

Introducing AutoCAD and AutoCAD LT

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This chapter helps ease you into using AutoCAD to create engineering drawings and how to get started. Although it's not uncommon to feel overwhelmed the first time you see AutoCAD, rest assured that you don't need to learn all of the controls that you see in the default environment to be an efficient user of the program.

After a brief introduction of the program, we show you just how easy it can be to use AutoCAD with an exercise. The exercise is followed up with some key concepts that you should understand when using AutoCAD, including how it differs from most other computer applications.



When you're starting out with AutoCAD, heed this quote from *The Hitchhiker's Guide to the Galaxy*: Don't panic!

Checking Out What AutoCAD Can Do for You

AutoCAD is, first and foremost, a program for creating *two-dimensional technical drawings* — in which measurements and precision are important because these kinds of drawings are often used to build something. And AutoCAD's 3D

capabilities have grown by leaps and bounds over the past several releases, with 3D modeling becoming a common way to check designs *before* they're drafted.

The upfront investment to use AutoCAD (not only your money if you paid for it, but your time to learn it) is certainly more expensive than the investment needed to use pencil and paper, and the learning curve is much steeper, too. But this book is here to help you with that learning curve.

Whether you're choosing to use AutoCAD for your computer-aided drafting (CAD) needs or the software was foisted upon you, you'll appreciate these attributes, which make the program easier to use than the pencil and paper you may have used in the past:

- ✓ **Precision:** Creating lines, circles, and other shapes with exact dimensions is easier using AutoCAD than a pencil.
- ✓ **Modifiability:** Drawings are much easier to modify on the computer screen than on paper. CAD modifications are a lot cleaner, too.
- ✓ **Efficiency:** Creating many kinds of drawings is faster with a CAD program, especially drawings that involve repetition, such as floor plans in a multistory building.
- ✓ **Popularity:** Everyone is using it. Several flavors are available from Autodesk to suit specific markets such as mechanical, electrical, architectural, and civil. There are far more copies of AutoCAD in use than all other CAD programs combined.

Opening AutoCAD

The first thing you need to do to start using AutoCAD is launch AutoCAD (well, duh!) and, if necessary, maximize its screen display. AutoCAD has so many tools and palettes that you'll always want to use it in full-screen mode. Follow these steps:

1. Double-click the AutoCAD shortcut on the Windows desktop.

If you don't have an AutoCAD shortcut on your desktop, choose Start⇨[All] Programs⇨Autodesk⇨AutoCAD 2014 English⇨AutoCAD 2014 English, if you are using Windows XP or Windows 7. If you're using Windows 8, click AutoCAD 2014 – English on the start screen. The exact wording of the selections vary between the different versions of AutoCAD and Windows, but it isn't difficult to figure out what you're looking for.

2. Click the Close button in the lower-right corner of the Welcome screen.

If you don't want to encounter the Welcome screen again, select the Display at Startup check box in the lower-left corner.



3. Expand AutoCAD to full-screen mode by clicking the middle Windows button in the upper-right corner of the application window.
4. Expand the graphic area (the big, gray area in the middle) to full-screen size by clicking the middle button in the upper-right corner, near the compass rosette.
5. If the Design Feed palette is displayed, close it by clicking the X at its top-left corner.



AutoCAD remembers how it was last closed and opens the same way the next time you open it.

6. Place the cursor in the gray graphics area (midscreen) and then press the Esc key twice to make sure that no commands are active.

Now you're ready to start drawing in AutoCAD, as shown in Figure 1-1. You can find out how to create a custom profile and how to reset AutoCAD back to its default configuration in the online extras for this book. (See the Introduction for more details on how to find the online extras.)



Your screen should be dark gray as in Figure 1-1, but our screen shots in the rest of the book have a white background so they're easier to see on the page.

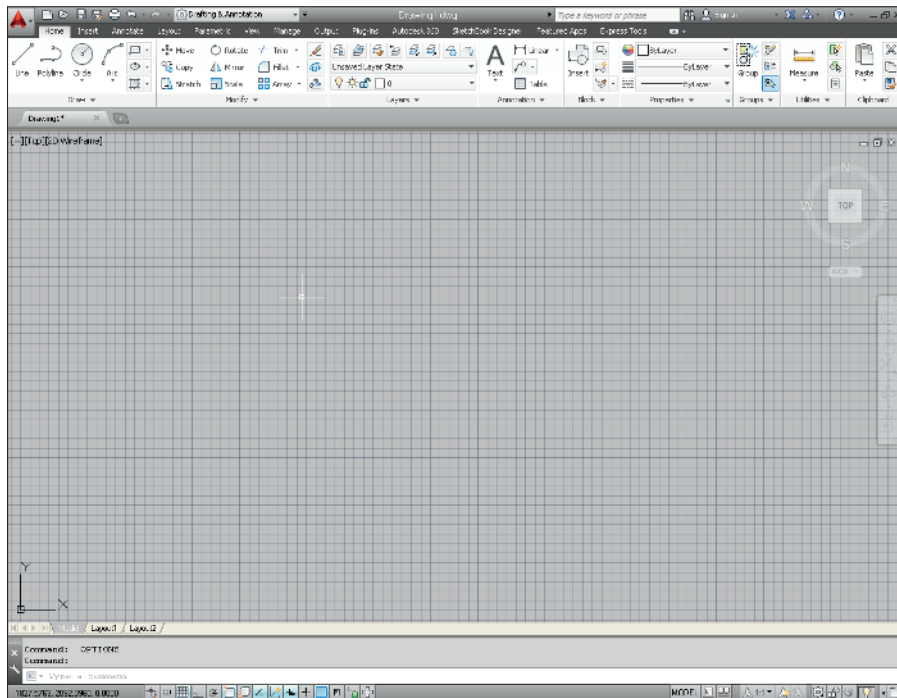


Figure 1-1: AutoCAD 2014, ready to draw!

Drawing in AutoCAD

AutoCAD offers a wide range of commands to create, modify, and annotate 2D designs. Don't feel like you need to learn and master every command that AutoCAD offers to be a proficient drafter, as even the most veteran drafter will tell you that they only use around 50 commands to complete the most common drafting tasks.

The following exercise introduces a few of the commonly used commands to establish the size of the drawing area you will be working in, and then the commands you will use for creating straight line segments and circles. The lines and circles that you create will make up a simple bicycle.

You always start commands by clicking a button in the application window, or by entering its name in a text entry area called the *command line*.

In this exercise and others in this book, AutoCAD's command line entries look like this, and you type the commands and responses shown in **bold**. Press Enter after each command or response that you type.



Don't add spaces on either side of a commas! AutoCAD treats pressing the spacebar the same as pressing Enter in most situations. This makes keyboard entry fast and easy, but messes things up if you do it at the wrong time.

1. Set up an appropriate size for the drawing:

LIMITS

Reset Model space limits:

Specify lower left corner or [ON/OFF] <0.0000,0.0000>:
0,0

Specify upper right corner <12.0000,9.0000>: **60,40**

Zoom A

2. Disable Dynamic Input mode to work with the command line:

Dynmode

Enter new value for DYNMODE <3>: **-3**

3. Draw the frame and seat of the bicycle:

Line

Specify first point: **26,12**

Specify next point or [Undo]: **13,12**

Specify next point or [Undo]: **22,24**

Specify next point or [Undo]: **40.5,24**

```
Specify next point or [Undo]: 41,22  
Specify next point or [Undo]: 26,12  
Specify next point or [Undo]: 20.6667,28  
Specify next point or [Undo]: 25,28  
Specify next point or [Undo]: Enter
```

4. Draw the front forks and handlebars:

```
Line  
Specify first point: 45,12.5  
Specify next point or [Undo]: 42.87,14.53  
Specify next point or [Undo]: 39.38,28.5  
Specify next point or [Undo]: 35.3,30  
Specify next point or [Undo]: Enter
```

5. Draw the rear wheel:

```
Circle  
Specify center point for circle or [3P/2P/Ttr (tan tan  
radius)]: 13,12  
Specify radius of circle or [Diameter]: 8
```

6. Draw the front wheel:

```
Circle  
Specify center point for circle or [3P/2P/Ttr (tan tan  
radius)]: 45,12.5  
Specify radius of circle or [Diameter]: 8
```

Figure 1-2 shows the bicycle you've drawn, and you didn't even need training wheels!

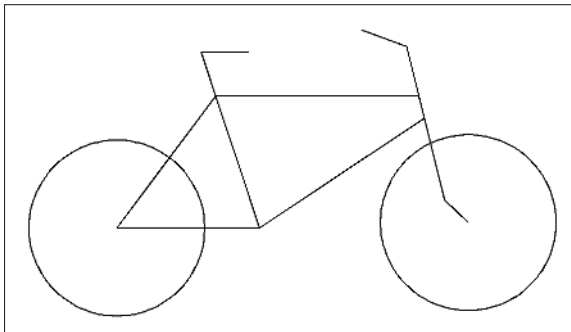


Figure 1-2: Your first AutoCAD drawing.

Understanding Pixels and Vectors

To use AutoCAD effectively (or even at all) you need to understand how an image is displayed on your computer screen, and how the image is stored when it is not being displayed.

- ✓ **An image on a computer screen is made up of “pixels.”** If you look very closely at the screen, you will see that the image is formed from a large number of small dots of light, as shown in Figure 1-3.
- ✓ **All programs that display a graphic image simply turn on or off suitable spots to build the picture.** This is a “raster” image. A straight line in a raster image is simply a fortuitous alignment of appropriate dots, and after it’s been created, it can’t be edited.
- ✓ **The major difference between CAD programs and computer graphics programs (such as Microsoft Paint) lies in how they save the image to disk.** When the image from a Paint-type program is saved to disk, it’s stored as a bitmap that lists the color of each pixel. What gets saved to disk is simply a snapshot of what you see onscreen.
- ✓ **All CAD programs work with and stores on disk a vector file.** This is a big collection of numbers and words that list the type, size, and location of every entity in the drawing. When a CAD program displays your drawing onscreen, it analyses the vector data and calculates which pixels to turn on or off, depending on which portion of the drawing you’re viewing. CAD programs understand that a circle is a closed curve with a center point and a constant radius. If you change its radius, the CAD program redraws the image onscreen to show the new size.

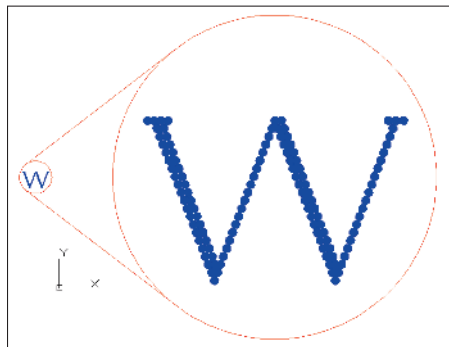


Figure 1-3: Pixels.

- ✓ **AutoCAD doesn't limit you to working only with what you can see onscreen.** You can include as much detail in a drawing as needed. You can zoom in to see more detail and zoom out to see the big picture. At any time, the screen shows only those entities and their detail that the screen is capable of showing.

Some screens can show more pixels than others can. The number ranges from the 320 per row by 200 rows (320 x 200) of the very old Color Graphics Adapter (CGA) to 4000 x 3000 and beyond for special-purpose adapters. However, the drawing file always contains the same information. If it were moved to a computer with a higher resolution graphics adapter and monitor, then greater detail would show without you having to zoom in as far.

How big is “the big picture”? AutoCAD can draw a circle with a radius of 10^{99} (a 1 followed by 99 zeros) units, but the observable (so far) universe is “only” about 3×10^{23} miles in diameter, depending on how you measure and whose numbers you use (subject to change without notice).

- ✓ **It's possible for a drawing file to contain much more than you can see at any one time.** The computer screen is not really the drawing; it is just a viewer that lets you look at all or part of the drawing file.



The Cartesian Coordinate System

AutoCAD uses the Cartesian coordinate system to define all locations in the drawing. This includes things like the start and end of lines, the center of circles, the location of text notes, and so on. (Cartesian coordinates are named for French philosopher René Descartes, who is famous for statement “I think, therefore I am,” although today he might say, “I tweet, therefore I am” — although tweeting doesn't always involve thinking.)

In his *Discourse on Method*, Descartes came up with the idea of locating any point on a planar surface by measuring its distance from the intersection of a pair of axes. (That's *axes* as in more than one axis, not several tools for chopping wood.) By convention, the intersection of these axes (called, also by convention, the X-axis and the Y-axis) are perpendicular to one another, and their intersection point is identified as 0,0 — or the origin.

For example, if your address is 625 East 18th Street in a typical town, you live 6 and one-quarter blocks east of First Avenue and 18 blocks north of Main Street.

AutoCAD uses the standard notation that the origin is at point 0,0. Positive values are to the right of and above this point, and negative values are to the left of and below it. Any location on a drawing can be identified by its horizontal distance from the origin, followed by its vertical distance from the same starting point.

AutoCAD shows Cartesian coordinates as a pair of numbers separated by a comma. The number to the left of the comma is the X (horizontal) coordinate, and the value to the right is the Y (vertical) coordinate. When working in three dimensions (see Chapter 21), you add a third coordinate: Z.

The Importance of Being DWG

To take full advantage of AutoCAD in your work environment, be aware of the *DWG* file format — the format in which AutoCAD saves drawings. Here are some DWG facts to keep in mind:

- ✓ **In many cases, an older release of AutoCAD can't open a DWG file that's been saved by a newer AutoCAD release.** Table 1-1 shows the relationship between AutoCAD versions and their corresponding file formats.
- ✓ **A newer release of AutoCAD can *always* open files saved by older versions.** We have sample files dating back to 1984 that open in AutoCAD 2014.
- ✓ **Some previous AutoCAD releases can open files saved by a subsequent version or two.** As Table 1-1 shows, the DWG file format has been changing every three years (starting in 2000), so drawings created in AutoCAD 2014 can be opened with AutoCAD 2013.
- ✓ **You can use the Save As option in newer releases to save a file to an older DWG format.** In fact, AutoCAD 2014 can save as far back as AutoCAD Release 14, which dates all the way back to 1997. In addition, you can save a file as a simple text-based DXF format back as far as Release 11. Table 1-1 shows which versions use which DWG file formats.

Earlier formats don't support all the features of later ones. AutoCAD does its best at translating, but some items may be lost or may not fully survive the round trip to an older release and back to the newer one.



Table 1-1**AutoCAD Versions and DWG File Formats**

<i>AutoCAD Version</i>	<i>AutoCAD LT Version</i>	<i>DWG File Format</i>
AutoCAD 2013–2014	AutoCAD LT 2013–2014	AutoCAD 2013
AutoCAD 2010–2012	AutoCAD LT 2010–2012	AutoCAD 2010
AutoCAD 2007–2009	AutoCAD LT 2007–2009	AutoCAD 2007
AutoCAD 2004–2006	AutoCAD LT 2004–2006	AutoCAD 2004
AutoCAD 2000, 2000i, 2002	AutoCAD LT 2000, 2000i, 2002	AutoCAD 2000
AutoCAD R14	AutoCAD LT 1998, 1997	AutoCAD R14
AutoCAD R13	AutoCAD LT 1995	AutoCAD R13
AutoCAD R11, R12	AutoCAD LT R2	AutoCAD R11

