Introduction to Isometric Drawings

The most common type of *pictorial drawing* used in the drafting industry is the *isometric drawing*. See Figure 3B-1. This supplement focuses on tools and drawing aids that help you create 2D isometric views that *look* 3D, as if the object tilts toward you. However, a 3D model provides a better way to display isometric views, for most applications. *AutoCAD and Its Applications—Advanced* describes how to construct 3D models.

**Figure 3B-1.** An example of a 2D mechanical part drawing with an isometric view used to help visualize the product.

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**pictorial drawing:** A drawing that shows the height, width, and depth of an object in a single view.

**isometric drawing:** A view in which all three axes appear at equal 120° angles with the plane of projection.
The term *isometric* means equal (iso) measure (metric). An isometric drawing has no perspective, and therefore edges that are equal in length are drawn equal in length. The angles between the three principle planes and edges of an object are equal. See Figure 3B-2A. The vertical edges of an object are parallel to each other and form measurable *isometric lines* 90° from horizontal. The horizontal edges of an object are parallel to each other and form measurable isometric lines 30° from horizontal. All other lines are *nonisometric lines*. See Figure 3B-2B.

Circular features appear elliptical in an isometric drawing. The *Isocircle* option of the ELLIPSE tool, described in Chapter 4, allows you to construct isometric circles and arcs easily. Isometric text uses a specific obliquing angle and rotation depending on the plane and drawing application. Chapters 9 and 10 cover AutoCAD text.

**Figure 3B-2.** A—An isometric drawing creates equal angles between the three principle planes and edges of an object. B—An example of an isometric drawing with isometric and nonisometric lines.

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**isometric lines:** Lines that are parallel to an axis in an isometric drawing.

**nonisometric lines:** Lines that are not parallel to the axes in an isometric drawing.
Isometric Snap

Once you understand the geometric layout of an isometric view, you can use any point entry method to construct an isometric drawing. Polar coordinates and dynamic input or dimensional input are common basic point entry options for isometric construction because they allow you to specify angles. Polar tracking set to 30° increment angles is also an effective method. One of the most useful aids for isometric drawing is the Isometric snap option of Snap and Grid modes.

Use the Snap and Grid tab of the Drafting Settings dialog box to set Isometric snap. See Figure 3B-3. A quick way to access the Snap and Grid tab is to right-click on the Grid Display or Snap Mode button on the status bar and select Settings…. Pick the Isometric snap radio button in the Snap

Figure 3B-3. Use the Snap and Grid tab of the Drafting Settings dialog box to specify isometric grid and snap settings.

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type area to activate **isometric snap**. Then specify the snap increment using the **Snap Y spacing**: text box of the **Snap spacing** area, and the grid spacing using the **Grid Y spacing**: text box of the **Grid spacing** area. You can only set the Y snap and grid spacing. The X spacing is not applicable because the X axis relates to horizontal measurements. For this same reason, you must also check **2D model space** in the **Grid style** area to display the grid as a pattern of dots.

Activate **Grid** and **Snap** modes and you are ready to begin drawing. As shown in **Figure 3B-3**, the grid and crosshairs rotate to an isometric orientation that aids in drawing objects at isometric angles. **Figure 3B-4** shows the steps required to construct an isometric cube using the **LINE** tool. Apply the same techniques to drawing other objects. Notice that isometric snap can be very helpful when you are constructing isometric lines.

### Specifying the Isometric Plane

Isometric grid and snap modes orient the grid and snap to isometric angles. You can align the crosshairs with the left, right, or top **isoplane**, depending on the plane on which you plan to draw. See **Figure 3B-5**. Changing the isoplane is not required when drawing isometric lines, but doing so can be helpful for visualization and drawing ease. You must change the isoplane orientation to construct isometric circles and arcs using the **Isocircle** option of the **ELLIPSE** tool, described in Chapter 4. Press [F5] repeatedly to cycle through the isoplanes, or access the **ISOPLANE** tool and specify the **Left**, **Top**, or **Right** option, depending on the isoplane orientation appropriate for the isometric plane on which you plan to draw.

**isoplane**: One of the three isometric planes: left, right, or top.

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**Figure 3B-4.** Creating a 2 unit × 2 unit cube using isometric grid and snap. Other default drawing aids are also on to help describe the construction process.

**NOTE**

When using **Isometric snap**, the crosshairs is always oriented with the specified isoplane. The isoplane does not apply to window or crossing selection and similar operations that use a box to make a selection.
Figure 3B-5. Adjusting the isoplane orientation of the crosshairs to match a specific isometric plane.

Left Isoplane
150° “X axis”
90° “Y axis”

Right Isoplane
30° “X axis”
90° “Y axis”

Top Isoplane
150° “X axis”
30° “Y axis”

NOTE
Some of the following activities require the use of a decimal-unit isometric template with active isometric grid and snap modes. If you do not have such a template, create it now. Then use it as indicated in these activities.

Activity 3B-1
1. Start a new drawing from scratch using the imperial format.
2. Access the Drafting Settings dialog box. On the Snap and Grid tab, pick the Isometric snap radio button, enter .25 for the Y snap and grid spacing values, and pick the 2D model space check box.
3. Toggle Grid mode on from the status bar if it is not active.
4. Toggle Snap mode on from the status bar if it is not active.
Activity 3B-1

5. Access the **LINE** tool and use grid and snaps to draw the isometric view shown below. Change the isoplane orientation as appropriate for drawing objects on each isometric plane. Do not dimension the drawing.

6. Save the drawing as **ACT3B-1**.
Activity 3B-2
For each of the following isometric drawings, start a new drawing using a decimal-unit isometric template that includes active isometric grid and snap modes. Draw an isometric part view similar to each drawing using dimensions of your choice. Save the drawings using the file names shown.

1. File name: ACT3B-2A

2. File name: ACT3B-2B

(Continued.)
Activity 3B-2

3. 

File name: ACT3B-2C

4. 

File name: ACT3B-2D

(Continued.)
Activity 3B-2

5.

File name: ACT3B-2E

6.

File name: ACT3B-2F