

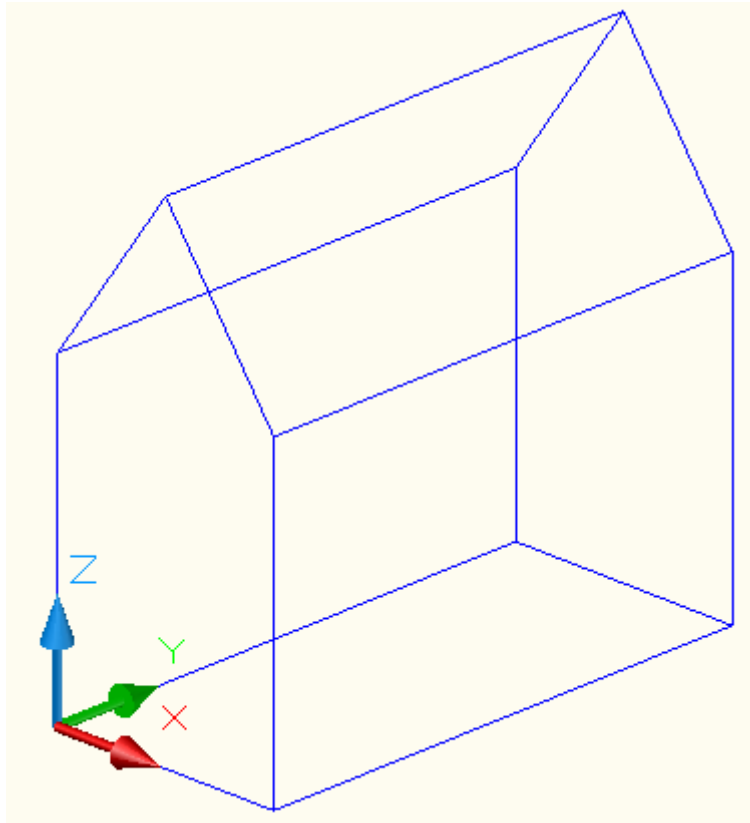
Topics covered in this Lesson:

Setting and Using the UCS | [Dynamic UCS](#)

When working in 3D, it's sometimes necessary to change the plane that you are drawing on. For example, if you need to add some detail to the side of a wall, you would want to draw on that plane. It's like taking a sheet of paper up off the floor (WCS) and taping it onto the wall (UCS).

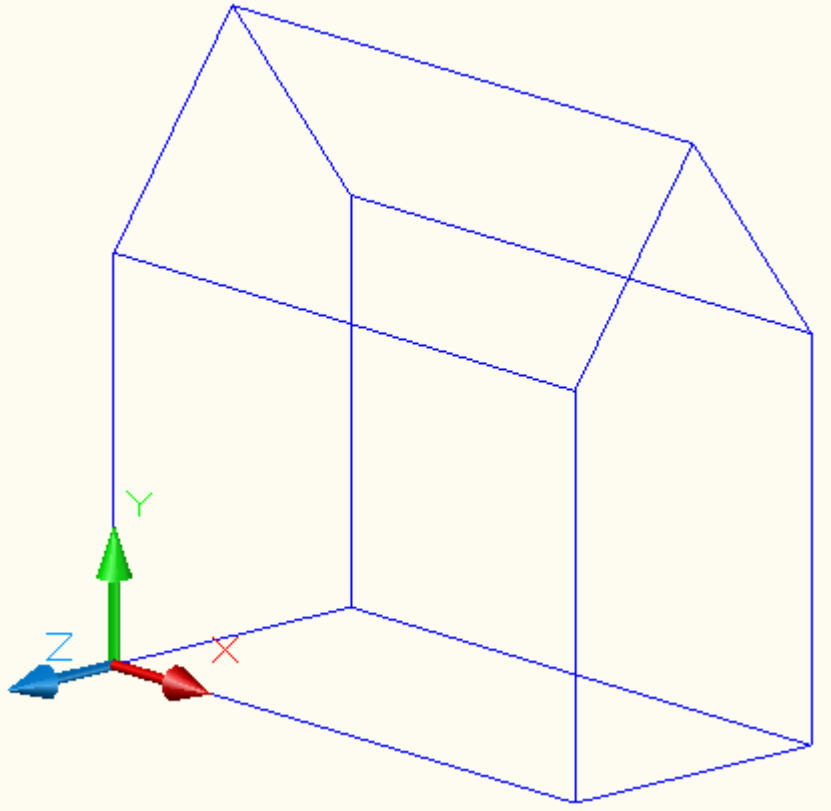
The WCS is the World Co-ordinate System. This is the way that the standard X, Y and Z axis are directed when you begin a new drawing (X to the right, Y pointing up and Z pointing towards you). The UCS is the User Co-ordinate System. This is a 'redirection' of the WCS based on parameters set by the AutoCAD user.

There are several ways of doing this, and we'll look at an example here.



This is a simple shape drawn on the WCS with one corner located at 0,0,0.

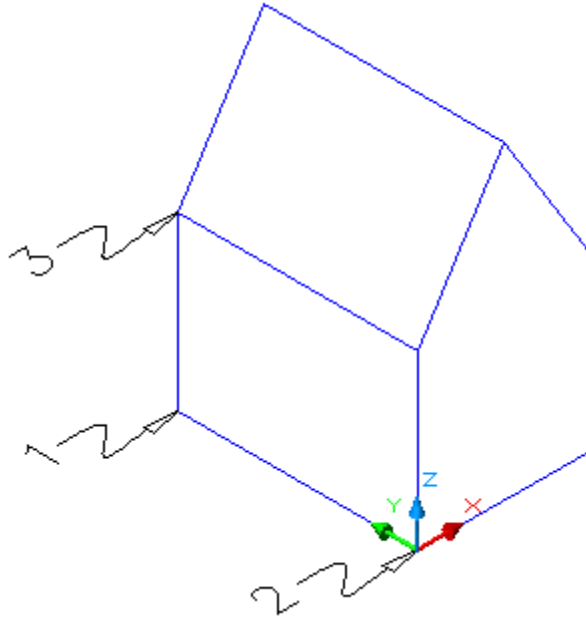
Here is the same object shown a new UCS based on the side of the object, so that you are enabled to draw on the side of the building - maybe to put a door in? Note the direction that the X and Y axes are now pointing.



Notice that the positive X Axis is now pointing along side of the structure.

Here's how it was changed: You first choose the 3 point option by typing 3 at the prompt. Next you have to pick three points to define the plane. The first point is the new origin. The second point is where you want the positive X-axis to be positioned. The last point is for the positive Y-Axis.

```
Command: UCS
Current ucs name: *NO NAME*
Enter an option [New/Move/orthoGraphic/Prev/Restore/Save/Del/Apply/?/World]
<World>: 3
Specify new origin point <0,0,0>: <P1>
Specify point on positive portion of X-axis <1.0000,7.0000,0.0000>: <P2>
Specify point on positive-Y portion of the UCS XY plane
<1.0000,7.0000,0.0000>: <P3>
```



This is the '3-Point' option of the UCS Command. It is one of the most useful, because you control exactly where the new drawing plane will be. You must also be extremely careful when picking the 3 points, or your plane can be shifted and cause some major problems. I would recommend using this method for most of your UCS work - or at least get very comfortable with it before moving on to other methods.

NOTE: Pressing enter immediately after entering the UCS command accepts the default of returning to the WCS.

Here are the other options of the UCS command.

ORIGIN:

Command: UCS
 Origin/ZAxis/3point/ObJect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: O
 Origin point <0,0,0>: <PICK A POINT>

This option moves the UCS based on a newly picked origin point. It does not shift the drawing plane at all as you only pick one point.

Z-AXIS:

Command: UCS
 Origin/ZAxis/3point/ObJect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: ZA
 Origin point <0,0,0>: <PICK A POINT>
 Point on positive portion of Z-axis <-8.0000,0.0000,1.0000>: <PICK A POINT>

This choice allows you to pick two points. First you pick the new origin, then you pick a point for the positive Z-Axis. Make sure you type ZA to choose this option.

OBJECT:

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: OB
Select object to align UCS: <SELECT AN OBJECT>

Using this method, you have to pick on a 2D object that is lying on a particular drawing plane. This gets tricky, as you have to be aware how your positive X and Y axes end up.

VIEW:

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: V

By choosing the view option, AutoCAD will automatically reset the UCS to be aligned with your current view, keeping the origin where it was previously located.

X/Y/Z:

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: X
Rotation angle about X axis <0>: -90

By selecting either the X, Y or Z options, you need to first pick a point along the axis you have chosen, then provide a rotation angle based on the right hand rule mentioned earlier. This example shows how you would rotate the UCS -90 around the positive X axis.

PREVIOUS:

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: P

This option returns you to the last setting you had for the UCS. You'll use this one a lot in 3D. You might need to change your UCS to draw one object, then go back to what you had it set at before.

Restore/Save/Del/?/

The next options are used in conjunction with each other. You have the option of saving a particular UCS with a name. You can then restore that named UCS or delete if you no longer will be using it. Here are examples of these options:

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: S
?/Desired UCS name: VIEW1

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: R
?/Name of UCS to restore: VIEW1

Command: UCS
Origin/ZAxis/3point/Obj ect/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: ?
UCS name(s) to list <*>:

```
Current UCS: VIEW1
Saved coordinate systems:
VIEW1
Origin = <0.0000,0.0000,0.0000>, X Axis = <1.0000,0.0000,0.0000>
Y Axis = <0.0000,1.0000,0.0000>, Z Axis = <0.0000,0.0000,1.0000>
Origin/ZAxis/3point/OBject/View/X/Y/Z/Prev/Restore/Save/Del/?/<World>: D
UCS name(s) to delete <none>: VIEW1
Deleted 1 UCS name.
```

This was a series where a view named VIEW1 was saved, restored, listed, and then deleted.

DYNAMIC UCS

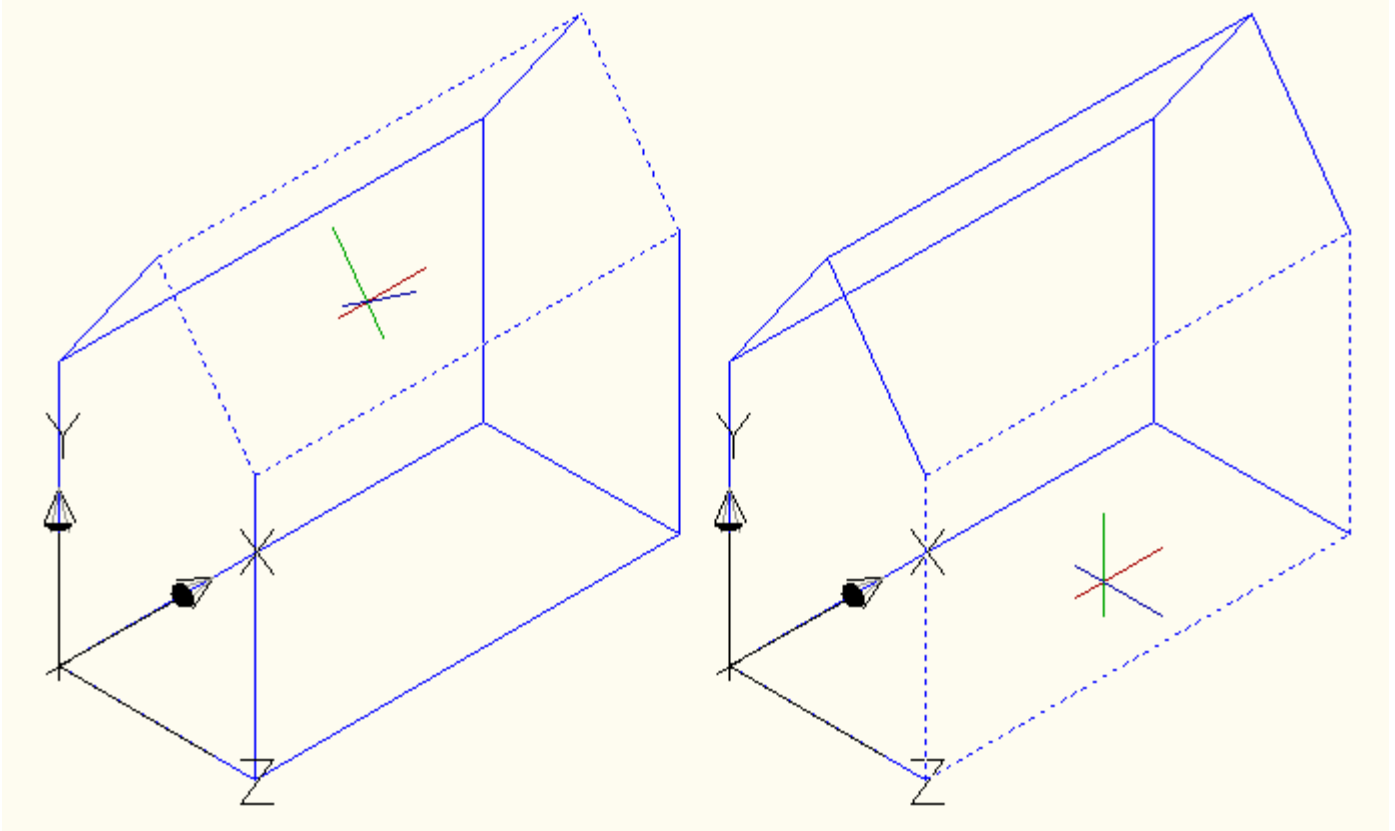
Another option to try is using Dynamic UCS, but I don't recommend this technique for new users. Here it is anyway. Down on the

status bar, you have an icon that turns this setting on or off.



With Dynamic UCS turned on, you can easily draw on any surface you want. If you have a drawing like the basic building shown at the top of the page, you can draw a rectangle or box on the roof without manually setting a new UCS. The key is to look and see which face is highlighted as you move your cursor on the screen.

In the images below, you can see how this works. The left side shows the 'roof' face is highlighted and the cursor has changed to reflect the new UCS. The right shows how this looks when the right side face is active. Not the change in the colored cursor while the UCS icon remains the same.



Other notes about the UCS:

Be careful when choosing a UCS. Look to the UCS icon and see that it is aligned the way you want it to be. Look for a clean vertical lines if it should be aligned along a vertical plane. Most of the time I will use the 3 Point UCS option and then Previous to return and then back to a different 3 point option and so on. 3 Point gives me a lot of versatility without having to think about it too much (and concentrate on how I'm going to draw the project.

Always be aware of where your UCS is located. Make sure that positive X is where you expect it to be.

Extra Practice: Create this drawing by switching the UCS to the correct plane to draw the roof and skylights. For the geometry, use a combination of extruding and boolean operations to build it.

Extra Practice: Create this drawing by setting the UCS to achieve what you need. Tip: Extrude a rectangle, set the UCS and extrude another rectangle.