Lesson 1   Introduction to Mastercam V9

Introduction To Mastercam V9

Lesson 1 is developed to get you the user, familiar with the Mastercam software. You will be introduced to the screen layout as well as the tools and menus. This lesson has tools, menus and a quick key list that will be a valuable resource throughout the entire book.

There are a few short tutorials that take you through the steps required to create lines, circles and rectangles. These short tutorials show you how to create basic geometry but also demonstrate how to get a round in the Mastercam environment.

The next section shows you where and how to make some basic customizations to the Mastercam layout, such as background color, grid size etc.

The last section is a short summarization of the entire lesson. This lesson also has the Lesson 1 Review section which consists of twenty review questions. If a hands-on-review is what you're best at there are five practice exercises in the Lesson 1 Exercises section.

Lesson 1 Objectives

The objective of this lesson is to introduce you the user to Mastercam V9. When you are done with this lesson you should have an understanding of the following:

    a.) How to start Mastercam V9 and know what some of the start options are.

    b.) Mastercam V9 screen layout.

    c.) Mastercam V9 tool options.

    d.) Mastercam V9 quick key options.

    e.) How to start and save a Mastercam V9 design file.

    f.) How to create a basic 2D geometry.

    g.) How make basic modifications to the Mastercam properties.

The purpose of this Lesson is to give you the user the knowledge (tools) to get around in the Mastercam V9 and the tools to create simple geometry. This information is a vital foundation for the following lessons to build upon.

Starting Mastercam V9

It is assumed that you have some computer experience in basic windows operations. If this is not the case consult your Microsoft Windows handbook and/or **Help** file. You can access the windows help menu under **Start (**lower left corner of your computer screen) then select **Help.**

After the computer has been started and the boot up is completed look on the Windows Desktop for a **Mill 9** shortcut. Reference the shortcut icon to the right. If a shortcut is not available complete the following steps to start Mastercam (reference Figure 1.1):

1.) From the Windows desktop select **Start** from the lower left of your computer screen.

2.) Select All **Programs**. All **Programs** displays all the software programs loaded and available on your computer. Scan through the list until you locate the **Mastercam 9** option.

Figure 1.1
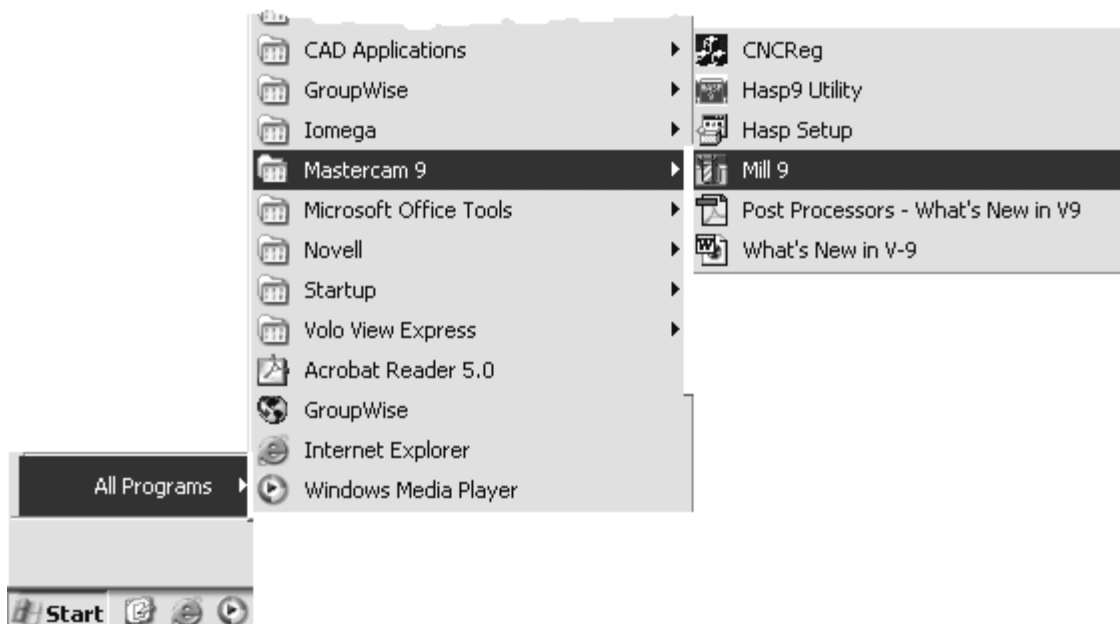
3.) Select **Mastercam 9** from the programs list. This will bring up a list of Mastercam options.   The **Design 9** option will allow you to create geometry only. The **Mill 9** option will allow you to create geometry and create tool paths. To simplify the step select the **Mill 9** option.

4.) Depending on your Mastercam license and setup, you will be prompted to accept the license agreement prior to being allowed to enter Mastercam V9. Accept the license agreement to enter Mastercam V9 program.

You know that you are in Mastercam program when your screen looks similar to the one shown in Figure 1.2. At this point you can open an existing file or start a new one. The following section familiarizes you with the Mastercam screen layout and tools.

Mastercam V9 Standard Menus And Tools

The following standard screen layout shows you where different tools and tool bars are located. The numbers coordinate with the following pages where the tool label is bolded. The tool label is followed by a brief explanation and in some cases, steps on how to use and/or access the tool.

Figure 1.2
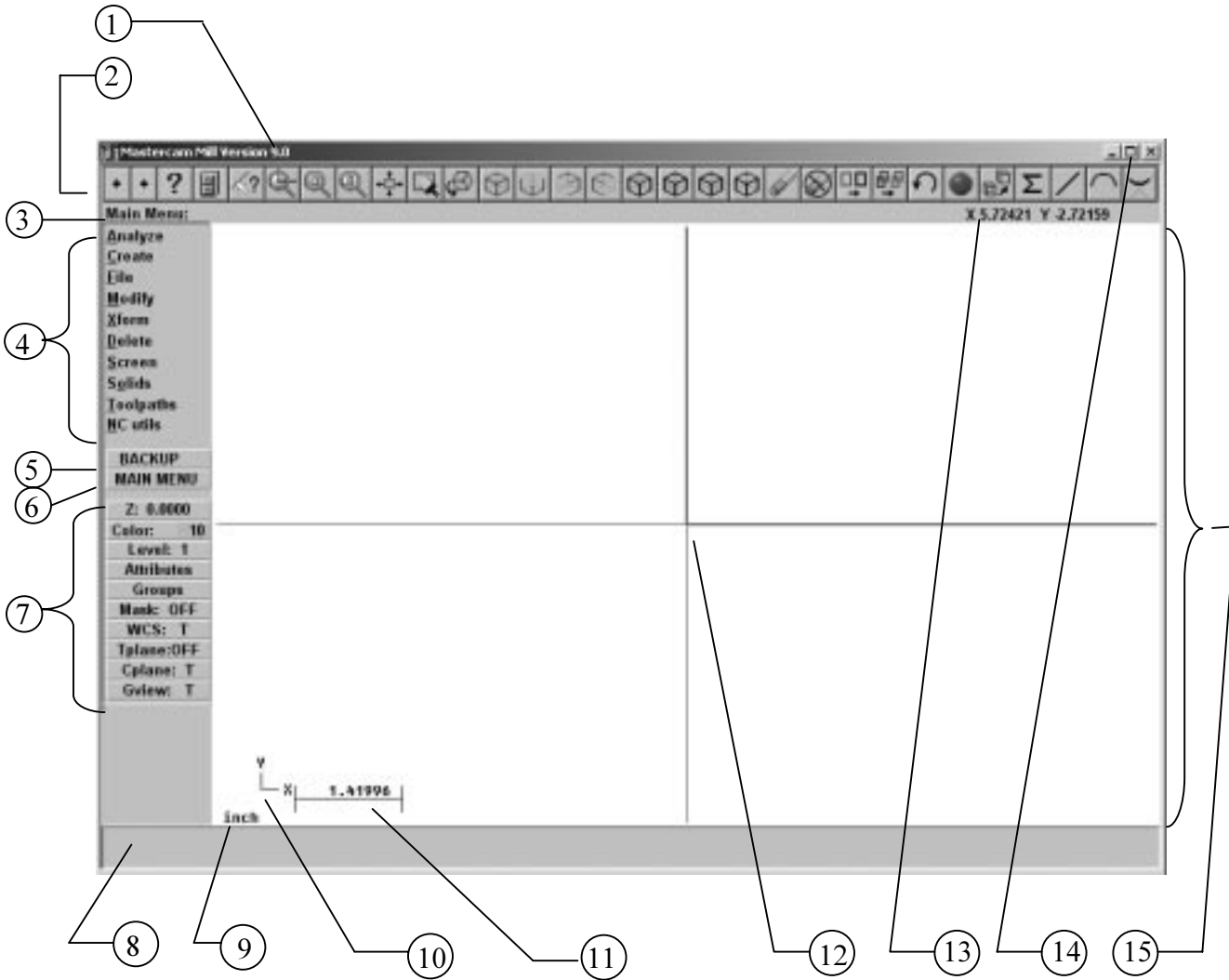
The following list of menus is not meant to be a comprehensive definition of every tool on the standard Mastercam V9 screen. The purpose is to provide a quick reference and an introduction with a brief explanation. If more detailed information is needed and/or required, refer to the Mastercam V9 Help menu and/or Internet homepage.

Menu 1
The **Mastercam Program Identifier**

Mastercam Mill Version 9.0   This part of the screen is used to identify the particular Mastercam program that is loaded and the program version. The options are Mill, Lathe and Design.

Menu 2
Toolbar Menu

This horizontal bar of tool icons stretches across the entire upper portion of the screen. The icons represent tools that can be accessed in the design and mill operations. Most of the tools can also be selected from the **Main Menu** area as well. The following gives a brief description on each tool. **Alt** + **B** hides/shows the toolbar. Some tools bring up windows, some menus and others are just toggle tools.

Tool Bar	Tool Name	Tool Definition
←	**Previous Page**	This tool allows you to scroll back through the **Toolbar** menu. There are too many tools to be displayed all at the same time thus the need for the scroll tools.
→	**Next Page**	This tool allows you to scroll forward through the **Toolbar**. It scrolls opposite direction of the previous tool.
?	**Help**	This tool brings up the Mastercam V9 **Help** window. This is a very helpful tool, use it! **Alt** + **H** is the Help quick key.
(file icon)	**File**	This tool can also be selected from the **Main Menu**. Select either the tool icon or from the **Main Menu** and the **Menu Heading** changes to the active tool. Reference **Menu 3**. If you select the tool icon reference the **Main Menu** (Menu 4) to display the additional options under **File**.
(analyze icon)	**Analyze**	This tool allows you to analyze the design and or mill geometry created on the work area of the screen. Notice that the **Analyze** option is also listed on the **Main Menu**. When either the icon or **Main Menu** options is selected the additional options are displayed.
(zoom icon)	**Screen Zoom**	The user is prompted to select a rectangular window to zoom in on.
(unzoom icon)	**Screen U...**	This tool automatically unzooms (zooms out).

	Unzoom	
	Unzoom by 0.8	Zooms out from the displayed image in increments of 0.2.
	Screen Fit	This tool automatically fits the displayed image to the graphic screen area.
	Screen Repaint	Refreshes the screen, gets rid of remnant geometry.
	Gview - Dynamic	This tool allows the user to rotate the geometry in all three dimensions.
	Gview - Isometric	This tool allows the user to view the created geometry from an **Isometric View** point.
	Gview -Top	This tool allows the user to view the created geometry from a **Top View** point.
	Gview - Front	This tool allows the user to view the created geometry from a **Front View** point.
	Gview - Side	This tool allows the user to view the created geometry from a **Side View** point.
	Cplaine - Top	The construction plane is the active plane that the geometry is created on. This tool makes the top plane the active construction plane.
	Cplane - Front	This tool makes the front plane the active construction plane
	Cplaine - Side	This tool makes the side plane the active construction plane.
	Cplane-3D	This tool makes it possible to create geometry in 3D. The previous three tools restricted geometry creation to 2D. This means you must define geometry in terms of 3D, such as a point requires an X, Y and Z value.
	Delete	This tool allows the user to delete selected geometry.
	Delete-Undelete-Single	This tool allows you to undo the last deletion.
	Screen Change Colors	This tool brings up the **Change Color** menu. The tool allows the user to change the color of selected geometry.
	Screen Clear Colors	This tool makes all geometry the same color and/or group.
	Undo	This tool allows you to undo the last operation as long as you are in the same menu the operation was executed in.
	Screen Surf Disp-Shading	This tool allows you to apply the shading to surfaces.
	Screen-Blank	This tool brings up the **Blank** menu allowing you to blank select geometrical entities.

Σ	**Screen Statistics**	This tool list all the geometrical entities created. The information is displayed in the **Prompt Zone**.
/	**Create-Line**	This tool brings up the **Create/Line** menu.
⌒	**Create-Arc**	This tool brings up the **Create/Arc** menu.
⌣	**Create-Fillet**	This tool brings up the **Create/Fillet** menu
⌐	**Create-Spline**	This tool brings up the **Create/Spline** menu.
▭	**Create-Rectangle**	This tool brings up the **Create/Rectangle** menu.
+	**Create-Point**	This tool brings up the **Create/Point** menu.
◈	**Create-Surface**	This tool brings up the **Create/Surface** menu.
▱	**Create-Solid**	This tool brings up the **Create/Solid** menu.
冒	**Create Solids History**	This tool brings up the **Solids History**. This tool allows you to see the steps used to create the resultant solid.

Menu 2 **Toolbar Menu** Continued	

This horizontal bar of icons is what will be displayed when you select the **Next** tool.

←	**Previous Page**	Use this button to scroll through the **Toolbar**.
→	**Next Page**	Use this button to scroll through the **Toolbar**.
✕	**Modify-Trim-1 Entity**	This tool brings up the **Modify/Trim/1 Entity** function in the **Prompt Zone**.
⋎	**Modify-Trim-2 Entity**	This tool brings up the **Modify/Trim/2 Entity** function in the **Prompt Zone**.
⋇	**Modify-Trim-3 Entity**	This tool brings up the **Modify/Trim/3 Entity** function in the **Prompt Zone**.
✕	**Modify-Trim-Divide**	This tool brings up the **Modify/Trim/Divide** function in the **Prompt Zone**.
↗	**Modify-Extend**	This tool brings up the **Modify/Extend** menu. Also notice the information displayed in the **Prompt Zone**.

	Modify-Break	This tool brings up the **Modify/Break** menu.
	Modify-Normal	This tool brings up the **Modify/Normal** menu. This tool deals specifically with surfaces.
	Xform-Mirror	This tool brings up the **Modify/Mirror** menu. This tool is a shortcut for the **Xform** option found in the **Main Menu**.
	Xform-Rotate	This tool brings up the **Modify/Rotate** menu. This tool is a shortcut for the **Xform** option found in the **Main Menu**.
	Xform-Scale`	This tool brings up the **Xform/Scale** menu. This tool is a shortcut for the **Xform** option found in the **Main Menu**.
	Xform-Translate	This tool brings up the **Xform-Translate** menu. This tool is a shortcut for the **Xform** option found in the **Main Menu**.
	Xform-Offset	This tool brings up the **Offset** window. This allows you to create duplicate entities a specified distance apart.
	Screen Display Info	This tool is a toggle tool from the following information: The quick key is **F9**. - Current axis system. - Current geometry file information. - Current Toolpath file information.
	Cursor Tracking (Toggle)	This tool tracks the location of the cursor, it is a toggle tool.
	Create-Drafting-Dimension	This tool brings up the **Create/Drafting/Dimension** menu.
	Draft Global	This tool brings up the **Drafting Global** window. This window is where you set the drafting parameters.
	Screen Configuration	This tool brings up the **System Configuration** window. This window is where you can set Mastercam default and systems defaults.
	Toolpaths-Contour	This tool brings up the **Tooplpaths/Contour** menu. The tool is used to create a **Contour** Toolpath.
	Toolpaths-Drill	This tool brings up the **Tooplpaths/Drill** menu. The tool is used to create a **Drill** Toolpath.
	Toolpaths-Pocket	This tool brings up the **Tooplpaths/Pocket** menu. The tool is used to create a Pocket Toolpath.
	Tooplpaths-Flowline	This tool brings up the **Toolpaths/Flowline** menu.
	Toolpaths-Surface	This tool brings up the **Toolpaths/Surface** menu.
	NC Utils-Backplot	This tool brings up the NC **Utils/Backplot** menu.
	Screen-Regenerate	This tool brings up the **Mastercam Rebuilds Display List** window. This tool is used to optimize Mastercam.
	NC Utils-Filter	This tool brings up the **NC Utils/Filter** menu.

	NC Utils-Post Proc	This tool brings up the **NC Utils/Post Proc** menu.
	File-dos Shell	This tool brings up a **DOS** window and Dos prompt.
	File Communic	This tool brings up a **Communications** window.
	Screen Viewport	This tool brings up the **Viewport** window. The tool allows you to define multiple screen configurations.
	File New	This tool allows you to start a new Mastercam session.
	Create Ellipse	This tool brings up the **Create Ellipse** window.
	Create Line-Multi	This brings up the **Create/Line/Multi** menu. This tool is a quick way to creating a line using a specific method.
	Create-Line-Horizontal	This brings up the **Create/Line/Horizontal** menu. This tool is a quick way to creating a line using a specific method.
	Create-Line-Vertical	This brings up the **Create/Line/Vertical** menu. This tool is a quick way to creating a line using a specific method.

Menu 2
Toolbar Menu Continued, Again

This horizontal bar of icons is what will be displayed; select the **Next** tool for the second time.

	Previous Page	Use this button to scroll through the **Toolbar**.
	Next Page	Use this button to scroll through the **Toolbar**.
	Create-Line-Endpoints	This brings up the **Create/Line/Endpoints** menu. This tool is a quick way to creating a line using a specific method.
	Create-Line-Polar	This tool brings up the **Create/Line/Polar** menu. This tool is a quick way to creating a line using a specific method.
	Create-Line-Parallel	This tool brings up the **Create/Line/Parallel** menu. This tool is a quick way to creating a line using a specific method.
	Create-Arc-Polar-Centerpoint	This tool brings up the **Create/Arc/Polar/Centerpoint** menu. This tool is a quick way to creating a circle/arc using a specific method.
	Create-Arc-Endpoints	This tool brings up the **Create/Arc/Endpoint** menu. This tool is a quick way to creating a circle/arc using a specific method.

	File Ramsaver	This tool allows you to automatically delete duplicate geometry.
	Screen Change Attributes	This tool brings up the Screen Change **Attributes** window. This window allows you to specify the attributes of geometrical entities.
	Toolpaths Job Setup	This tool brings up the Toolpaths **Job Setup** window. This window is where you can define the parameters of a toolpath such as raw stock, toolpath configuration and material.
	Toolpath Oparations Manager	This tool brings up the **Toolpath Operations Manager** window.
	WCS View Manager	This tool brings up the WCS **View Manager** window.
	Delete Last Operation	This tool allows you to delete the last toolpath operation.
	Create Drafting	This tool brings up the Create **Drafting** menu.
	Create Dimension Horizontal	This tool brings up the **Create/Drafting/Dimension/Horizontal** menu.
	Create Dimension Vertical	This tool brings up the **Create/Drafting/Dimension/Vertical** menu.
	Create Dimension Parallel	This tool brings up the **Create/Drafting/Dimension/Parallel** menu.
	Create Dimension Angular	This tool brings up the **Create/Drafting/Dimension/Angular** menu.
	Create Dimension Circular	This tool brings up the **Create/Drafting/Dimension/Circular** menu.
	Crdmrad	This tool brings up the **Create/Drafting/Dimension/Circular** menu.
	Create Dimension Baseline	This tool brings up the **Create/Drafting/Dimension/Baseline** menu.
	Create Dimension Chained	This tool brings up the **Create/Drafting/Dimension/Chained** menu.
	Create Dimension Ordinate	This tool brings up the **Create/Drafting/Dimension/Ordinate** menu.
	Create Dimension Point	This tool brings up the **Create/Drafting/Dimension/Point** menu.

	Create Drafting Label	This tool brings up the **Note Dialog** window. The **Note Dialog** window allows you to create text notes.
	Create Drafting Hatch	This tool brings up the **Hatch** window. This window allows you to select the type of hatch you want to apply to the geometry.
	Macro-Record (Toggle)	This tool allows you to **Create** and save a **Macro**.
	Macro-Playback (Toggle)	This tool allows you to load and **Play** a **Macro**.
	Macro-Pause (Toggle)	This tool allows you to **Pause** the current **Macro**.

Menu 3
The **Main Menu Identifier**

Main Menu:

This area of the window identifies the active menu option. The options can be selected from the **Main Menu** selection or from the **Toolbar** option.

Menu 4
The **Main Menu**

The options shown in this menu are Mastercam V9's main tools. Notice that most of the options also are the first few tools represented in the **Toolbar** (Menu 2). Once the main option is selected the next level of options are displayed. **Menu 3** helps you keep track of where in the menu option you are by labeling the menu option. Notice that the each options has one letter underlined. The under lined letter is a **Quick Key** to activating the particular tool.

Tool Bar	Tool Name	Tool Definition
Analyze	**Analyze**	This option allows you to analyze the design and or mill geometry in the work area of the screen.
Create	**Create**	This option allows you to create geometrical and drafting entities, such as lines and dimensions.
File	**File**	This option allows you to save, get, import and/or export Mastercam files.
Modify	**Modify**	This option gives you access to all the tools used to modify existing geometry such as trim and extend.
Xform	**Xfrom**	This option gives you access to all the tools that allow you to transform existing geometry such as mirror and rotate.
Delete	**Delete**	This option allows you several different methods of selecting the entities you want to delete.
Screen	**Screen**	This option gives you access tools that allow you to modify and or define all parameters related to the Mastercam screen and layout defaults.
Solids	**Solids**	This option gives you access to the **Solids** tools.
Toolpaths	**Toolpaths**	This option is where you go to create the toolpaths such as contour, drill and pocket.
NC utils	**NC Utils**	This option is where you have access to the toolpath defaults, setup and verification tools.

Menu 5
The **Backup Menu Tool**

| BACKUP |

This tool is a handy tool, it allows you to backup one menu level at a time.

Menu 6
The **Main Menu Tool**

| MAIN MENU |

This tool allows you to jump directly back to the main menu no matter where or what level of a particular menu you are at.

Menu 7
The **Secondary Menu Tools**

This Toolbar controls the graphical aspect of the entities in the work area.

Tool Bar	Tool Name	Tool Definition
Z: 0.0000	**Z: Height**	This status bar indicates the current **Z** value.
Color: 10	**Color:**	This status bar indicates the current color and its assigned number.
Level: 1	**Level:**	This status bar indicates the current (active) Level. Selecting this tool brings up the **Level Manager** window. From this window you can create and change the current level.
Attributes	**Attributes**	This tool brings up the **Attributes** window. In the **Attributes** window you can change the color, type and thickness of the geometrical entities.
Groups	**Groups**	This tool brings up the **Groups** window. In this window you can create new and modify existing groups.
Mask: OFF	**Mask:**	Selecting this tool will bring up the **Level Manager** window where you can turn the levels Off or On (mask). This tool also gives the current status of the **Mask**.

WCS: T	**WCS:**	This tool brings up the **View Manager** window.
Tplane:OFF	**Tplane:**	This tool brings up the **Tool Plane** menu, where you can specify what tool plane you require (Front, Top, Side…). Notice it also shows the status (active TPlane).
Cplane: T	**Cplane:**	This tool brings up the **Construction Plane** menu, where you can specify what tool plane you require (Front, Top, Side…). Notice it also shows the status (active CPlane).
Gview: T	**Gview:**	This tool brings up the **Gview** menu, where you can specify what specific view you want your geometry to shown in. Notice it also shows the status (active Gview).

Menu 8
The **Prompt Zone**

Create line, horizontal: Specify the first endpoint

This area of the screen is reserved for prompting the user for specific input. The prompt message will depend on what tools has been selected. The example shown is the prompt message after selecting **Create** from the **Main Menu** and **Line** in the second level menu.

Menu 9
The **Units Display**

inch

This area of the screen is dedicated to identifying the units the file is being created, edited and saved in.

Menu 10
The **Axis Orientation**

This tool shows the orientation and/or working plane. By default you will be working in the **X**, **Y** plane as shown. If you rotate to a new work plane the Axis will show you the current orientation three dimensionally as shown below the two dimensional axis.

Menu 11
The **Zoom Screen Scale**

This information displays the zoom screen value. This display can be turned off selecting the **F9** key. If you select the **Alt** + **F2** you can verify the zoom value to change in increments of .2.

Menu 12
The **Axis Identifier**
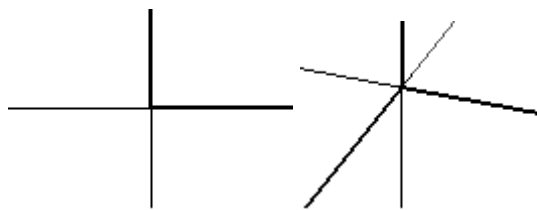
The first axis is two dimensional with the x, y plane active. The second axis is rotated to an isometric view. This tool helps identify the orientation of the work space as well as the 0,0,0 point. This tool is a toggle tool, **F9** turns the axis display on and off.

Menu 13
The **Cursor Location Display**

X 1.30479 Y 0.92272

This area is dedicated to displaying the location of the cursor in the work area. You can move the cursor around in the work space. Notice the values update to the new location of the in reference to 0,0,0. **Alt** + **F3** toggles this display On and Off.

Menu 14
The **Standard Window Tools**

These tools are the standard Microsoft Windows tools. The options are to **Minimize** the current Mastercam window, **Customize** the window size or **Exit** out of the current Mastercam window. If you exit out without saving the current file, Mastercam will prompt you to **Save** or **Exit** without saving.

Menu 15
The **Work Area**

This area is where the geometry and tool paths are created and modified.

Mastercam V9 Function Keys and Quick Keys

Quick Key	Function Name	Function Discription
F1	Zoom	Shortcut to the **Screen Zoom** tool. You can use this tool to magnify specific area of your geometry.
F2	Unzoom	Shortcut to the **Screen Unzoom** tool. This tool zooms out every time you push this function key.
F3	Repaint	Shortcut to the **Screen Repaint** tool. This tool updates the screen and displays only the current active entities.
F4	Analyze	Shortcut to the **Analyze** menu.
F5	Delete	Shortcut to the **Delete** menu.
F6	File	Shortcut to the **File** menu.
F7	Modify	Shortcut to the **Modify** menu.
F8	Create	Shortcut to the **Create** menu.
F9	Display Information	This quick key displays the following information: - Current System Construction Origins (screen axis). - Zoom value. - Current Mastercam file name (Prompt Zone). - Current Tool Path file name (Prompt Zone).
F10	Function Assignment window	This quick key brings up the **Function Assignment** window. This tool allows you to assign your own quick keys.
Alt+F1	Screen Fit	This quick key automatically zooms the screen to fit all entities within the screen.
Alt+F2	Scale Zoom	This quick key automatically zooms out in increments of 0.2.
Alt+F3	Cursor Location	This quick key toggles the **Cursor Location** display on and off. Reference Menu 13.
Alt+F4	Mastercam Exit window	This quick key brings up the **Mastercam Exits** window. This window will ask if you are sure you want to exit Mastercam.
Alt+F5	Delete Window Menu	This quick key brings up the **Delete Window Menu**.
Alt+F6	Type of File to Edit Menu	This quick key brings up the **Type of File to Edit Menu**.
Alt+F8	System Configure window	This quick key brings up the **System Configure** window. This lesson introduces some of the options available.
Alt+F9	Display Axes	This quick key displays the current World View Axis (center), the current Construction Plane Axis (lower left), and the current Tool Plane Axis (lower right).
Alt+A	Autosave	This quick key brings up the **AutoSave** window.

	Window	
Alt+B	**Horizontal Toolbar**	This quick key toggles the **Horizontal Toolbar** on and off. Reference Menu 2.
Alt+C	**C-Hooks Window**	This quick key brings up the **C-Hook window**. From this window you can select a C-Hook application to run. C-Hooks are customized programmed Mastercam programs/functions.
Alt+D	**Drafting Global Window**	This quick key brings up the **Drafting Global** window. This window is where you set all the drafting parameters.
Alt+F	**Fonts Window**	This quick key brings up the **Font Window**. This window is where you can set the default text font and size.
Alt+H	**Mastercam Help Window**	This quick key brings up the **Mastercam Help Window**. This lesson introduces the Mastercam Help window and how to use it.
Alt+L	**Attributes Window**	This quick key brings up the **Attributes Window**. This window is where you can set line type, thickness and color.
Alt+M	**Memory Allocations Window**	This quick key brings up the **Memory Allocation** Window. This is a diagnostic tool only.
Alt+O	**Operations Manager Window**	This quick key brings up the **Operations Manager Window**. This window displays the existing toolpaths and toolpath properties.
Alt+P	**Prompt Toggle**	This quick key toggles the **Prompt Area** on and off.
Alt+S	**Shading Toggle**	This quick key toggles the **Shading** on and off.
Alt+T	**Toolpath Display**	This quick key toggles the **Toolpath** display on and off.
Alt+U	**Undo**	This quick key allows you to undo the last step/operation completed in Mastercam. This option is available only in the operation that the last entity was created in.
Alt+V	**Mastercam License Information**	This quick key brings up the **Mastercam** software version and serial number of your SIM.
Alt+W	**Viewport Window**	This quick key brings up the **Viewport Window**. This window lets you set the viewport configuration.
Alt+X	**Set Main**	This quick key allows you to set the color, level, style and width of an entity. The options are displayed in the **Prompt Zone**.
Alt+Z	**Level Manager**	This quick key brings up the **Level Manager** window. This window is where you can create and set parameters for different levels.
Alt+0	**Point Menu**	This quick key brings up the **Point Menu**.
Alt+1	**Color Window**	This quick key brings up the **Color Window**. The Color Window allows you to select a color for entity creation.

Alt+2	Level Manager	This quick key brings up the **Level Manager Window**.
Alt+3	Mask Level	This quick key brings up the **Level Manager Window**. This allows the user to set the **Mask level**.
Alt+4	Tool Plane (Tplane)	This quick key displays the **Tool Plane** information in the **Prompt Zone** (Tplane).
Alt+5	Construction Plane (Cplane)	This quick key displays the **Construction Plane** information in the **Prompt Zone** (Cplane).
Alt+'	Create-Arc-2pt. cir	This quick key brings up the **Create/Arc/2pt. circle point menu**. Make your selections from the point menu to create your circle.
Alt+Tab	Switch between Open applications	This quick key allows you to switch between open window s applications. This is a standard Microsoft tool.
Esc	System Interrupt	The **Esc** key will interrupt the current command.
	Backup key	Press **Esc** to back up to a previous menu.
Page Up/Page Down	Zoom	To zoom in press the **Page Up** key. To zoom out press the **Page Down** key.
Cursor Arrows	Pan	The Cursor Arrows allow you to pan across the screen.

Mastercam V9 Coordinate System

This section reviews the **Cartesian Coordinate System**. If you have a good understanding of this system you can skip to the next section. If not this section would be a good introduction and/or review of how geometry/parts are created and located in the Mastercam work area.

There are a few basic concepts that are important to understand and visualize when using Mastercam V9. The Mastercam V9 work area uses the Cartesian Coordinate System to create and locate geometry. The Cartesian Coordinate System has a horizontal numbered line called the x axis. Mastercam refers to the x and y axis as the x and y coordinate. All numbers on the x axis to the right of 0 are positive and all numbers on the x axis to the left of 0 are negative. Zero is called the origin. Reference Figure 1.3
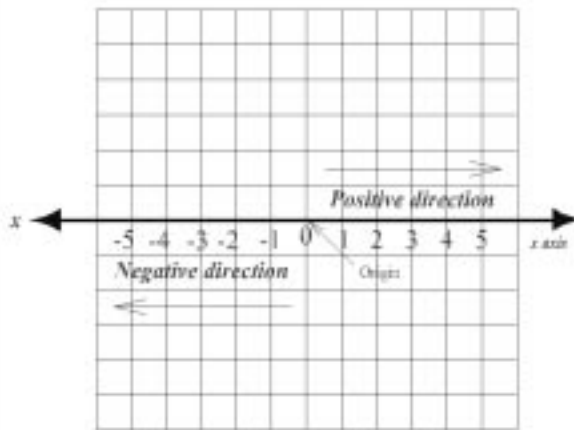
Figure 1.3   **Figure 1.4**
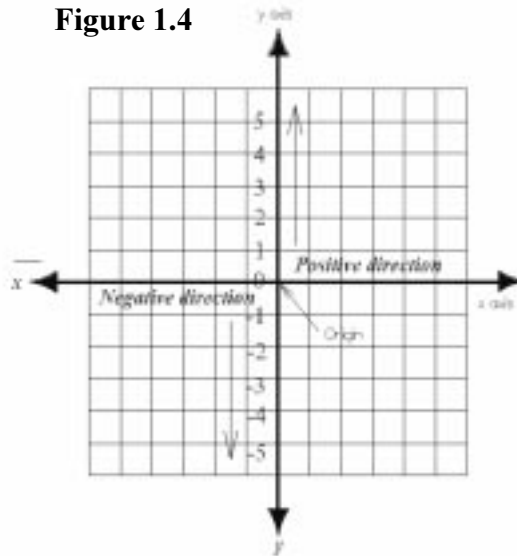
Figure 1.5
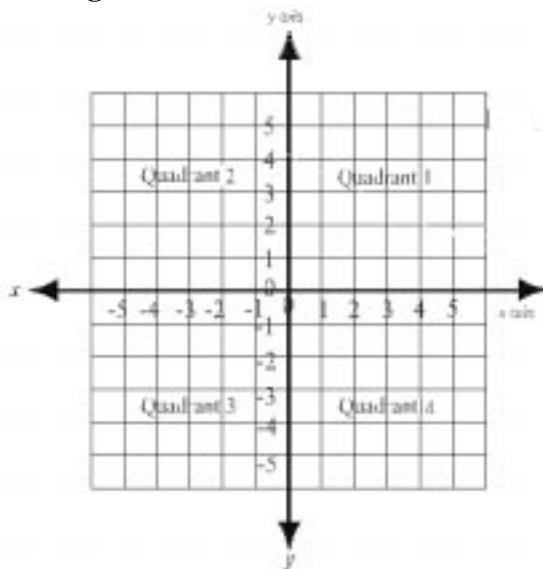
There is another number line that runs vertical (up and down) on the screen. This vertical line is called the y axis. Numbers above 0 on the y axis are positive while all numbers below 0 are negative. Reference Figure 1.4.

The x and y axis divides the screen into 4 equal parts called quadrants. The first quadrant is the upper right and other quadrants II, III, and VI follow in a counter clockwise direction. Reference Figure 1.5.

To view the x y axis in the Mastercam work area (screen) select the **F9** function key. The **F9** key is a toggle key that turns the axis on and off. Note that the positive and negative numbers on the x and y axis do not appear when the **F9** key is selected. Figure 1.6 displays all the concepts presented thus far.

Figure 1.6
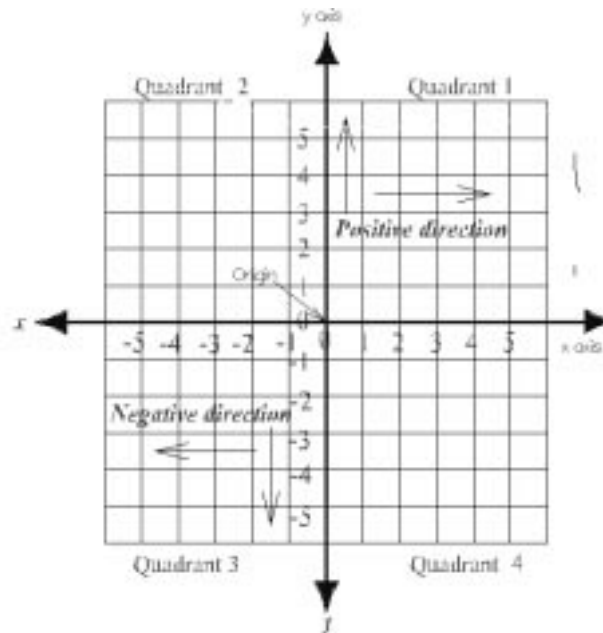
Mastercam allows you to create geometry in any quadrant or use a combination of quadrants. The best quadrant to locate your part geometry in depends on the geometry and how it will be used. Generally the easiest quadrant to work with is the first quadrant (quadrant I). Creating the part in the first quadrant keeps all the values positive. If you are dealing with cylindrical parts the center of the cylinder (circle) would probably be best located at the Mastercam origin (0,0).

Creating Simple Geometry In The Mastercam V9 Coordinate System

1 Creating Circles

This section will help you get started on creating some simple Mastercam V9 geometry as well as get used to moving around the Mastercam V9 menu system. To create a circle at the origin, complete the following steps (reference Figure 1.7 for all menu options):

    1.1 Select the **Create** tool from the **Main Menu**.

    1.2 Select the **Arc** tool from the **Create Menu**.

    1.3 Select the **Circ pt+rad** tool from the **Arc Menu**.

    1.4 The **Main Menu** area will go blank and you will be prompted in the **Prompt Zone** for the radius of the circle. For this step type in the value of **3″**.

1.5   Press **Enter** key.

1.6 Mastercam V9 will create a circle with a 3″ radius and the **Main Menu** area now displays the **Point Entry** menu. You can drag the circle around the screen. If the object snap is on you can snap it to the origin (**Alt**+**G**). If not you may select from the **Point Entry** menu. For this step select the **Origin** option. This will place the circle at the origin.

Figure 1.7
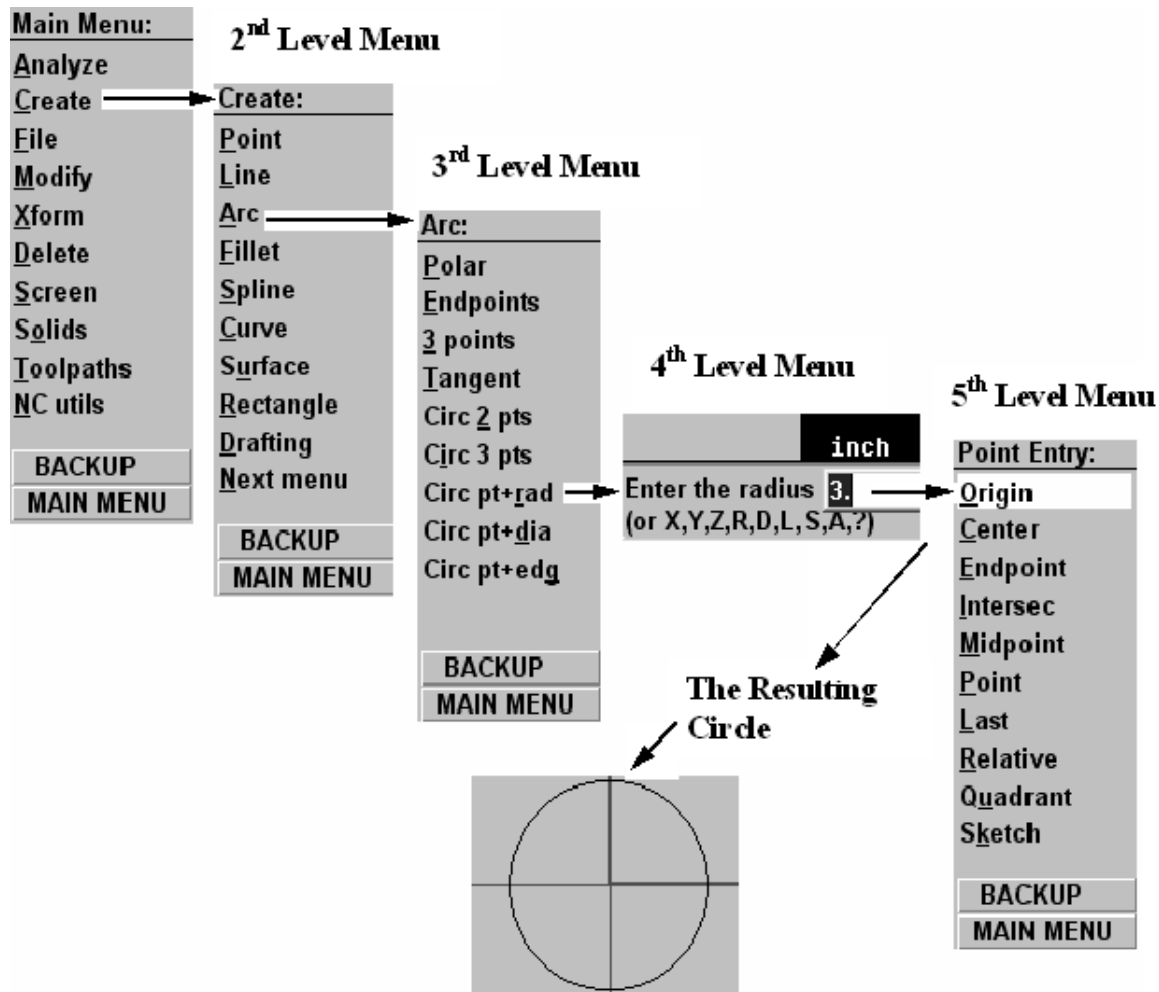
1.7   Mastercam also gives you the option to create the 3″ radius circle where ever you select. Notice that you can drag the circle around the screen, select a location with the mouse. You can continue to duplicate the circle without any additional tool selections. Notice in the Prompt Zone the x y location value is displayed.

1.8 To complete and exit the circle command, select the **Esc** key. The **Esc** key exits the current command. In this example the Esc key moved you back from the 4th level menu to the 3rd level menu.

As you created the circle(s) there are several things that you might have noticed. Mastercam uses multiple levels of menus to create a geometry. This multiple menu level is also used to create tool paths, as you will experience in the latter lessons. The different levels experienced in creating a circle are represented in Figure 1.7. At any point that you change your mind you can select the **BACKUP** menu. This selection takes you back one menu level where you can make other selections. For example if you selected **Polar** option you could select the **BACKUP** tool and select **Circ pt+rad** option instead. If you want to go directly back to the **Main Menu** and start over you could select the **MAIN MENU** tool. Another option that Mastercam allows you to do is to select the **Create Arc** tool from the **Toolbar** option. This will bring up the **Arc Menu** (3rd Menu Level). All the circle options were not covered but this should give you a good idea how to create some circles. It is strongly suggested that you test some of the other circle options. You need to get to a point that you are comfortable moving around the Mastercam Circle menus.

2 Creating Lines

This next section will take you through the basics of creating simple lines to complete a square. With the basic skills under your belt you can explore all the different options. To create the rectangle shown in Figure 1.9, complete the following steps:

2.1 Select the **F9** key to turn on the Mastercam Coordinate.

2.2 From the **Main Menu** select the **Create** option.

2.3 From the **Create Menu** select the **Line** option.

2.4 From the **Line** menu select the **Vertical** option. This will create a line that, you guessed it, will be vertical. This will bring up a menu that should be somewhat familiar, the **Point Entry** menu.

2.5 From the **Point Entry** menu select the **Origin** option. This selection makes this step easy. It will be vertical and start at the origin.

2.6 You can drag the mouse up and down (vertical) on the screen, the preview of line is displayed. It will be vertical and starting at the origin. At this point you would have to select the mouse twice to create the line. The first click would determine the length. The second click would determine location of the vertical line along the coordinate, but since the starting point is constrained to the origin the second click would not change the location. Another and more accurate process is to type in the x, y location of the endpoint. For this step type in **0,2** in the **Prompt Zone**.

2.7 Press the **Enter** key. This brings up the "**Enter the x coordinate**:" prompt.

2.8 Type in "**0**" and press the **Enter** key. Congratulations you have just created your first Mastercam line.

2.9 Now you need to create the horizontal line. If you are not yet comfortable with the Mastercam menu system select the **Main Menu** tool. This will take you back to the main menu. If you selected the **BACKUP** menu once it you would still be in the **Create**, **Line**, **Vertical** menu. You need to back out enough to select the **Horizontal** tool.

2.10   Select **Create** from the **Main Menu**.

2.11   Select **Line**.

2.12   Select **Horizontal**.

2.13   Select **Endpoint** option. This option allows you to snap to the closest endpoint of an existing line.

2.14   Select the top end of the existing line. As your pointer gets close to the endpoint a snap box will appear indicating that it has located the endpoint of the line.

2.15   At this point you can drag your pointer horizontally across the screen. The length of the line corresponds to the location of the pointer. You can arbitrarily determine the length of line by selecting anywhere. Very few part requirements allow you such tolerance luxury. To be more exact you can type in the endpoint of the line, x, y values. In this case type in **2,2**. Note: Mastercam does not prompt you for the x,y location. Once you start to enter a value, the value option will appear in the Prompt Zone.

2.16 Press the **Enter** key. The Prompt Zone will now prompt you for the y value of the horizontal line. Since it is a horizontal line and located off the endpoint of the first line it is already constrained to the y value. For this step enter **2**.

Figure 1.8
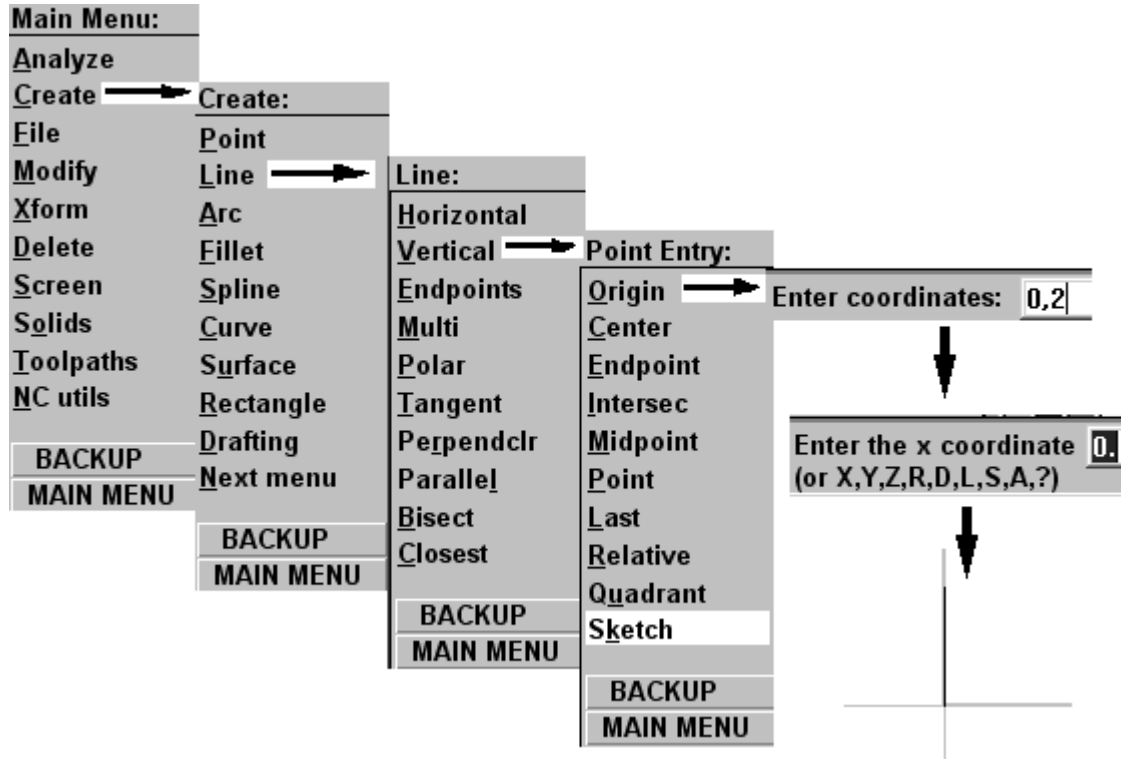
2.17   To create the third line select the **Main Menu** tool again.

2.18 Select **Create**.

2.19 Select **Line**.

2.20 Select **Multi**.

2.21 Select **Endpoint**.

2.22 With the mouse select the end of the second line.

2.23 Type in the x,y values for the endpoint of the third line. To create a square the values would be **2,0**.

2.24 To create the fourth and last line, select the **Main Menu**.

2.25 Select **Create Line** tool from the **Toolbar**. This is a shortcut to the **Line** menu.

2.26   From the **Line** menu select the **Endpoint** option.

2.27   Move your pointer to the endpoint of line three, select the endpoint. This creates the beginning point of the line you are about to create.

2.28   From the **Line** menu re-select the **Endpoint** option.

Figure 1.9

2.29   Move your mouse over the origin. Select the end of line 1. Your square should look similar to the one shown in Figure 1.9.

Point (2,2)
line 1
line 2
line 3
line 4
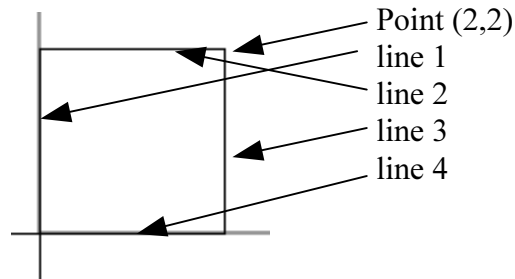
This is an introduction to a few of the different ways Mastercam V9 allows lines to be created. You are strongly encouraged to try all the options found in the **Line** menu. Find a few of the methods that work best for you.

3 Creating A Rectangle

Mastercam V9 does supply a tool to create a rectangle faster than the steps explained in the previous steps. To create a rectangle using the Rectangle tool complete the following steps:

3.1   Select the **Create** Menu. You could select the **Create Rectangle** tool directly from the **Toolbar** menu. If you selected the tool from the **Toolbar** menu you could skip step 3.2.

Figure 1.10

3.2   Select the **Rectangle** tool.

3.3   Select the **2 Points** Option.

3.4   Select the **Origin** option. As in the previous steps this will constrain the first point of the rectangle to the origin.

3.5   At this point you could arbitrarily select the size of the rectangle but since we want an exact size rectangle type in the x, y value of the second point of the rectangle. For this step make it a **-2, -2**. What quadrant does this create
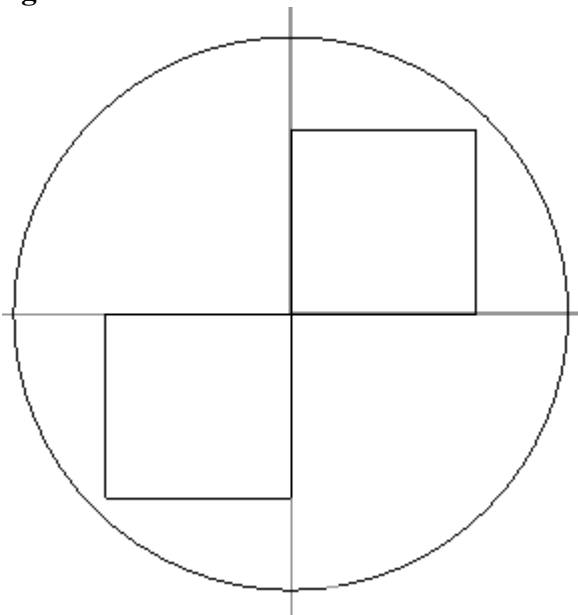
the rectangle in? If you can not answer then reference the **Cartesian Coordinate** section of this lesson.

3.6 The **1 Point** rectangle option is also a powerful tool. Create a few rectangles using the **1 Point** option.

4 Saving The Newly Created Geometry

At this point you should have quite a bit of geometry (lines, circles and rectangles) on the screen. Depending on how much additional geometry you have created while practicing your screen should look somewhat similar to the one shown in Figure 1.10. Figure 1.10 only shows the geometry that was created following steps 1 through 4. If you wanted to quit Mastercam V9 and save your newly created geometry so you could bring it up and add to it at a latter date complete the following steps:

4.1 From the **Main Menu** select **File**. If you want to select the same option from the **Toolbar** option select the **File** tool, displayed to the right.

4.2 Both options in Step 4.1 will bring up the **File** menu. In the **File** menu, select the **Save** option.

4.3 This will bring up the **Specify File Name to Write** window up as shown in Figure 1.11.

    Figure 1.11
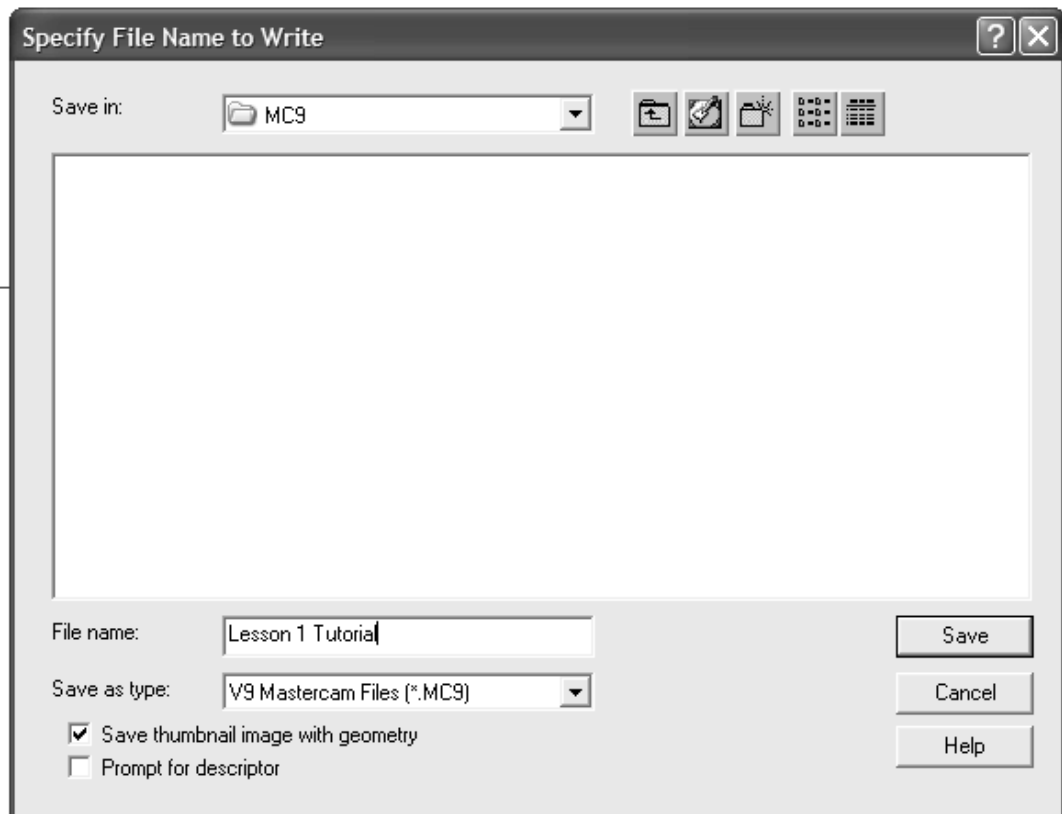
4.4 You will have to determine what directory you want to save the file in. If you are not sure you will have to check with your instructor and/or the systems administrator. Figure 1.11 shows that it will be saved in the MC9 directory. You can select the down arrow to the right of the directory to browse to the desired directory.

4.5 In the **File Name** box type in "**Lesson 1 Tutorial**". Notice that the file type (file extension) will default to MC9. This is shown in the field just below the **File Name** box.

4.6 Select **Save**. This saves the file name in the location (directory) you just specified and under the name you just specified.

The file is now saved. You can now exit Mastercam or start a new design. To start a new design select the **File**, **New** option. This will bring up a prompt window asking you if you are sure you want to initialize new geometry. If you select **Yes** the existing geometry will disappear and a blank new Mastercam screen will appear. At this point you could start creating new geometry.

5 Opening An Existing Mastercam Design (File)

You have now created Mastercam geometry and saved it. If you want to load the file you created and saved in the previous steps or any other existing Mastercam file complete the following steps:

5.1 Start Mastercam if you have not already done so.

5.2 From the Main Menu select the **File** option.

5.3 Select the **Get** option. This brings up the **Specify File Name To Read** window. This window is very similar to the one shown in Figure 1.11.

5.4 Select the directory the file is saved in. If you do not know how to do this you will need to reference the **Microsoft Help** files.

5.5 If you have the correct directory selected, the file should show up in the list of files. If it does not you will need to make sure you have specified the correct file extension in the box labeled "**Files of Type**". The extension you want to be listed is **MC9**.

5.6 Find your file and select it, so it is highlighted. For this step select **Lesson 1 Tutorial** file.

5.7 Select the **Open** button at the bottom right of the window. This will open the file The geometry will show up on the screen just as you have saved it.

5.8 At this point you could continue to practice creating Mastercam geometry. If you attempt to exit Mastercam prior to saving your latest changes, Mastercam will warn you that there are unsaved changes and ask if you want to save the changes. At this point it is your choice if you want to save your practice geometry, select **Yes**. If you don't want to save your changes, select **No** and Mastercam will close down without saving the latest changes.

Although this step specified a particular file to load into Mastercam you should be able to apply this process to any Mastercam file. You need to get comfortable with this process, and you will be required to know this information without instruction throughout the remainder of the lessons.

6 Customizing Mastercam

This one section will not be nearly enough to adequately cover all the customization options found in Mastercam. This section shows you where to go within the menu system to customize Mastercam. You will be introduced to the many different options but will have to do some exploring on your own to customize anything not covered in this section. To customize the Mastercam screen complete the following steps (reference Figure 1.12):

6.1 From the **Main Menu** select the **Screen** option. The quick key for this option is **Alt + F8**.

6.2 From the **Screen** menu select the **Configure** option.

6.3 This will bring up the **System Configuration** window. This window has ten different tabs. The tabs that you will probably be most interested in are the **Screen**, **Cad Settings** and **Plot Settings** tabs. Figure 1.12 shows the **Systems Configuration** window with the **Screen** tab selected.   For this step select the **Systems Colors** button. This will bring up the **Systems Colors** window.

6.4 Highlight the **Graphic Background Color** option and then select the **Color** button as shown in Figure 1.12. This will bring up the Color window.

6.5 Select the <u>White</u> color box.

6.6 Select the **Ok** button to complete the color change. Notice you have to back through the windows selecting the **OK** button to apply the change. If you wanted to make additional changes you could do that prior to selecting the **OK** button at the **System Configuration** window. Once you select the Ok and exit the **System Configuration** window the background color will change to white. The default background color should be black.

Figure 1.12
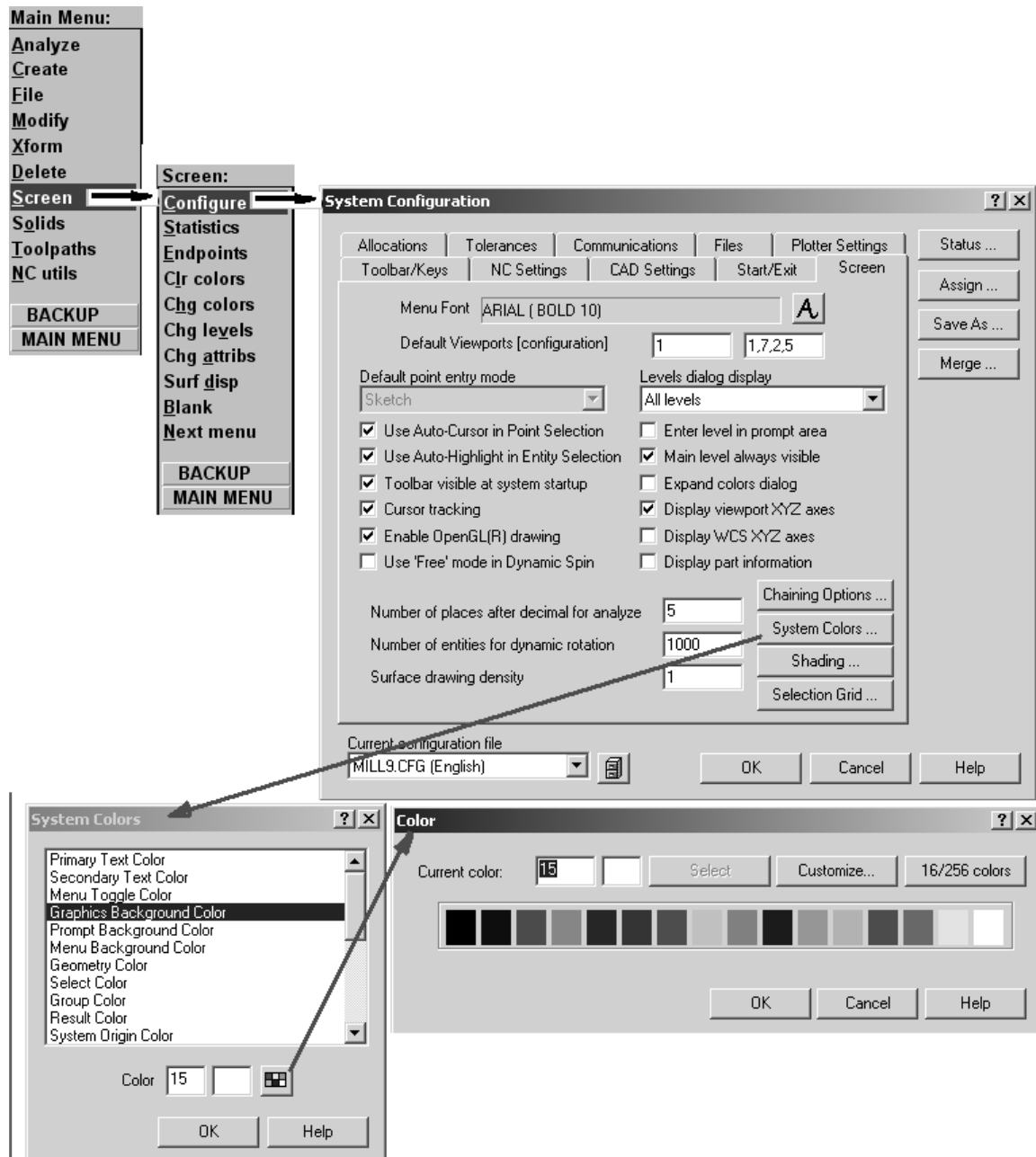
This step had you make one simple change but it should show you the way to multiple possibilities. Figure 1.12 shows you some of the possible options. You are encouraged to test some of these options out, see what you can do to change your Mastercam environment.

7 Getting Help

One last tool that is well worth the time to cover that is the **Help** tool. You might have to pickup up on this tool, it is listed in the horizontal tool bar. To get help with Mastercam complete the following steps (reference Figure 1.13):

7.1 From the **Horizontal Tool Bar** select the **Help** tool. This will bring up the Mastercam Help window.

7.2 As you can see on Figure 1.13 you can get help from an index and or do a search on a particular subject. This is very similar to any Microsoft Help window.

7.3 Select the **Search** option.

7.4 In box 1 type in "**contour**" and hit **Enter**. Box 2 will show you a list of all the contour subjects found in the **Help** file.

7.5 Select the first occurrence of "contour" found in box 2.

7.6 Select the first occurrence in box 3. This will display the help file on that subject in the text box (to the right). Figure 1.13 currently shows the **Screen Menu Help** file.

During any lesson if you need more and/or additional information on a specific subject this tool can be very helpful (yes, the pun was intended).

Figure 1.13
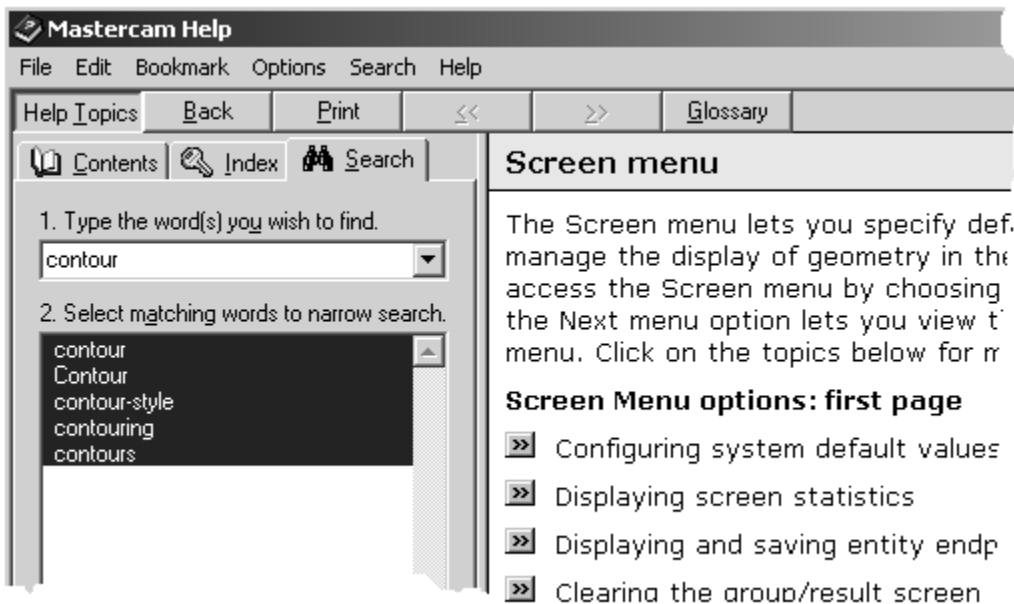
Lesson 1 Summary

This lesson has briefly introduced you to the tools and processes you will need to successfully navigate and complete the following lessons. If you feel comfortable with the tools and processes presented, you are ready to test your knowledge with the **Lesson 1 Review** and then apply the knowledge to complete the Lesson 1 Exercises. You may have to reference this lesson numerous times particularly the **Toolbar** and **Quick Key** sections. The geometry creation and **File Save**/**File Get** steps need to become second nature.

Lesson 1 Review

After completing this lesson you should be able to answer the questions and explain the concepts listed below.

1. T or F Numbers on the x axis to the left of 0 are positive.

2. T or F Numbers on the y axis above 0 are positive

3. T or F Zero is also called the origin.

4. A point using the **Cartesian Coordinate System** is specified using the following format (2,1). What is the value for the x coordinate for the specified point?
     a.) 2
     b.) 1
     c.) Both a and b

5. What is the y value in question 4?
     a.) 2
     b.) 1
     c.) Both a and b

6. If you create lines using the following coordinates, what alphanumeric character would you create (start at: (3,1) go to (3,0) got to (0,0) go to (0,3) go to (3,3) and end at (3,2))?
     a.) F
     b.) V
     c.) C
     d.) A
     e.) None of the above

7. If you create lines using the following coordinates, what alphanumeric character would you create (start at: (-1, 2) go to (0,0) end at (1,2))?
     a.) F
     b.) V
     c.) C
     d.) A
     e.) None of the above

8. What menu area contains the following tools: Attributes, Groups, Cplane etc.?
     a.) Main Menu
     b.) Toolbar
     c.) Secondary Menu
     d.) Prompt Zone
     e.) None of the above

9. What screen area allows the user to key in value information?
    a.) Main Menu
    b.) Toolbar
    c.) Secondary Menu
    d.) Prompt Zone
    e.) None of the above

10. The point (15,-10) in the **Cartesian Coordinate System** is located in what quadrant?
    a.) First
    b.) Second
    c.) Third
    d.) Fourth
    e.) None of the above

11. The point (-9,-10) in the Cartesian Coordinate System is located in what quadrant?
    a.) First
    b.) Second
    c.) Third
    d.) Fourth
    e.) None of the above

12. Which set of coordinates is in the second quadrant?
    a.) (-2,22)
    b.) (-22,2)
    c.) (-5,5)
    d.) All of the above
    e.) None of the above

13. The x axis is a _____ line.
    a.) horizontal
    b.) vertical
    c.) diagonal
    d.) All of the above
    e.) None of the above

14. T or F If you created all your geometry in the 1st quadrant all the x and y values would be positive.

15. T or F In Mastercam you can create a line, circle and rectangle by selecting the tool from both the **Toolbar** option and the **Main Menu** option.

16. What function key displays the coordinate system (axis)?
    a.) F9
    b.) F13
    c.) F8
    d.) F1
    e.) None of the above

17. T or F In Mastercam, once a circle has been defined you can create multiple
       copies of that circle without re-entering the circle variables.

18. Mastercam Undo tool allows a maximum of two steps to be undone.
    a.) True
    b.) False

19. T or F When a Mastercam file is saved it is assigned the MC9 extension.

20. T or F If you attempt to exit Mastercam without saving your file, Mastercam will
       warn you and give you a chance to save prior to exiting the program.

Lesson 1 Exercises

Test your new learned knowledge by completing the following exercises:

1. Create a rectangle that meets the following criteria:
     a.) Create in the 3rd quadrant.
     b.) Is 3″ wide and 2″ high.
     c.) The first point is located at the 0,0 location.

2. Create a circle using any method you want as long as it meets the following criteria:
     a.) Diameter of 2″.
     b.) Center of the circle is at (-3,4).

3. Create a circle using any method you want as long as it meets the following criteria:
     a.) Diameter of 3.5″.
     b.) Center of the circle is at (5,-5).

4. Create a line that is tangent to the top of the circle created in the exercise 2 and tangent to the top of the circle created in exercise 3.

5. Create a line that is tangent to the top of the circle created in the exercise 2 and tangent to the bottom of the circle created in exercise 3.

6. Create a line that is tangent to the top of the circle created in the exercise 2 and to the center of the circle exercise 3.

7. Create a line that is horizontal starting at the center of the circle created in exercise 2 and is 5 inches long.

8. Save the file as **Lesson 1 Exercises**.