

## Taking the Magic Out of the Hole Wizard

- ***SolidWorks***
- *COSMOS*
- *PDM*
- *Rapid Prototyping*
- *Office Productivity Tools*

The Hole Wizard is probably the most popular "Macro Feature" inside SolidWorks. It eliminates a lot of the drudgery of sizing and locating holes: First, by incorporating a library of standards (a la Machinery's Handbook), and second, by positioning multiple holes using a Sketch Driven Pattern.

However, there are two subtle but important variations on how hole position is controlled. When I visit SolidWorks users, and review their geometry, I frequently discover that this nuance is not widely understood. If you've ever had trouble getting a drilled hole to stay-put, or fail to be fully-defined even when you've dimensioned the drill point, then this KAP's corner is for you.

### **About KAP**

#### **Keith A. Pedersen, Principal Engineer**

Keith Pedersen has a BSME from Clarkson College and an MSME from Boston University. After a stint at General Electric in Burlington, VT, Keith was the lead Applications Engineer for Advanced Surfacing products for Matra Datavision USA, including EUCLID-IS, UniSurf, and STRIM. He joined CAP in 1998 to support advanced surfacing applications in SDRC I-DEAS and joined our SolidWorks group one year later. Keith has extensive industry and consulting experience in non-linear Finite Element Analysis and Computational Fluid Dynamics in addition to surfacing applications. He is a Certified SolidWorks Professional (CSWP) and certified to train and support COSMOSWorks.

### **About CAP**

#### **Computer-Aided Products**

With offices throughout New England, Computer-Aided Products is the leading regional reseller of CAD/FEA/PDM software, rapid prototyping systems, training, consulting, and support. Our engineering staff includes experts in design, analysis, drafting, PDM, and Windows networks. Our partnership with the best solutions in the industry, along with over 16 years of practical experience, provides a solid foundation for your mechanical engineering and design process.

Your Source for CAD Excellence: Products, Training and Service

## The Hole Wizard – Past and Present

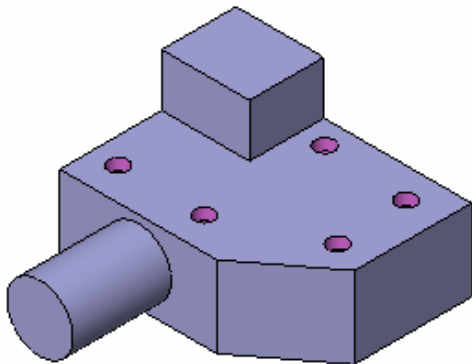
---

*KAP's Tip: One of the (few) cardinal rules governing computer software is: everything is the way that it IS, because it was the way that it WAS. If you understand the history of the evolution of a feature, it can provide insights into how it works and how best to deploy it.*

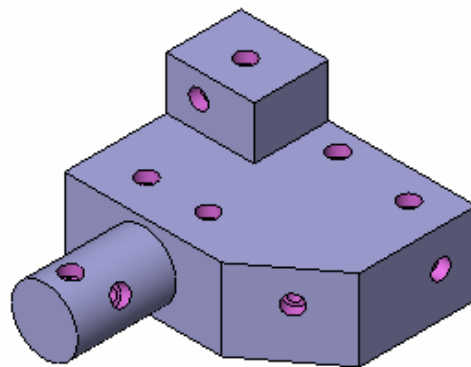
---

The Hole Wizard started out its career very simply. You could position any number of holes at once, but they all had to be located on a single, planar, face of the model. In fact, you had to pre-select the target face, before the menu item (or icon) for the Hole Wizard even became available. You could not position the holes by way of a reference plane, nor could you place them on curved surfaces, (such as cross-drilling a shaft), (see below).

The pre-selected face would become the host to a Positioning Sketch where you would place and dimension the center-points of each hole. These points therefore all had to lie on a common plane.



**THEN: All holes lie on a common face**



**NOW: Holes can lie in a variety of Faces and Orientations**

Then around 2003, the hole Wizard was enhanced in two important ways. First, they eliminated the need for you to pre-select a target face before launching the Wizard. The menu and the icon are now always available, and you can then post-select the location points once you are inside the Wizard. Most importantly, you can now place the drill points on a variety of faces and orientations, including curved faces, all controlled within a single Hole feature, as pictured above.

## How Did They Do That?

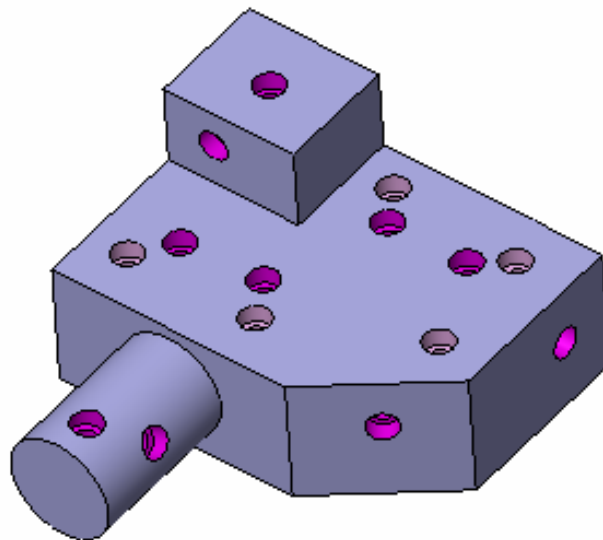
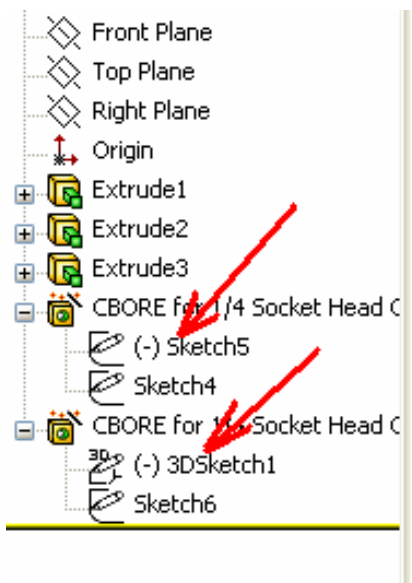
---

*KAP's Tip: In the standard SolidWorks training curricula, the ins-and-outs of the 3D Sketcher have usually been reserved for the Advanced class, so this can be unfamiliar ground for a number of users.*

---

Buried inside this enhancement is the important fact that there are now two flavors of the hole Wizard. In the original flavor, drill points are still located by a 2D Sketch as before. In the new flavor, the positioning sketch is a 3D Sketch. Creating and constraining points and lines in a 3D Sketch is more involved than in 2D, as there are now 3 degrees of freedom to every point, and new kinds of relationships to consider, (such as "Along Z" and "On Surface"). So, if you are going to exploit the new abilities, be prepared to invest about 50% more effort in locating those points in space.

You can expand the Feature Manager listing for a Hole feature, and see whether it is the old flavor, or the new, by looking at the type of Positioning Sketch it uses. The first Sketch under each Hole is the sketch containing the Positioning points, and the second sketch contains the hole shape and sizing. In the model below, there are two Hole Wizard features. The first CBORE feature, is positioned via "Sketch5", which is a 2D sketch, and this results in the pink holes seen below. All of the purple holes are created by the second CBORE feature, and you see that the icon for its positioning sketch is clearly different – this is how SolidWorks identifies a 3-D Sketch.



## Take Me Back, Mr. Wizard...

---

*KAP's Tip: How do you ensure that you will get the right Hole Wizard? The key is to **Pre-Select a Face before launching the Hole Wizard.** The geometry of the face you select will determine whether the 2D or 3D wizard is invoked.*

---

There are certainly times when this new, 3D flavor of the Hole Wizard is a tremendous time-saver. But there are still many times when the holes to be drilled all lie on a common plane, and we would prefer the ease and simplicity of a 2-D Sketch to locate the points. How do we invoke the original flavor of the Hole Wizard?

SolidWorks chooses which flavor of Wizard to run, simply based on what you pre-select prior to launching the Menu or the Icon. If you pre-select a Planar face, you get the original 2-D Hole flavor. If you pre-select a curved face, you get the 3-D Hole flavor. **AND – this is the important point** – if you pre-select nothing before hitting the icon, you get the newer, 3-D flavor of the Hole Wizard. This fact is the source of most of the frustration I uncover during customer visits – users are accidentally invoking the high-powered flavor of the hole wizard, even when they intend to drill a single set-up, into a single face. And, perhaps lacking in familiarity or experience with the 3-D sketcher, they discover that the drill points are somehow stubborn, or respond oddly to applied dimensions.

An ounce of prevention is worth a gigabyte of cure, so I advise users to take the following simple precautions: **Pre-Select a Face before launching the Hole Wizard.**

That's it. Usually you want the simpler, 2-D Hole Wizard, so you pre-select a planar target face. If you need to cross-drill a shaft, pre-select the cylindrical face, (NOT the end face). Finally, if you want to drill several set-ups on several face orientations, with a single use of the Wizard, this is the *only* time you should launch the wizard without pre-selecting a target.

## Conclusion

If you've experienced frustration in the past with the hole wizard, open up some of those old parts now, and compare their Positioning Sketch icons, to the ones shown in figure 2, above. You will probably find that you inadvertently activated the newer wizard, and have a 3-D sketch. There is really no way to convert a new Hole Feature back to the old style, so you'll just have to hunt down and restrain that additional, 3rd degree-of-freedom. But from now on, you know how to invoke the newer, more flexible Hole Wizard, only when it is wanted.

Have a SolidWorks bone to pick? Want more tips in a specific area of the CAD? Keith is looking for requests from readers for future KAP Corner topics. Email your suggestions to; [KAP@CAPINC.COM](mailto:KAP@CAPINC.COM)