Chapter 12

Graphical COGO

12.1 Objectives

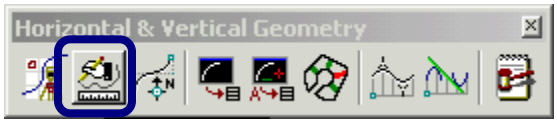
Create and store coordinate geometry elements using the Graphical Coordinate Geometry tools.

12.2 Definitions

Graphical Coordinate Geometry (Graphical COGO) is a set of tools that allows the user to store or modify coordinate geometry elements (points, lines, curves, spirals, chains, and parcels) by key-in or a mouse click. (**Note**: Use a "left click" to data point or accept and a "right click" to reject.) The elements are stored directly into the coordinate geometry database (.gpk) while being created or modified graphically on the screen.

12.3 Accessing

The Graphical Coordinate Geometry tools can be accessed from the Road tool frame or from the MicroStation Application pull down menu. Click on the second icon in the Horizontal & Vertical Geometry tools shown below to access the tool from the Road tool frame.

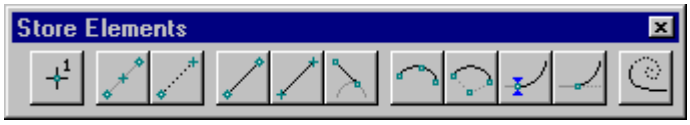


Or select **Applications > GEOPAK Road > Geometry > Graphical Coordinate Geometry** to access the tool. If the user attempts to activate Graphical COGO without an active session of coordinate geometry, a warning dialog appears advising the user that a coordinate geometry session must be started.

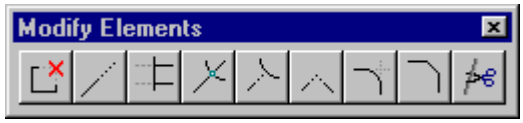
12.4 Tool Frame

When Graphical COGO is started, the tool frame shown in the figure to the right appears. It contains the following four toolboxes. When a tool in one of the toolboxes is selected, a dialog box will appear for the user to key-in any required information.

12.4.1 Store Elements



12.4.2 Modify Elements



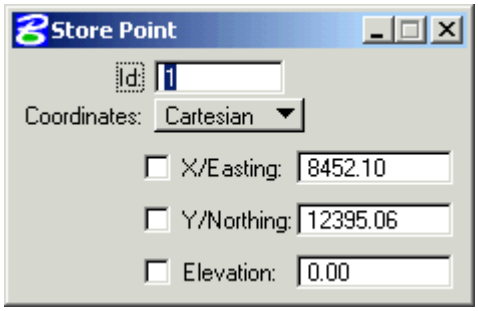
12.4.3 Manipulate Elements

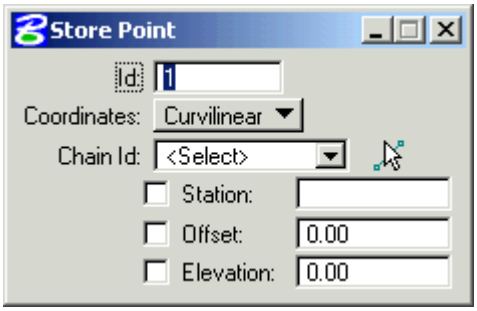
12.4.4 Groups

12.5 Store Elements Tools

The Store Elements toolbox is used to store points, lines, curves, and spirals. The following tools are contained in the Store Elements toolbox.

12.5.1 Store Point





The user can store a point by either Cartesian coordinates (XYZ), or curvilinear coordinates (station and offset). The XY and/or Z coordinates or the station, offset, and/or elevation can be locked or a data point can be used to place the point.

ID - New point name to be created.

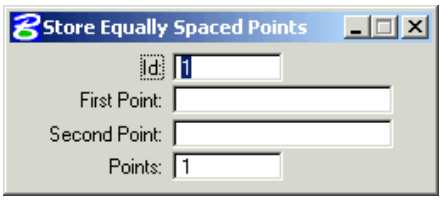
Coordinates - **Cartesian** and **Curvilinear** options are supported.

X/Easting, Y/Northing Elevation - Utilized in the **Cartesian** option, coordinates can be manually typed in, and "locked" by activating the toggle to the left each field. Multiple "locks" are supported, so the user may lock just the **X** coordinate, or the **X** and **Y** coordinate or all three. The coordinates may be determined graphically by moving the cursor on the screen, while the corresponding coordinates are displayed. Note only unlocked fields dynamically change. If the user is in a 2D file, the **Elevation** may be manually typed in, however, there is no dynamic setting of the value.

Chain ID - Utilized in the **Curvilinear** option, the desired chain may be selected from the list of all chains in the current coordinate geometry database. In lieu of selecting from the list, click the **ID** button, and then graphically select an element of a visualized chain.

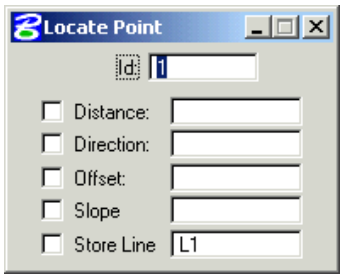
Station, Offset and Elevation - Utilized in the **Curvilinear** option, the **Station** and **Offset** can be manually typed in, and "locked" by activating the toggle to the left each field. For left offsets, utilize a minus (-) sign. If no sign is utilized, a right offset is assumed. Multiple "locks" are supported, so the user may lock just the **Station**, or the **Station** and **Offset** or all three. The **Station** / **Offset** / **Elevation** may be determined graphically by moving the cursor on the screen, while the corresponding values are displayed. Note only unlocked fields dynamically change. If the user is in a 2D file, the **Elevation** may be manually typed in, however, there is no dynamic setting of the value.

12.5.2 Store Equally Spaced Points



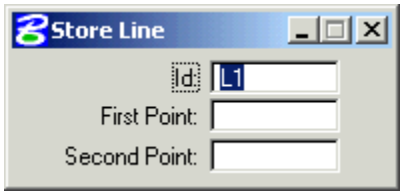
Stores a given number of points spaced equally between two specified points. The points may be either previously stored to COGO points or may be stored automatically by data pointing at the location of the desired point. (Note the line is neither drawn nor stored.)

12.5.3 Locate Point



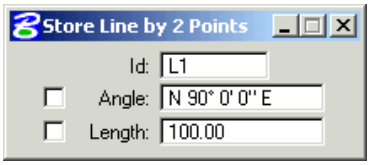
Stores a point by distance and direction. The distance, direction, offset, and slope can be locked. A line segment can also be stored.

12.5.4 Store Line



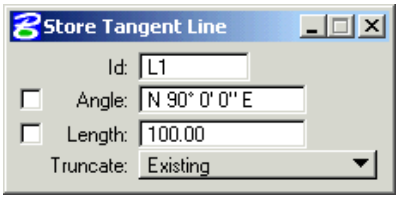
Stores a line segment between two previously stored points.

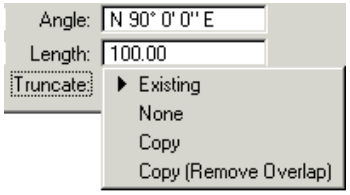
12.5.5 Store Line by 2 Points



Stores a line segment and its endpoints. The distance and direction of the line segment can be specified.

12.5.6 Store Tangent Line





Stores a line segment that is tangent to a curve. The two endpoints of the line segment are also stored. The angle and the length of the tangent line can be specified. Four **Truncate** options affect what happens to the original COGO element. They are:

Existing: The original COGO element is truncated or extended to the end of the new COGO element.

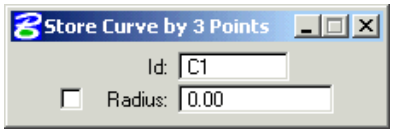
None: The original COGO element is unchanged and is not truncated.

Copy: The original COGO element is copied and the copy is truncated or extended so that the original element is left unchanged

Copy (Remove Overlap): If the end of the new COGO element is not on the original element, a copy is made of the original element. The copy is extended to the new element and any overlap with the original element is removed.

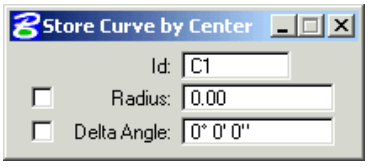
Note: Redefine must be activated for the original element to be modified.

12.5.7 Store Curve by 3 Points



Stores a circular curve by data pointing to locate the beginning (PC) and ending points (PT) of the curve. The radius of the curve may be specified (by entering and locking its value in the **Radius:** field) or set dynamically by a data point locating a point on the curve (prompt requests a Through Point). If the radius is specified the final data point determines which of the possible solutions is stored.

12.5.8 Store Curve by Center



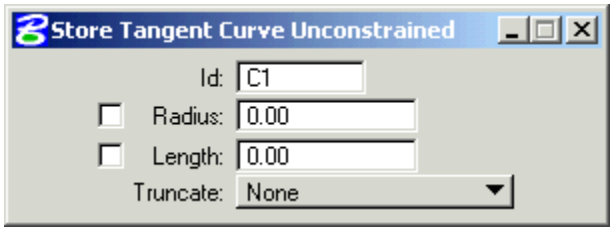
Stores a curve by specifying the center and the beginning location of the curve. The **Radius** may

be specified or set dynamically by a data point locating the start of the curve. The **Delta Angle** may be specified or set dynamically by locating the ending point.

12.5.9 Store Tangent Curve Constrained

Stores a curve tangent to a previously stored COGO element selected with a data point. The curve **Radius** may be specified or set dynamically by a data point locating the center of the curve. Once the radius is set, the length of the curve may set manually by specifying either the **Delta** angle, the **Direction** ahead, or the **Length** of the curve with the final data point determining which of the possible solutions is stored. If the length of the curve is not specified, a data point sets it dynamically.

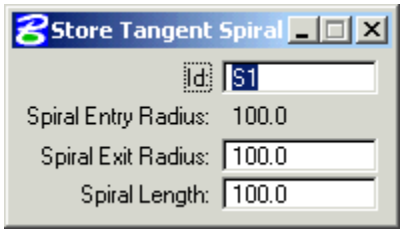
12.5.10 Store Tangent Curve Unconstrained



Stores a curve tangent to a previously stored COGO element selected by the first data point. The second data point dynamically specifies the through point. The **Radius** and/or the **Length** of the curve may be specified or set dynamically by a data point. The **Truncate** options are the same as those described for Store Tangent Line.

Note: Redefine must be activated for the original element to be modified.

12.5.11 Store Tangent Spiral



Stores a spiral tangent to a previously stored COGO element. To use the tool, manually enter the

Spiral Exit Radius and **Spiral Length**. Once these are set, identify the COGO element. The **Spiral Entry Radius** is calculated from the identified element and displayed. Move the cursor to see the possible solutions and data point when the desired one is displayed.

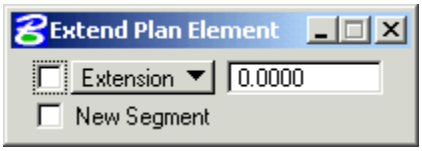
12.6 Modify Element Tools

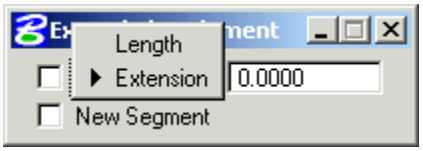
The Modify Elements toolbox is used to modify previously stored cogo elements. The **Redefine** toggle must be turned on to modify existing elements. **Note: When using the tools it is very important to pay attention to the prompts in the lower left hand corner of the MicroStation window**. This is because may of the tools require the user to identify the element to be modified and than accept or reject the selection before moving on to the next step. This functionality is provided because unlike the MicroStation, Graphical COGO does not have an undo function. The following tools are contained in the Modify Elements toolbox.

12.6.1 Partial Delete

Deletes part of a COGO element creating two separate COGO elements. Additional points will be stored if needed. It works like the MicroStation Partial Delete tool. The first data point indicates the start of the deletion. With this defined the movement of the cursor shows the dynamic deletion with the second data point indicating the end of the deletion.

12.6.2 Extend Plan Element



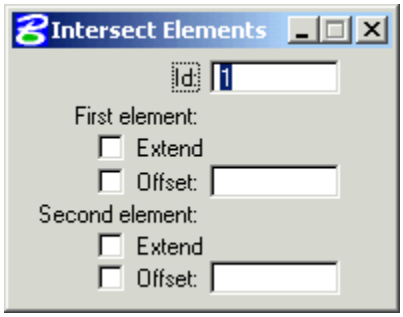


Extends or shortens any COGO element. The tool work similar to the MicroStation Extend tool with the addition that the total **Length** of the modified element or only the amount of the **Extension** may be specified manual. A **positive** extension value lengthens the element and a **negative** value shortens it. If the **New Segment** is toggled on and the new length is longer than the original element, the original element is left unchanged and a new COGO line segment is created to bridge the gap. New Segment has no effect if the original element is shortened.

12.6.3 Trim Elements

Trims or extends COGO elements to another COGO element. Its function is similar to the MicroStation Trim Element tool. First select and accept the COGO element to be used as the cutting element (2 separate mouse data points). With the cutting element selected, identify the COGO element to be trimmed or extended by a data point on the end of the element to trimmed or extended. COGO will display the tentative solution. Data point on the screen to accept or press the mouse resent button to reject. If desired, additional elements can be modified based on the cutting line by identifying the end of the next COGO element to be modified.

12.6.4 Intersect Elements



Stores a new COGO point at the intersection of two COGO elements. The original elements are not modified. If the elements do not actually cross, **Extend** must de activated (toggled on) for the element(s) that needs to projected. An **Offset** may be specified for either of the elements by activating the option and entering the offset amount (positive for an offset to the right and negative for an offset to the left). The steps to using the tool are to identify the first element and accept it; identify the second element and accept it; and accept the proposed solution. Clicking the mouse-reset will stop the process.

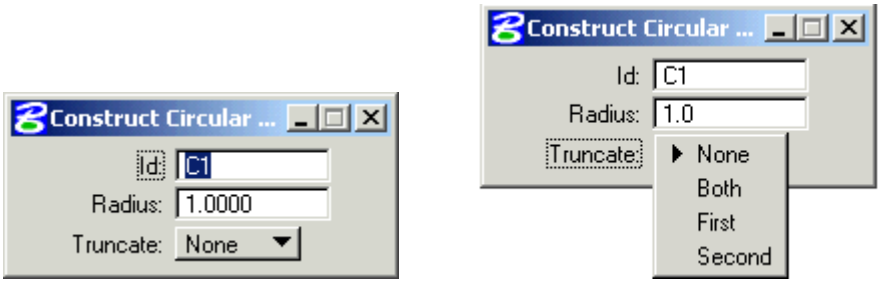
12.6.5 Extend Element to Intersection

Lengthen or shorten a COGO element to another COGO element. Works functionally the same as its MicroStation counterpart with the addition of the accept/reject option.

12.6.6 Extend Elements to Intersection

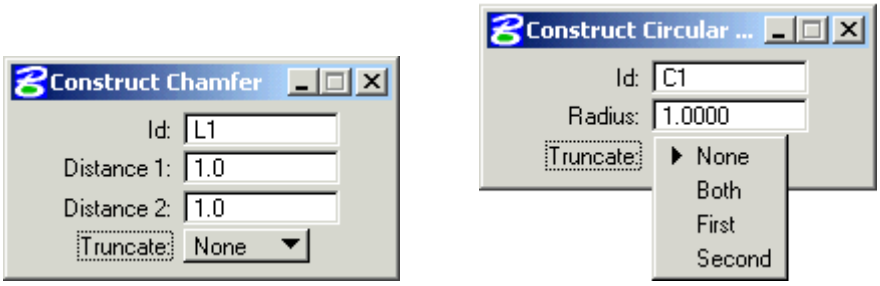
Lengthens or shortens two elements to intersect each other. Works functionally the same as its MicroStation counterpart with the addition of the accept/reject option.

12.6.7 Construct Circular Fillet



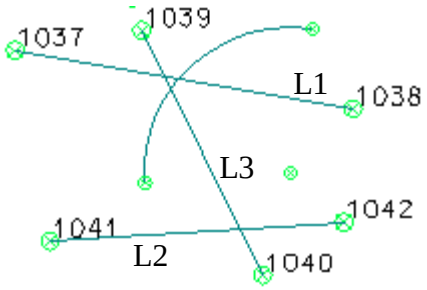
Stores a circular curve between two COGO elements. To use the tool, specify the name of the curve to be created and its radius or accept the next available name. There are four **Truncate** options determine whether or not the original elements are modified: **None**—neither element is modified, **Both**—both original elements are lengthened or shortened as need, **First**—only the first element is modified, and **Second**—only the element selected second is modified. After identifying and accepting the first element and identifying the second element, at tentative solution will be displayed if there is one. Moving the cursor will through the four possible quadrants will vary the solution. With the desired solution displayed data point to accept the solution.

12.6.8 Construct Chamfer



Stores a line and its endpoints between two nonparallel elements. To use the tool, specify the name of the line to be created or accept the next available name. **Distance 1** is the distance along the first selected COGO element from the intersection point of the two original elements to the start of the chamfer. **Distance 2** is the along the second COGO element from intersection point to the end of the chamfer. After identifying & accepting the first element and identifying the second element, the movement of the cursor will display the different possible solutions. Data point when the desired solution is displayed to accept that solution. The four **Truncate** options are the same as those for constructing a circular fillet.

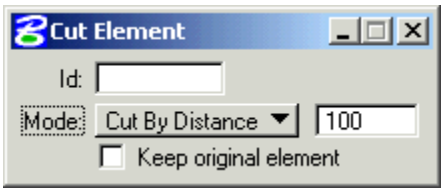
12.6.9 Cut Element



The tool cuts a COGO element into segments. **Keep original element** causes the original element(s) to remain unchanged and only copies of the element are modified if this option is activated. There are four operation modes for the tool. The figure to the right is used to describe the first two modes.

One Cut Many: If a MicroStation selection set is not used, the first element identified is the element to be cut and the second element is the cutting element. However, if more than one element is to be cut, a MicroStation selection set must be used. For this option, place the elements to be cut into a selection set, activate the Cut Element tool, identify the cutting element, and accept/reject the proposed solution. As an example: L1, L2 and the curve can be cut at the same time by placing them into a MicroStation selection set and selecting L3 as the cutting element.

Many Cut One: If a MicroStation selection set is not used, the first element identified is the cutting element and the second element is the element to be cut. However, if one element is to be cut by many, a MicroStation selection set must be used. For this option, place the cutting elements in a selection set, activate the Cut Element tool, identify the element to be cut, and accept/reject the proposed solution. As an example: To cut L3 using the other element, place L1, L2 and the curve into a MicroStation selection set, activate the tool, and select as the element to be cut.



Cut by Distance: The original COGO element is divided into segments of the user specified length starting at the beginning point of the element. The length of the original element determines the number of segments. The final segment will be shorter than the others unless the length of the original element is evenly divisible by the segment length. After identifying the element to be cut, the tentative solution is displayed, which can be accepted or rejected.

Cut by Interval: Divides a COGO element into segments of equal length. The number of segments is determined by the value entered into the field to the right of the Mode toggle. After identifying the element to be cut, the tentative solution is displayed, which can be accepted or rejected.

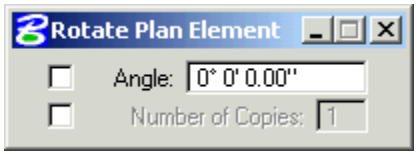
12.7 Manipulate Elements

The Manipulate Elements tools allow the user to adjust previously created COGO elements. If an element is moved, the redefine toggle must be turned on. The following tools are in the Manipulate Elements toolbox.

12.7.1 Move Plan View Element

Moves or copies a COGO element. The **Number of Copies** toggle determines if the element is moved or copied. If activated, the number of copies may be specified. To use the tool, identify and accept the element, data point to locate an origin point and data point a second time to locate the end point.

12.7.2 Rotate Plan View Element



Rotates the element about a specified point. The user may specify the **Angle** of rotation and the **Number of Copies**, if any. After identifying and accepting the element, data point to locate the point of rotation, data point to locate a first point, and data point to locate the second point or to accept the solution using the specified angle.

12.7.3 Copy Parallel

Copies an element parallel to the original element. The user may specify an offset distance by activating the **Distance** toggle and providing the value. If this option is not activated, the user provides the parallel offset dynamically.

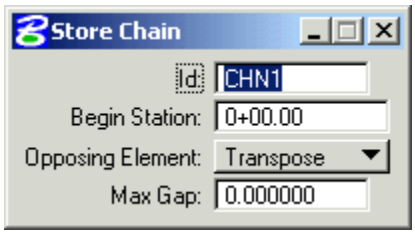
12.7.4 Delete Element

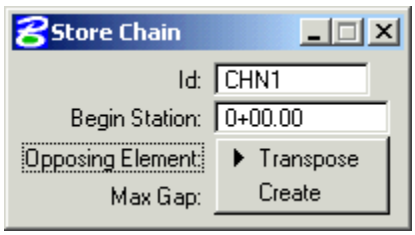
Deletes an element from a coordinate database (GPK file). **Warning**: There is no undo for this command. The tool functions just like it's MicroStation counter part.

12.8 Groups

The Groups tools allow the user to create a chain or parcel from a series of COGO elements that are connected end to end. The elements cannot overlap or have a gap greater than the **Max Gap** amount specified. The following tools are contained in the Groups toolbox. If COGO encounters an **Opposing Element**, the user has the option to **Transpose** the original element or to **Create** a new element going in the right direction. **Redefine** must be activated for an element to be transposed.

12.8.1 Store Chain

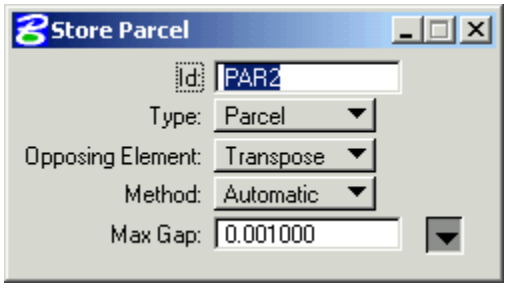


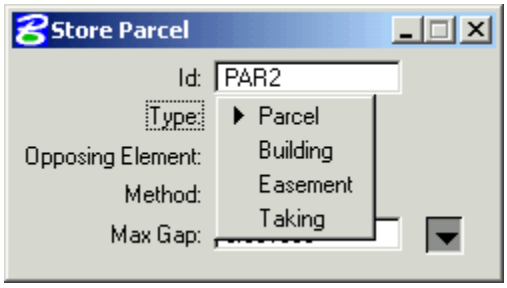


Stores a chain from previously stored COGO elements. The user selects the first element and data points to accept each element connected to the previous element. When all elements are selected, the user is prompted to data point for the direction of the stationing.

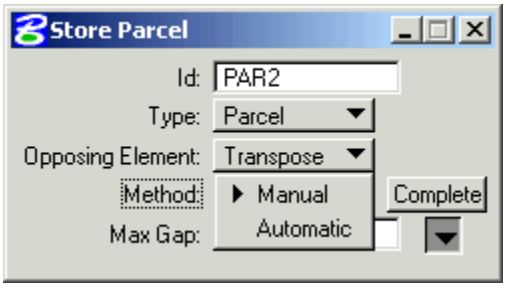
12.8.2 Store Parcel

The tool stores property information to the GPK from previously stored COGO elements. For a given piece of property, the **Parcel** must be stored first. Once this is gone, the **Type** toggle may be switched to the other right of way features that are supported: **Building**, **Easement**, and **Taking**. When the type is set to Parcel, the dialog may be expanded to enable the user to store the **Owner Name** and an **Improvement** description.





The **Opposing Element** option works the same as it does for Store Chain. **Method** defines the way the elements are selected. **Automatic** causes the tool to select elements in the same way as Store Chain. **Manual** allows the user to select the individual elements and click on the **Complete** button to store the element.



When all of the elements are selected, the user is prompted for the direction of the parcel, and the point of beginning.