Chapter Six

Changing Elements and Creating your First Drawing

INTRODUCTION

All design drawings will be changed a number of times before final approval and fabrication of the part or construction of the project. That is because a drawing is one of the principal means of communication between the designer and the client. It is supposed to be that way. Consequently, any CAD software should be very good at making changes if it is to be productive.

MicroStation offers a rich variety of commands for changing elements after they have been placed in a drawing file, discussed below.

MANIPULATING ELEMENTS

The Manipulate Element tools use one element to create another. For example, you can scale an element up or down in size, or you can copy one element to make another.

The Manipulate Element toolbox houses ten different tools: Copy, Move, Scale, Rotate, Mirror, Array, Align Elements, Stretch, Move Parallel, and Move to Contact. These tools are outlined and described below.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy</td>
<td>Copy an element(s)</td>
</tr>
<tr>
<td>Move</td>
<td>Move an element(s)</td>
</tr>
<tr>
<td>Scale</td>
<td>Resize an element(s)</td>
</tr>
<tr>
<td>Rotate</td>
<td>Rotate an element(s)</td>
</tr>
<tr>
<td>Mirror</td>
<td>Mirror an element(s)</td>
</tr>
<tr>
<td>Array</td>
<td>Copy an element(s) many times to create an array</td>
</tr>
<tr>
<td>Align Elements</td>
<td>Justify element(s)</td>
</tr>
<tr>
<td>Stretch</td>
<td>Stretch an element(s)</td>
</tr>
<tr>
<td>Move Parallel</td>
<td>Move or copy an element parallel to the original. (line, line string, multi-line, curve, arc, ellipse, shape, complex chain or complex shape)</td>
</tr>
<tr>
<td>Move to Contact</td>
<td>Move an element to come in contact with another element</td>
</tr>
</tbody>
</table>
After creating a drawing you will want to scale some objects to make them larger or smaller, copy objects and more.

Experimenting with *Manipulate Element* Tools

1. With the scratch file you opened in the previous chapter, open the Manipulate toolbox by clicking and holding the data point on the third tool in the main task bar and selecting *Open ‘Manipulate’ as toolbox*.

   *Note:* You can also press ‘3’ on your keyboard to open the drop down menu instead of clicking and holding the tool.

2. Click on the *Copy* tool.

   The name of the function appears in the status bar in the bottom left hand corner of the screen while holding down the data button.

3. Note the prompt message at the bottom of the screen says to identify the element. That means to take the cursor to the element and click on it. Try it with one of the lines you entered.

   The line is now “glued” to your cursor and you can drag it anywhere. Click again to place the copy. You can make as many copies as you like. Hit the “reset” button to stay in *Copy* but without the element attached.

4. Click on *Move*.

5. Click on the box you drew.

6. Drag and place it.

   The original box has moved to a new location rather than copy as before.


   Just like *Copy* but it moves parallel to the original element. You can enter an exact distance in the Tool Settings dialog. Also you can select the Keep Original option if you want a copy of the parallel element rather than move the original one.

   The side will be where the cursor is relative to the original element.

   The *Move Parallel* tool is very powerful. For example, when laying out a floor plan you can draw parallel lines to locate column centerlines or other key locations such as walls. You can
then use the *Extend* and *Trim* functions to complete the layout. Also note that you can move lines, arcs and even Bezier curves parallel.

8. Try *Scale*, *Rotate*, *Mirror* and *Array* on your own.

**MODIFYING ELEMENTS**

The *Modify Element* tools are used to modify the geometry of an element already placed in a drawing. For example, deleting half of a circle or extending a line are common element modification operations.

The *Modify Element* toolbox houses twelve tools: Modify Element, Partial Delete, Break Element, Extend Element, Extend Elements to Intersection, Extend Element to Intersection, Trim Elements, IntelliTrim, Insert Vertex, Delete Vertex, Construct Circular Fillet, and Construct Chamfer. These tools are outlined and described below.

<table>
<thead>
<tr>
<th>Modify Element</th>
<th>Moves vertices and line segments, scales, modifies rounded segments and shapes, changes a circle's radius and moves dimension text.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial Delete</td>
<td>Deletes part of an element.</td>
</tr>
<tr>
<td>Break Element</td>
<td>Breaks an element into two separate elements.</td>
</tr>
<tr>
<td>Extend Element</td>
<td>Extends or shortens a line or an end segment of a line string or multi-line.</td>
</tr>
<tr>
<td>Extend Elements to Intersection</td>
<td>Extends of shortens two lines, line strings or arcs to their intersection.</td>
</tr>
<tr>
<td>Extend Element to Intersection</td>
<td>Extends or shortens a line, line string or arc to its intersection with another element.</td>
</tr>
<tr>
<td>Trim Elements</td>
<td>Trims or cuts an element or series of elements at their intersection with one or more cutting elements.</td>
</tr>
<tr>
<td>IntelliTrim</td>
<td>Works like the tool just above with additional enhancements to deal with many elements at the same time.</td>
</tr>
<tr>
<td>Insert Vertex</td>
<td>Inserts a vertex, attaches a line segment, extends a point curve and adds an extension line.</td>
</tr>
<tr>
<td>Delete Vertex</td>
<td>Deletes a vertex or removes an extension line on a dimension.</td>
</tr>
<tr>
<td>Construct Circular Fillet</td>
<td>Constructs a circular fillet between two elements, two segments of a line string or two sides of a shape.</td>
</tr>
<tr>
<td>Construct Chamfer</td>
<td>Constructs a chamfer between two lines or adjacent segments of a line string or shape.</td>
</tr>
</tbody>
</table>
EXPERIMENTING WITH MODIFY ELEMENT TOOLS

1. Open the Modify toolbox by clicking and holding the seventh tool in the main task bar and selecting *Open ‘Modify’ as toolbox*. You can also use the right mouse button menu to gain immediate access to the “Open...” command.

   *Note:* You can also press ‘7’ on your keyboard to open the drop down menu instead of clicking and holding the tool.

2. The first icon titled *Modify Element* allows you to modify the vertices of lines or line strings, the radius of a circle, and the size of a polygon. Try selecting several of the elements to see how each can be modified.

3. *Partial Delete* allows you to take a bite out of an element. Move the cursor to indicate which part of the object you wish to keep and which you want to throw away.

4. *Break Element* allows you to break an element into two or more separate elements. Move the cursor to indicate where in the element you want the break to occur.

5. *Extend Element* enables you to stretch a line while maintaining the plane of the line.

6. *Extend Elements to Intersection* automatically extends to point of intersection.

7. *Extend Element to Intersection*. Try it by selecting a line and then a circle or arc that the line can intersect.

8. *Trim Elements*. Select a line to be the “cutter.” Then select a line, circle or arc it intersects. Click on the side of the cutter you want eliminated.

9. *IntelliTrim*. Select the line to be trimmed or extended, press reset. Identify the cutting element, press reset again to complete.

10. *Insert Vertex*. Select a box. Pull out a fifth vertex. (You can even insert a dimension in a chain of dimensions with this tool).


The other *Modify Element* icons are advanced functions that will be treated later.
CHANGING ELEMENT ATTRIBUTES

The *Change Element Attribute* tools are used for changing an existing element’s color, line style and other attributes.

The *Change Element Attribute* toolbox houses seven tools: Change Element Attributes, Change to Active Area, Change to Active Fill Type, Modify Line Style Attributes, Change Multi-Line Definition, Match Element Attributes, and SmartMatch. These tools are outlined and described on the following page.

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Element Attributes</td>
<td>Changes selected attributes of an element(s) such as level, color, line style, line weight or class.</td>
</tr>
<tr>
<td>Change (Element) to Active Area</td>
<td>Changes the area attribute of a closed element(s) to the Active Area. (Shapes, ellipses, complex shapes or B-spline curves)</td>
</tr>
<tr>
<td>Change (Element) to Active Fill Type</td>
<td>Changes a closed element to the Active Fill Type which are none (no fill), opaque (filled with Active color), and outlined. Also changes the Active color.</td>
</tr>
<tr>
<td>Modify Line Style Attributes</td>
<td>Interactively modifies the line style attributes of an element with a custom line style.</td>
</tr>
<tr>
<td>Change Multi-Line to (Active) Definition</td>
<td>Changes a multi-line’s attributes to the active multi-line definition.</td>
</tr>
<tr>
<td>Match Element Attributes</td>
<td>Changes the active element attribute settings so they match the attributes of an element in the design.</td>
</tr>
<tr>
<td>SmartMatch (Match All Element Settings)</td>
<td>Changes all active element attribute settings, including those specific to particular element types, so they match the attributes of an element in the design.</td>
</tr>
</tbody>
</table>

EXPERIMENTING WITH *CHANGE ELEMENT ATTRIBUTES* TOOLS

1. Close all of the toolboxes you have opened by clicking the X in the upper right hand corner of each. Remember to leave *Tool Settings* window open.

2. Open the Change Element Attributes toolbox by clicking and holding the fifth tool in the Main task bar and selecting *Open ‘Change Attributes’ as toolbox*.

3. Click on *Change Element Attributes* from the Change Attributes toolbox.

4. In the Change Attributes Tool Settings window, select or turn on the Color option.
5. Hold down the data point on the colored box next to the Color option and select a new color.

6. Click on any element. The element’s color changes to match the one you selected in the previous step.

**EXERCISE : DRAWING A SIMPLE SCHEMATIC**

In this exercise, you will draw the simple schematic diagram shown above. You will construct rectangles, polygons, lines and text, and learn how to copy elements. This exercise introduces new concepts, so be sure to watch the command prompt at the bottom of your screen as you follow these step by step instructions.

1. Create a new design file by selecting *File menu >New* if MicroStation is already open. If you’ve just launched MicroStation, select the *File New* icon at the top of the dialog.

2. Click on the *Browse* button at the bottom of the dialog.

3. When the Seed File dialog is presented, note “Seed2D.” To find the seed file, you may have to navigate to \Documents and Settings\All Users\Application Data\Bentley\MicroStation\WorkSpace\System\Seed\Seed2D.dgn. Double click with the cursor placed over Seed2D. This will start your new file with the information stored in this seed file. (If using Vista, navigate to \ProgramData\Bentley\MicroStation\WorkSpace\System\Seed\Seed2D.dgn) Click Open to select Seed2d.dgn. This puts you back in the “New” file Dialog.

4. Type in a name for your new file “Schematic.”

5. Click *Save* to save the file. Next, select and open the new file for work.
6. Next, in MicroStation, open the Design File settings dialog (Settings menu > Design File). Click on the Working Units category.

7. Your file may have units of feet and inches or meters. You are going to change to inches as the master unit. Click on Master Units and select Inches.

8. Use your mouse and click on subunits. Select mils.
Your drawing is now set up for master units of inches, subunits of thousandths of an inch (mils).

9. While still in Settings>Design File, change the Format to MU. Since you chose inches as the master unit, this will cause MicroStation to display coordinates in inches and decimal inches rather than using a colon to separate master and subunits.

10. Select the Grid category. Set Grid Master to 0.1 and Grid Reference to 10.

11. While still in the Grid category, turn on the Grid Lock (on the square box to the left). This will constrain your drawing graphics to tenths of an inch, adequate for this schematic exercise.

12. Close the Design File Settings dialog by clicking OK. If you can’t see the grid, first click on Settings>View Attributes and ensure that the Grid checkbox is checked. Then, using the Zoom In tool from View 1’s view controls toolbar, zoom-in the drawing a few times and you will see the grids. MicroStation automatically turns
off grids if they get too close together. The dim dots you see are the master grid and the brighter lines or crosses are the reference grids.

**EXERCISE: DRAWING A SIMPLE SCHEMATIC, PART 2**

1. Select the *Place Block* tool.

   You know you are using the right tool by the “Place Block” text display in the status bar located at the bottom of the application window. It also prompts you to “Enter first point.” In the Tool Settings dialog, be sure that Method is set to Orthogonal; Area to Solid, Fill type is set to None.

2. Place the cursor over one of the reference grids. Data point and drag the diagonally opposite rectangle corner one reference grid to the right and two down. Data point again to create the rectangle.

   *Note:* The prompt says *Enter First Point* again. MicroStation is ready for you to enter another rectangle. Instead, you are going to use the Copy tool to make exact copies of the first rectangle.

3. Select the *Copy* tool from the Main toolbox.

   *Note:* The command shown in the status bar and the prompt says *Identify element*. Move the cursor to the upper left corner of the rectangle you already placed and data point. You will see a copy of your rectangle “glued” to your cursor.

4. Reject the selection by pressing the reset button.

   *Note:* The prompt is back to asking you to *identify element*. Move the cursor close to a corner of the first rectangle and data point.

5. Move your rectangle copy two reference grid lines to the right and data point on the reference grid point. A new copy of the rectangle appears. Move the cursor two more reference points to the right and data point again.

6. Press the reset button. You have now successfully placed three rectangles of identical dimensions precisely on a grid.
7. If you inadvertently placed an extra rectangle or if one is at the wrong location, click on the *Element Selection* arrow. Next, click on the bad rectangle and click on the Delete Element tool in the task bar or press the ‘Delete’ key on your keyboard. The bad rectangle is deleted. Try it with one of the good rectangles. Now select *Edit*, then ‘Undo Delete Element’ and see the good rectangle reappear.

8. Select the *Place SmartLine* tool from the Linear toolbox. The keyboard shortcut for this tool is “Q1”. The tool prompt in the status bar: “Enter first point.” Move the cursor to a point on the right side of first rectangle and data point.

9. Move the cursor to the left side of the middle rectangle keeping the line horizontal and data point. Press the reset button. This “disconnects” the line and puts you back ready to enter the first point of another line.

10. Move the cursor to begin the next line. Repeat this process to draw all of the lines representing the conductors in your schematic, as shown below.

```
1  3
2  4

      5
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11. To draw the connectors at the ends of each line, you will use a regular polygon. Select the *Place Regular Polygon* tool from the Polygons toolbox. The keyboard shortcut to this tool is “W4”. Verify the Place Regular Polygon Tool Settings are set to Method: Inscribed and Edges: 6.

12. Move the cursor to the end point of one of the lines. Data point to place the center of the polygon at the end of the line. Move the cursor and then click to set polygon radius.

13. Select the *Copy* tool as before.

14. Data point on the polygon. If you accidently get the rectangle or the line, press reset to reject the highlighted element. Keep rejecting until the polygon is selected. Using data points, place copies of the polygon at the connection of each line with a rectangle.

15. Select *Element menu > Text Styles*. The Text Styles dialog appears.
16. Under the General tab, in the Font field, select the *Engineering* font from the option menu. Change Height and Width to 0.2 inches. This will make lettering on your drawing 0.2 inches wide by 0.2 high. Close the Text Styles dialog by clicking on the “X” in upper right corner of the dialog.

17. Select the *Place Text* tool in the Text toolbox (shortcut: “A1”) The Text Editor box appears.

18. Type-in the numeral “1”.

19. Move your cursor near your schematic and see the numeral 1 follow. Click on a point near connector 1 on your drawing.

20. Click in the text window again. Press the backspace key to erase the 1.

21. Type-in the numeral “2”. Place it near connector 2.

22. Repeat for all 5 connectors.

Your first drawing is complete.