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Snapping Guide for the Summit Evolution Stereoplotter with DAT/EM Capture for AutoCAD

Contents

Introduction	1
Do This First! Turn Off Unwanted Snaps and Tracking After AutoCAD Installation	1
AutoCAD Object Snapping Commands	5
OSNAP	5
OSNAP on the DAT/EM Keypad	7
OSNAP on a Button Manager Button.....	8
OSNAPZ	10
OSNAPZ on the DAT/EM Keypad	11
OSNAPZ on a Button Manager Button.....	12
Combining OSNAP, OSNAPZ, and Other Commands	12
AutoCAD Snap Overrides, Such as NEA and INT	13
DAT/EM Snapping Commands.....	13
AUTOARC3D Uses Its Own 2D/3D Snap Toggle Instead of OSNAPZ	13
AUTOARC2D Uses OSNAPZ	15
ADVOSNAPS (DAT/EM “Advanced OSNAP Settings”)	15
DATEMSNAP Drives the Cursor to Snap Locations	15
Use MapEditor to Post-Process 2D and 3D Snaps	16

Introduction

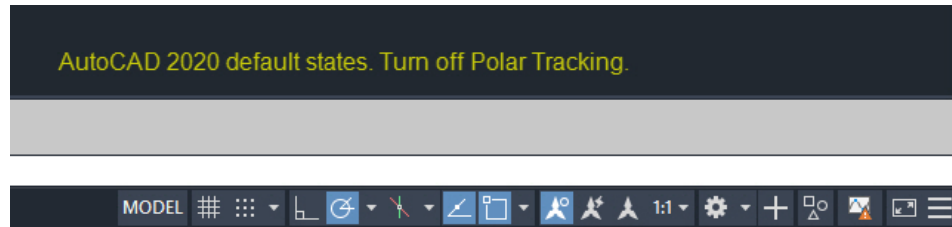
This guide offers hints for snapping using the DAT/EM Summit Evolution stereoplotter (Summit), DAT/EM Capture for AutoCAD (Capture), and DAT/EM MapEditor for AutoCAD (MapEditor). This includes how to set a 2D or 3D snap, snap mode settings, keyins to use for the DAT/EM Keypad and Summit’s Button Manager buttons, and enforcing snaps as a post-process using MapEditor.

Do This First! Turn Off Unwanted Snaps and Tracking After AutoCAD Installation

All versions of AutoCAD install with some default locks and coordinate snaps set on, which you will need to turn off. Some of them are very important, such as grid, coordinate resolution snap, axis, and angle locks that will prevent the AutoCAD cursor from moving to or digitizing at the exact locations of the Summit cursor.

This may be done after installing AutoCAD, and either before or after configuring AutoCAD to run with DAT/EM Capture. It should be done before digitizing any vectors in AutoCAD using DAT/EM Capture and the Summit digitizer. Check the following:

1. View the icons along the lower right edge of the AutoCAD window and turn off Polar Tracking, Snap mode, and Orthomode. They are off if they do not have a blue highlight.



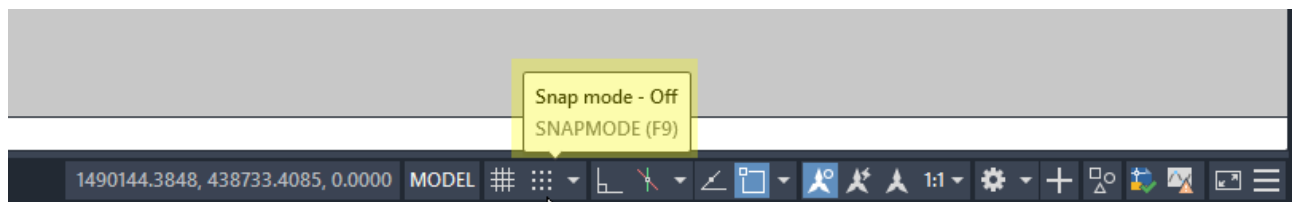
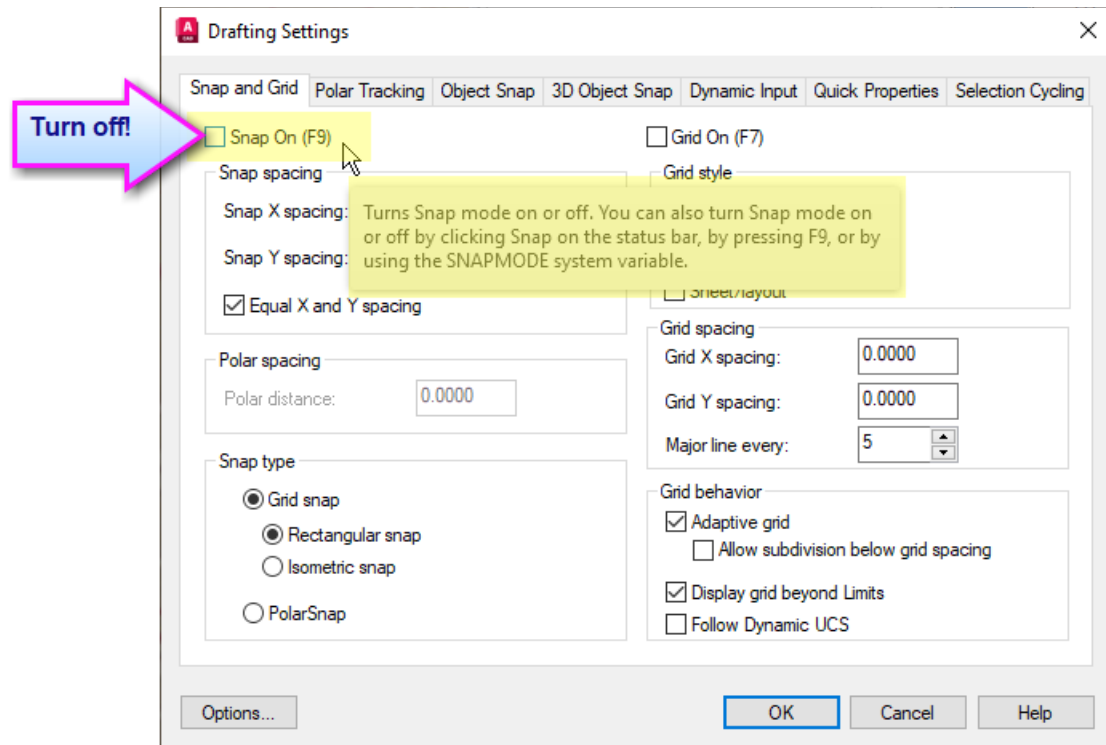
*AutoCAD 2020 defaults shown. Turn off **Polar Tracking** (first blue highlighted icon on the left). If you find them on in your version, also turn off **Snap mode** and **Orthomode**.*

Other versions may have other locks on. Hover the system mouse over each blue highlighted icon to see what it is. Turn off anything that might interfere with drawing using Summit.

Important! SNAP (SNAPMODE) is not an object snapping command! Its name can be misleading! SNAP is a coordinate resolution snap, which rounds off the coordinates of digitized points to the nearest resolution value, such as 0.01 meter or foot. *SNAP must be off for photogrammetric mapping!* SNAPMODE is a “dangerous” snap; by installation default, it is on and set to a small distance such as 0.01. You may not notice that it’s on, because the rounding could be small, yet when it is on, the digitized coordinates will always be rounded. For example, if Summit is at x=100.0263 and SNAP is on with **X spacing at 0.01**, the digitized x coordinate will be x=100.0300. We would much rather SNAP be off so that it digitizes at the exact stereoplotter position. Turn it off with the **SNAP OFF** keyin (this is the same as setting the SNAPMODE variable) or right click on its icon along the lower edge of the AutoCAD window and select **Settings**, then **uncheck Snap On**:

Command: **SNAP**

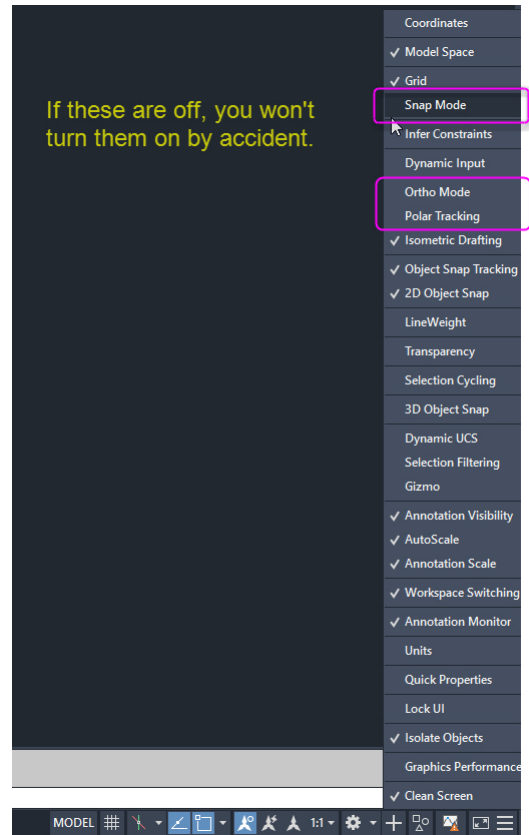
Specify snap spacing or [ON/OFF/Aspect/Legacy/Style/Type] <0.0100>: **off**



Note: OSNAP may be either on or off. OSNAP is used for object snapping and will be toggled often during regular use. It doesn't matter whether it is on or off now.

Use AutoCAD "Help" to look up any settings that are unknown to you. Some of them do not interfere with mapping activities or are used frequently, and you may want them visible.

(Optional, but recommended) To prevent snap mode, orthomode, or polar tracking from being turned back on by a stray mouse click, you could optionally remove their icons from the display. First make sure the modes are turned off (not highlighted in blue), because *turning off the icon display does not toggle the current mode setting!* Once the modes are off, click the three parallel lines icon on the far lower right corner. Uncheck Snap Mode, Ortho Mode, and Polar Tracking.

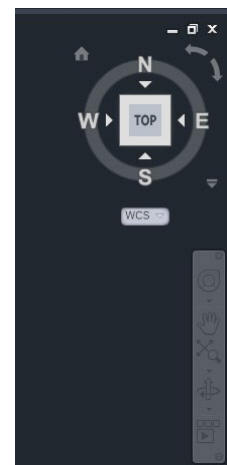
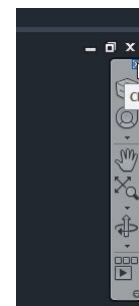


2. This has nothing to do with snapping, but it may bother you, so here's a bonus hint. To turn off the WCS compass that appears by default in the upper right corner of the AutoCAD view, key in on the command line:

Command: **DISPLAYVIEWCUBEIN2D**

Enter new value for DISPLAYVIEWCUBEIN2D <ON>: **OFF**

Also click the "x" on the remaining toolbar:



AutoCAD Object Snapping Commands

While using DAT/EM Capture for AutoCAD, most snapping will be done with AutoCAD's **OSNAP** modes combined with the **OSNAPZ** variable to control the elevation of the snap.

Note: The exception is the **AUTOARC3D** command, which has a built-in 2D/3D snap toggle. See page 13.

Note: The AutoCAD terms are confusing. AutoCAD's "2D Object snap" (OSNAP) and "3D Object snap" (3DOSNAP) descriptions refer to the *type of objects being snapping to*; they do not refer to the elevation of the snap point.

- In photogrammetric mapping, we typically use AutoCAD's "2D Object Snap" (OSNAP) for snapping to the type of objects we use most often, such as points, blocks, and polylines. The AutoCAD tooltip for this snap is, "*Snap cursor to 2D reference points,*" which is misleading. This snap can be 2D (xy of the snapped-to object, stereoplotter z) when the OSNAPZ variable is off and 3D (full xyz of the snapped-to object) when OSNAPZ is on.
- "3D Object snap" (3DOSNAP) is for snapping to 3D objects such as solids, which are typically not the type of objects we draw for photogrammetric mapping; however, if you often create 3D solids or surfaces, you may certainly use 3DOSNAP and 3DOSNAPZ. Just substitute it in the instructions below where we mention OSNAP and OSNAPZ.

We will discuss the more typical OSNAP and OSNAPZ combination in this document. The following sections introduce the snapping commands, first alone, and then in combination with each other. See:

- "OSNAP" immediately below.
- "OSNAPZ" on page 10
- "Combining OSNAP, OSNAPZ, and Other Commands" on page 12
- "AutoCAD Snap Overrides, Such as NEA and INT" on page 13

OSNAP

The most commonly used snap toggle is **OSNAP <ON/OFF>** along with all the OSNAP commands that set its snap modes, such as **nearest**, **midpoint**, **intersection**, **center**, and **endpoint** snapping.

- Commands: '**OSNAP <On/Off/OSNAP mode-setting subcommands>**

OSNAP entered directly on the AutoCAD Command line activates a dialog, but dialogs are slow and may cancel an ongoing drawing command. The - suppresses the dialog. Starting with ' makes the command transparent so it can be run during a drawing command without breaking the command. Here, we use both characters.

- If you are using a localized language version of AutoCAD, you can use either the localized language version of the command or use the English version command starting with the _ character. For example, '**_OSNAP**. Most of the examples below do not show the _ character, but you can add it if necessary.

Examples of transparent and dialog-suppressed OSNAP keyins:

'-osnap off

'-osnap end

'-osnap nea

'-osnap int

There are more. See table below.

Or set more than one snap type at a time, example:

'-osnap end,nea,int,cen

Each of the commands to set these snap modes (end, nea, int, etc.) also turn on OSNAP. This means you need a separate command to set OSNAP OFF, but perhaps not for ON.

The following image is a screen capture of AutoCAD 2020 “Help” showing OSNAP snap modes. The CAPITAL letters indicate the shorter version of the keyin. (You may search for the equivalent of this list in your particular AutoCAD version’s Help, in case anything has changed in the different versions.)

Object Snap Modes	
Specify one or more object snap modes by entering the uppercase characters of the name in the following table. If you enter more than one name, separate the names with commas.	
Mode	Description
ENDpoint	Snaps to the closest endpoint or corner of a geometric object
MIDpoint	Snaps to the midpoint of a geometric object
CENTER	Snaps to the center of an arc, circle, ellipse, or elliptical arc
Geometric Center	Snaps to the centroid of any closed polylines and splines
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 geometric objects
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
INSertion	Snaps to the insertion point of objects such as an attribute, a block, or text
PERpendicular	Snaps to a point perpendicular to the selected geometric object
TANGent	Snaps to the tangent of an arc, circle, ellipse, elliptical arc, polyline arc, or spline
NEARest	Snaps to the nearest point on an object such as an arc, circle, ellipse, elliptical arc, line, point, polyline, ray, spline, or xline
APParent intersection	Snaps to the visual intersection of two objects that do not intersect in 3D space but may appear to intersect in the current view
PARallel	Constrains a new line segment, polyline segment, ray or xline to be parallel to an existing linear object that you identify by hovering your cursor
NONE	Turns off object snap modes

For more information on each of these object snap modes, see the Object Snap tab of the Drafting Settings dialog box.

Autodesk’s AutoCAD 2020 “Help” for OSNAP keyins, which may be set on a digitizer “User CAD” button or the DAT/EM Keypad.

Any AutoCAD command line keyin that affects snapping may be activated from the DAT/EM Keypad or a Summit Button Manager “User CAD” button. See below:

- “OSNAP on the DAT/EM Keypad”, immediately below
- “OSNAP on a Button Manager Button”, page 8

OSNAP on the DAT/EM Keypad

You can set the DAT/EM Keypad to make the OSNAP settings with the most commonly used OSNAP toggles and modes. Examples of settings in the Keypad Controller’s Edit Key Text field:

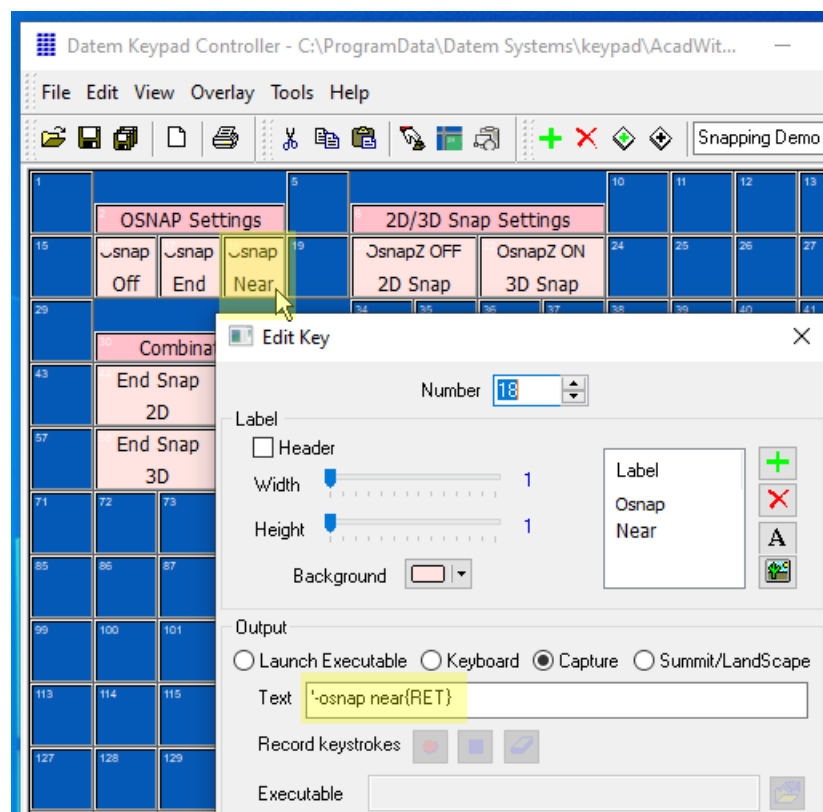
'-osnap off{RET} (this sets all running snapping modes off/unchecked)

'-osnap end{RET} (this sets snapping on and the snap mode to end)

'-osnap nea{RET}

'-osnap int{RET}

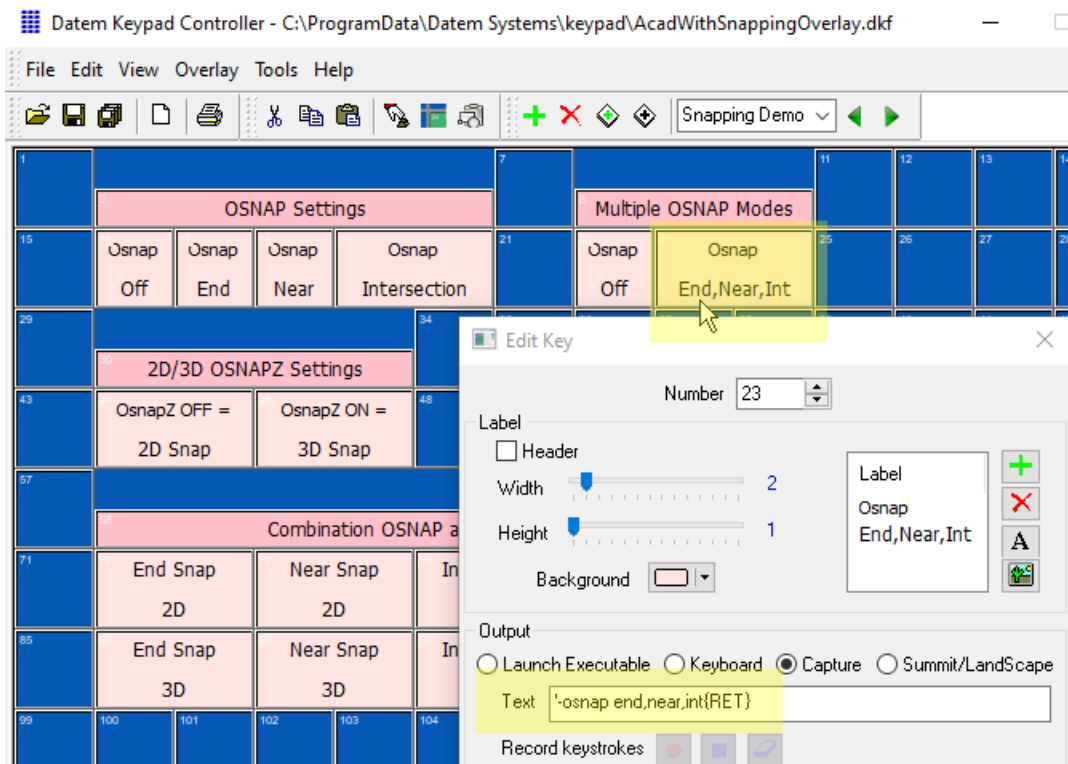
When these are issued separately, they turn off other modes and set only the single listed mode.



*Example of the DAT/EM Keypad button **Text** that sets OSNAP to the near point snap mode and turns off all other snap modes*

Alternatively, you may set multiple OSNAP modes on at one time by listing them separated by a , character:

'-osnap end,nea,int{RET}



Example of Keypad key that sets the End, Near, and Intersection snap modes on at the same time

OSNAP on a Button Manager Button

On a Summit Button Manager button (**Summit > Tools > Button Manager**), it's possible to set either one setting or string together multiple settings to use in series each time you press the button. Separate each distinct command with the colon : character. Each time you press the button, it will issue the next command past the :, cycling around to the beginning after issuing the last command.

You can choose snap toggles and mode methods to suit your project and personal preferences. This first set of examples shows how to set single OSNAP snapping modes:

Type=User CAD, Action='-osnap off{RET} (this sets all running snapping modes off/unchecked)

Type=User CAD, Action='-osnap end{RET} (this sets snapping on and the snap mode to end)

Type=User CAD, Action='-osnap nea{RET}

Type=User CAD, Action='-osnap int{RET}

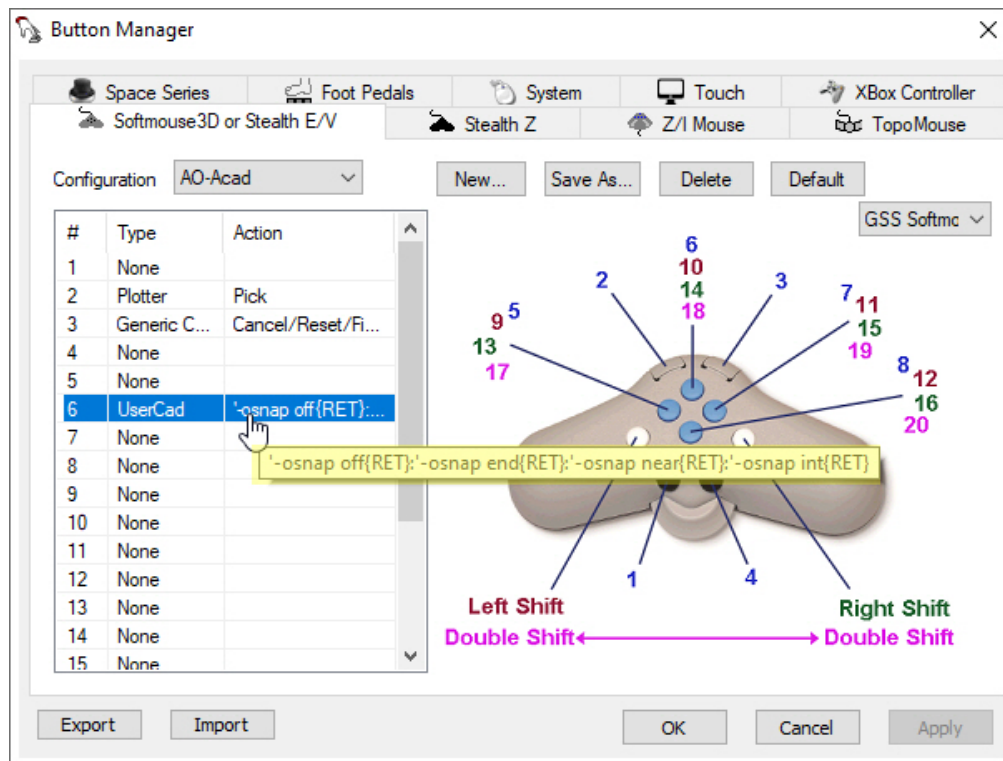
You could make a simple OSNAP on/off toggle button. This example would toggle OSNAP without setting or changing the snap modes:

Type=User CAD, Action='-osnap off{RET}:-osnap on{RET}

However, since the snap mode keyins also turn on OSNAP, you could set a single button to a series that first turns OSNAP off, then sets the individual modes with subsequent presses:

Type=User CAD, Action='-osnap off{RET}:-osnap end{RET}:-osnap nea{RET}:-osnap int{RET}

For example, to change from *Osnap End* to *Intersection* in this example, you would press the button two times:



*Example of a series of OSNAP settings on one Button Manager button
(the : character method only works in Button Manager, not on the DAT/EM Keypad)*

Alternatively, you could set a series that first sets OSNAP off followed by a combination of multiple OSNAP modes. Osnap mode settings turn on OSNAP, so you don't need to include OSNAP ON:

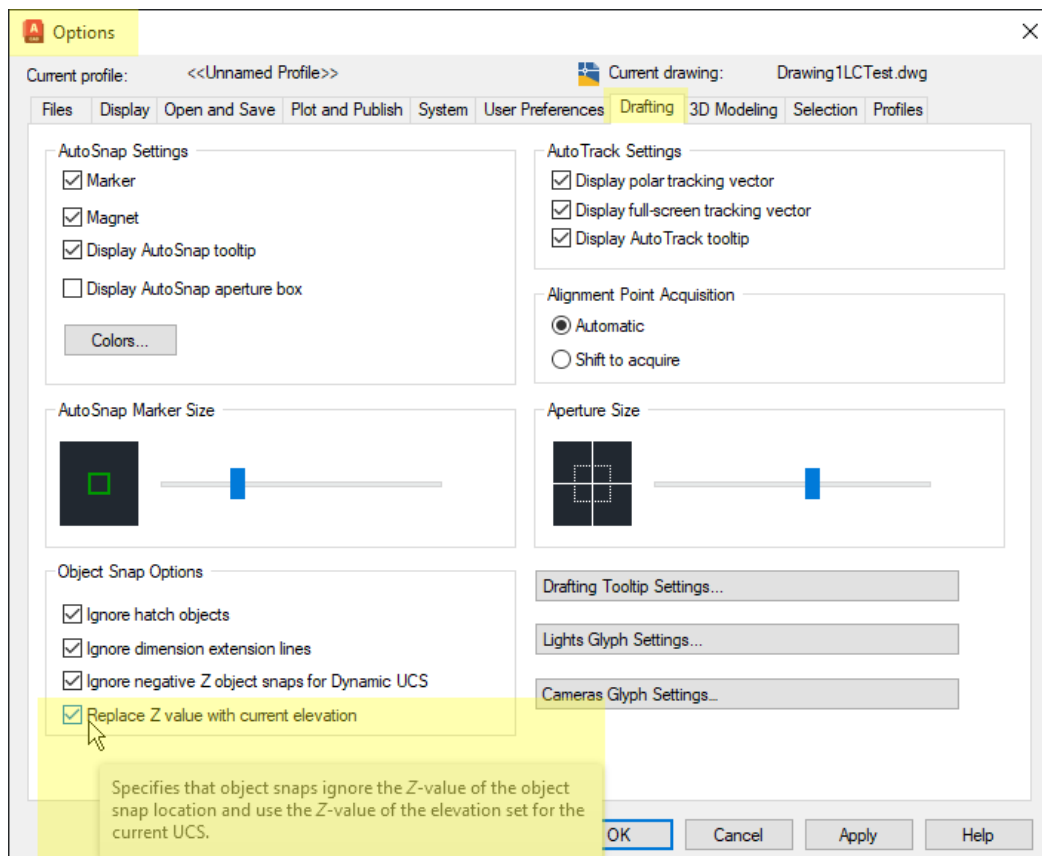
Type=User CAD, Action='-osnap off{RET}:-osnap end,nea,int,cen{RET}

OSNAPZ

OSNAPZ is the variable used to toggle 2D and 3D object snapping for OSNAP. It works for all drawing commands except AUTOARC3D (see “AUTOARC3D Uses Its Own 2D/3D Snap Toggle Instead of OSNAPZ” on page 13).

OSNAPZ is used together with OSNAP and OSNAP’s snapping modes (see “OSNAP” starting on page 5 above).

- **‘OSNAPZ 1** transparently activates 3D snapping (snapped-to xy, Summit stereoplotter z)
- **‘OSNAPZ 0** transparently activates 2D snapping (snapped-to xyz)
- The ‘ character allows it to be set transparently, without breaking any active drawing command.
- For localized language versions of AutoCAD, use the equivalent command or optionally use _ to use the English command in a localized language AutoCAD version, for example **‘_OSNAPZ 1**.
- The - character is not used in this case, because OSNAPZ does not launch a dialog. It is an environment variable setting keyin. The environment variable is also shown in a dialog, but in this case AutoCAD’s **OPTIONS** dialog > **Drafting** tab > **Replace Z with the current elevation**. This is given for information only; it’s faster to enter the **OSNAPZ <1/0>** command.



Replace Z value with current elevation shows the current state of the OSNAPZ variable

Suggested information in AutoCAD Help: Search for “About using object snaps”, “Commands for object snaps”. Remember that when Autodesk mentions 2D and 3D, they mean the type of object you’re snapping to, such as polylines or solids, not the (x,y,z) coordinate of an object snap. Their “2D Object” means objects such as 2D polylines, 3D polylines, points, and blocks. Their “3D Object” means objects such as solids.

Again, with OSNAPZ, you can put the command line version on the DAT/EM Keypad or a Button Manager button. For the Keypad, make 2D snap and 3D snap buttons. See examples in:

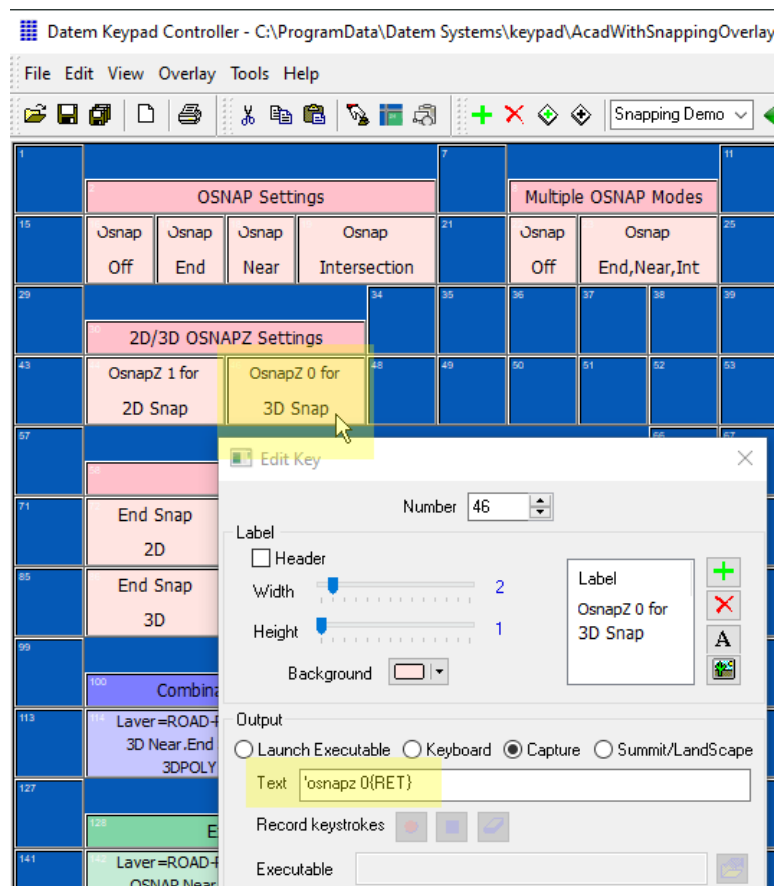
- “OSNAPZ on the DAT/EM Keypad” immediately below
- “OSNAPZ on a Button Manager Button” on page 12 below

OSNAPZ on the DAT/EM Keypad

For simple OSNAPZ toggles on the DAT/EM Keypad, set two separate buttons to:

‘osnapz 0{RET}

‘osnapz 1{RET}



Example of setting OSNAPZ to 0 for a 3D snap on the DAT/EM Keypad

You can also combine the OSNAPZ setting with other commands. See “Combining OSNAP, OSNAPZ, and Other Commands” on page 12.

OSNAPZ on a Button Manager Button

For the Button Manager button, make a toggle button that combines them on one button. Use the ' for transparent operation (- is not needed, because this keyin does not launch a dialog). Use : to separate the commands:

Type=User CAD, Action='osnapz 1{RET}:'osnapz 0{RET}'

Combining OSNAP, OSNAPZ, and Other Commands

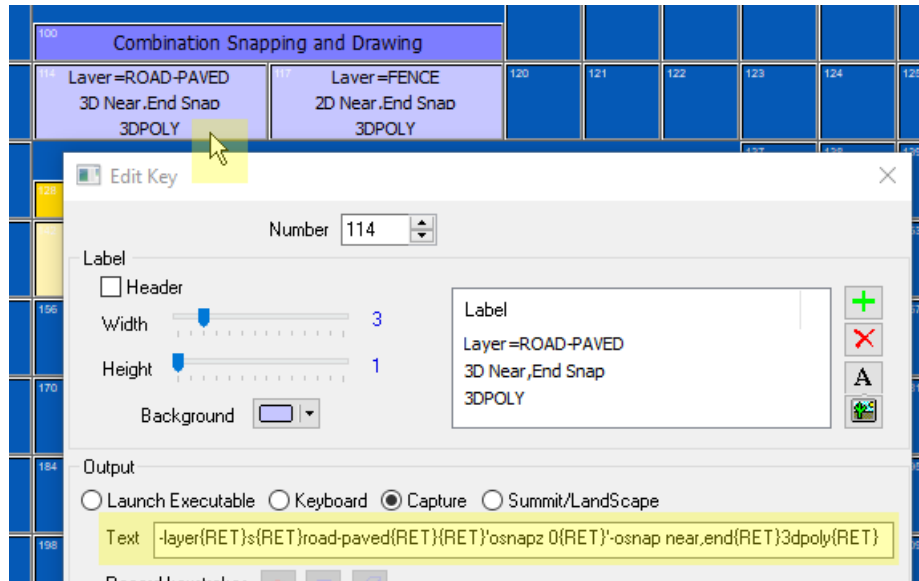
Any command keyins that work in AutoCAD may be combined on the DAT/EM Keypad and Button Manager buttons. You may combine OSNAP and OSNAPZ commands on the same keys and buttons and add any other keyin strings that work in AutoCAD, such as layer settings and drawing commands.

Both the Button Manager and the Keypad see {RET} as a return character, which you would use anywhere you might key in a return (Enter keyboard key) if using the Command line in AutoCAD. This allows you to string together multiple commands on one key or button.

The following are two examples that set a layer, set the snap to 2D or 3D, set multiple snap modes, and start the 3DPOLY command. These can be copied to a DAT/EM Keypad key or a Button Manager **User Cad** button:

-layer{RET}s{RET}road-paved{RET}{RET}'osnapz 0{RET}'-osnap near,end{RET}3dpoly{RET}

-layer{RET}s{RET}FENCE{RET}{RET}'osnapz 1{RET}'-osnap near,end{RET}3dpoly{RET}



Example of a Keypad key that's a combination of snapping and drawing settings

In the case of the Button Manager, you can both combine commands and/or make a series of commands separated by the : character. Each time the button is pressed, the next in the series is submitted. The following line would alternately toggle 2D and 3D snapping, set multiple snap modes (Near and Endpoint), and start the 3DPOLY command (this is one continuous line, which is wrapped to fit in this document view):

**'osnapz 0{RET}'-osnap near,end{RET}3dpoly{RET};'osnapz 1{RET}'-osnap
near,end{RET}3dpoly{RET}**

In the following example, a third command that turns off snapping is added to the series. All three commands start 3DPOLY, but with different OSNAP and OSNAPZ settings in each (this is one continuous line, which is wrapped to fit in this document view):

**'-osnap off{RET}3dpoly{RET};'osnapz 0{RET}'-osnap near,end{RET}3dpoly{RET};'osnapz
1{RET}'-osnap near,end{RET}3dpoly{RET}**

You can combine any keyins that suit your Keypad or Button Manager needs.

AutoCAD Snap Overrides, Such as NEA and INT

If OSNAP is off, you may still accomplish a snap with AutoCAD snap override keyins, such as NEA (one-time near snap) and INT (one-time intersection snap). See AutoCAD Help for more information on how these overrides work.

DAT/EM Snapping Commands

The following sections discuss DAT/EM-specific snap commands and tools.

- “AUTOARC3D Uses Its Own 2D/3D Snap Toggle” immediately below
- “ADVOSNAPS (DAT/EM “Advanced OSNAP Settings”)” on page 15
- “DATEMSNAP Drives the Cursor to Snap Locations” on page 15

AUTOARC3D Uses Its Own 2D/3D Snap Toggle Instead of OSNAPZ

OSNAPZ works to toggle 2D/3D snapping for many digitizing commands, but not for DAT/EM’s AUTOARC3D. Historically, some AutoCAD versions didn’t work properly toggling OSNAPZ during AUTOARC3D, so DAT/EM added a 2D/3D snap toggle that is internal to the command.

AUTOARC3D still uses OSNAP to turn overall snapping on and off and to set snap modes, such as end or near. It is only OSNAPZ that doesn’t affect AUTOARC3D

Notice the AUTOARC3D command line prompt includes “Plotter z” and shows the current setting in square brackets, [OFF] or [ON]:

Command: AUTOARC3D

From point/Stroke/Plotter z[OFF]:P

From point/Stroke/Plotter z[ON]:p

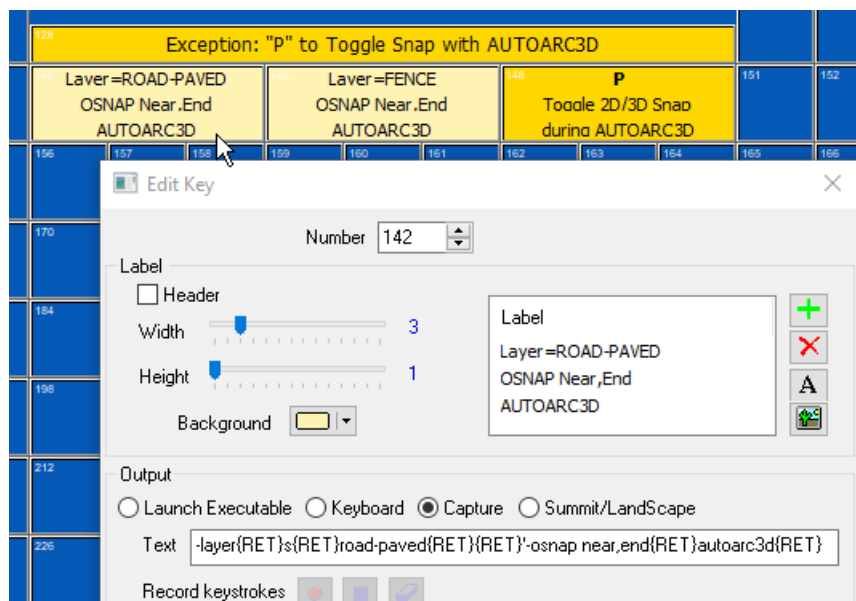
From point/Stroke/Plotter z[OFF]:

“Plotter z” indicates whether a snap will use the stereoplotted elevation or not.

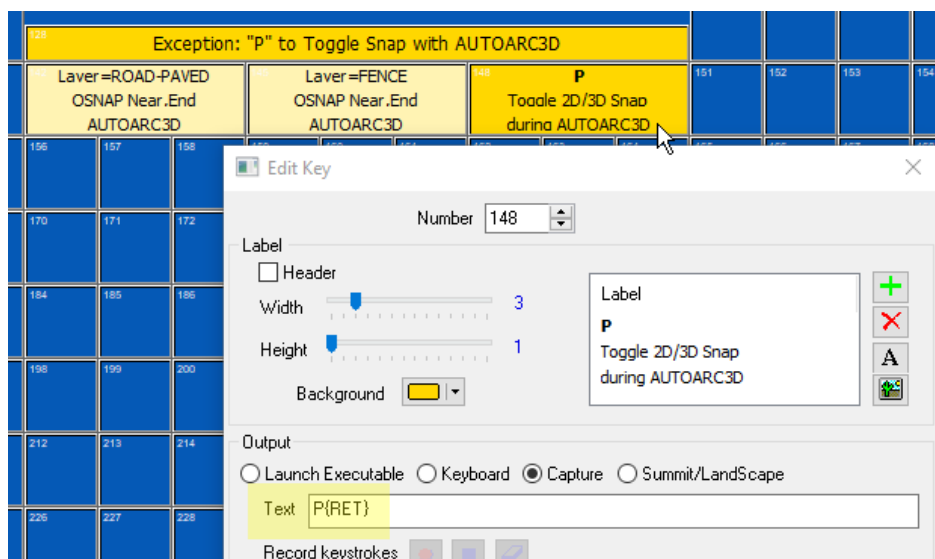
- When “Plotter z” is off, AUTOARC3D will snap in 2D.
- When “Plotter z” is on, AUTOARC3D will snap in 3D.
- Toggle it with **p** or **P**.

Example of two separate Keypad keys to start AUTOARC3D and to toggle its snap:

**-layer{RET}s{RET}ROAD-UNPAVED{RET}{RET}'-osnap near,end{RET}autoarc3d{RET}
p{RET}**



This key sets a layer, sets OSNAP snapping modes, and starts AUTOARC3D



This key toggles AUTOARC3D's 2D/3D snap setting

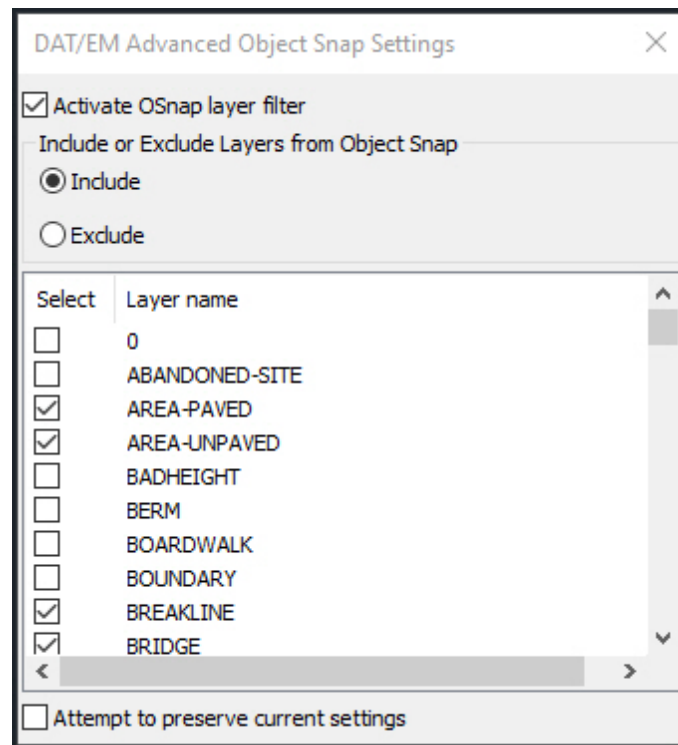
AUTOARC2D Uses OSNAPZ

To clarify, there is a difference between AUTOARC3D and AUTOARC2D snapping methods. AUTOARC2D only needs to specify the elevation of its first point, since it draws a 2D polyline at the first point's elevation. AUTOARC2D's first point snap is compatible with OSNAP and OSNAPZ. Only AUTOARC3D has its own 2D/3D snap toggle.

ADVOSNAPS (DAT/EM "Advanced OSNAP Settings")

ADVOSNAPS (DAT/EM Advanced OSNAP Settings) is a DAT/EM Capture command that lets you choose layers that AutoCAD OSNAP will either recognize or ignore for snapping.

- If **Activate Osnap layer filter** is unchecked, OSNAP will snap to all layers. This is the default behavior of OSNAP in AutoCAD.
- If **Activate Osnap layer filter** is checked on, only those layers that are checked on with **Include**, or unchecked with **Exclude** work with OSNAP Snapping.



ADVOSNAPS shown checked on and several layers unchecked/checked

DATEMSNAP Drives the Cursor to Snap Locations

DAT/EM provides a command called DATEMSNAP that works during drawing with DAT/EM's AUTOARC3D and AutoCAD's 3DPOLY commands. It moves the stereoplottor cursor to selected snap coordinates in 2D or 3D, whichever is currently set by OSNAPZ or AUTOARC3D P.

To use DATEMSNAP, perform the following steps:

1. In an active drawing, turn on DATEMSNAP from a keyin or a DAT/EM Keypad key:

```
Command: datemsnap  
DATEMSNAP On/Off: On  
Datemsnap is now ON.
```

To turn it off, so that the stereoplottter stays in its original location while picking the snap:

```
Command: datemsnap  
DATEMSNAP On/Off: Off  
Datemsnap is now OFF.
```

To set DATEMSNAP on and off from two separate DAT/EM Keypad keys, use the strings:

```
datemsnap{RET}on{RET}  
datemsnap{RET}off{RET}
```

To toggle DATEMSNAP from a Button Manager **User Cad** button, use the combined string:

```
datemsnap{RET}on{RET};datemsnap{RET}off{RET}
```

2. Start either **3DPOLY** or **AUTOARC3D** and begin drawing. During drawing, if you pick any type of snap, the stereoplottter will move to the snapped location.

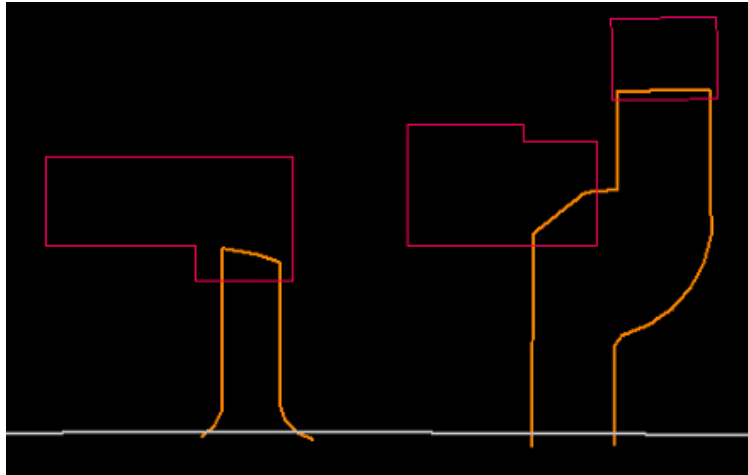
Use MapEditor to Post-Process 2D and 3D Snaps

DAT/EM MapEditor for AutoCAD can post-process 2D and 3D snaps. It offers options to add nodes (vertices) or break objects at intersections.

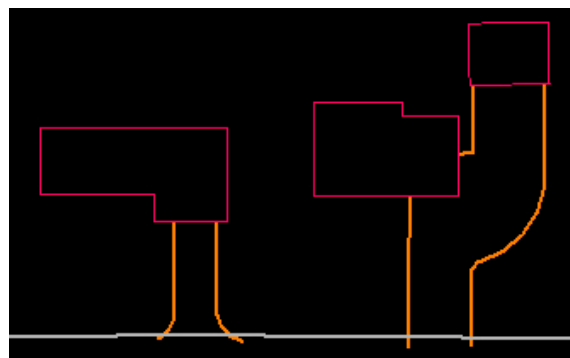
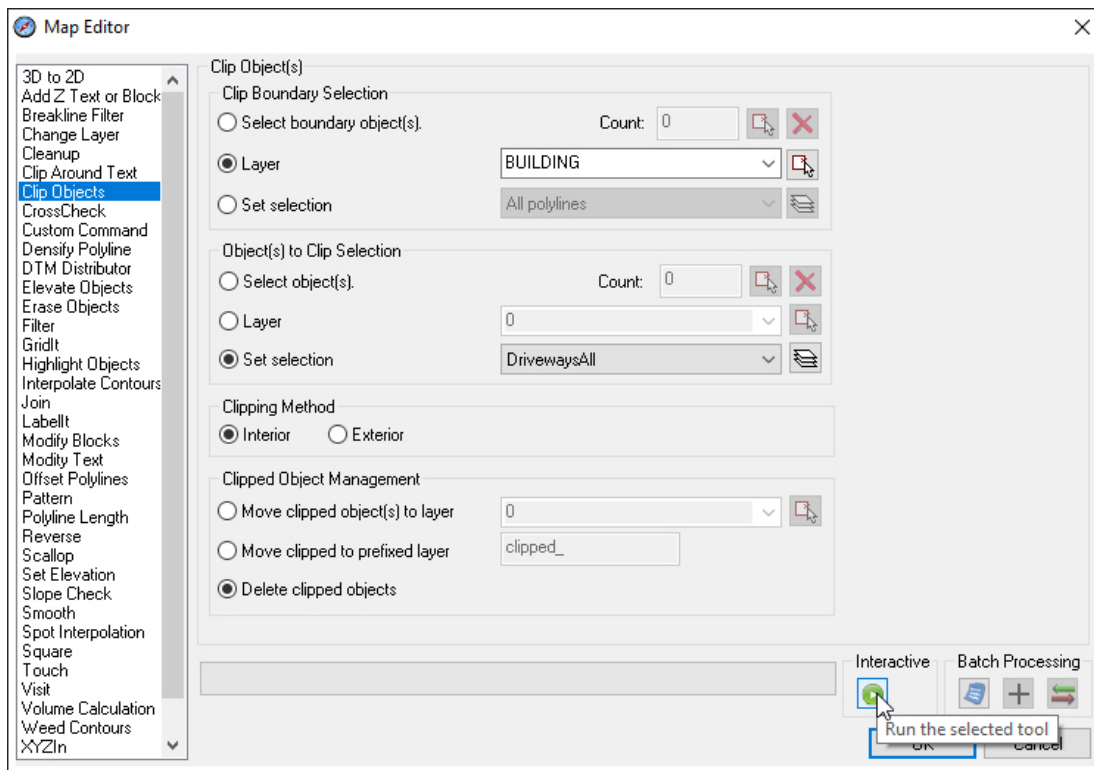
MapEditor can be run on a quick, one-time-only, this-drawing-only basis, or it can run a list of preset tasks from a parameter file. If you often use the same drawing file template so that you always have the same set of layer names, it will be worth the time to create a parameter file to ensure the desired snaps. You will save a lot of time at the drawing stage if you have MapEditor perform the commonly done object snaps later.

Even if you carefully snap during digitizing, MapEditor can still check the snaps. It could catch that one out of a thousand that was missed or 2D snapped when it should have been 3D snapped. It can also quickly “visit” the edited locations to let you visually check the MapEditor edits. It could also simply visit the proposed edit locations and let you decide what to do there.

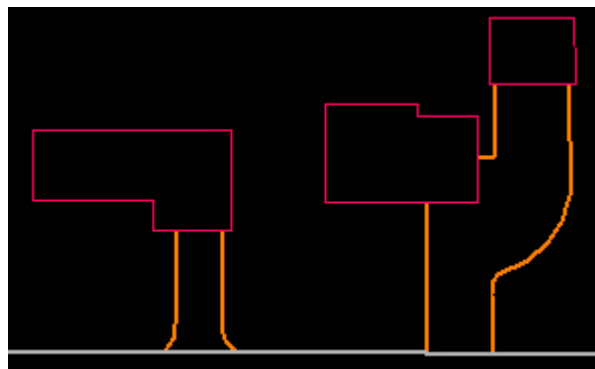
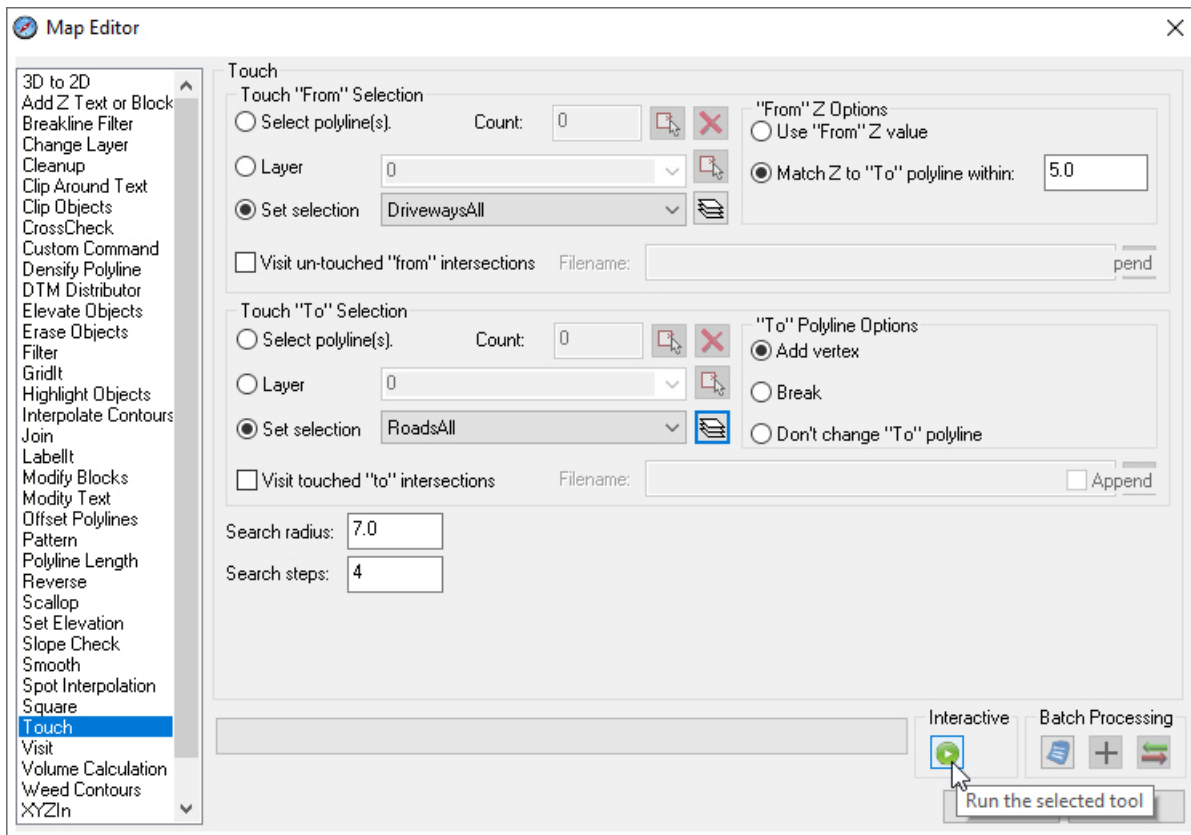
You can draw objects such as driveways, fences, and vegetation lines running into building roof polygons without worrying about precise 2D snaps at the time of drawing. You can also draw driveway lines that fall a little short or overlap the road. Run MapEditor Clip to remove the objects from inside the buildings while enforcing a 2D snap, then MapEditor Touch can extend or trim the driveways to the road using a 3D snap. It can also add a node (vertex) at the intersection on the road line and optionally create a “Visit” file for you to visually verify each edit:



Example of driveway lines drawn overlapping the road and building objects

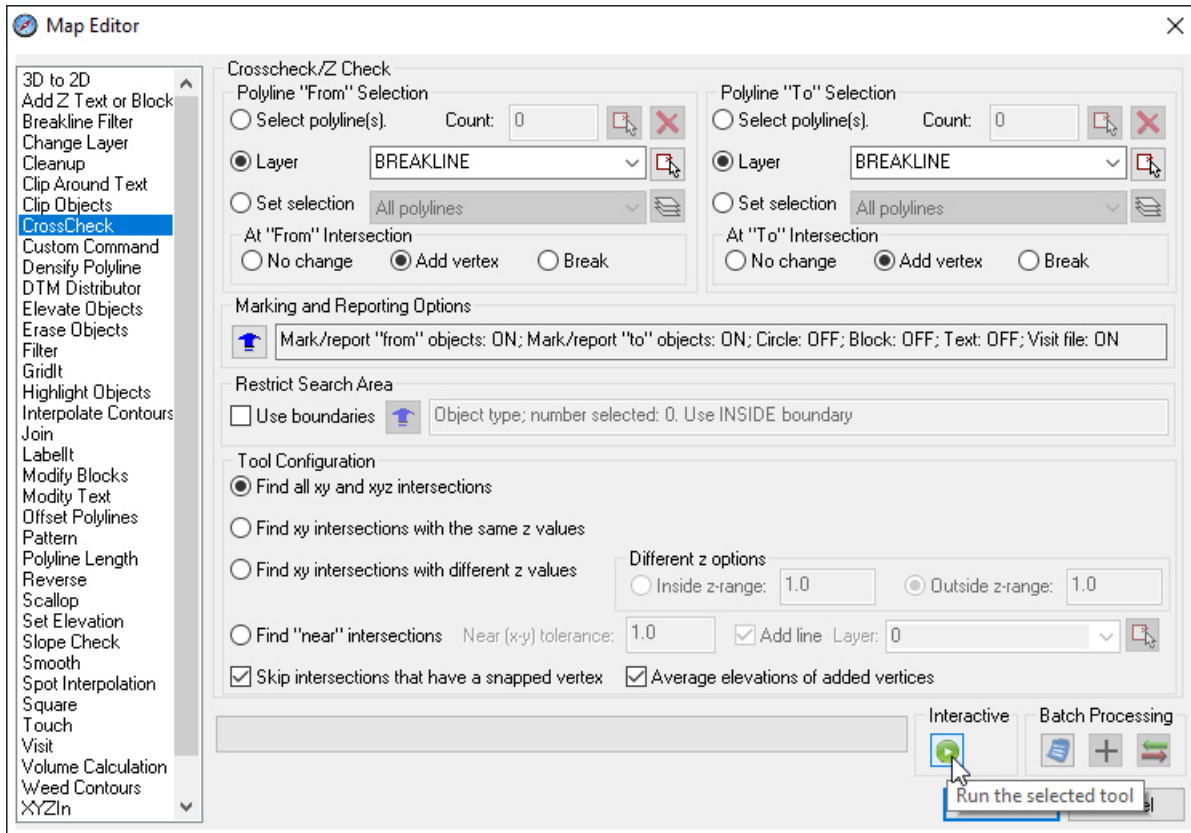


Example of MapEditor Clip Objects set to clip the driveways out of the buildings, resulting in 2D snaps



Example of MapEditor Touch settings to extend/trim the driveways to the road, resulting in 3D snaps and a node added to the road line at each driveway intersection.

As another example, you could ensure that breakline-level polylines always intersect with each other and have a node at their intersection. For this, use MapEditor's CrossCheck command set to average the elevations (result is a 3D snap) at intersections, add a node on both "from" and "to" objects, and optionally visit the edited intersections when finished.



CrossCheck is set here to find intersections, ensure a 3D snap, and add nodes at the intersection. At the end of processing, CrossCheck can launch Visit to show the intersections that were either edited or qualify for editing.