

Міністерство освіти і науки України
Харківська національна академія міського господарства

Geometrical constructing with the use of Object Snap.

Guidance for laboratory works for “Informatics and computer modeling basics” course /for foreign students of 2nd year studying by orientation 6.060102 «Architecture»/

Харків – ХНАМГ – 2009

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Theme: Geometrical constructing with the use of Object Snap.

Purpose: acquiring skills of geometrical constructing with the use of Object Snap

Work order:

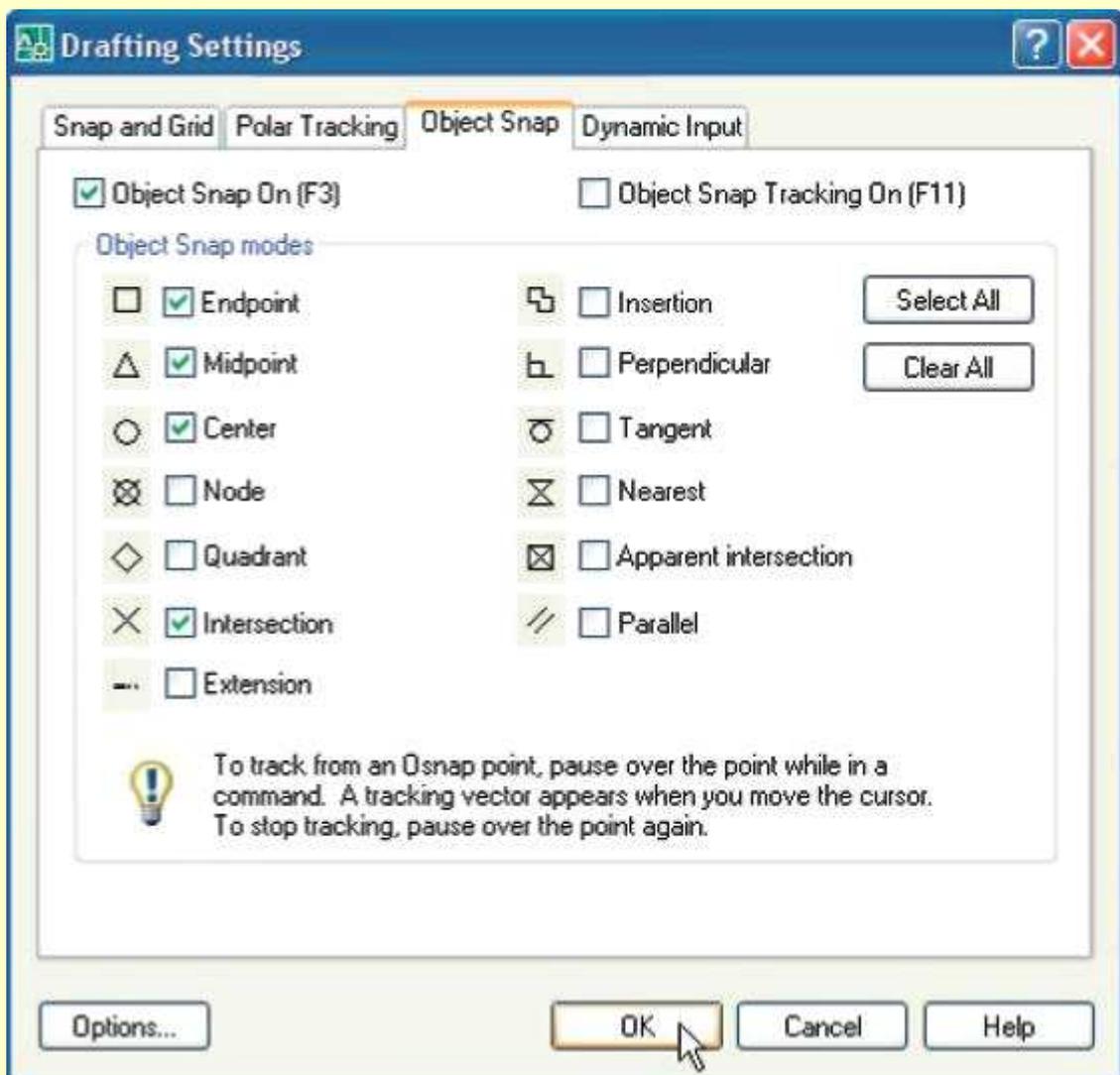
1. Create a new drawing - tsk2.dwg and save it in the personal folder.
2. Create a new layer.
3. Disable the snap mode.
4. Draw 10 circles of different diameters.
5. Join their centers with a closed polyline (none-zero width).
6. Create a new layer.
7. Disable the snap mode.
8. Draw 8 segments and 5 arcs of arbitrary sizes.
9. Join their centers with a closed polyline (none-zero width).
10. Join their extreme points with a closed polyline (none-zero width).
11. Create a new layer.
12. Disable the snap mode.
13. Draw a circle, 5 segments, intersecting the circle fully, and 7 arcs, intersecting the circle fully.
14. Join together the points of the circle and segments, the circle and arcs intersections with a closed polyline (none-zero width).
15. Create a new layer.
16. Copy all the entities created in pp. 2-14.
17. Remove all these entities into the new layer (using the CHANGE command).
18. Rotate all the entities (around the point located to the left of the drawing), consistently, on 43, 178, 251, -36 degrees.
19. Create a new layer.
20. Copy all the entities created in pp. 2-14.
21. Transfer all these entities into a new layer (using the CHANGE command).

22. Change the sizes of all the entities (a base point is found approximately in the center of the drawing), consistently, in 3.45, 0.79, 35.78/67.45 times.
23. Save the drawing in the personal folder and compress it (Zip).
24. Save this archive in the Academy distance learning system.

Use Precision Tools

You can use a variety of precision drawing tools to help you produce accurate drawings quickly and without performing tedious calculations.

You can use **Drafting Settings Dialog Box** that specifies drafting settings organized for drawing aids in four categories: Snap and Grid, Polar Tracking, Object Snap, and Dynamic Input.



Menu: Tools ► Drafting Settings

Shortcut menu: Right-click Snap, Grid, Polar, Osnap, Otrack, or Dyn on the status bar and click Settings.



Command entry: dsettings (or 'dsettings for transparent use)

Snap and Grid

To enhance drawing speed and efficiency, you can display and snap to a rectangular grid. You can also control its spacing, angle, and alignment.

The grid is a rectangular pattern of dots or lines that extends over the area you specify as the grid limits. Using the grid is similar to placing a sheet of grid paper under a drawing. The grid helps you align objects and visualize the distances between them. The grid is not plotted.

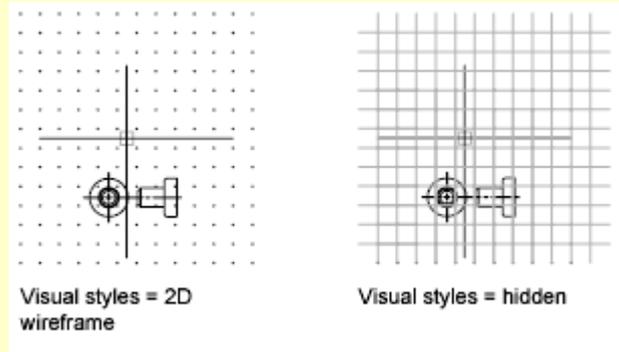
Snap mode restricts the movement of the crosshairs to intervals that you define. When Snap mode is on, the cursor seems to adhere, or "snap," to an invisible rectangular grid. Snap is useful for specifying precise points with the arrow keys or the pointing device.

Grid mode and Snap mode are independent but are often turned on at the same time.

Control the Display Style and Area of the Grid

You can display the grid either as a rectangular pattern of dots or as rectangular pattern of lines. The grid displays dots only when the current visual style is set to 2D

Wireframe, otherwise the grid displays lines. A lined grid is displayed for all visual styles while working in 3D. There are several methods to change the current visual style, including the `VSCURRENT` command.



By default, the X and Y axes of the UCS display in a different color than the grid lines. You can control the color in the Drawing Window Colors dialog box. This dialog box is accessible from the Drafting tab in the Options dialog box.

The `LIMITS` command controls the drawing area covered by the grid. As an option, you can override the limits to make the grid cover the entire XY plane of the user coordinate system (UCS). You can access this option in the Drafting Settings dialog box or use the `GRIDDISPLAY` system variable.

Note. When you use dynamic UCS, the grid limits are set automatically relative to the size of the selected face of the solid and the drawing area available.

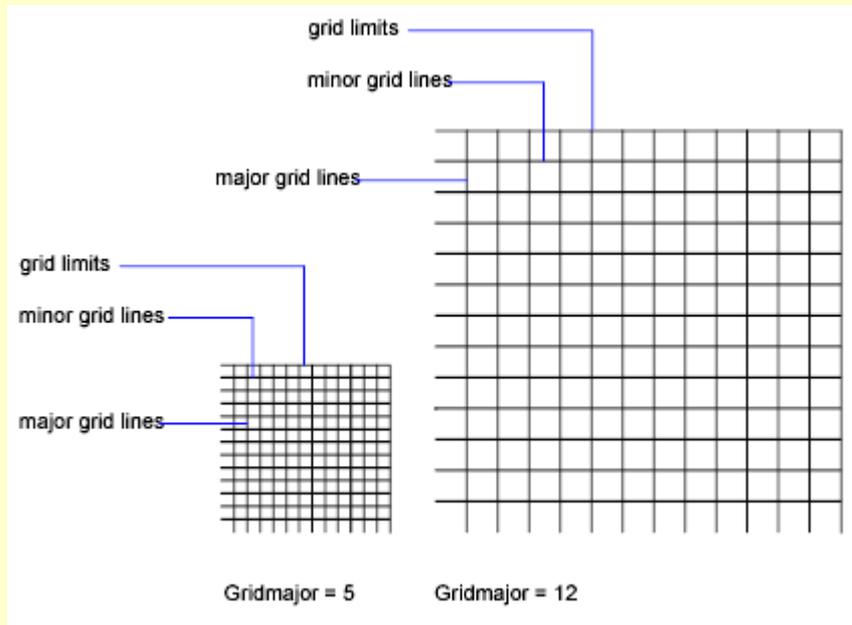
Control the Frequency of Major Grid Lines

If the grid is displayed as lines rather than dots, darker lines called major grid lines display at intervals. When working in decimal units or with feet and inches, major grid lines are especially useful for measuring distances quickly. You can control the frequency of major grid lines in the Drafting Settings dialog box.

To turn off the display of major grid lines, set the frequency of major grid lines to 1.

Note. If the grid is displayed as lines, the grid limits are displayed also as darker lines. Do not confuse these boundaries with major grid lines.

Note. When the grid is displayed as lines and SNAPANG is set to a value other than 0, the grid will not display. SNAPANG does not affect the display of the dotted grid.



Change the Grid Dynamically During Zooming

If you zoom in or out of your drawing, the grid spacing is adjusted automatically to be more appropriate for the new magnification. This is called adaptive grid display.

For example, if you zoom way out, the density of displayed grid lines reduces automatically. Conversely, if you zoom way in, additional grid lines display in the same proportion as the major grid lines.

Change Grid and Snap Spacing

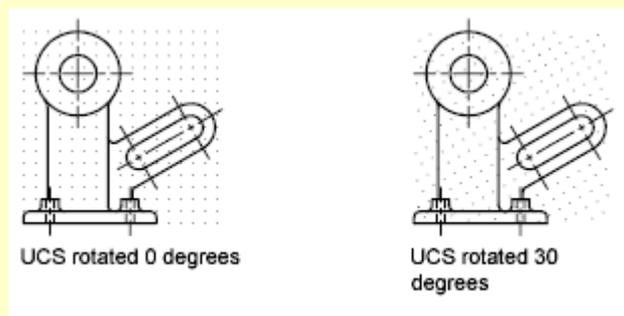
As you work, you can turn Grid and Snap mode on and off, and you can change the grid and snap spacing. You can turn Snap mode on and off temporarily by using an override key.

Snap spacing does not have to match grid spacing. For example, you might set a wide grid spacing to be used as a reference but maintain a closer snap spacing for

accuracy in specifying points.

Change the Grid and Snap Angle and Base

If you need to draw along a specific alignment or angle, you can change the grid and snap angle by rotating the user coordinate system (UCS). This rotation realigns the crosshairs on the screen to match the new angle. In the following example, the UCS is rotated 30 degrees to match the angle of the anchor bracket.



The grid and snap points are always aligned with the UCS origin. If you need to shift the grid and grid snap origin, move the UCS.

Snap and Grid Tab (Drafting Settings Dialog Box) specifies Snap and Grid settings.

Snap On

Turns Snap mode on or off. You can also turn Snap mode on or off by clicking Snap on the status bar, by pressing F9, or by using the SNAPMODE system variable.

Snap Spacing

Controls an invisible, rectangular grid of snap locations that restricts cursor movement to specified X and Y intervals.

Snap X Spacing specifies the snap spacing in the X direction. The value must be a positive real number. (SNAPUNIT system variable)

Snap Y Spacing specifies the snap spacing in the Y direction. The value must be a positive real number. (SNAPUNIT system variable)

Equal X and Y Spacing forces the X and Y spacing to the same values for snap spacing and for grid spacing. The snap spacing intervals can be different from the

grid spacing intervals.

Polar Spacing

Controls the PolarSnap increment distance.

Polar Distance sets the snap increment distance when PolarSnap is selected under Snap Type & Style. If this value is 0, the PolarSnap distance assumes the value for Snap X Spacing. The Polar Distance setting is used in conjunction with polar tracking and/or object snap tracking. If neither tracking feature is enabled, the Polar Distance setting has no effect. (POLARDIST system variable)

Snap Type

Sets the snap style and snap type.

Grid Snap sets the snap type to Grid. When you specify points, the cursor snaps along vertical or horizontal grid points. (SNAPTYPE system variable)

Rectangular Snap sets the snap style to standard Rectangular snap mode. When the snap type is set to Grid snap and Snap mode is on, the cursor snaps to a rectangular snap grid. (SNAPSTYL system variable)

Isometric Snap sets the snap style to Isometric snap mode. When the snap type is set to Grid snap and Snap mode is on, the cursor snaps to an isometric snap grid. (SNAPSTYL system variable)

PolarSnap sets the snap type to Polar. When Snap mode is on and you specify points with polar tracking turned on, the cursor snaps along polar alignment angles set on the Polar Tracking tab relative to the starting polar tracking point. (SNAPTYPE system variable)

Grid On

Turns the grid on or off. You can also turn grid mode on or off by clicking Grid on the status bar, by pressing F7, or by using the GRIDMODE system variable.

Grid Spacing

Controls the display of a grid that helps you visualize distances.

Note. The limits of the grid are controlled by the LIMITS command and the GRIDDISPLAY system variable.

Grid X Spacing specifies the grid spacing in the X direction. If this value is 0,

the grid assumes the value set for Snap X Spacing (GRIDUNIT system variable).

Grid Y Spacing specifies the grid spacing in the Y direction. If this value is 0, the grid assumes the value set for Snap Y Spacing (GRIDUNIT system variable).

Major Line Every specifies the frequency of major grid lines compared to minor grid lines. Grid lines rather than grid dots are displayed when the VSCURRENT is set to any visual style except 2D Wireframe (GRIDMAJOR system variable).

Grid Behavior

Controls the appearance of the grid lines that are displayed when VSCURRENT is set to any visual style except 2D Wireframe.

Adaptive Grid limits the density of the grid when zoomed out. (GRIDDISPLAY system variable)

Allow Subdivision Below Grid Spacing generates additional, more closely spaced grid lines when zoomed in. The frequency of these grid lines is determined by the frequency of the major grid lines. (GRIDDISPLAY and GRIDMAJOR system variables)

Display Grid Beyond Limits displays the grid beyond the area specified by the LIMITS command. (GRIDDISPLAY system variable)

Follow Dynamic UCS changes the grid plane to follow the XY plane of the dynamic UCS. (GRIDDISPLAY system variable)

Polar Tracking

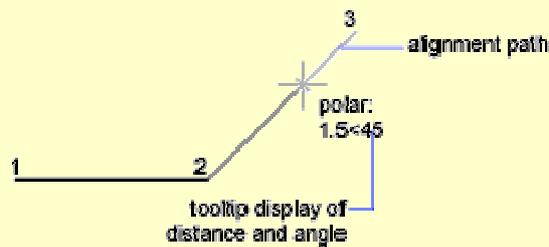
Polar tracking restricts cursor movement to specified angles. PolarSnap restricts cursor movement to specified increments along a polar angle.

When you are creating or modifying objects, you can use polar tracking to display temporary alignment paths defined by the polar angles you specify. In 3D views, polar tracking additionally provides an alignment path in the up and down directions. In that case, the tooltip displays a +Z or -Z for the angle.

Polar angles are relative to the orientation of the current user coordinate system

(UCS) and the setting for the base angle convention in a drawing. The angle base direction is set in the Drawing Units dialog box.

Use PolarSnap to snap to specified distances along the alignment path. For example, in the following illustration you draw a two-unit line from point 1 to point 2, and then draw a two-unit line to point 3 at a 45-degree angle to the line. If you turn on the 45-degree polar angle increment, an alignment path and tooltip are displayed when your cursor crosses the 0 or 45-degree angle. The alignment path and tooltip disappear when you move the cursor away from the angle.

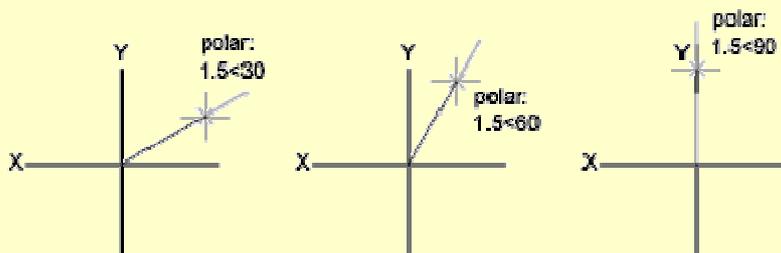


As you move your cursor, alignment paths and tooltips are displayed when you move the cursor near polar angles. The default angle measurement is 90 degrees. Use the alignment path and tooltip to draw your object. You can use polar tracking with Intersection and Apparent Intersection object snaps to find where a polar alignment path intersects another object.

Note. Ortho mode and polar tracking cannot be on at the same time. Turning on polar tracking turns off Ortho mode. Similarly, PolarSnap and grid snap cannot be on at the same time. Turning on PolarSnap turns off grid snap.

Specify Polar Angles (Polar Tracking)

You can use polar tracking to track along polar angle increments of 90, 60, 45, 30, 22.5, 18, 15, 10, and 5 degrees, or you can specify other angles. The following illustration shows the alignment paths displayed as you move your cursor 90 degrees with the polar angle increment set to 30 degrees.



The orientation of 0 depends on the angle you set in the Drawing Units dialog box (UNITS). The direction of snap (clockwise or counterclockwise) depends on the units direction you specify when setting units of measurement.

You can turn polar tracking on and off temporarily by using an override key. The direct distance entry method is not available while you are using the temporary override key for polar tracking.

Specify Polar Distances (PolarSnap)

PolarSnap restricts cursor movement to increments of a polar distance you specify. For example, if you specify a length of 4 units, the cursor snaps from the first point specified to lengths of 0, 4, 8, 12, 16, and so on. As you move your cursor, a tooltip indicates the nearest PolarSnap increment. To restrict point entry to polar distances, both polar tracking and Snap mode (set to PolarSnap) must be on. You can turn off all snapping and tracking temporarily by using an override key.

Polar Tracking Tab (Drafting Settings Dialog Box) controls the AutoTrack settings.

Polar Tracking On

Turns polar tracking on and off. You can also turn polar tracking on or off by pressing F10 or by using the AUTOSNAP system variable.

Polar Angle Settings

Sets the alignment angles for polar tracking. (POLARANG system variable)

Increment Angle sets the polar increment angle used to display polar tracking alignment paths. You can enter any angle, or select a common angle of 90, 45, 30, 22.5, 18, 15, 10, or 5 degrees from the list. (POLARANG system variable)

Additional Angles makes any additional angles in the list available for polar tracking. The Additional Angles check box is also controlled by the POLARMODE system variable, and the list of additional angles is also controlled by the POLARADDANG system variable.

Note. Additional angles are absolute, not incremental.

List of Angles if Additional Angles is selected, lists the additional angles that are available. To add new angles, click New. To remove existing angles, click Delete.

(POLARADDANG system variable)

New adds up to 10 additional polar tracking alignment angles.

Note. Before adding fractional angles, you must set the AUPREC system variable to the appropriate decimal precision to avoid undesired rounding. For example, if the value of AUPREC is 0 (the default value), all fractional angles you enter are rounded to the nearest whole number.

Delete deletes selected additional angles.

Object Snap Tracking Settings

Sets options for object snap tracking.

Track Orthogonally Only displays only orthogonal (horizontal/vertical) object snap tracking paths for acquired object snap points when object snap tracking is on.

(POLARMODE system variable)

Track Using All Polar Angle Settings applies polar tracking settings to object snap tracking. When you use object snap tracking, the cursor tracks along polar alignment angles from acquired object snap points. (POLARMODE system variable)

Note. Clicking Polar and Otrack on the status bar also turns polar tracking and object snap tracking on and off.

Polar Angle Measurement

Sets the basis by which polar tracking alignment angles are measured.

Absolute bases polar tracking angles on the current user coordinate system (UCS).

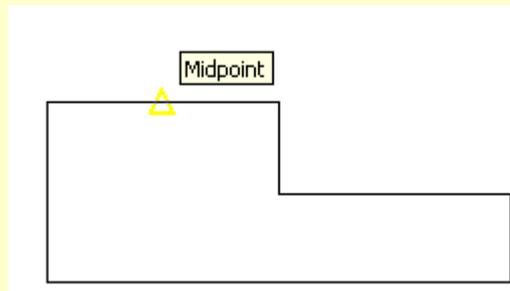
Relative to Last Segment bases polar tracking angles on the last segment drawn.

Object Snap

Use object snaps to specify precise locations on objects. For example, you can use an object snap to draw a line to the center of a circle or to the midpoint of a polyline segment.

You can specify an object snap whenever you are prompted for a point. By

default, a marker and a tooltip are displayed when you move the cursor over an object snap location on an object. This feature, called AutoSnap™, provides a visual clue that indicates which object snaps are in effect.



Specify an Object Snap

To specify an object snap at a prompt for a point, you can

- Press SHIFT and right-click to display the Object Snap shortcut menu.
- Click an object snap button on the Object Snap toolbar.
- Enter the name of an object snap at the command prompt.

When you specify an object snap at a prompt for a point, the object snap stays in effect only for the next point that you specify.

Note. Object snaps work only when you are prompted for a point. If you try to use an object snap at the Command prompt, an error message is displayed.

Use Running Object Snaps

If you need to use one or more object snaps repeatedly, you can turn on running object snaps. For example, you might set Center as a running object snap if you need to connect the centers of a series of circles with a line.

You can specify one or more running object snaps on the Object Snaps tab in the Drafting Settings dialog box, which is accessible from the Tools menu. If several running object snaps are on, more than one object snap may be eligible at a given location. Press TAB to cycle through the possibilities before you specify the point.

Click the OSNAP button on the status bar or press F3 to turn running object snaps on and off.

Note. If you want object snaps to ignore hatch objects, set the OSOPTIONS system variable to 1.

Object Snap Tab (Drafting Settings Dialog Box) controls running object snap settings.

With running object snap settings, also called Osnap, you can specify a snap point at an exact location on an object. When more than one option is selected, the selected snap modes are applied to return a point closest to the center of the aperture box. Press TAB to cycle through the options.

Object Snap On

Turns running object snaps on and off. The object snaps selected under Object Snap Modes are active while object snap is on. (OSMODE system variable)

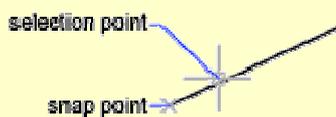
Object Snap Tracking On

Turns object snap tracking on and off. With object snap tracking, the cursor can track along alignment paths based on other object snap points when specifying points in a command. To use object snap tracking, you must turn on one or more object snaps. (AUTOSNAP system variable)

Object Snap Modes

Lists object snaps that you can turn on as running object snaps.

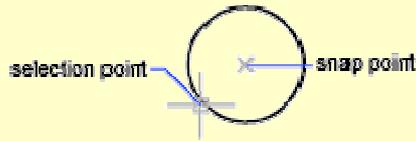
Endpoint snaps to the closest endpoint of an arc, elliptical arc, line, multiline, polyline segment, spline, region, or ray, or to the closest corner of a trace, solid, or 3D face.



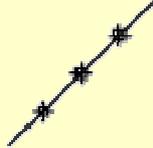
Midpoint snaps to the midpoint of an arc, ellipse, elliptical arc, line, multiline, polyline segment, region, solid, spline, or xline.



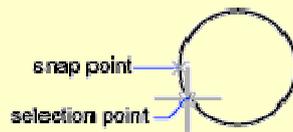
Center snaps to the center of an arc, circle, ellipse, or elliptical arc.



Node snaps to a point object, dimension definition point, or dimension text origin.



Quadrant snaps to a quadrant point of an arc, circle, ellipse, or elliptical arc.



Intersection snaps to the intersection of an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, region, spline, or xline. Extended Intersection is not available as a running object snap.

Intersection and Extended Intersection do not work with edges or corners of 3D solids.



Note. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on at the same time.

Extension causes a temporary extension line or arc to be displayed when you pass the cursor over the endpoint of objects, so you can specify points on the extension.

Note. When working in perspective view, you cannot track along the extension line of an arc or elliptical arc.

Insertion snaps to the insertion point of an attribute, a block, a shape, or text.

Perpendicular snaps to a point perpendicular to an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, region, solid, spline, or xline. Deferred Perpendicular snap mode is automatically turned on when the object you are drawing requires that you complete more than one perpendicular snap. You can use a line, arc, circle, polyline, ray, xline, multiline, or 3D solid edge as an object from which to draw a perpendicular line. You can use Deferred Perpendicular to draw perpendicular lines between such objects. When the aperture box passes over a Deferred Perpendicular snap point, an AutoSnap tooltip and marker are displayed.



Tangent snaps to the tangent of an arc, circle, ellipse, elliptical arc, or spline. Deferred Tangent snap mode is automatically turned on when the object you are drawing requires that you complete more than one tangent snap. You can use Deferred Tangent to draw a line or xline that is tangent to arcs, polyline arcs, or circles. When the aperture box passes over a Deferred Tangent snap point, a marker and an AutoSnap tooltip are displayed.



Note. When you use the From option in conjunction with the Tangent snap mode to draw objects other than lines from arcs or circles, the first point drawn is tangent to the arc or circle in relation to the last point selected in the drawing area.

Nearest snaps to the nearest point on an arc, circle, ellipse, elliptical arc, line, multiline, point, polyline, ray, spline, or xline.

Apparent Intersection snaps to the visual intersection of two objects that are not in the same plane but may appear to intersect in the current view. Extended Apparent Intersection is not available as a running object snap. Apparent and Extended Apparent Intersection do not work with edges or corners of 3D solids.

Note. You might get varying results if you have both the Intersection and Apparent

Intersection running object snaps turned on at the same time.

Parallel constrains a line segment, polyline segment, ray or xline to be parallel to another linear object. After you specify the first point of a linear object, specify the parallel object snap. Unlike other object snap modes, you move the cursor and hover over another linear object until the angle is acquired. Then, move the cursor back toward the object that you are creating. When the path of the object is parallel to the previous linear object, an alignment path is displayed, which you can use to create the parallel object.

Note. Turn off ORTHO mode before using the parallel object snap. Object snap tracking and polar snap are turned off automatically during a parallel object snap operation. You must specify the first point of a linear object before using the parallel object snap.

Dynamic Input

Dynamic Input provides a command interface near the cursor to help you keep your focus in the drafting area.

When Dynamic Input is on, tooltips display information near the cursor that is dynamically updated as the cursor moves. When a command is active, the tooltips provide a place for user entry.

After you type a value in an input field and press TAB, the field then displays a lock icon, and the cursor is constrained by the value that you entered. You can then enter a value for the second input field. Alternately, if you type a value and press ENTER, the second input field is ignored and the value is interpreted as direct distance entry.

The actions required to complete a command or to use grips are similar to those for the command prompt. The difference is that your attention can stay near the cursor.

Dynamic Input is not designed to replace the command window. You can hide the command window to add screen area for drawing, but you will need to display it

for some operations. Press F2 to hide and display command prompts and error messages as needed. Alternately, you can undock the command window and use Auto-hide to roll open or roll up the window.

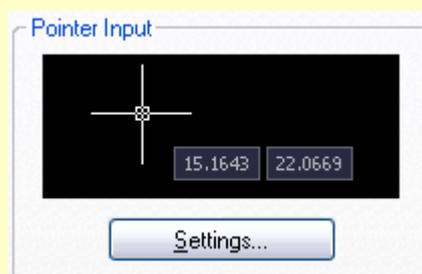
Turn Dynamic Input On and Off

Click Dyn on the status bar to turn Dynamic Input on and off. You can turn it off temporarily by holding down the F12 key. Dynamic Input has three components: pointer input, dimensional input, and dynamic prompts. Right-click Dyn and click Settings to control what is displayed by each component when Dynamic Input is on.

Pointer Input

When pointer input is on and a command is active, the location of the crosshairs is displayed as coordinates in a tooltip near the cursor. You can enter coordinate values in the tooltip instead of on the command line.

The default for second and subsequent points is relative polar coordinates (relative Cartesian for RECTANG). There is no need to type the at sign (@). If you want to use absolute coordinates, use the pound sign (#) prefix. For example, to move an object to the origin, for the second point prompt, enter #0,0.

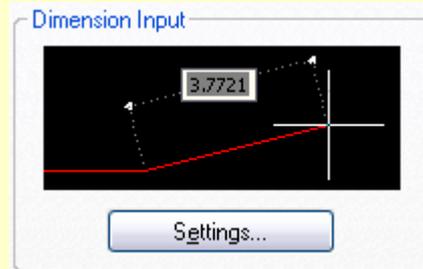


Use the pointer input settings to change the default format for coordinates and to control when pointer input tooltips are displayed.

Dimensional Input

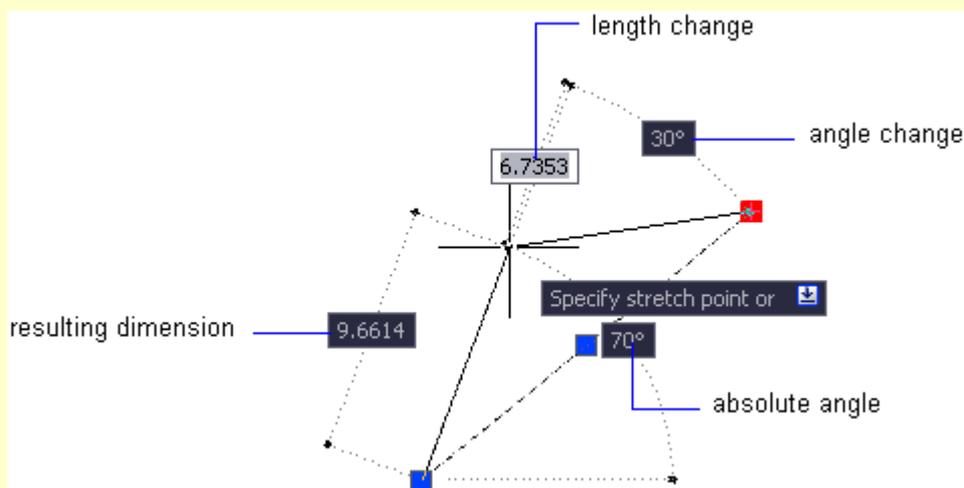
When dimensional input is on, the tooltips display distance and angle values

when a command prompts for a second point. The values in the dimensional tooltips change as you move the cursor. Press TAB to move to the value you want to change. Dimensional input is available for ARC, CIRCLE, ELLIPSE, LINE, and PLINE.



When you use grips to edit an object, the dimensional input tooltips can display the following information:

- Original length
- A length that updates as you move the grip
- The change in the length
- Angle
- The change in the angle as you move the grip
- The radius of an arc
-



Use the dimensional input settings to display only the information you want to see.

When you use grips to stretch objects or when you create new objects, dimensional input displays only acute angles, that is, all angles are displayed as 180

degrees or less. Thus, an angle of 270 degrees is displayed as 90 degrees regardless of the ANGDIR system variable setting (set in the Drawing Units dialog box). Angles specified when creating new objects rely on the cursor location to determine the positive angle direction.

Dynamic Prompts

When dynamic prompts are on, prompts are displayed in a tooltip near the cursor. You can enter a response in the tooltip instead of on the command line. Press the DOWN ARROW key to view and select options. Press the UP ARROW key to display recent input.



Note. To use PASTECLIP in a dynamic prompt tooltip, type a letter and then backspace to delete it before you paste the entry. Otherwise, the entry is pasted into the drawing as text.

Dynamic Input Tab (Drafting Settings Dialog Box) controls pointer input, dimension input, dynamic prompting, and the appearance of drafting tooltips.

Enable Pointer Input

Turns on pointer input. When pointer input and dimensional input are both turned on, dimensional input supersedes pointer input when it is available. (DYNMODE system variable)

Pointer Input

Displays the location of the crosshairs as coordinate values in a tooltip near the cursor. When a command prompts for a point, you can enter coordinate values in the tooltip instead of on the command line.

Preview Area shows an example of pointer input.

Settings Displays the Pointer Input Settings dialog box.

Enable Dimension Input

Turns on dimensional input. Dimensional input is not available for some commands that prompt for a second point. (DYNMODE system variable)

Dimension Input

Displays a dimension with tooltips for distance value and angle value when a command prompts for a second point or a distance. The values in the dimension tooltips change as you move the cursor. You can enter values in the tooltip instead of on the command line.

Preview Area shows an example of dimensional input.

Settings displays the Dimension Input Settings dialog box.

Dynamic Prompts

Displays prompts in a tooltip near the cursor when necessary in order to complete the command. You can enter values in the tooltip instead of on the command line.

Preview Area shows an example of dynamic prompts.

Show Command Prompting and Command Input near the Crosshairs displays prompts in Dynamic Input tooltips. (DYNPROMPT system variable)

Навчальне видання

Geometrical constructing with the use of Object Snap.

Guidance for laboratory works for “Informatics and computer modeling basics” course /for foreign students of 2nd year studying by orientation 6.060102 «Architecture»/

Укладачі: Борис Петрович Бочаров,
Ігор Леонідович Яковицький,
Марія Юріївна Воєводіна,
Юрій Володимирович Левіков

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Обсяг 1,0 обл. - вид. арк.

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