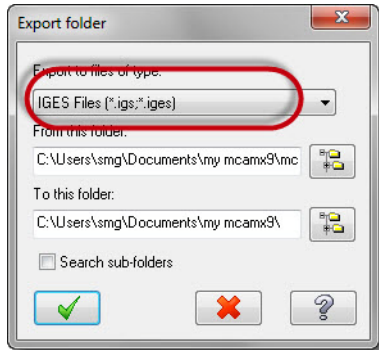
When you have many Mastercam files to export into a different format, you can convert them simultaneously using the **Export Folder** command. This exercise demonstrates how this function works.

- 1 Select **File, Export Folder** from the Mastercam menu.

The Export folder dialog box displays.

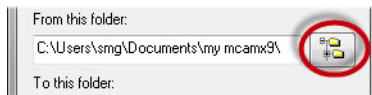


- 2 In the Export folder dialog box, select **IGES Files (\*.igs, \*.iges)** from the **Export to files of type** dropdown.

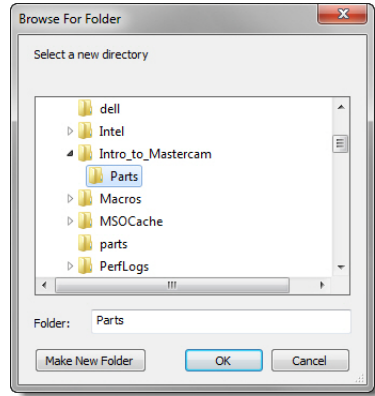


- 3 Click the **Browse** button to the right of the **From this folder** box.

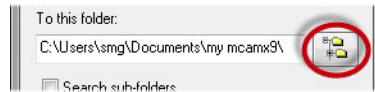
The Browse for Folder dialog box displays.



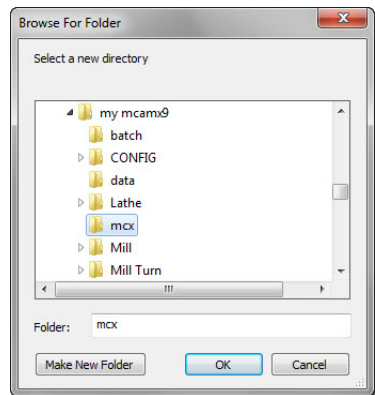
- 4 Select the directory where you stored the tutorial parts, and click **OK**.



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

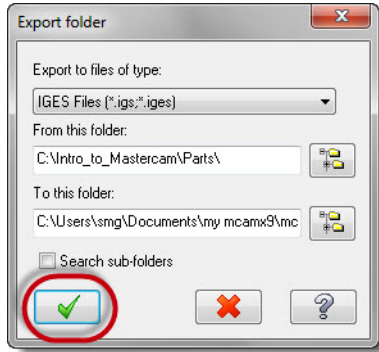


- 6 Select \My Documents\my mcam9\mcx and click **OK**.



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

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



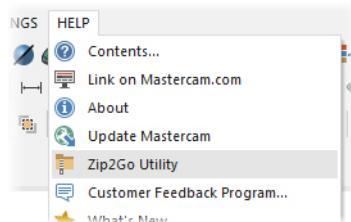
## Exercise 6: Using Zip2Go

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

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

- Open `Brace.mcx-9`, which was provided with this tutorial.
- Select **Help, Zip2Go Utility** from the Mastercam menu.

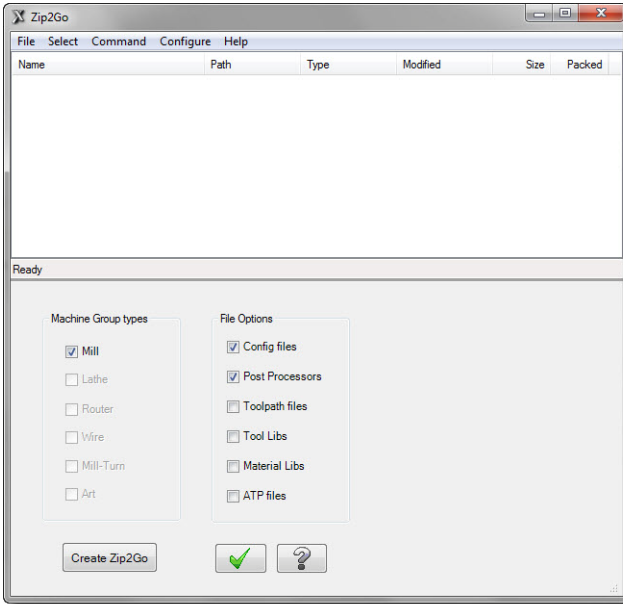
The Zip2Go dialog box displays.



You 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

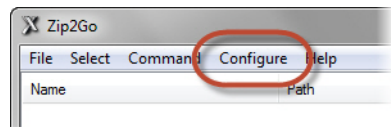


check and uncheck files that you want or do not want to include in the Zip2Go file. For this tutorial, you keep the default settings.

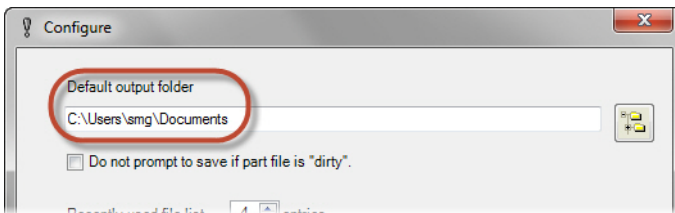


- 3** Select **Configure** from the menu bar.

The Configure dialog box displays.



You use this dialog box to set the default values for Zip2Go. The current default output folder is your \Documents folder.



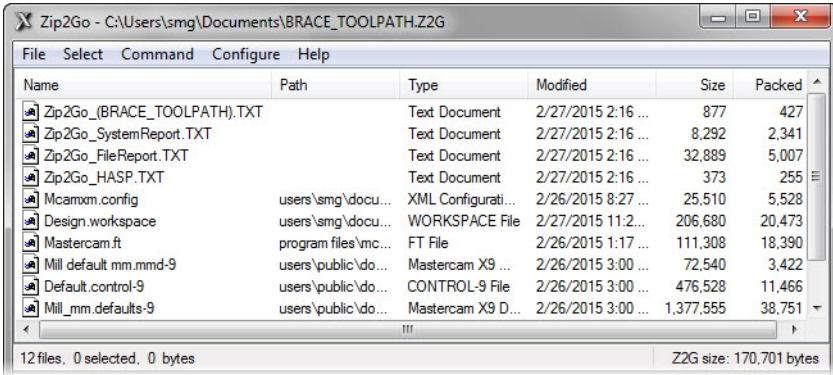
- 4** Click **OK** without changing anything.

- 5 Click the **Create Zip2Go** button.

Mastercam creates a zipped file with a .ZYG extension in the selected folder.



The file list is then populated by files located in the Zip2Go file you created.



- 6 Click **OK** to close the Zip2Go dialog box.

Zip2Go is an easy way to package your files so that you can share them with other users or technical support.



**NOTE:** You must have at least one toolpath operation in the Toolpaths Manager when you run Zip2Go. If the part file contains no toolpaths, Zip2Go will only package the configuration files.

You have now completed Section 1 of the *Introduction to Mastercam* tutorial. In the next section, you will learn more about the graphics window and related functions.

## Section 2

# Mastercam's Graphics Window

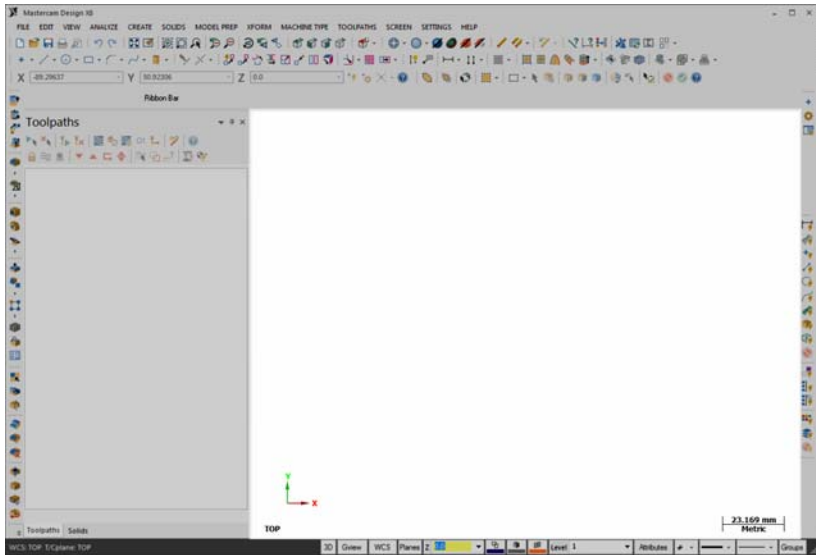




# LESSON 1

## Working With the Graphics Window

The graphics window is your workspace in the main Mastercam window.



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.

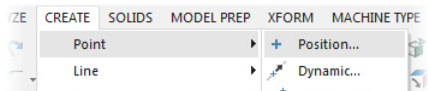
In this first lesson, you explore the graphics window itself and change display settings.

### *Exercise 1: Customizing Function Prompts*

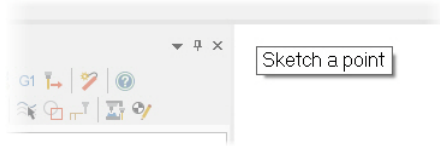
When you use a function that requires your input, such as selecting an entity, Mastercam provides brief directions in a prompt. You can customize these prompts to change their size, text color, and background color.

- 1 Select **Point, Position** from the Create menu.

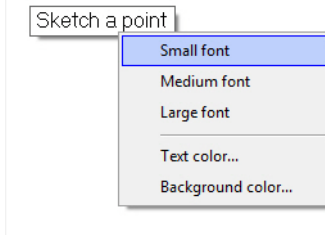
The Point ribbon bar displays.



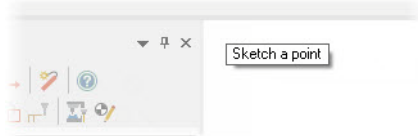
Notice the prompt displayed in the upper left corner of the graphics window.



- 2 Right-click on the prompt and select **Small font**.

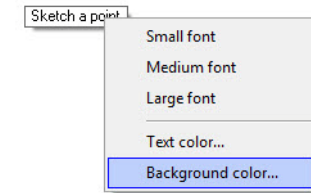


The prompt now displays as shown.

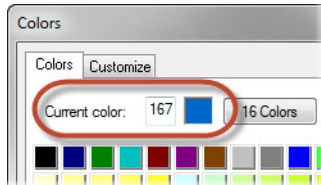


- 3 Right-click on the prompt and select **Background color**.

The Colors dialog box displays.

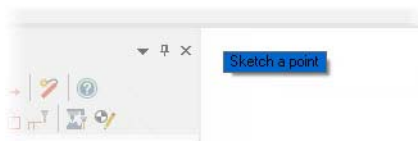


- 4 Enter **167** in the **Current color** attribute.



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

The function prompt now displays with a blue background.






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

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**TIP:** You can move the location of the function prompt by dragging it to a desired location.

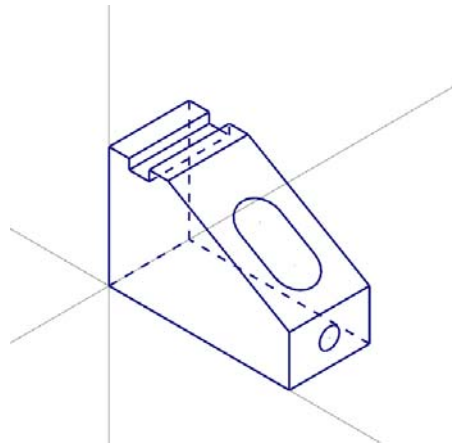
---

- 6 Return the prompts to their 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**.

## *Exercise 2: Changing Standard Views*

In this exercise, you change your Gview using Mastercam's standard views.

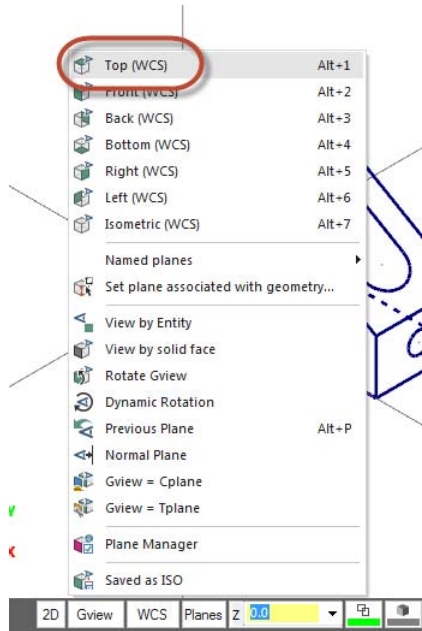
- 1 Open `ANGLEBLOCK-MM.MCX-9`, which was provided with this tutorial. The part opens in Isometric (ISO) Gview.
- 2 Press **[F9]** to toggle the display of the XYZ axes. The coordinate axes show the origin and the part orientation to help you visualize the part in 3D space.



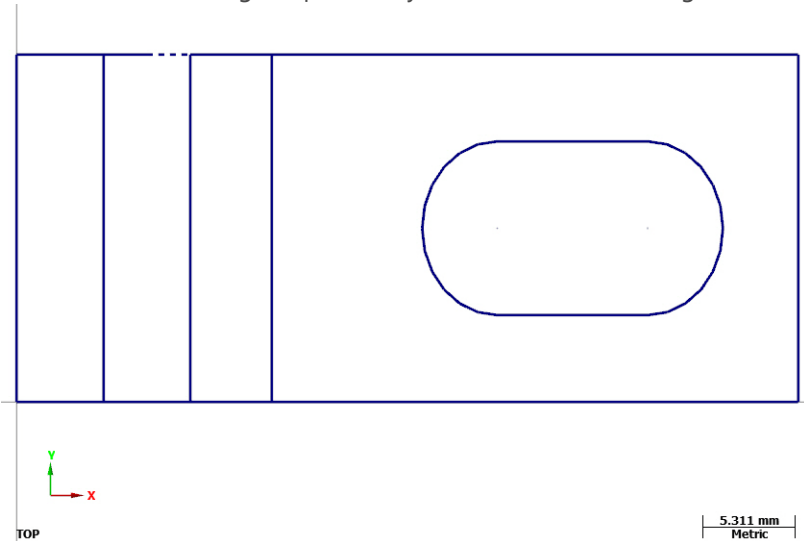
- 3 In the Status bar, located along the bottom of the Mastercam window, click **Gview** to open the Gview menu.

This menu provides access to functions you use to manipulate the part display in the graphics window.

4 Select **Top (WCS)** from the menu.



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



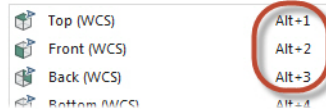
5 Practice switching to other Gviews by choosing options from the Gview menu.





**TIP:** You can also use Graphics Views toolbar functions or shortcut keys to change between standard Gviews.

In Mastercam menus, shortcut key assignments appear to the right of their corresponding functions.



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

You have now completed Lesson 1 of the *Graphics Window* section. In the next lesson, you learn more about viewing your part.



## LESSON 2

# 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 and how to use Viewsheets.

### *Lesson Goals*

- Fit all entities in a Mastercam part in the graphics window.
- Use zoom functions to expand your view of selected entities.
- Use the middle mouse button or wheel and other functions to dynamically rotate and pan entities in the graphics window.
- Create a Viewsheet.
- Blank and hide entities.

### *Exercise 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.MCX-9`, change your Gview to **Isometric** and press **[F9]** if necessary to show the axes.



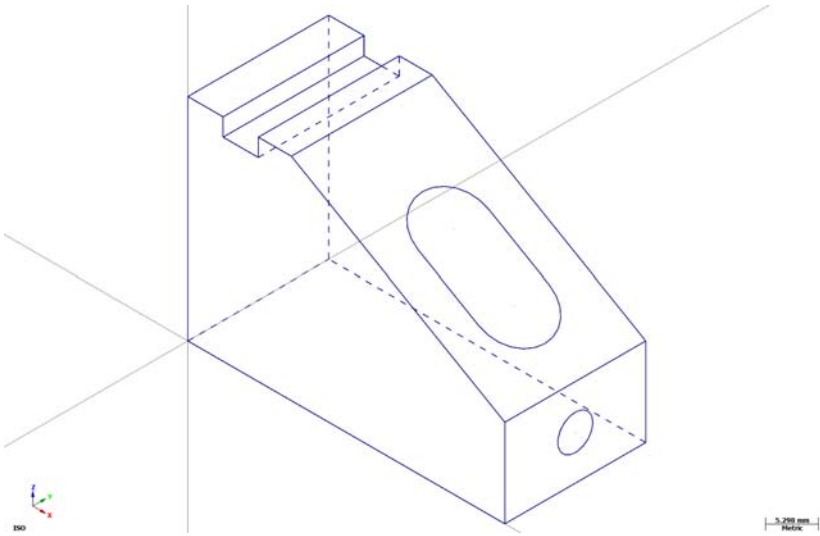
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**NOTE:** See Lesson 1, Exercise 2, “Changing Standard Views” on page 57 to review how to complete this step.

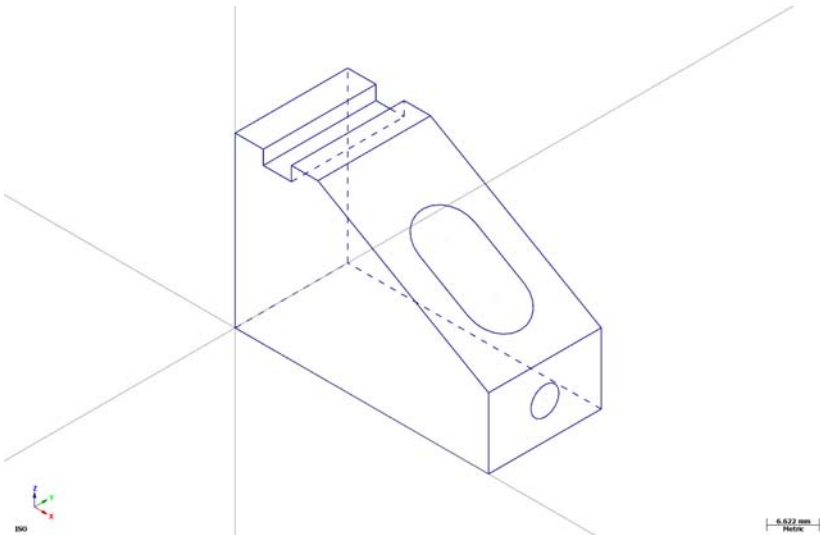
---

- 2 Choose **View, Fit** or press **[Alt+F1]**.

The part now fills the entire graphics window.



- 3 Choose **View, Unzoom 80%** to decrease the size of the display to 80%. This creates a border of free space around the part.



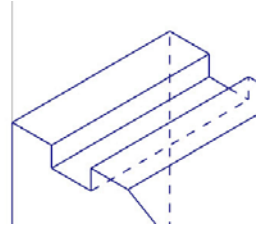


**TIP: Unzoom previous / 50** (also available from the **View** menu) restores zoom to its previous settings. If the zoom “queue” contains no previous setting, this function reduces the size of the displayed geometry by 50% of its current size.

## Exercise 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.

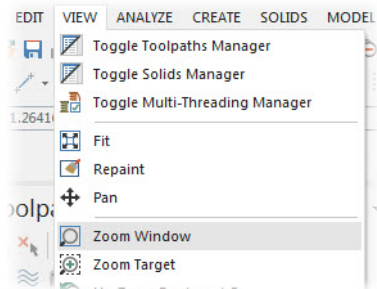


- 2 If your mouse has a middle mouse wheel, spin it back and forth to dynamically zoom in and out.



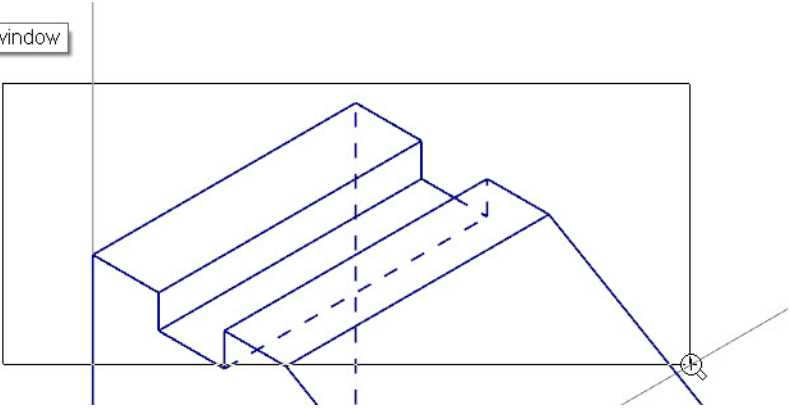
**TIP:** You can also press the [**Page Up**] and [**Page Down**] keys to zoom in and out.

- 3 Fit the part to the screen by pressing [**Alt+F1**].
- 4 Choose **View, Zoom Window** from the Mastercam menu bar.

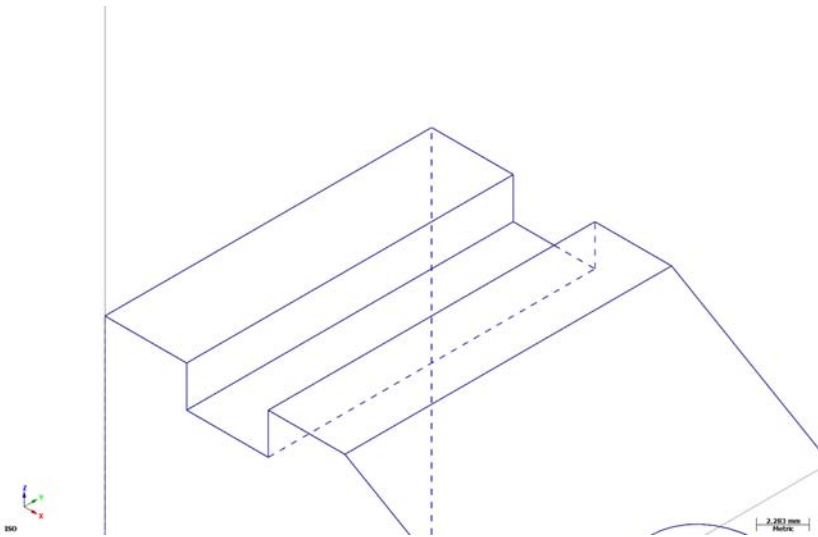


- 5 Click and drag a diagonal window as shown.

Specify zoom window

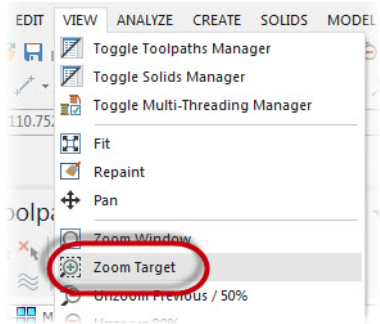


- 6 Click again to set the zoom window. Mastercam scales the selected area to fit the entire graphics window.



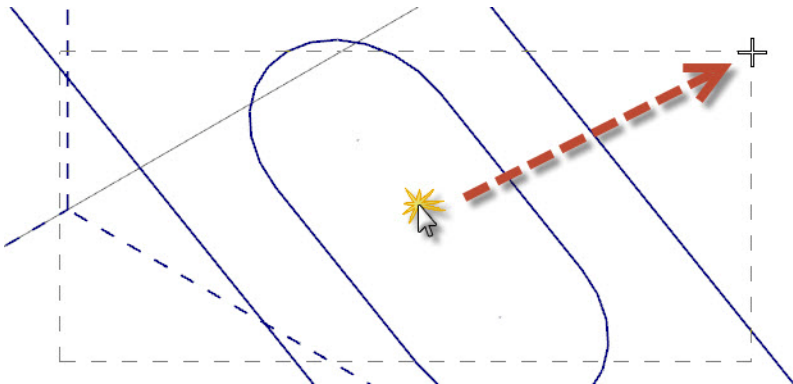
- 7 **Fit** the part to the screen.

- 8 Choose **View, Zoom Target** from the Mastercam menu bar.

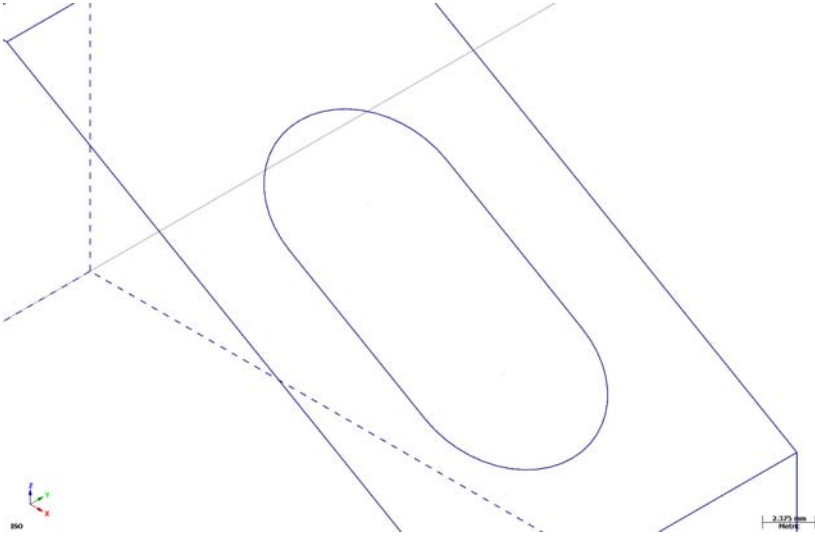


- 9 Click the location indicated below to anchor the center of your selected window. As you move your mouse, Mastercam draws a rectangular window outward in all directions from the center point you selected.

The shape of the window changes when you move the mouse vertically and horizontally.



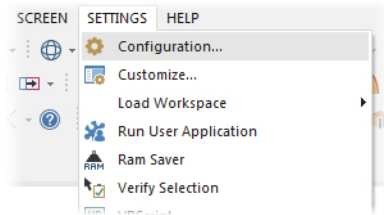
- Click to set the target area. Mastercam scales the selected area to fill the entire graphics window.



### Exercise 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.

- Select **Settings, Configuration** from the Mastercam menu bar.



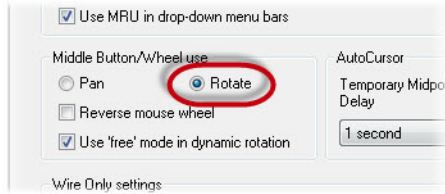
- Select the **Screen** page.



- If necessary, set the Middle Button/Wheel use to **Rotate**.



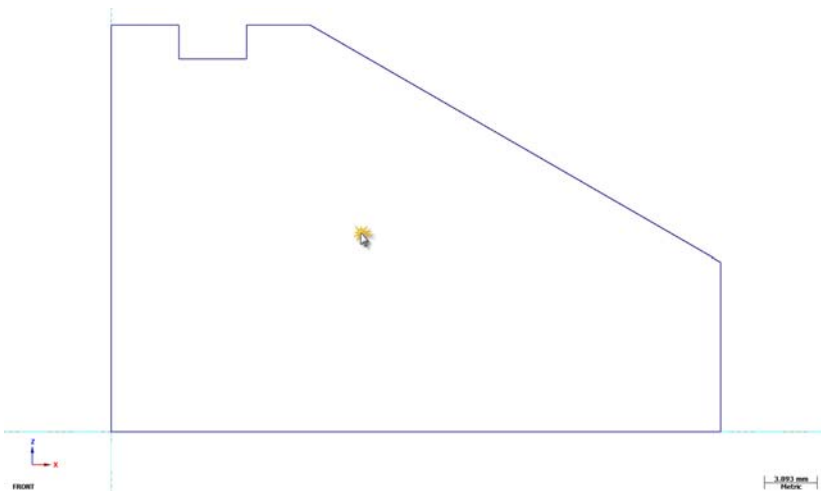
By choosing Rotate, Mastercam sets dynamic rotation as the primary function when you click and hold the middle mouse button or mouse wheel.



- 4 If you changed the setting, click **Apply**.



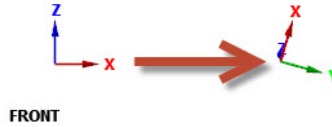
- 5 If necessary, click **No**, to use these settings for this session only.
- 6 Click **OK** to close the System Configuration dialog box.
- 7 Set the part up in the graphics window, as follows:
- a Set the Gview to **Front**.
  - b **Fit** the part to the screen.
  - c Un-zoom to 80%.
- 8 Middle-click in the graphics window where indicated 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.

- 9 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.

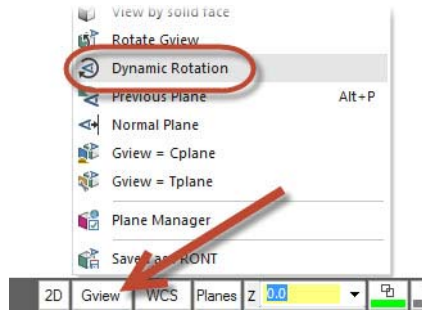


- 10 Return to **Isometric** gview, and fit the part to the screen.



### TIPS:

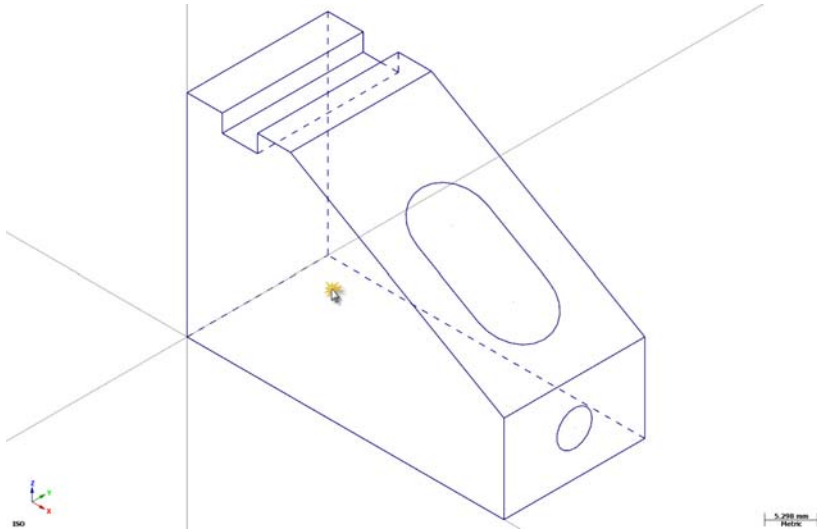
- You can choose **Dynamic Rotation** from the Status bar Gview menu or Mastercam's default right-click mouse menu.
- Hold the **[Shift]** key while using the middle mouse button/wheel to switch between rotating and panning.



## Exercise 4: Panning Geometry

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 geometry.

- 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.



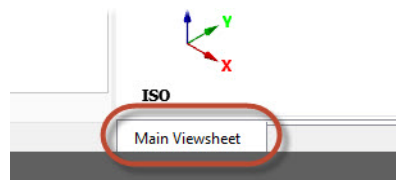
**NOTE:** The Gview does not change as you pan the entities.

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

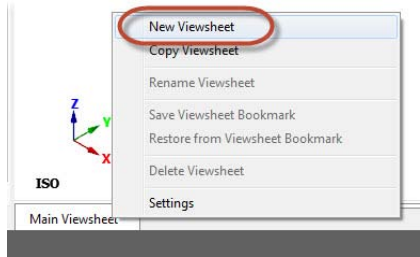
### *Exercise 5: Using Viewsheets*

Mastercam allows you to view your part in different orientations by using Viewsheets. In this exercise, you create a viewsheet.

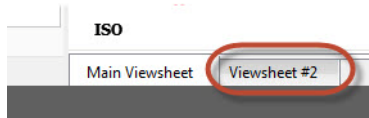
At the bottom of the graphics window, notice a tab named **Main Viewsheet**. This is the main view of your part and cannot be deleted.



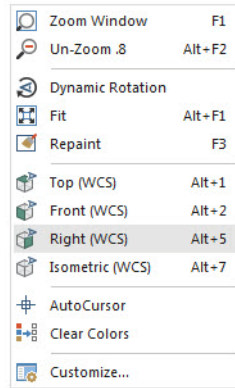
- 1 If necessary, fit the part to the graphics window and set the view to **Isometric**.
- 2 Right-click on the **Main Viewsheet** tab, and select **New Viewsheet** from the menu. Press [Enter] to accept the default name.



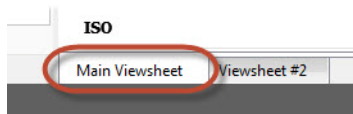
**Viewsheet #2** tab is created and displayed next to the **Main Viewsheet** tab.



- 3 Select the **Viewsheet #2** tab.
- 4 Right-click in the graphics window and select **Right (WCS)** to view the part on its right side.



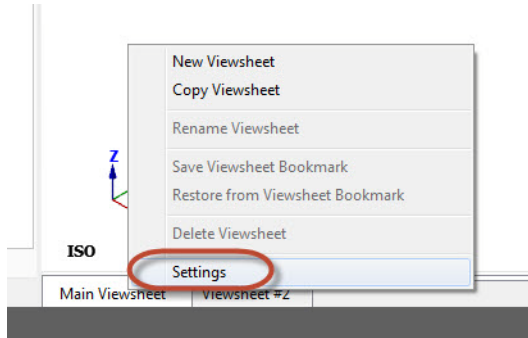
- 5 Select the **Main Viewsheet** tab.



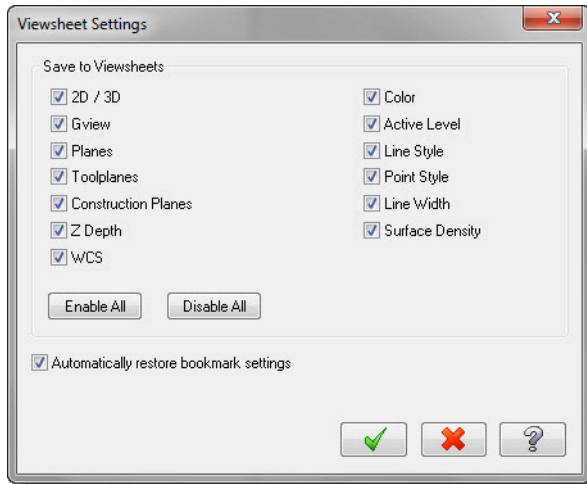
Notice that the view did not change on the Main Viewsheet. Each tab can contain different views and planes.

- 6 Right-click the **Main Viewsheet** tab and select **Settings** from the menu.

The Viewsheet Settings dialog box displays.



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



**NOTE:** When you save your part file, Mastercam stores the viewsheet settings along with the part.

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

Viewsheets make viewing a large part easier, as you can set up multiple viewsheets with different views.

## Exercise 6: Blanking and Hiding Entities

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

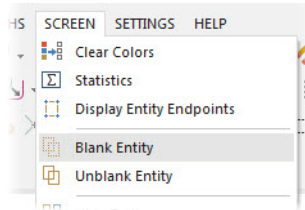
Similar to **Blank Entity** is **Hide Entity**. Hide Entity allows you select entities to keep, instead of remove.

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

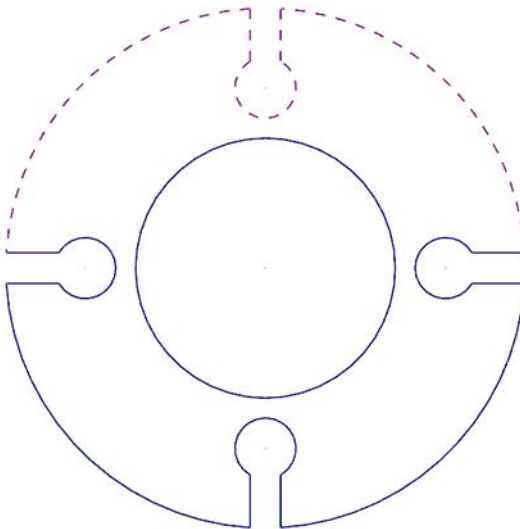
- 1 Open `BLANK_PART.mcx-9`, which was provided with this tutorial.

- 2 Select **Screen, Blank Entity** from the Mastercam menu.

Mastercam then prompts you to select entities to blank.

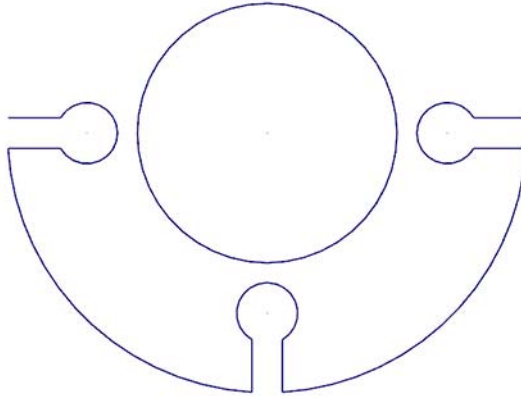


- 3 Select the geometry shown below:



- 4 Press **[Enter]** to accept the selections.

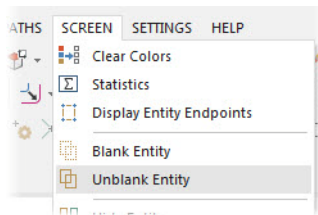
The geometry no longer displays in the graphics window.



Now, you will un-blank the geometry selected in the previous steps.

- 5 Select **Screen, Unblank Entity** from the Mastercam menu.

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.

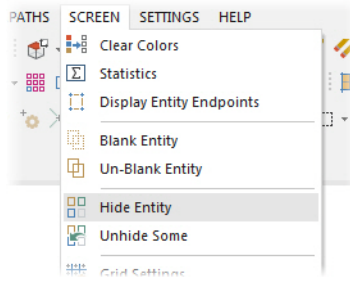


- 6 Select all of the blanked entities and press [**Enter**]. The part should be whole again.

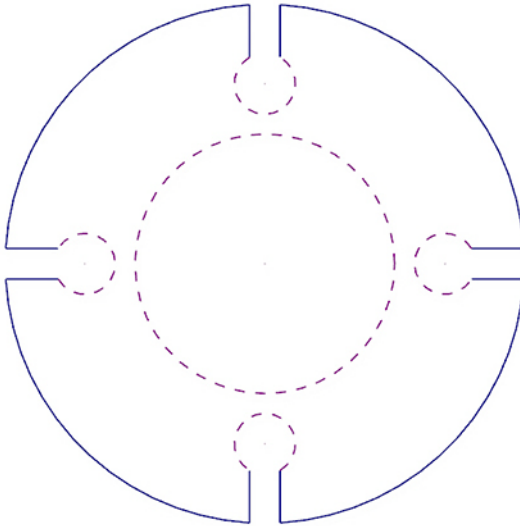
Next, you use the Hide Entity function.

- 7 Select **Screen, Hide Entity** from the Mastercam menu.

Mastercam then prompts you to select entities to keep.



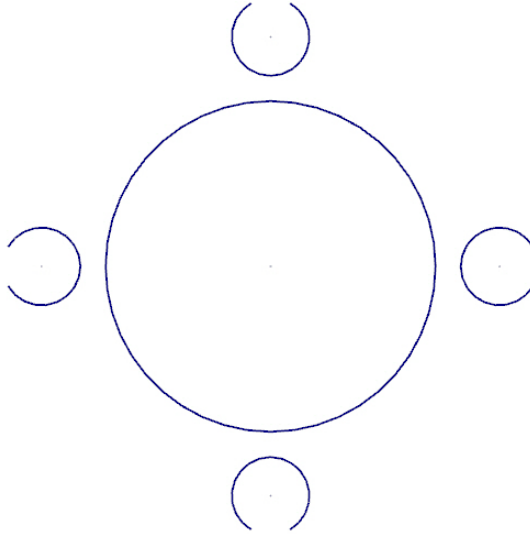
- 8 Select the geometry shown below:



- 9 Press [**Enter**] to accept the selection.



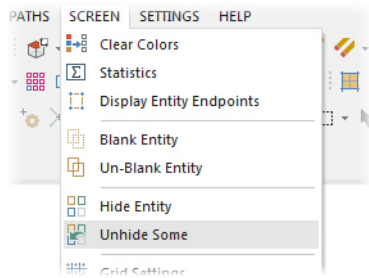
The graphics window hides all of the unselected geometry.



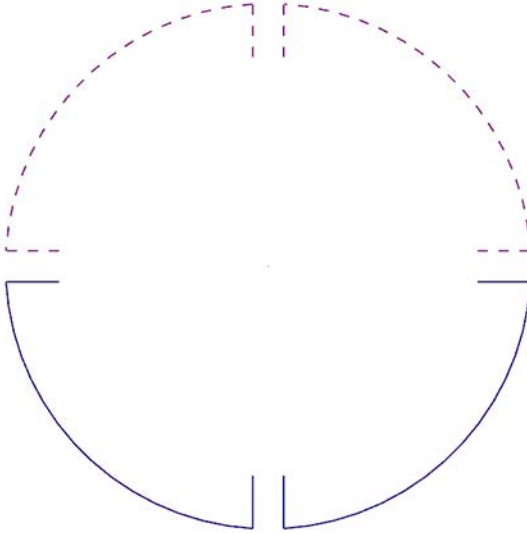
Next, you unhide the geometry using **Unhide Some**.

- 10 Select **Screen, Unhide Some** from the Mastercam menu.

Mastercam then prompts you to select entities to show.

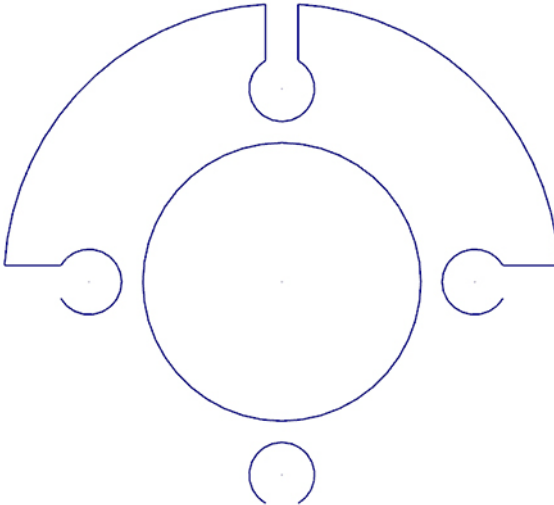


11 Select the geometry shown below:



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

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



Both functions have their benefits, but some important differences are:

- With **Hide**, you select the entities that will remain in the graphics window; all unselected entities are removed. With **Blank**, you select only the entities to remove.
- You can save blanked entities; hidden entities are not saved.
- Choose **Hide** 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.

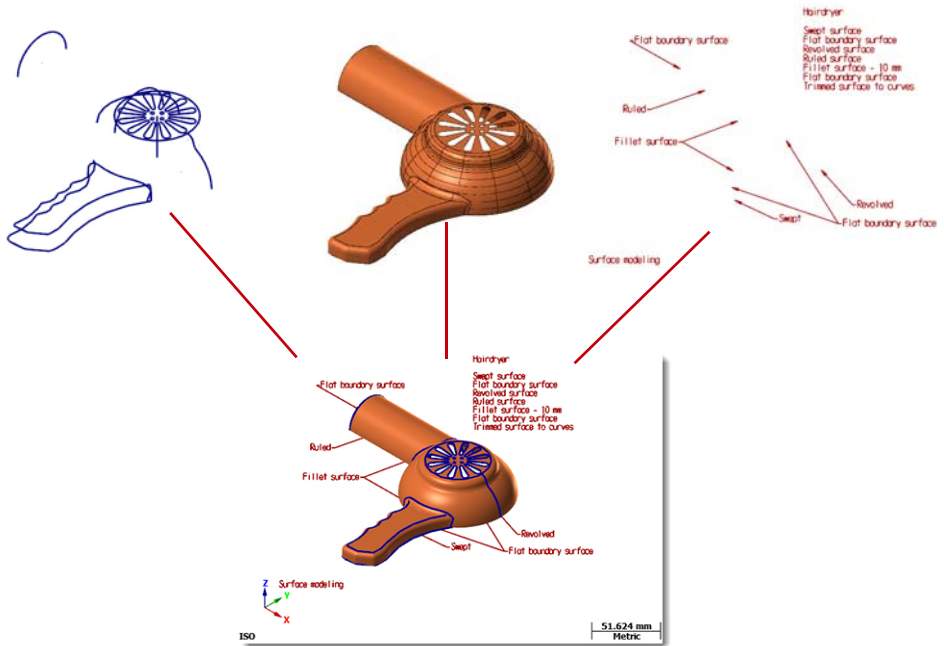
You have now completed Lesson 2 of the *Graphics Window* section. In the next lesson, you learn more about levels.



# LESSON 3

## 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 at any time 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 main level. The main level is the current working level. For each level you create, you assign a unique number and, optionally, a name. Mastercam's Level Manager provides a central location where you can view and create levels, and set their properties.

### Lesson Goals

- Open the Level Manager.

- Turn level displays off and on.
- Change the main level.
- Name and assign entities to a level.
- Move selected entities to a different level.

## Exercise 1: Accessing the Level 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 Level Manager and view all of the levels in the file.

In this exercise, you access the Level Manager.

- 1 Open HAIRDRYER-MM.MCX-9, which was provided with the tutorial.
- 2 In the Status bar, left-click on **Level**.



### TIPS:

- The number of the current main level displays in the Status bar Level field.
- The tool tip that displays when you hold the mouse over the Level field tells you the name of the current main level. (In this example, level 2 is named Wireframe.)
- The mouse icon indicates that a right-mouse button function is available for this option.
- You will learn more about these features in “Changing the Main Level” on page 84 and “Moving and Copying Entities to a Different Level” on page 86.

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

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

The yellow highlight indicates the current main level setting.

Main level parameters display in this section.

Enables or disables the display of all entities on all levels.

Number	Visible	Name	# Entities	Level Set
1	X	Surfaces	18	
2	X	Wireframe	30	
3	X	Notes	8	

Main Level  
 Number: 2 Name: Wireframe  
 Level Set: [ ]  
 Arrow keys set main level

Visible Levels  
 Main level is always visible  
 Only main level is visible

List Levels  
 Used  
 Named  
 Used or named  
 Range  
 1 [ ]  
 1000 [ ]

[All on] [All off] [Green Checkmark] [Question Mark]

Use these options to filter the level list.



## NOTES:

- The Level Manager is a modeless dialog box. This means that you can leave the Level Manager on the screen as you work in Mastercam's main window. You can even move the Level Manager to another monitor in a multi-monitor system.
- When you first open the Level Manager, the levels are listed by number from lowest to highest. If you change how levels are listed and close the Level Manager, Mastercam remembers the list method and restores it the next time you open the Level Manager.

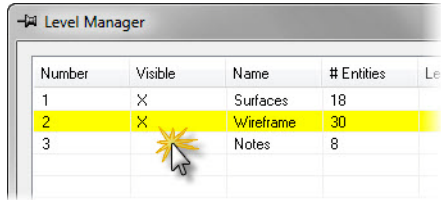
In the next exercise, you learn to turn level displays on and off.

## Exercise 2: Turning Level Displays Off and On

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

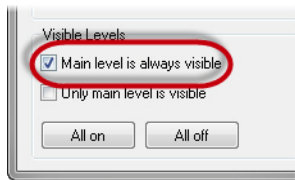
- 1 In the **Visible** column for level **3**, click once to turn off the display of **Notes**. The change is immediate in the graphics window.

You do not have to close the Level Manager to see the effect of turning off a level display. If necessary, drag the Level Manager window to a position that gives you a better view of the graphics window.



- 2 Click again in the **Visible** column for level 3 to toggle the level display on.
- 3 Turn off the display of levels 1 and 3.

- 4 Try turning off the display of level 2. When the Level Manager option **Main level is always visible** is selected, you cannot turn off the main level display in the graphics window.



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

- 5 Use options in the lower left corner of the Level Manager to turn the display of all levels on or off.



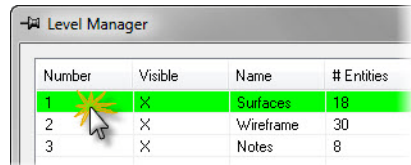


- 6 Make sure all levels are visible before continuing on to the next exercise.

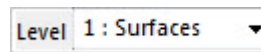
### Exercise 3: Changing the Main Level

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

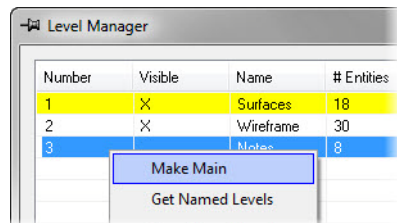
- 1 If necessary, open the tutorial part `HAIIRDYRER-MM.MCX-9`, and open the Level Manager.
- 2 In the Number column for level **1:Surfaces**, click once to set it as the new main level. The row turns green, informing you that it has been made the main level.



The Status bar Level field also changes to show that level 1 is the main level.

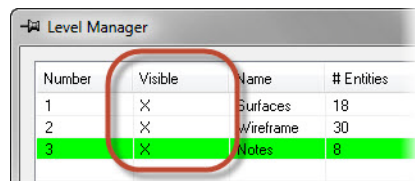


- 3 Turn off the display of level **3:Notes**.
- 4 Position the cursor anywhere in the row for level 3. Right-click and choose **Make Main**.



By making the Notes level the main level, the display is automatically made visible.

This is because of the Level Manager option, **Main level is always visible** is selected. The main level is made visible, regardless of its prior display setting.





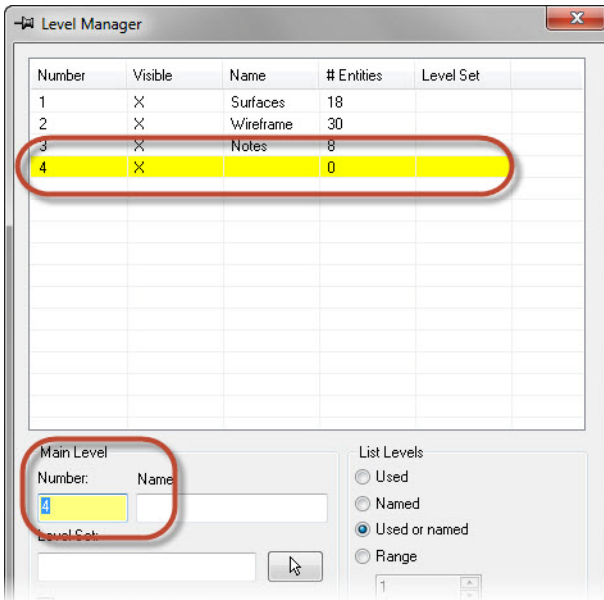
**TIP:** You can change the main level from the Status bar by entering the level you wish to make the main level, and pressing **[Enter]**.

### *Exercise 4: Naming and Assigning Entities to a Level*

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

- 1 In the Main Level section, type **4** in the **Number** field and press **[Tab]**.

Mastercam adds it to the Level Manager list, and sets it as the main level.

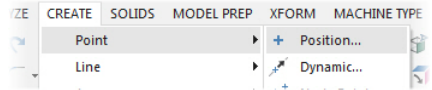


**TIP:** Use **List Levels** options to control the display of levels in the Level Manager. You can list only used levels (those assigned to entities), levels, that are named (regardless of whether they are used), either used or named levels, or limit the display to a range of level numbers.

- 2 In the **Name** field, type **Tutorial**. The Level Manager list updates to show the new name. Although level names are optional, descriptive names are helpful.

Number	Visible	Name	# Entities
1	X	Surfaces	18
2	X	Wireframe	30
3	X	Notes	8
4	X	Tutorial	0

- 3 Click **OK** to exit the Level Manager.
- 4 Select **Point, Position** from the **Create** menu.



- 5 Click a few times in different places in the graphics window to create some points.
- 6 Click **OK** on the Point ribbon bar to exit the function.
- 7 Access the Level Manager and verify that the new geometry was created on level 4 (**# Entities** is not 0).
- 8 Practice turning level displays on and off and changing the main level.

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

### *Exercise 5: Moving and Copy Entities to a Different Level*

In this exercise, you move entities from one level to another using the right-click option in the Status bar **Level** field. You can use the same basic procedure to copy entities to a different level.

- 1 Make level **2** the main level.
- 2 In the Status bar, right-click **Level**.



3 Mastercam prompts you to select entities. Use the following steps to select all geometry on level 3.

- a In the General Selection ribbon bar, choose **All**.

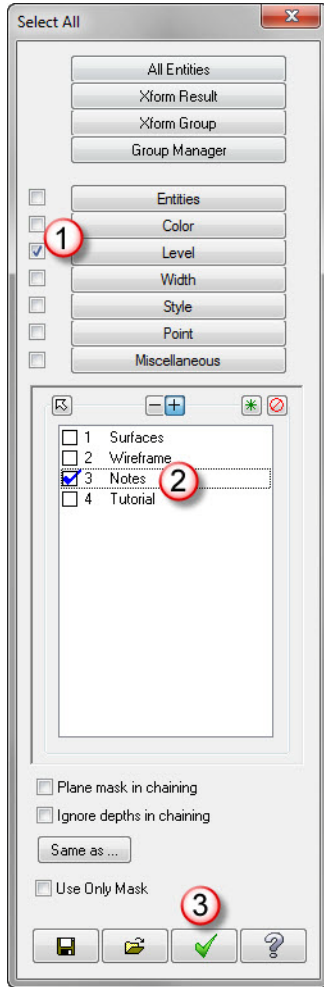
The Select All dialog box displays.

- b In the Select All dialog box, create a selection mask for all the entities on level 3.

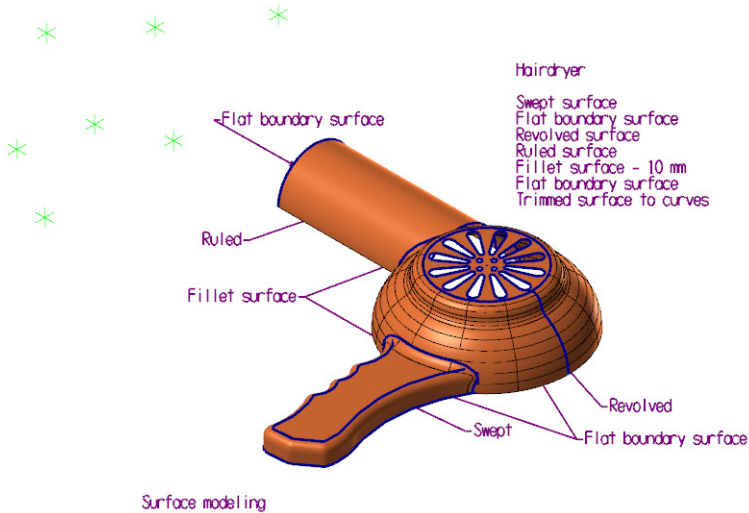
- Select the **Level** checkbox and click the **Level** button.
- Select level **3** in the list.
- Click **OK**.

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

Select entities to change the level of



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



**NOTE:** The number of points in the above image may not match how many points you created in the previous exercise.

- 4 Press **[Enter]** or choose **End Selection** in the General Selection ribbon bar.

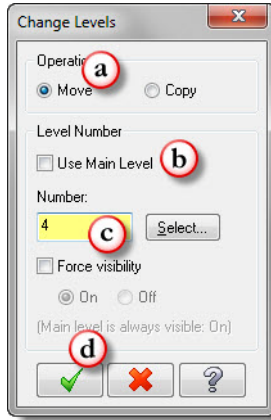


The Change Levels dialog box displays.



**TIP:** You can also use General Selection methods to pre-select entities before choosing the Level right-click option. When you pre-select entities, Mastercam does not prompt you to select additional entities for the level move or copy and you advance directly to the Change Levels dialog box.

- 5 In the Change Levels dialog box, complete the following steps:
  - a Choose **Move**.
  - b Deselect the **Use Main Level** checkbox.
  - c Type **4** in **Number**.
  - d Click **OK**.



- 6 In the Level Manager, verify that level 4 now contains the entities that were on level 3.  
Level 3 no longer contains entities.

The screenshot shows the 'Level Manager' dialog box with a table of levels. The table has columns for 'Number', 'Visible', 'Name', '# Entities', and 'Level Set'. The row for level 2 is highlighted in yellow. A red oval highlights the '# Entities' column, showing that level 2 now has 30 entities, while level 3 has 0.

Number	Visible	Name	# Entities	Level Set
1	X	Surfaces	18	
2	X	Wireframe	30	
3	X	Notes	0	
4	X	Tutorial	15	

You have now completed Lesson 3 of the *Graphics Window* section. In the next lesson, you will learn more about views and planes.

## LESSON 4

# 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.
- Create a custom plane.
- Create a custom plane for geometry creation.

### *Working with Views and Planes*

You use views and planes frequently 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 were explored in Lesson 2. These include **Top**, **Front**, **Right**, **Isometric**, and others.

The working 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.



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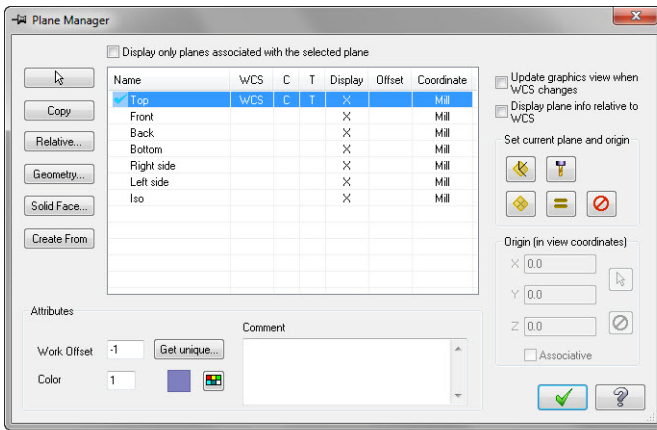
**NOTE:** If you would like to learn more about the Work Coordinate System, try the *Introduction to the Work Coordinate System* tutorial located on our website.

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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. They 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 can use Mastercam's Plane Manager as a central point for selecting, editing, creating, and managing planes. Access the Plane Manager from the Planes, WCS, or Gview menu.



Some of the functions of the Plane Manager include:

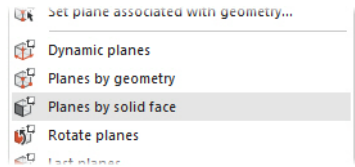
- Creating new planes
- Setting Cplanes, Tplanes, and WCS to selected planes
- Setting or changing the origin of planes
- Assigning work offsets to planes



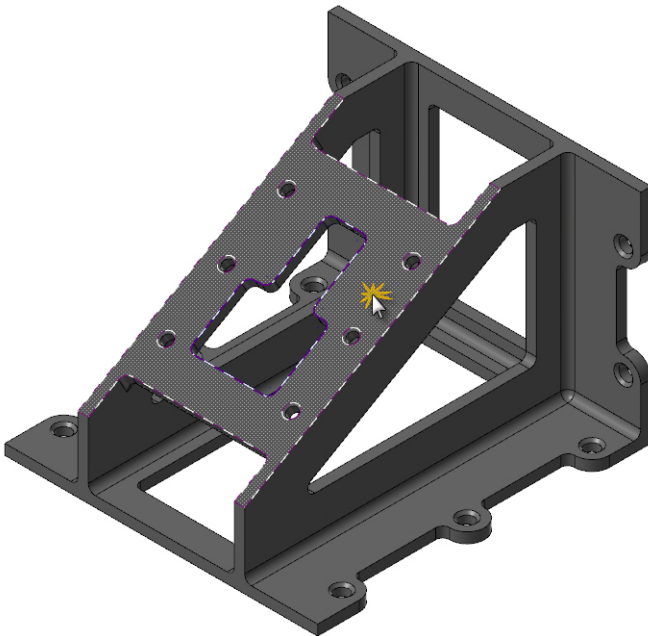
## Exercise 1: Creating a Custom Plane

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.

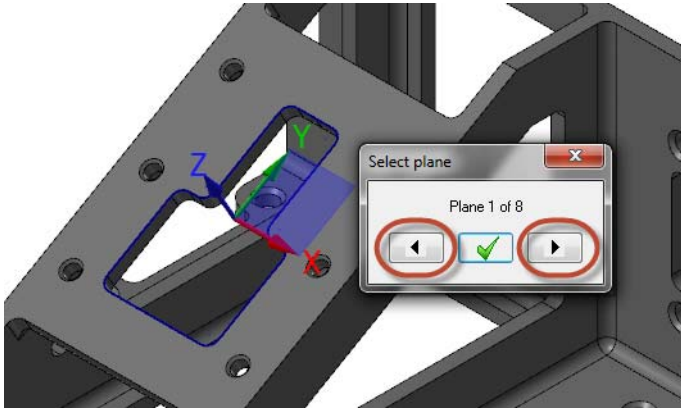
- 1 Open `BRACE.MCX-9`, which was provided with the tutorial.
- 2 Select **Planes, Planes by solid face** from the Status bar.



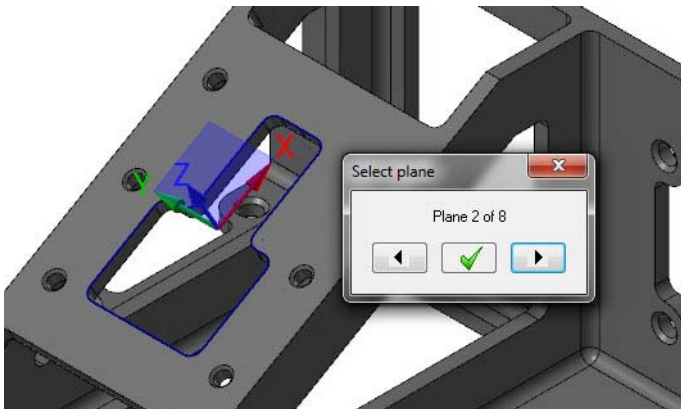
- 3 Select the slanted face of the part, shown below:



- 4 Click the arrows to cycle through the possible views. For most applications, it make sense to have +Z pointing away from the part.

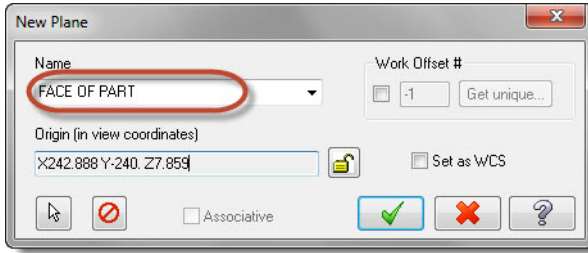


- 5 Cycle to the view shown below.

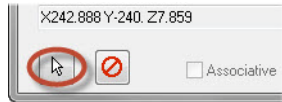


- 6 Click **OK** in the Select plane dialog box. The New Plane dialog box displays.

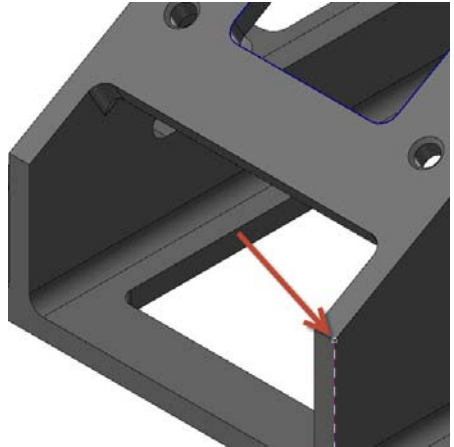
- 7 Enter **FACE OF PART** as the name of the new plane.



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



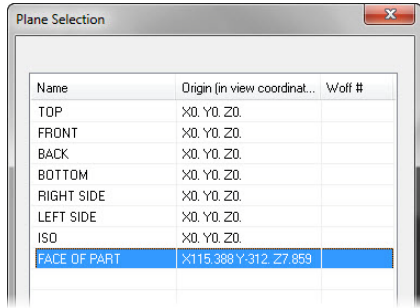
- 9 Select the point at the lower-right corner of the face.



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

- 11 Select **Planes, Named planes, Plane List** from the Status bar. The Plane Selection list displays.

Your new plane displays in the list.



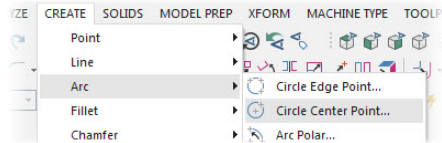
- 12 Click **OK** to close the Plane Selection dialog box.

Because you created the plane from the Planes menu, Mastercam automatically aligns the Cplane and Tplane with the new plane.

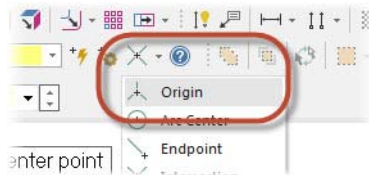
### *Exercise 2: Using a Custom Plane for Drawing Geometry*

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.

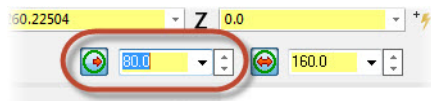
- 1 Select **Arc, Circle Center Point** from the **Create** menu.



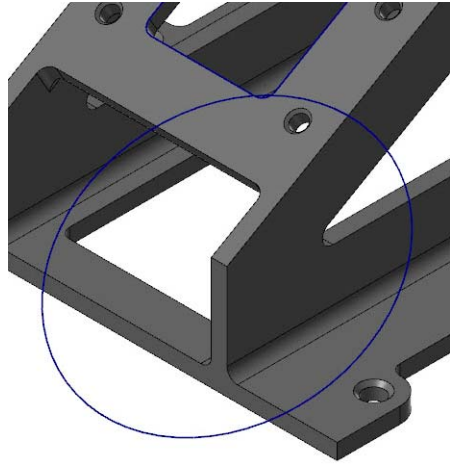
- 2 Select **Origin** from the **Override** drop-down in the AutoCursor ribbon bar.



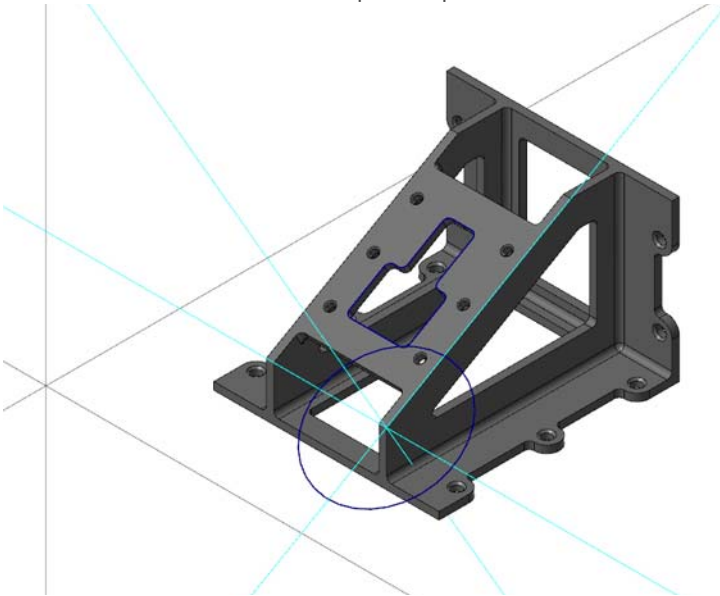
- 3 Enter a radius of **80.0** and click **OK** twice.



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.

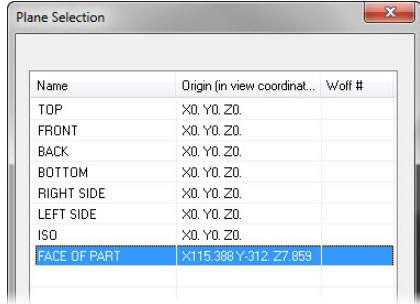


- 4 Press **[F9]** to display the XYZ axes. The default system axes and origin display in brown, and the customized Cplane/Tplane axes in blue.



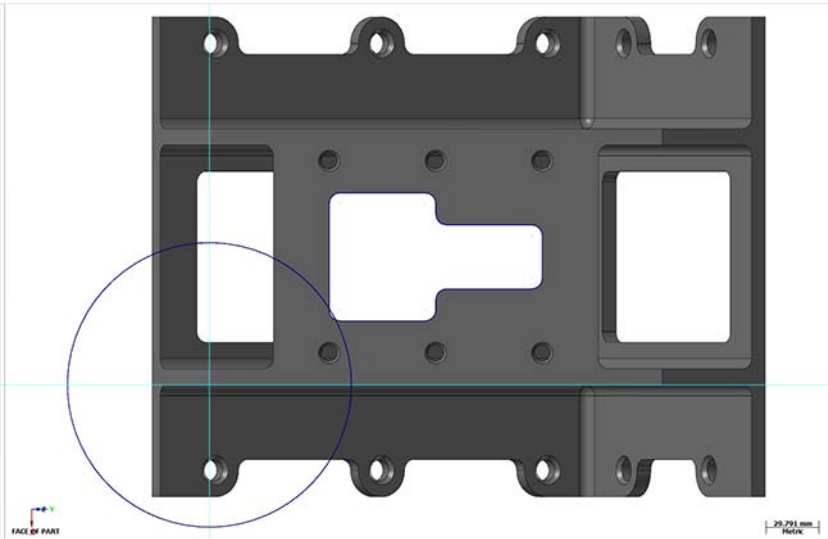
- 5 Press **[F9]** again to clear the axes from the screen.

- 6 Select **Gview**, **Named planes**, **Plane List** from the Status bar. The Plane Selection dialog box displays.
- 7 Select **FACE OF PART** and click **OK**.



**TIP:** You can select custom planes from the Named planes menu, instead of selecting them through the Plane List.

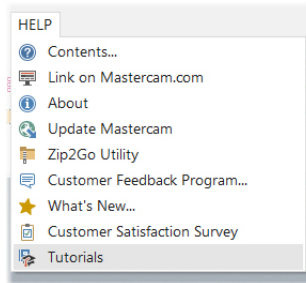
You are now looking straight down into the face of the part. The Gview is aligned with the custom plane that you just created.



# 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 **Tutorials** from the **Help** menu 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 menu bar 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](mailto: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 offer 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](http://www.mastercamu.com), or email [training@mastercam.com](mailto:training@mastercam.com).

- *Online communities*— You can find a wealth of information, including many videos, at [www.mastercam.com](http://www.mastercam.com).

For tech tips and the latest Mastercam news, follow us on Facebook ([www.facebook.com/mastercam](http://www.facebook.com/mastercam)), Twitter ([www.twitter.com/mastercam](http://www.twitter.com/mastercam)), or Google+ ([plus.google.com/+mastercam](https://plus.google.com/+mastercam)). Visit our YouTube channel to see Mastercam in action ([www.youtube.com/user/MastercamCadCam](http://www.youtube.com/user/MastercamCadCam))!

Registered users can search for information or ask questions on the Mastercam Web forum, [forum.mastercam.com](http://forum.mastercam.com), or use the knowledge base at [kb.mastercam.com](http://kb.mastercam.com). To register, select **Help, Link on Mastercam.com** from the Mastercam menu and follow the instructions.

## ***Mastercam Documentation***

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

- *What's New in Mastercam X9*
- *Mastercam X9 Installation Guide*
- *Mastercam X9 Administrator Guide*
- *Mastercam X9 Transition Guide*
- *Mastercam X9 Quick Reference Card*
- *Mastercam X9 ReadMe*

## **Contact Us**

For questions about this or other Mastercam documentation, contact the Technical Documentation department by email at [techdocs@mastercam.com](mailto:techdocs@mastercam.com).







**Attention! Updates may be available.  
Go to [Mastercam.com/Support](http://Mastercam.com/Support) for the latest downloads.**

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