10 Precision and Drawing Aids

Precision and Drawing Aids

3ds Max provides tools that give you control over the positioning and alignment of objects in 3D space. With these tools, you can do the following:

- Choose display units from the most common real-world measuring systems or define your own.
- Use the home grid as a construction plane, or use grid objects to position custom construction planes.
- Select different options to align objects with grids, points, and normals.
- Use 3D object snaps on a modeless dialog as you build and move geometry in your scene. Grid points and lines are among the many snap options.
- Use "helper objects" in your work. Grid objects are in this category, along with objects used for positioning and measurement.

This section presents these brief topics designed to help you quickly start learning how to use the tools that make precision possible:

Tools for Precision

A set of interrelated tools in the program gives you precise control of the scale, placement, and movement of objects in your scene. These are especially important tools for those who build precise models in real-world units of measurement.

Basic Tools

The tools for precision are grouped as follows:

Units—Define different measurement systems. Besides the generic unit, you have your choice of feet and inches in both decimals and fractions. Metric units range from millimeters to kilometers. You can also define other units.

Grids—Include the home grid and special grid objects. Both types of grid can act as construction planes. The software constructs objects using the orientation and position of the active grid. While the home grid is fixed in world space, you can rotate grid objects and place them anywhere in a scene, and align them to other objects and surfaces. You can also give each grid object its own spacing, and display any grid as a dedicated viewport.

Object alignment—Matches an object with the position, orientation, or normal of another object, or to a point in space.

Object snaps—Ensure precise placement when creating and rearranging objects. Keyboard shortcuts let you change object snaps as you work. You can also set snaps to find grid lines and intersections. An angle snap sets the increment for rotation, and a percent snap sets the increment for scaling.

Helpers—Provide useful assistance, as the name implies. These are specialized tools in the same category as grid objects. A Tape object measures distances in current units, and a Protractor object measure angles. A Grid object defines a construction plane, and a Point object marks a particular spot in 3D space.

How the Tools Work Together

The tools themselves establish a general order of use and interaction, although you can always change settings as needed without following this sequence.

- Choose a measuring unit. The default is generic units, sufficient for many purposes.
- Set grid spacing (the size of the smallest square), based on the measuring unit. The home grid and grid objects can have their own spacing, separate from the grid spacing.
- Move and align grid objects to a useful orientation.
- Set or vary snap settings as needed in your work.
- Use other helper objects like Point and Tape as part of the precision process.

As you work, you can change your settings (including the measuring unit) without losing any precision.

Helpers 

Create panel > Helpers

Create menu > Helpers

Helper objects play a supporting role, like stage hands or construction assistants.

Several categories of helpers are available from the drop-down list on the Create panel:

Standard helpers (page 2–15)

Atmospheric Apparatus (page 3–300)

Camera Match Helper (page 2–1235)

Assembly Head Helper Object (page 1–108)

- *Character Assembly (page 2–681)*
- *Luminaire Helper Object (page 1–108)*

Manipulator Helper Objects (page 2–26)

Particle Flow (*Speed By Icon Operator (page 2–158)* and *Find Target Test (page 2–214)*)

VRML97 Helper Objects (page 3–646)

reactor

Other helper objects might be available, depending on your configuration.

Using Units

Units are the key to connecting the three-dimensional world of 3ds Max with the physical world. You define the units you want to use from the *Units Setup dialog (page 3–891)*.

Changing Display Units

When you change display units, 3ds Max displays measurements in the new unit for your convenience. All dimensions are displayed in the new unit. Essentially, you're using a new "measuring stick." No object is changed in this process. As in the physical world, objects in the scene maintain their absolute size, regardless of how you measure them.

Type-In Entry

When you enter any dimension, 3ds Max always assumes the number you enter is expressed in the current units. You can also enter a series of numbers: 3ds Max then converts their sum into the current unit. Here are some examples that assume the current units are in centimeters:

- When you enter a dimension of 1' (one US foot), it converts to 30.48cm.
- If you enter a series of numbers such as 14 286 175 (separated by spaces), the series is totaled to 475.0cm.
- If you enter 1' 1 (one US foot and 1 centimeter), this is converted and summed into 31.48cm.

When you use US Standard as the display unit scale, you can select either feet or inches as the default for type-in entry. If you select feet and enter 12, the result is 12' 0". However, if you enter 1' 2, the software identifies the second digit as inches, producing 1' 2" as the result.

In any unit system, you can enter fractional amounts. For example, assume you're working in US Standard with feet as the default:

- If you enter 18/3, the result is 6'0".
- If you enter 18/3", the result is 0'6".
- You can specify units in a different system, and they are converted on the fly. For example, if you enter 18/3cm, the result is 0'2.362".

Understanding the System Unit

3ds Max keeps track of all measurements in its own internal system unit. No matter what kind of display units you use, measurements are stored in this absolute unit for storage and computation. The default system unit is defined as 1.000 inch. As long as the system unit is left at one inch, you can freely share models and change units on the fly with no effect on the underlying geometry. Except in rare circumstances, you never need to change this default scale. This means you can merge a model created with any standard unit into your scene at true scale.

You can change the system unit setting on the System Unit Setup dialog, available from the *Units Setup dialog (page 3–891)*. Changing the system unit is recommended only if your scene has very small (less than one inch) or very large dimensions. See *System Unit Setup Dialog (page 3–893)* for more information.

If you do need to change the system unit, change it *before* you create or import geometry. Do not change the system unit in an existing scene.