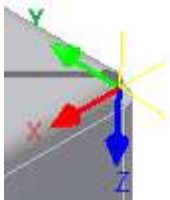


# USER COORDINATE SYSTEM

UCS (user coordinate system) is a collection of work features (three workplanes, three axes, and a center point).



Unlike Origin, there can be multiple UCS in a document, and you can place and orient them differently.

When you create or modify objects in a 3D environment (not available in Inventor LT), you can move and reorient the UCS in 3D model space to simplify your work.

Work features in UCS can be used to place sketches and features that update when the UCS is redefined.

**In a part file**, you can position UCS relatively to existing geometry by selecting three points, or relatively to the Origin.

In a part file, UCS placement supports the following inputs as points:

- Point (vertex of solid edge, midpoint of solid edge, sketch, or work point origin)
- Solid circular edge or solid elliptical edge

**In an assembly file** (not available in Inventor LT), you can position UCS relatively to the Origin but you cannot position UCS relatively to existing geometry. When placing UCS in an assembly, you can select a point, but the UCS is still placed in absolute coordinates and not related to the point!

You can use UCS for measurements, and its work geometry can be included in the drawing.

The UCS triad can be selected for the View Face command.

## Define the UCS Location

You can define a UCS in the following ways:

- Specify a new origin (one point), new X axis (two points), or new XY plane (three points).
- Align the UCS by selecting a face on a 3D solid object. The selection can be on a face or on an edge of the solid.
- Rotate the current UCS around any of its three major axes.

## UCS browser

UCS triad is represented with a triad icon in the browser. Similar to the Origin, the UCS node owns its work geometry nodes.

If you place multiple occurrences of a UCS, they are incrementally numbered and displayed in the order they were inserted. In a part file, drag to reorder them in the browser.

Set the default UCS prefix in the UCS Settings dialog box. You cannot change the name of UCS work features (center point, planes, axes), their names are dependent on the UCS name.

If you position UCS relatively to existing part geometry, Show Inputs option is available in the context menu. Click to highlight the geometry from which UCS was created.

## UCS context menu

During UCS edit, right-click in the graphics window to display the UCS context menu:

### **Finish**

Inserts UCS in the specified location. When selecting geometry placement, select origin, X axis, and Y axis to place UCS.

### **Restart**

Restarts the UCS command.

### **Done [Esc]**

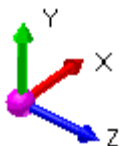
Cancel the UCS command, no UCS is inserted.

### **Back**

Reverses the most recent selection.

## What do the colors refer to on the UCS triad?

Because you can rotate the UCS triad, the colors help you identify axes. The colors correspond to the default colors of the principle part axes:



- Red is the X axis.
- Green is the Y axis.
- Blue is the Z axis.

If you customize system colors or the UCS triad colors, the colors might not match the part axes.

## What do the UCS triad segments mean?

When placing the UCS, the mouse cursor changes according to what you select in the triad. Click a triad segment or drag to indicate the type of transform you want. You can drag or enter precise coordinates or angles corresponding to your selection.



Select triad segment to define type of transformation.



Click the UCS origin to change its position. Drag the origin to desired location to change its position.



Click the arrowhead to move the UCS triad along the axis.



Click the axis to rotate the triad around the selected axis. Or, specify a point for XY plane when selecting part geometry.



Select a point to specify a direction for X axis.

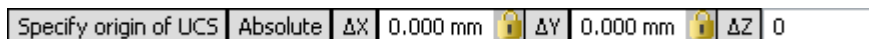
## Heads Up Display (HUD)

As you move the cursor over the UCS selection location, the HUD provides feedback and cues about each possible selection. There is a box where you can enter precise values.

Use the **TAB** key to move between boxes where you set the values for UCS coordinates, or angle of rotation.

When you place UCS absolutely and UCS faces the same direction as global axis, Heads Up Display coordinate values for UCS origin are absolute. Heads Up Display rotation values are relative to the current UCS orientation, and start with the zero value.

When you redefine UCS positioned relatively to existing geometry, Heads Up Display coordinate values for are absolute.



The HUD can contain:

- A prompt for the expected inputs.
- Relative or absolute flag for the input value.
- Description of the input.
- Edit field for the input value. You can manually enter the position of UCS origin. When you enter a value for X, Y, or Z axis, the edit field is locked. You can return or move between edit fields using the TAB key.

## UCS parameters

Each UCS defines six parameters - three positional coordinates, and three coordinates to drive the rotation angles.

If you position UCS absolutely, the parameter values are absolute.

If you place UCS on existing geometry, the coordinates and rotations are relative to the target geometry, so after the initial placement, the parameter values are set to 0. If you redefine the UCS to offset its position, the parameters reflect the relative transformation.

## UCS visibility

Each of the UCS work features shows a visibility state in the browser.


Set the default visibility of UCS triad and its work features in the UCS Settings dialog box. You can modify visibility of individual UCS work features independently.

You can also set the visibility of work features in your active part or assembly (not available in Inventor LT)file. Select View tab ➤ Visibility panel ➤ Object Visibility . For UCS, you can set visibility to UCS triad, UCS planes, UCS axes, and UCS points.

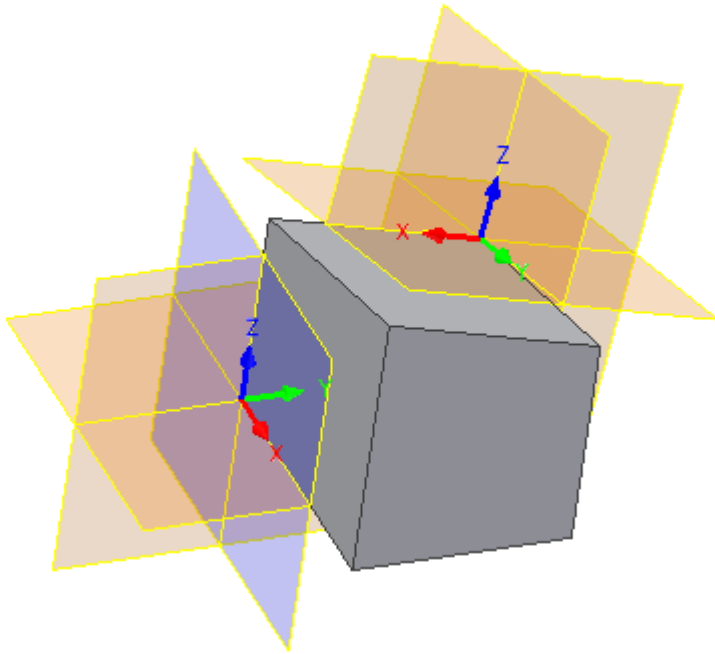
## To Work With the User Coordinate System


You can position a UCS relative to the origin or to existing geometry, align sketch geometry with a UCS, measure the distance of a UCS, redefine a UCS, or specify UCS document settings.

### Position a UCS Relative to the Origin

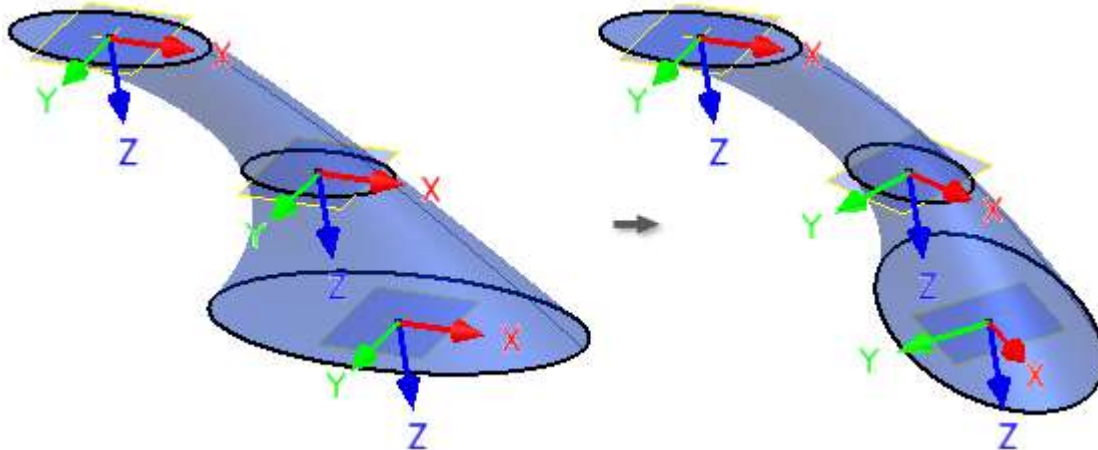
1. Click 3D Model tab ➤ Work Features panel ➤ UCS .
2. Click the axes to move the UCS in the desired direction. Click the arrowheads to rotate the UCS.
3. Right-click and choose Finish.

### Position a UCS Relative to Existing Geometry



1. Click 3D Model tab > Work Features panel > UCS .
2. Specify a point to select the direction of the X axis.
3. Specify a point to select the direction of Y axis.

## Align Sketch Geometry With a UCS



You can select the UCS triad as an input for 2D Sketch command. You can also use the UCS work features for 2D Sketch.

The origin of the sketch is aligned with the UCS center point, and the center point is projected to the sketch.

If the UCS position changes (either because its parameters or target geometry changed, or because the UCS was redefined), the sketch is updated.

## Measure Distance of a UCS

If a part or assembly file contains a UCS, the Measure Distance dialog box offers UCS options in its menu.

1. On the ribbon, click Tools tab ► Measure panel ► Distance.
2. In the Measure Distance dialog box, click the drop-down menu and:
  - Select Origin to show distance from an Origin of the part.
  - Select a desired UCS to show distance from the origin of the specified coordinate system.

## Redefine a UCS

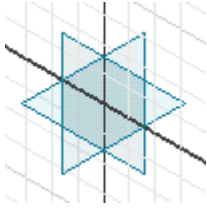
1. Do either of the following:
  - Double-click the UCS.
  - Select UCS, right-click, and choose Redefine Feature.
2. Do any of the following:
  - Specify the UCS position relatively to the Origin, or, in a part file, also relative to the existing geometry.
  - Click the UCS triad origin and move the UCS to a new location.
  - Click the axis to rotate the triad around the selected axis.
  - Click the arrowhead to move the triad along the selected axis.

## Specify UCS Document Settings

1. Click Tools tab ► Options panel ► Document Settings.
2. In the Modeling tab of the Document Settings dialog box, in the User Coordinate System area, click Settings.
3. In the UCS Settings dialog box, specify any of the following:
  - Naming Prefix. Sets the UCS prefix. UCS name is generated from this prefix and a numeric index.
  - Default Plane. Select the default 2D sketch plane. Affects the behavior of 2D Sketch and View Face commands, when UCS triad is selected as an input.
  - Visibility. Select the visibility of UCS objects.

## About Reference Planes

Every part and assembly file has reference planes; they are hidden work planes that intersect at the origin of the XYZ coordinates.



The work planes and a center point are listed under the Origin icon in the browser. You can display any of these work planes and use them to construct features. You can make your part symmetrical about the reference planes and center point.

When the reference planes are set to display, they are visible in both wireframe and shaded displays. To resize a reference plane, pause over one of its edges until the Move or Drag symbol appears, then drag a corner to resize it or drag one of its edges to move it. To sketch on a reference plane, select it and then click Sketch.

You can create sketches and construct features anywhere in the graphics window, but most parts require a reference point in space. It can be arbitrary, but it is established so that all features update relative to that point. For example, you can set the center point at the intersection of the reference planes and position it with a Fix constraint or use the Project Geometry command to project the center point onto the sketch plane.

## To Display Reference Planes

To view reference planes, right-click in the graphics window and click Home View.

In the browser, click the plus sign beside Origin.

Select a reference plane to display, then right-click and select Visibility from the menu.

Optionally, do one of the following:

To resize a reference plane, hover over a corner to show the Resize symbol, then drag a corner.

To move a reference plane, hover over an edge to show the Move symbol, then drag an edge.

Note: Click the Sketch command, and then click a reference plane to set it as the sketch plane.

A hidden center point exists at the intersection of the reference planes. To position sketches relative to the part origin, click SketchDraw and use the Project Geometry command to project the center point onto the sketch plane.