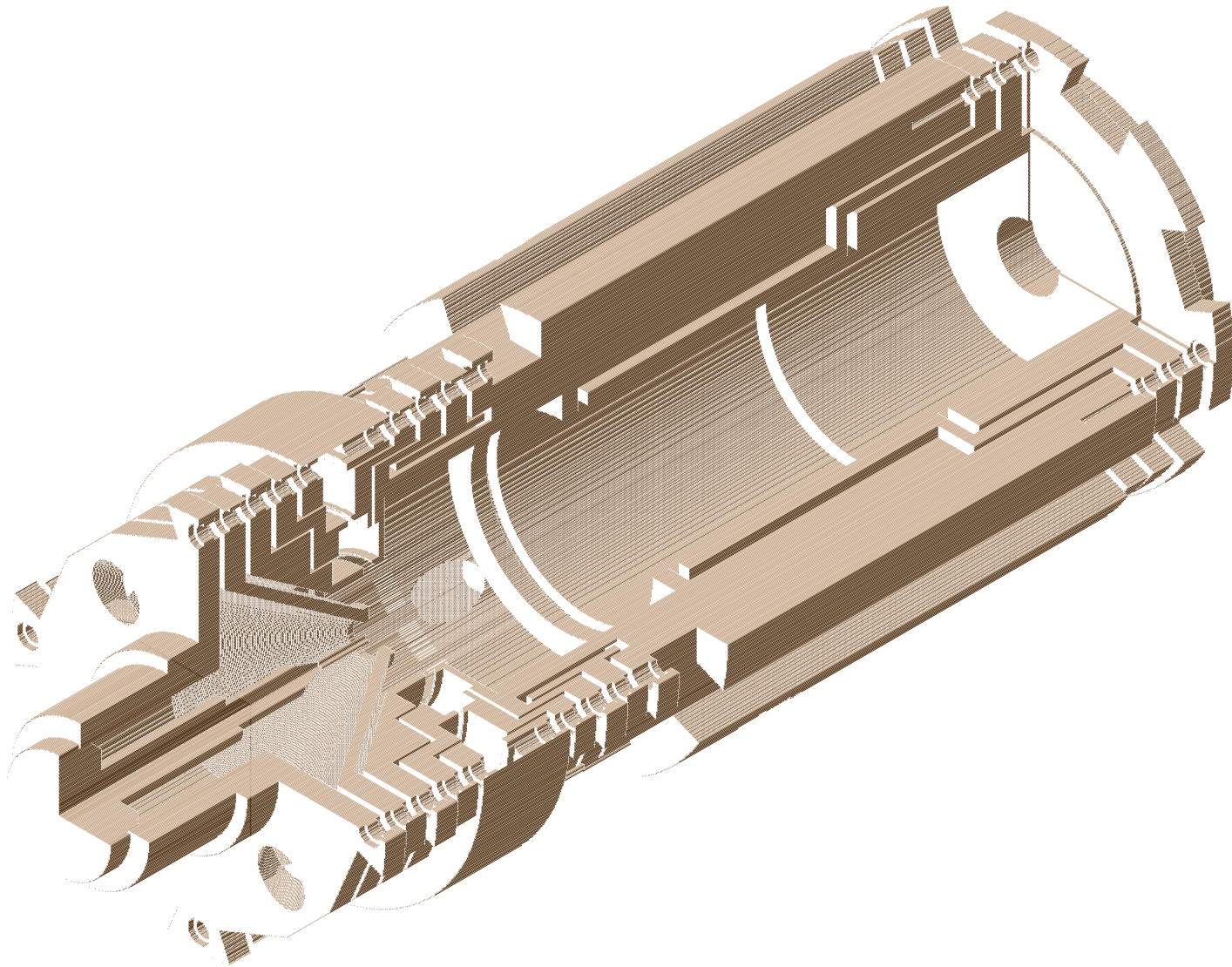# 7. A Complex Example

Adopted Strategy

- Do initial designs in 2D with Modify then 3D GEM.

- Symmetry allowed y and z mirroring so that 1/4 sized array can be used.

- Snap design dimensions to 0.010" to match maximum practical array size of 40,000,000 points (400 MB).

- Define each lens element separately at the origin and then move it to its physical location in the assembly.

- Use rotate_fills because of high cylindrical symmetry and then drill holes and slots with erasing fills.

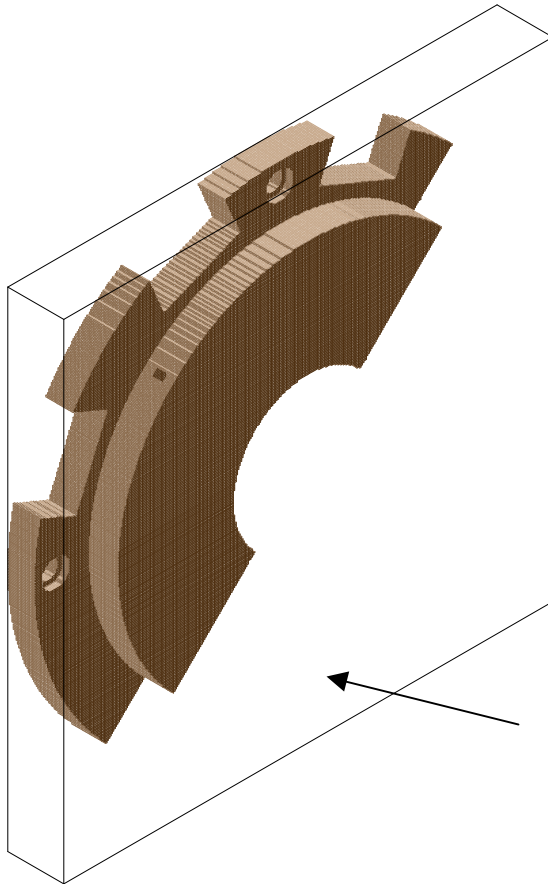- Design GEM for 2D/3D arrays and flexible orientation.
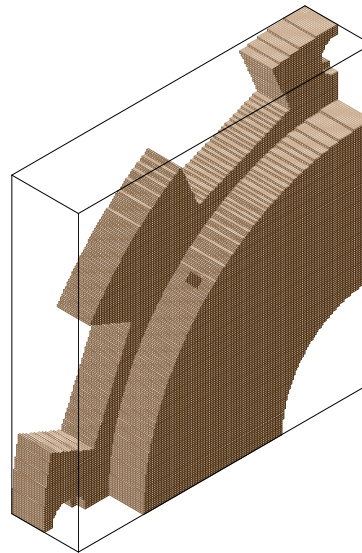
Buildup of Exit Ground Electrode

As Defined   In Array   with Mirroring

135° in details to support
45° alignment changes
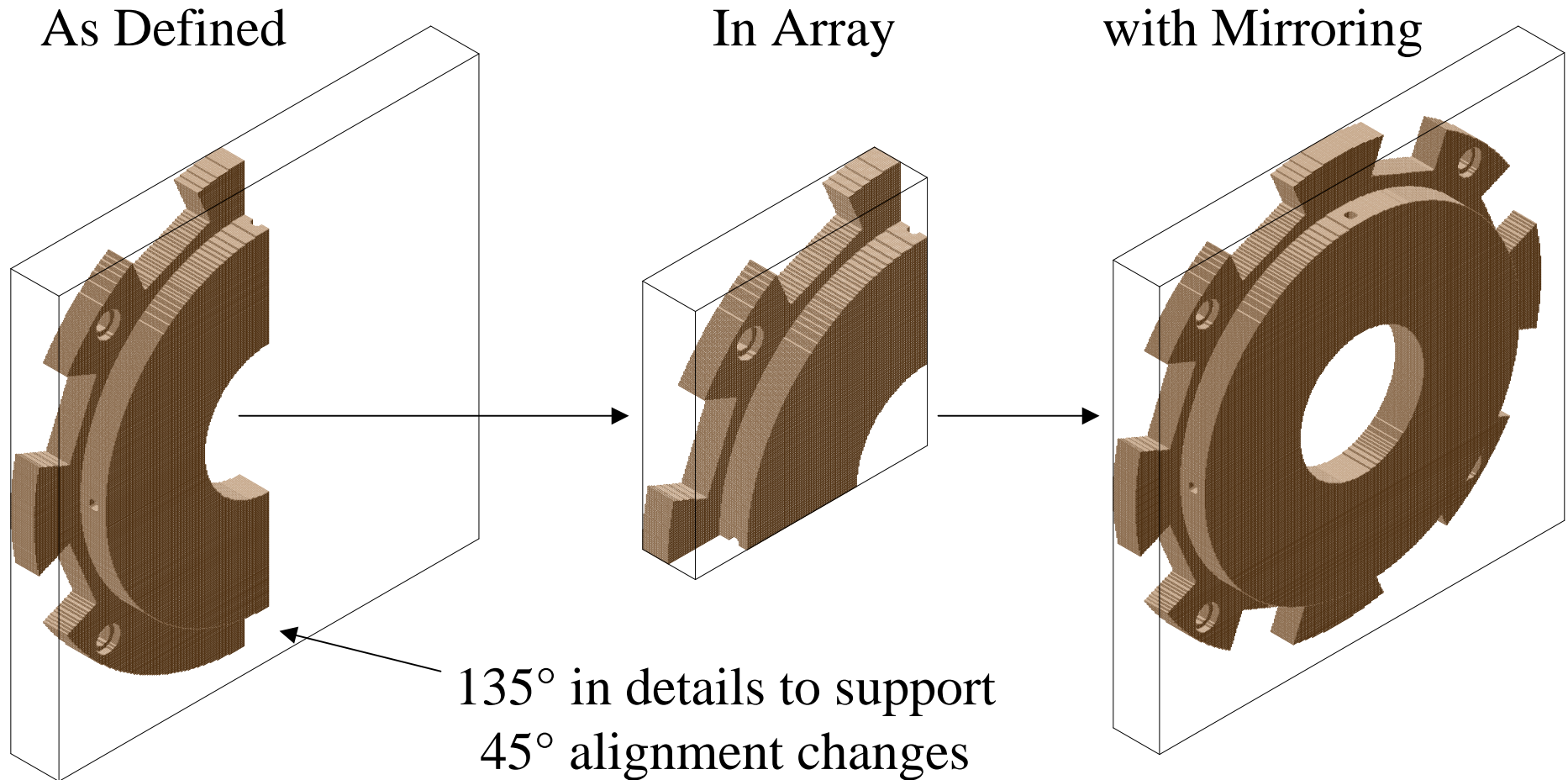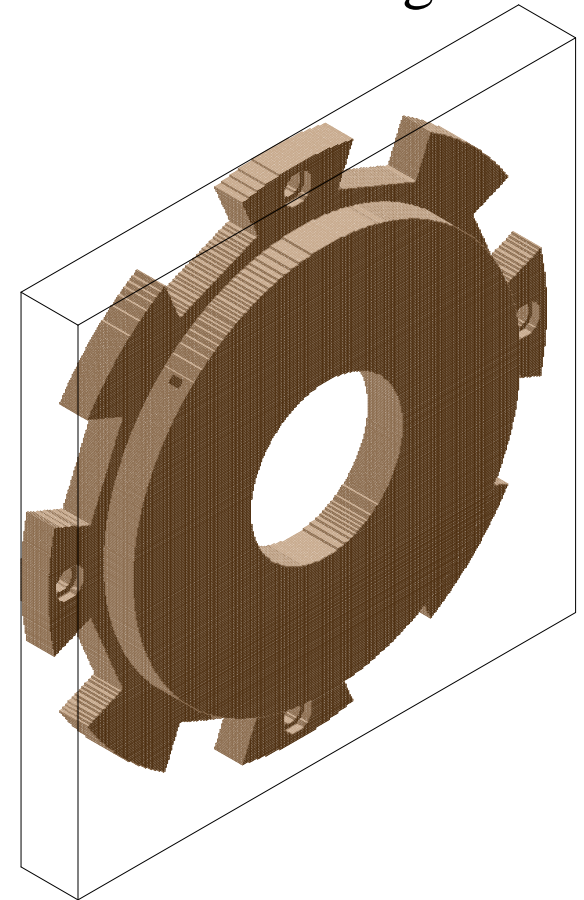
Mounting Hole Alignment

As Defined   In Array   with Mirroring
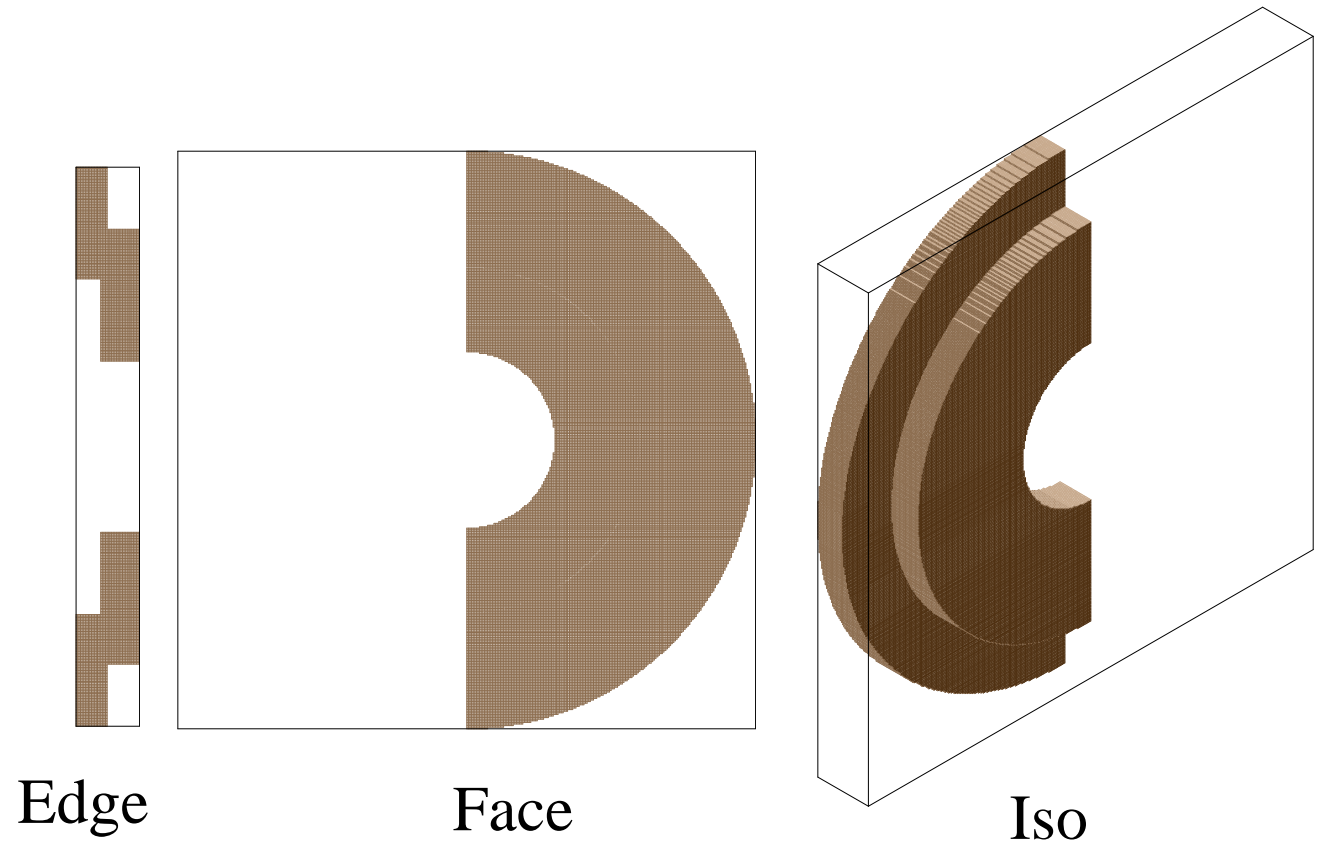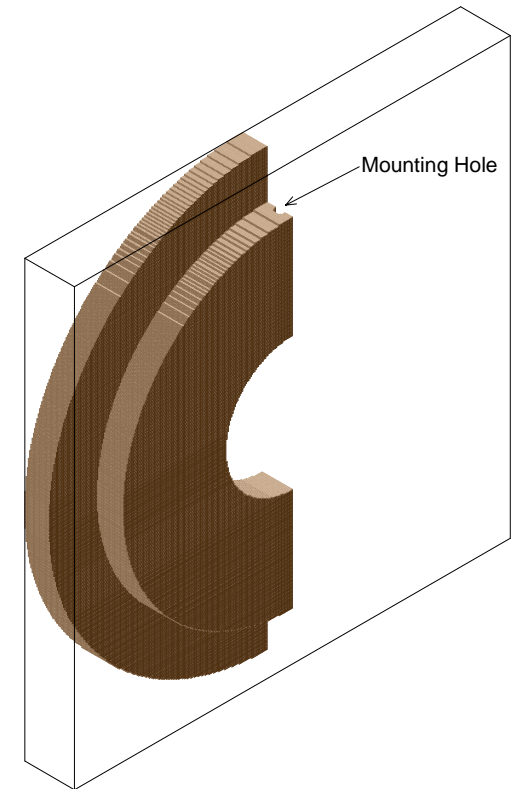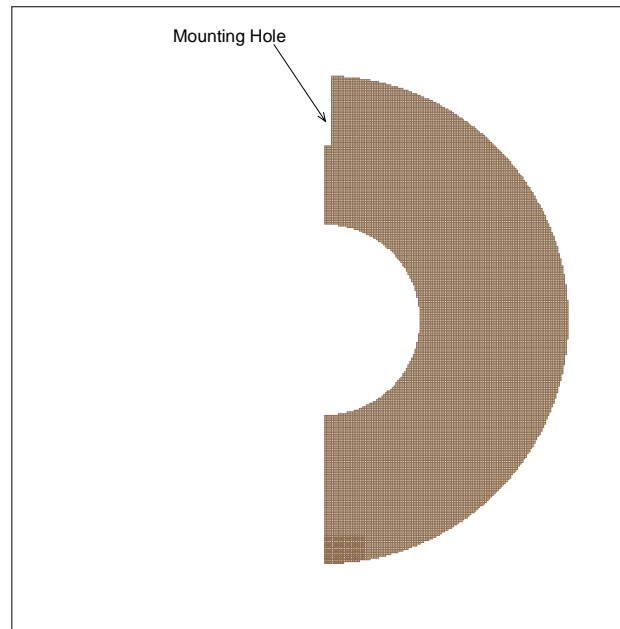

Mounting hole aligned
rotated 45°

1st -- Create Electrode Blank

```
Locate(0,0,0,1,90)
  {
  rotate_fill(180)
    {
    within{polyline(x,y,
             x,y,
             …)
        }
    }
  }
```

Edge   Face   Iso

Drill 1st Quad Mounting Hole

```
N(0)          ; erasing fill
{
fill          ; community fill
  {
  Locate()  ; dummy locate
    {       ; orient drill
    Locate(0,1.4,-.31,1,0,0,-90)
      {
      Within_inside
        {  ; drill hole
        Cylinder(0,0,.001,.04,.4)
        }
      }
    }
  }
}
```


Mounting Hole

Mounting Hole

Drill 2nd Quad Mounting Hole

(Copy 1st and modify)
         ; swing 90 deg. in el.
Locate(0,0,0,1,0,-90)
    {   ; orient drill
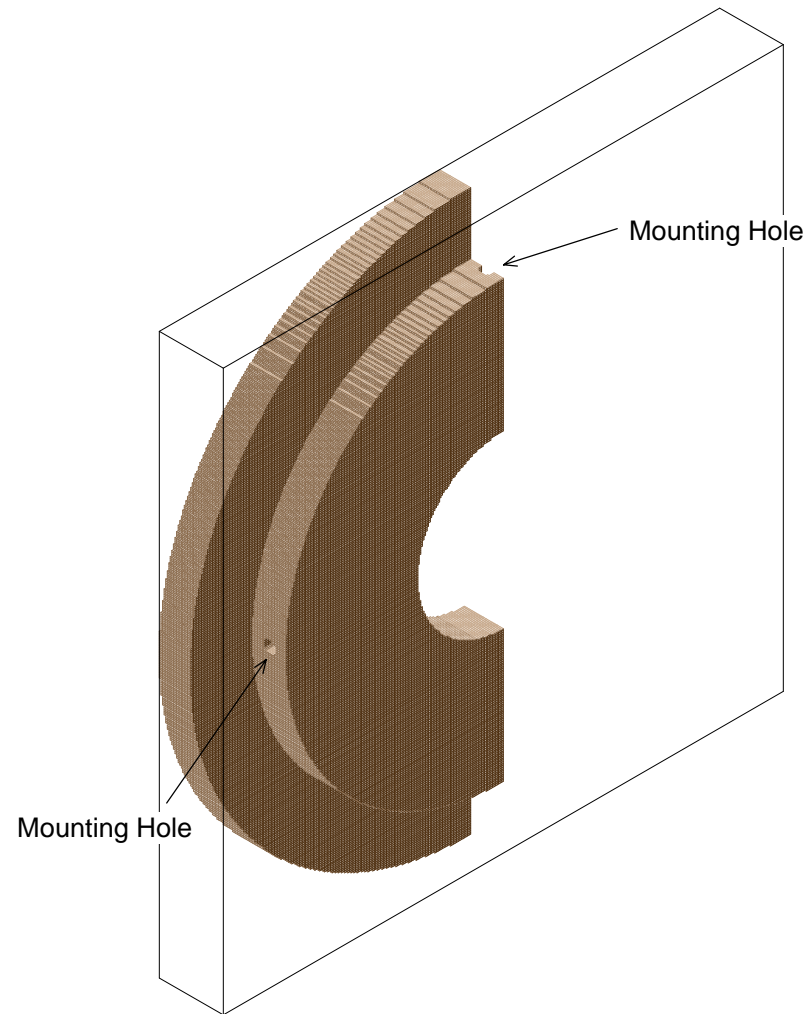   Locate(0,1.4,-.31,1,0,0,-90)
     {
    Within_inside
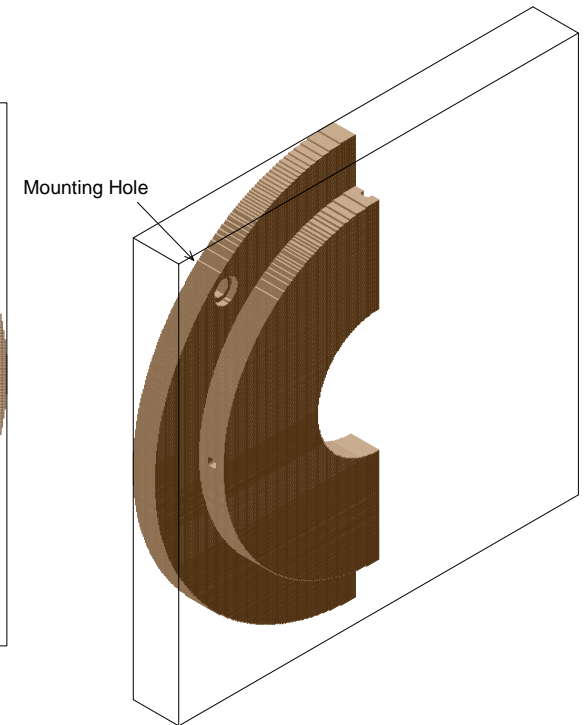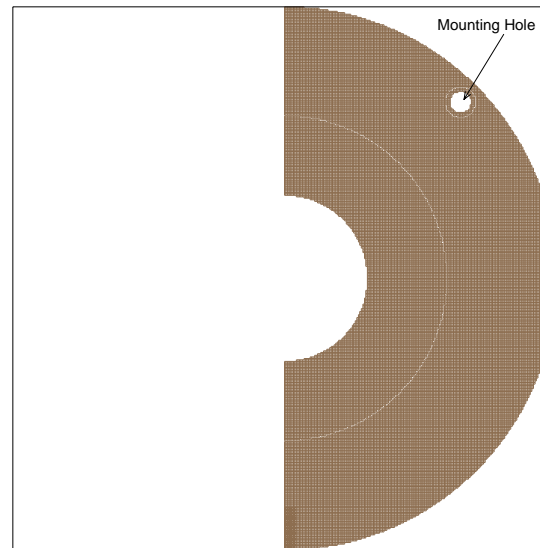   {   ; drill hole
     Cylinder(0,0,.001,.04,.4)
     }
    }
   }

Mounting Hole

Mounting Hole

Create 1st Mounting Hole

```
          ; swing into position
Locate(0,0,0,1,0,-45)
 {
 locate(0,1.65)       ; mounting circle
   {
   within_inside{cylinder(lft insul)}
   within_inside{cylinder(hole)}
   within_inside{cylinder(rht insul)}
   }
 }
```
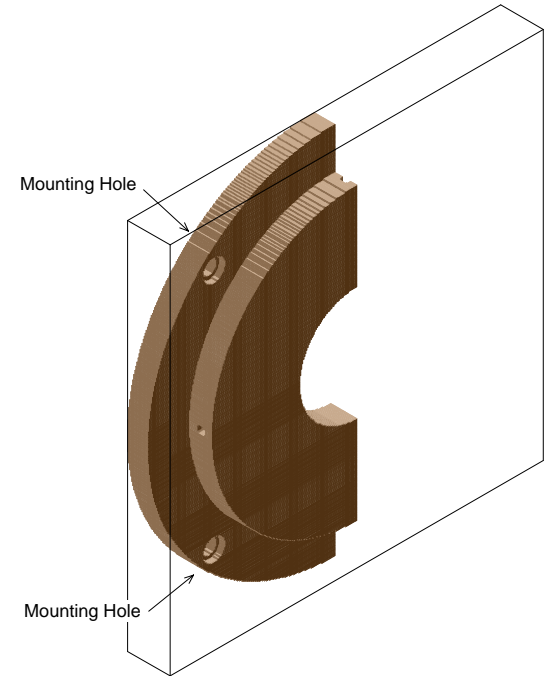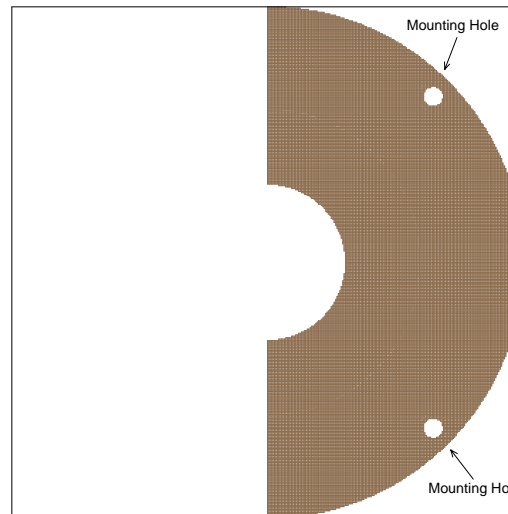

Mounting Hole

Mounting Hole

Create 2nd Mounting Hole

(Copy of 1st mounting hole)
   ; swing into position
Locate(0,0,0,1,0,-135)
  {
  locate(0,1.65)   ; mounting circle
    {
    within_inside{cylinder(lft insul)}
    within_inside{cylinder(hole)}
    within_inside{cylinder(rht insul)}
    }
  }

Mounting Hole

Mounting Hole

Mounting Hole

Mounting Hole

Mounting Hole

1st Wiring Slot

```
            ; swing -22.5 deg in el
Locate(0,0,0,1,0,-22.5)
{
Within_inside
   {          ; define 3D box
              ; on mounting
              ; circle radius
   box3d(-.3,1.5,-.201,.3,2,.001)
   }
}
```


Wire Slot

Wire Slot
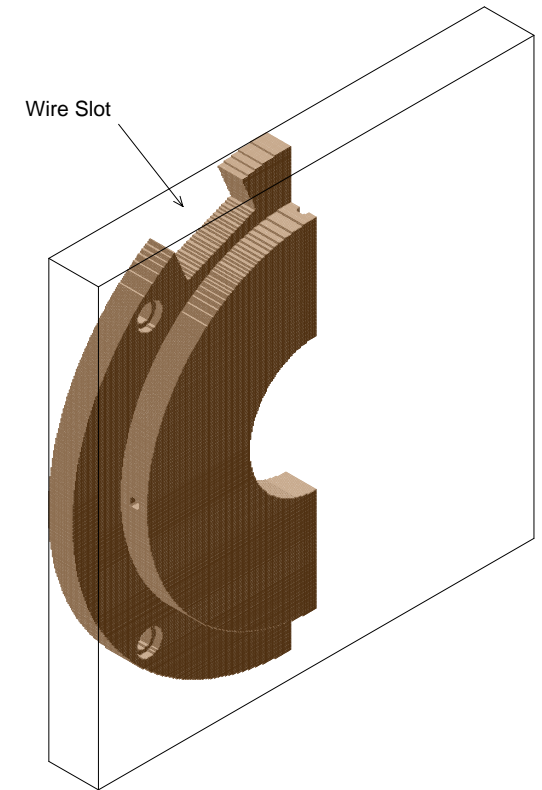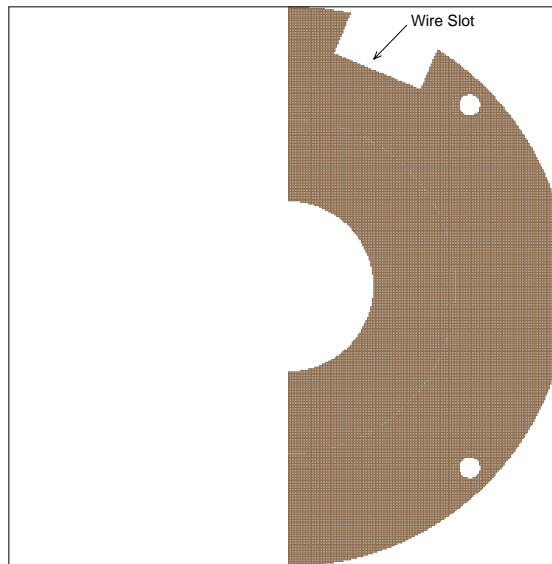
2nd and 3rd Wiring Slots

(copy 1st slot twice)
            ; swing -67.5 deg 2nd
Locate(0,0,0,1,0,-67.5)
{
Within_inside
  {   ; define 3D box
             ; on mounting
             ; circle radius
  box3d(-.3,1.5,-.201,.3,2,.001)
  }
}

            ; swing -112.5 deg 3rd
 Locate(0,0,0,1,0,-112.5)
 {
 (second copy of slot)
 }

Wiring Slots

Wiring Slot

Wiring Slots

Wiring Slot