

Understanding Angular Settings in AutoCAD Civil and Civil 3D

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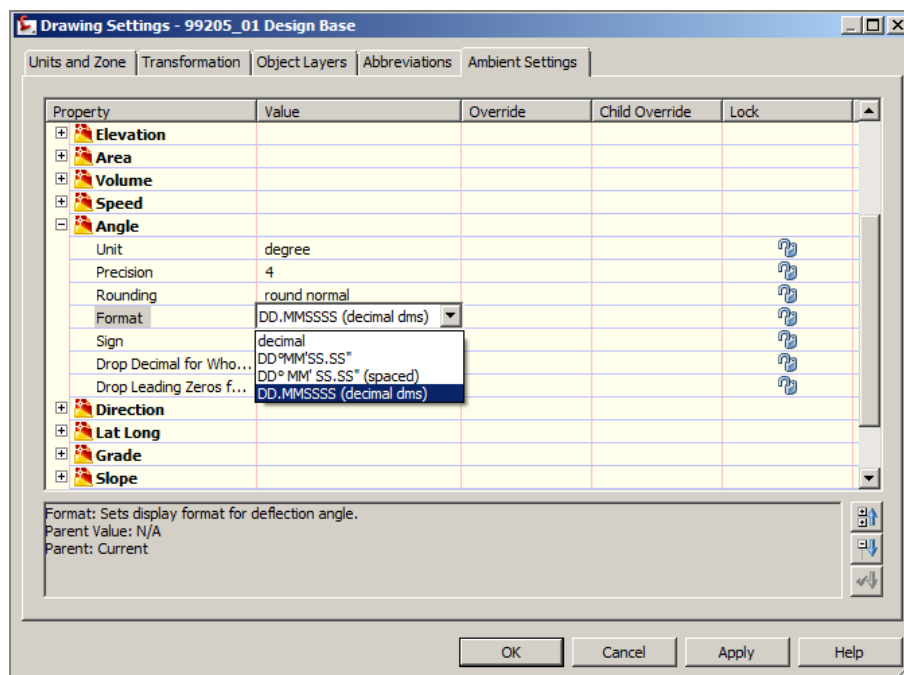
Angle and Rotation values were always expressed or entered as *decimal degrees-minutes-seconds (decimal dms)* by Land Desktop. Civil 3D defaults to the use of *decimal degrees* rather than *decimal dms*, which can lead to errors in entering survey angles in Civil 3D. The solution is to change Civil 3D to use *decimal dms* rather than *decimal degrees*, but it is important to understand how the difference affects Civil 3D, and how to change the value when necessary.

Decimal dms is a shortcut method of entering a degrees-minutes-seconds value, which is popular in many Surveying and Engineering programs. In *Decimal dms*, the entry of 30° 30' 30" (30 degrees, 30 minutes 30 seconds) is made as 30.303; the trailing zero can be ignored. Land Desktop used this entry method exclusively, and understood the entry as 30° 30' 30". Using out-of-the-box settings, Civil 3D would interpret this entry as 30.303° (30.303 degrees), or 30° 18' 10.80".

Changing Civil 3D to work with *Decimal dms* as its default corrects the entry and display for use with Civil 3D commands. This change does not affect AutoCAD commands used in Civil 3D, such as Rotate; AutoCAD commands continue to take only *decimal degree* entry, just as they did in Land Desktop.

☐ Remember that AutoCAD always works in Decimal Degrees, regardless of what Land Desktop or Civil 3D is set to. AutoCAD angles, such as reported by the List command, are always in Decimal Degrees.

Changing the Angular entry method in Civil 3D is easily accomplished on the Settings tab of the Civil 3D Toolspace. Right-click on the drawing name at the top of the Settings Tab, and pick Edit Drawing Settings. On the Ambient Settings tab, expand the Angle collection, and select the format as desired.

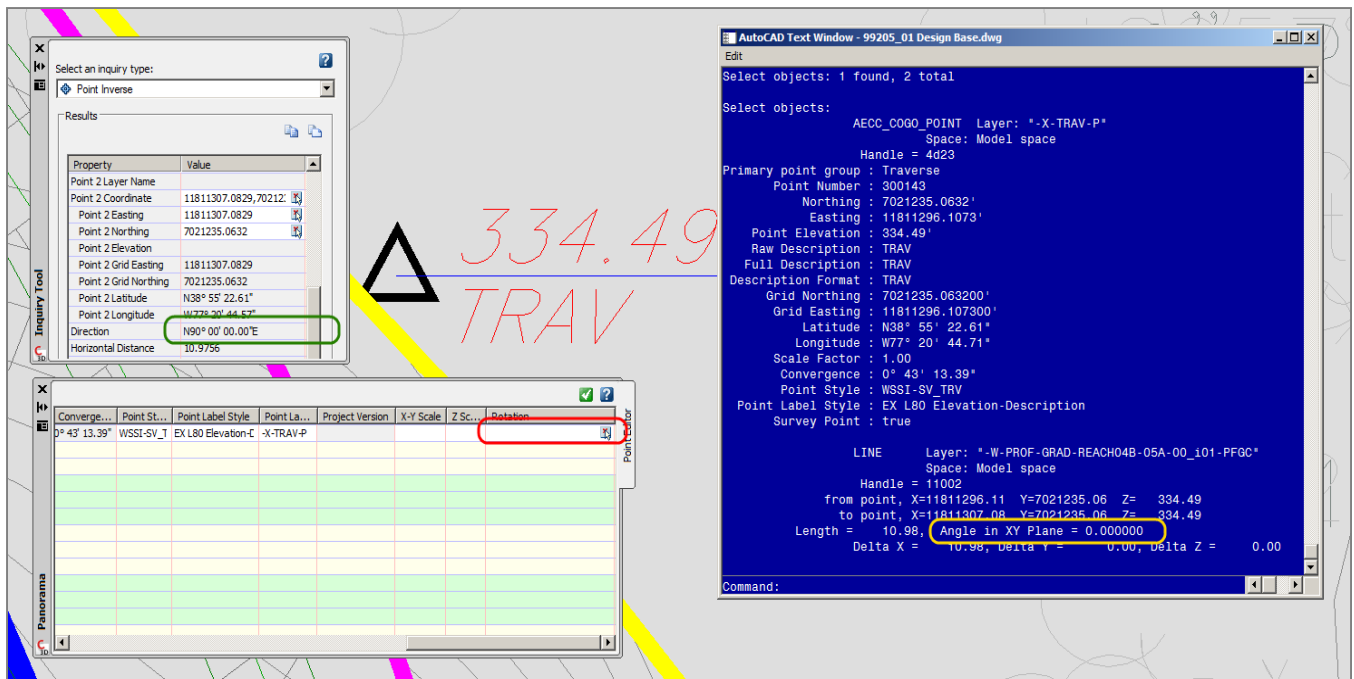


A change made to these settings will affect the display of any data displayed through Civil 3D commands, and any prompting in Civil 3D commands from this point forward. Remember that this setting has no affect on native AutoCAD commands, and that AutoCAD continues to work in Decimal Degrees regardless.

A couple of examples will serve to illustrate the differences in the various Angular entry methods.

In the Figure 2, a Civil 3D point and an AutoCAD line are shown, both with zero rotation. The point's rotation is set as an absent value (or 0) in the **Edit Points** command, highlighted in red, and the resulting AutoCAD rotation on the line is shown in the **List** command as 0.000000 (degrees), highlighted in yellow.

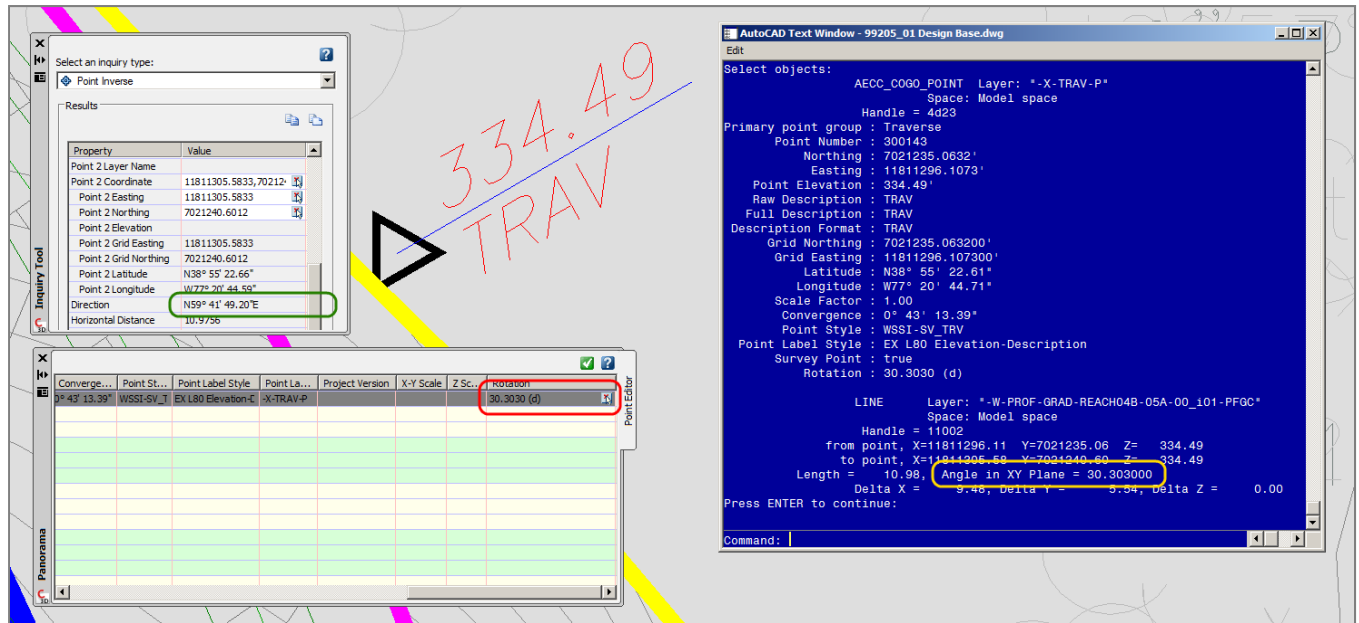
An inverse from the left end of the line to the right end results in a bearing due east of **N90° 00' 00"E**, highlighted in green in the Civil 3D **Inquiry Tool**.



In Figure 3 on the next page, the Angular settings in place are default Civil 3D settings; Civil 3D is working in Decimal Degrees, just like AutoCAD. The point is rotated by typing the value 30.303 in the Rotation field of Edit Points, highlighted in red; the value is interpreted as 30.303°.

The line has been rotated in AutoCAD to match. The rotation of the line reported by AutoCAD in the List command is 30.30000 (degrees), highlighted in yellow. Notice, however, the inverse from the left end of the line to the right end highlighted in green in the Civil 3D Inquiry Tool: the resulting bearing is N59° 41' 49.20"E, resulting from a deflection from east toward north of 30° 18' 10.80".

Since Civil 3D is working in Decimal Degrees, the result may not be what was expected; Land Desktop would have interpreted the typed entry as 30° 30' 30".



As described, the Angular settings in Civil 3D can easily be changed to match those in place in Land Desktop, expecting typed angular entry in Decimal DMS format. In this format the decimal place is used as the separator from degrees to minutes, the next two integers are minutes, the next two integers are seconds. If any integers are present beyond the fourth integer to the right of the decimal, they are interpreted as decimal seconds. In this manner the typed entry 42.15178135 is interpreted as 42° 15' 17.8135". Notice that this also means that integers one and three to the right of the decimal must be between 0 and 5, as they represent base-60 minutes and seconds; the entry 42.15718135 would return an error in Civil 3D or Land Desktop as it would represent 71 seconds.

In Figure 4, the Angular settings in Civil 3D have been changed to match those in place in Land Desktop. Civil 3D is expecting typed angular entry in Decimal DMS format. The point is rotated by typing the value 30.303 in the Rotation field of Edit Points, highlighted in red; the value is interpreted as 30° 30' 30" (notice the dms indicator to the right of the value in the Edit Points dialog). The line has been rotated in AutoCAD to match. The rotation of the line reported by AutoCAD in the List command is 30.508333 (degrees), highlighted in yellow. Notice the resulting inverse from the left end of the line to the right end highlighted in green in the Civil 3D Inquiry Tool: the resulting bearing is N59° 29' 30.00"E, resulting from a deflection from east toward north of 30° 30' 30". The result is exactly as would have been achieved in Land Desktop, and what most surveyors are used to seeing

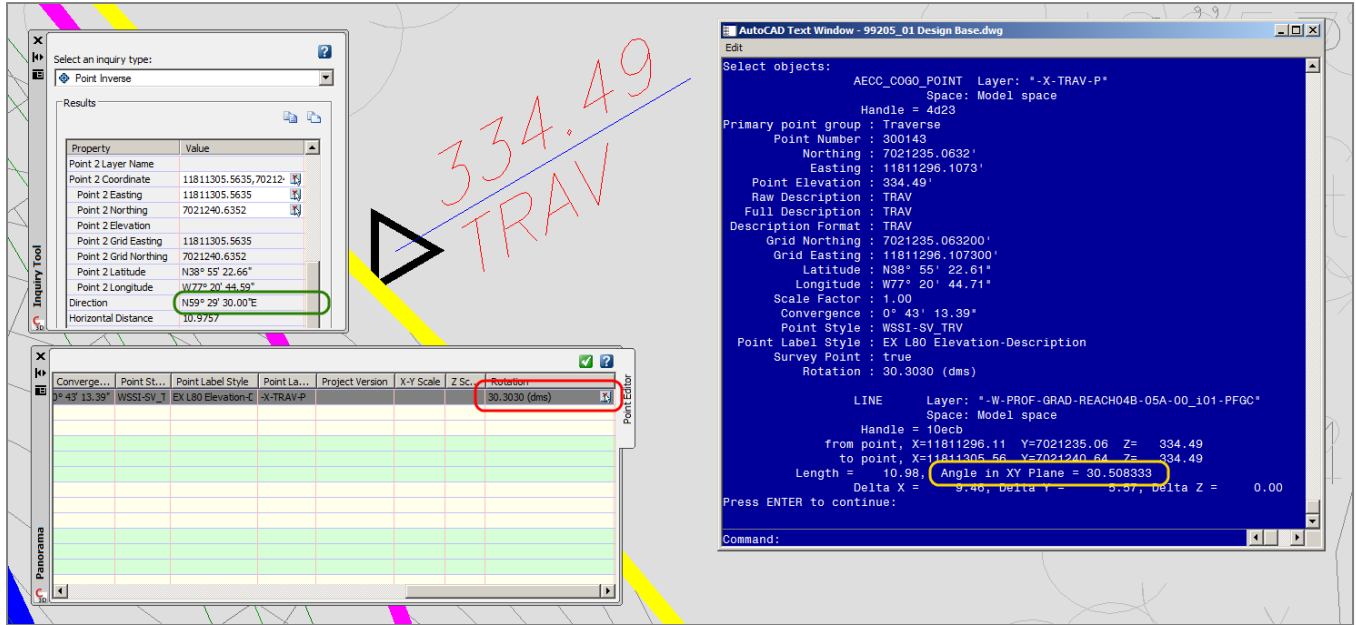


Figure 4 - Rotation in Civil 3D of 30 Degrees 30 Minutes 30 Seconds as Decimal DMS Entry

Civil 3D can, in fact, accept Angular entry in two other format, both space separated, or Spaced DMS. Popular in many GIS programs, these formats accept degrees, minutes and seconds as typed values with space separators. Typing a d, ', or " indicator is not required (as it is in some systems). The two options in Civil 3D that can accept this entry either suppress or display the spaces as typed, depending on the display requirements of the operator. Figure 5 on the next page shows the point and line rotated using Spaced DMS entry, and the resulting bearing displayed in the Civil 3D Inquiry Tool

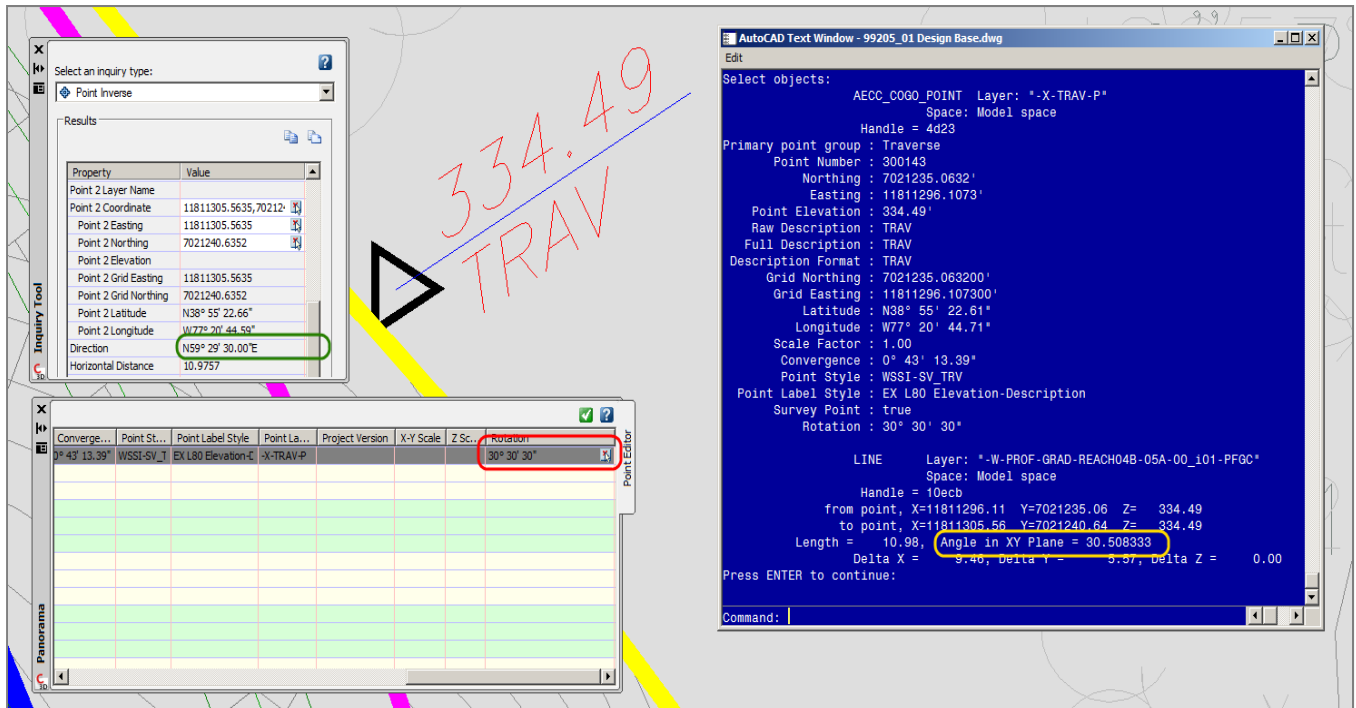


Figure 5 - Rotation in Civil 3D of 30 Degrees 30 Minutes 30 Seconds as Spaced DMS Entry

Given that Civil 3D can accept and expect typed Angular entry in any of three different formats, it is important to distinguish the method Civil 3D is expecting and be able to change the entry to the desired method. Some Civil 3D commands display an indicator at an Angle prompt; this indicator will appear (d) if the program is in Decimal Degree mode, (dms) if in Decimal DMS mode, or no indicator if in Spaced DMS mode. Unfortunately the absence of an indicator is not really a reliable indicator, so the best approach is to start typing and see what happens. An indicator will appear once values are typed, and the typed values will be spaced separated if in Spaced DMS mode. Additionally, if the program is in Decimal DMS or Spaced DMS mode an error will be generated if an integer 6 or above is typed in the Minutes or Seconds field as described previously.

