

Xpedition 3D Designer

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Xpedition Layout

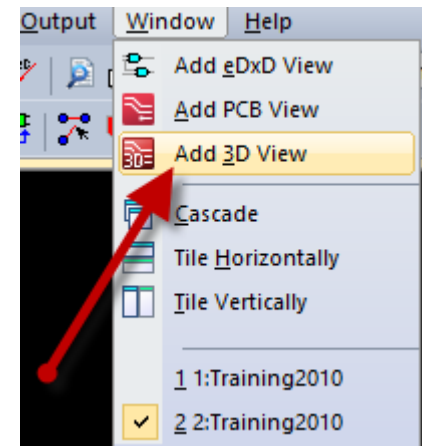
November 2014

Xpedition 3D Designer Features

- This presentation gives a high level overview of the *Xpedition 3D Designer* features

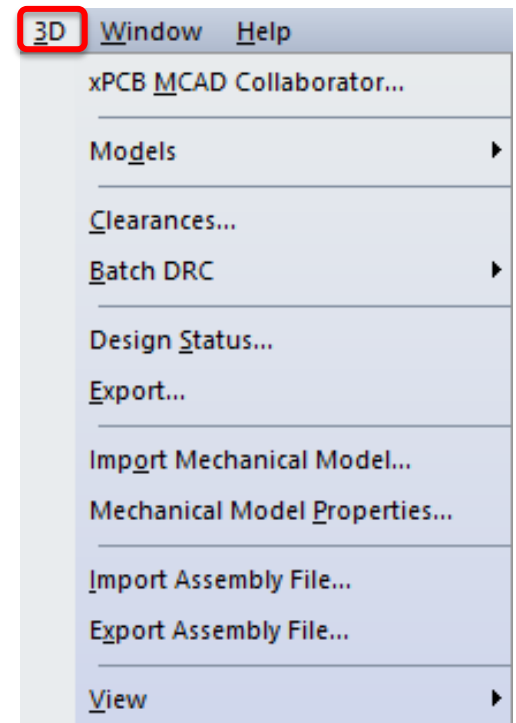
Enabling 3D

- In order to enable 3D functionality within Xpedition Layout, users must add the 3D view
 - The **Add 3D View** option is enabled if a 3D license is available
 - Once *Add 3D View* is selected, it will open the 3D graphics view and add the 3D pull-down menu features to the product



3D Pull-down Menu

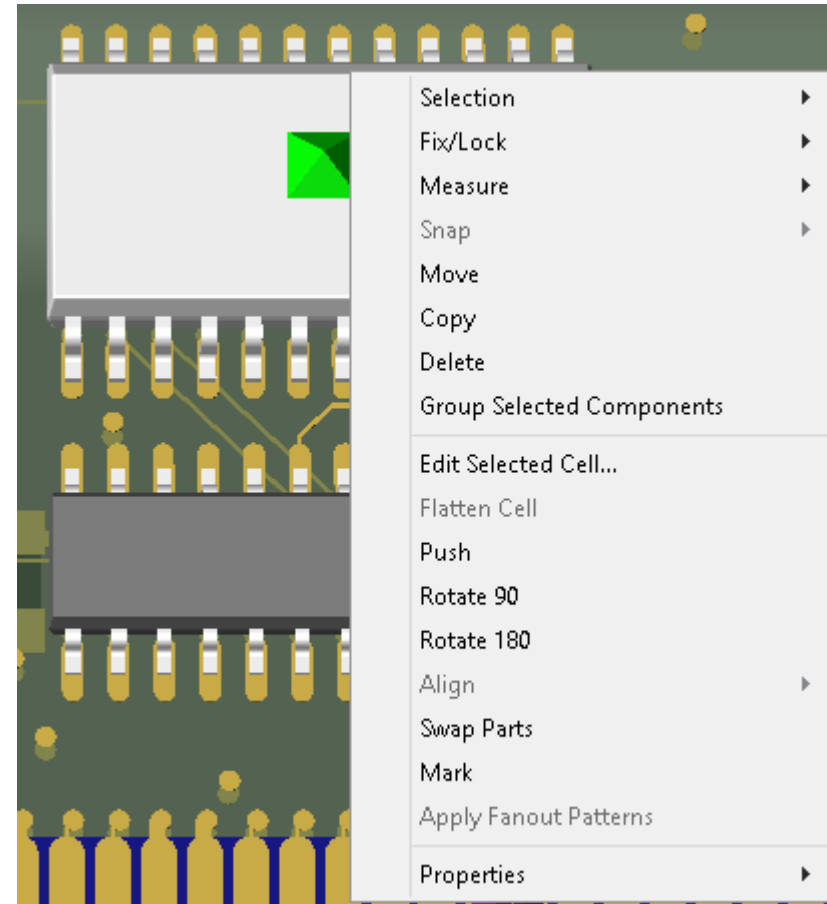
- Once the 3D View has been opened, all of the *Xpedition 3D Designer* features are located under the **3D** pull-down menu, but only when the required licenses for 3D are available



Common Layout Commands

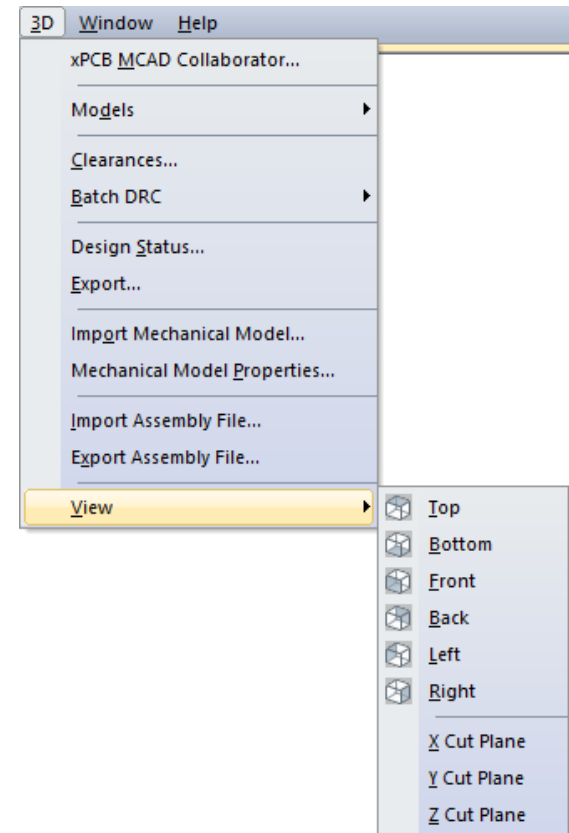
■ *Xpediton 3D Designer* uses the same layout features available within 2D

- Context sensitive Right Mouse Button options on selected objects
- Action Keys
- Toolbars and Pulldowns
- Component Explorer's placement of Parts and Planning Groups



3D View Controls

- Pre-defined Toolbar and Pull-down 3D viewpoint commands
 - *Top, Bottom, Front, Back, Left, and Right* view options alter the 3D View's viewing perspective
 - *Top* and *Bottom* views use the same view perception as seen in the 2D view
 - *X, Y, and Z Cut Plane* options allow users to define graphical slices through the design
- Dockable/Undockable 3D View control toolbar



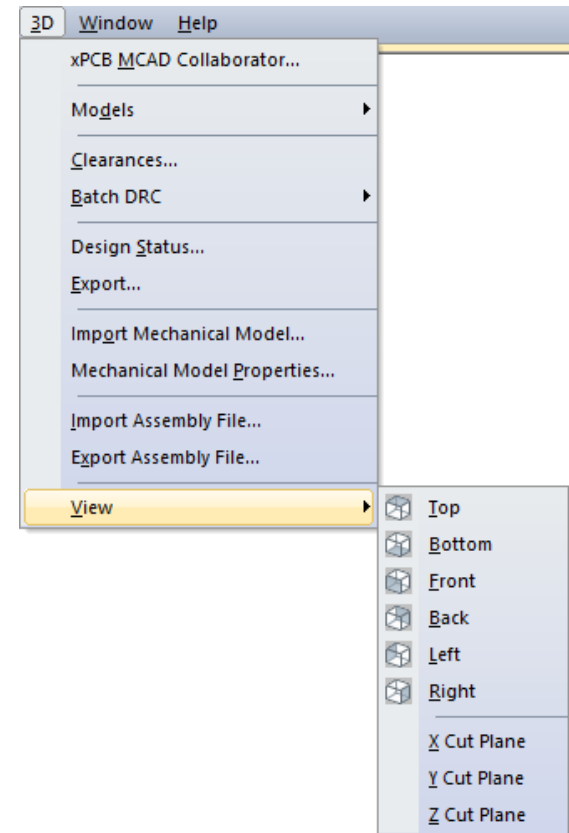
3D View Controls (cont.)

■ Middle Mouse Button (MMB) Modifiers

- **MMB Drag**, pans view like 2D
- **Mouse Wheel**, zooms in/out based on cursor position
- **Shift + MMB Drag**, tilts view on windows vertical or horizontal axis
- **Ctrl + MMB Drag**, rotates/spins the view on design's Z-axis
- **Ctrl + Shift + MMB Drag**, rotates about normal coming out of the screen
- **Space + MMB Drag**, walk into or out of the screen when panning

■ Keyboard Accelerators

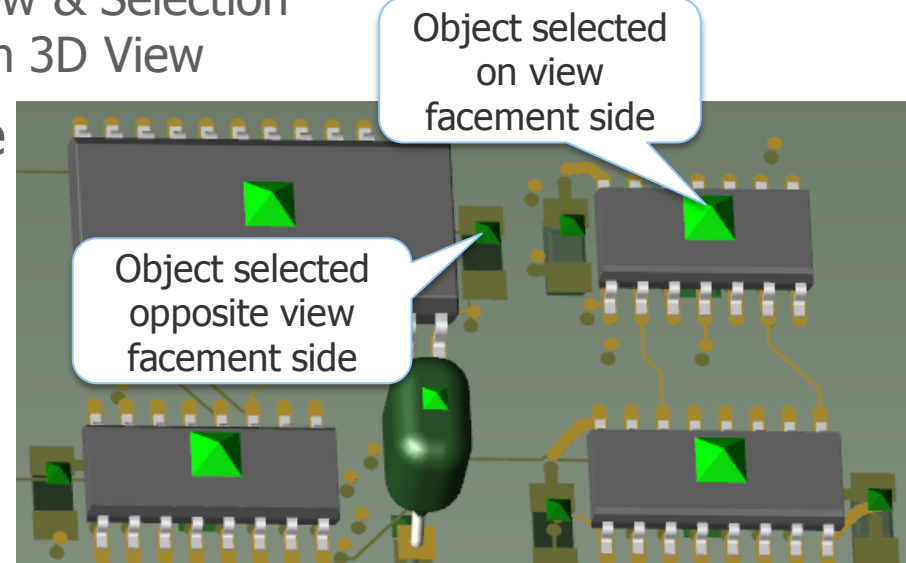
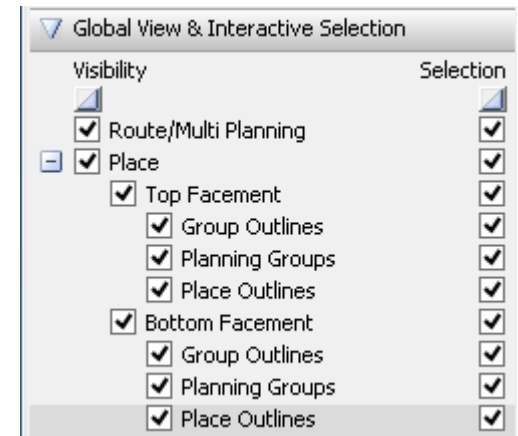
- **Shift + b** = Bottom view
- **Shift + f** = Front view
- **Shift + l** = Left view
- **Shift + r** = Right view
- **Shift + t** = Top view



3D Object Selections

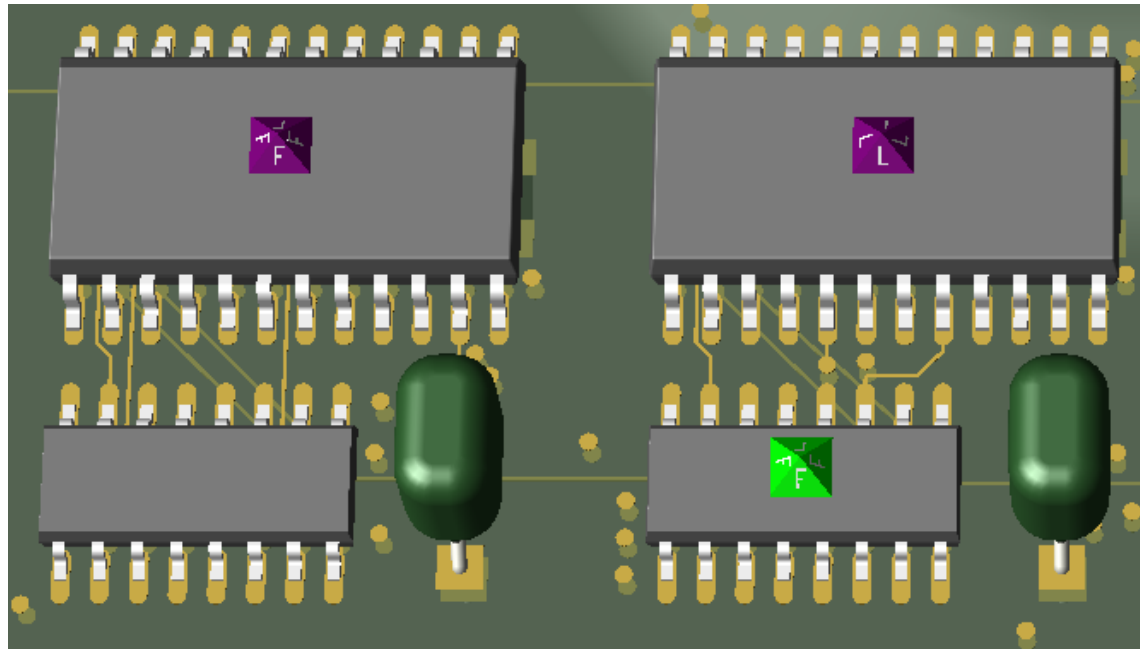
■ Selection in 3D is the same as within 2D supporting area and individual selection methods

- 3D object selections are based on new Global View & Selection settings in 2D View
 - If Groups, Planning or Placement Outlines are not selectable in Global View & Selection then these are not selectable in 3D View
- Bright Green diamonds indicate objects selected on view facement side
- Dark Green diamonds indicate objects selected on view opposite facement side



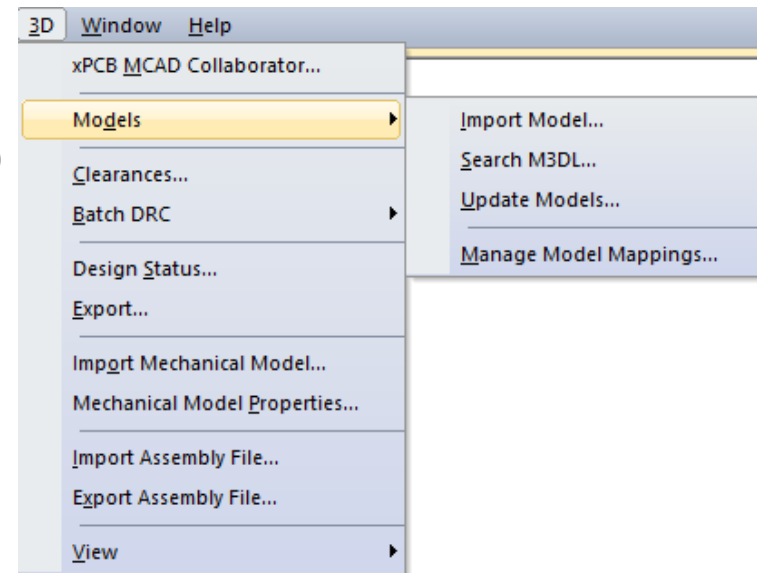
3D Fixed / Lock Objects

- *Fixed* and *Locked* objects continuously display a Purple diamond with a **F** (Fixed) or **L** (Lock) letter designation
 - Selected *Fixed* or *Locked* objects display a Bright or Dark green diamond, depending on view facement, but with fix/lock text displayed



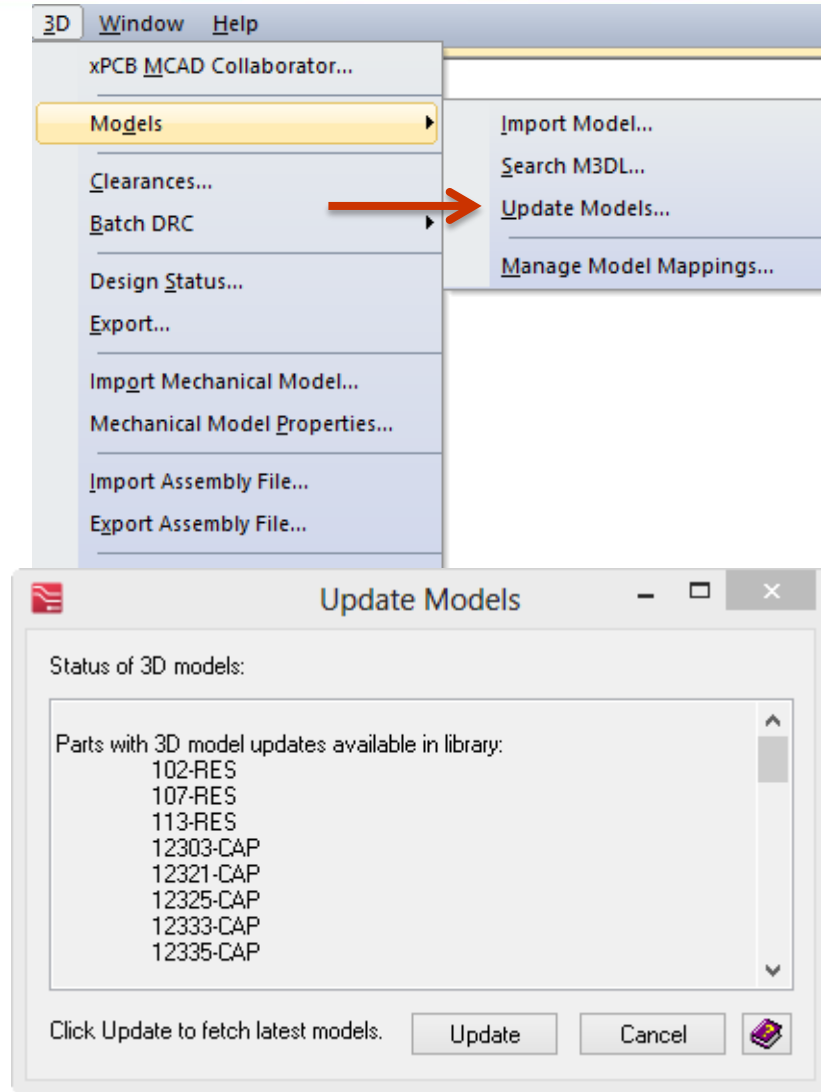
3D Component Models

- *Xpediton 3D Designer* allows the user to *Import Models, Search M3DL, Update and Manage Models* based on any selected part within the layout for components without 3D models assigned
 - **Import Model** will allow the designer to browse for a STEP or SAT 3D model and import/map it to the selected component within the layout
 - **Search M3DL** will allow the designer to search the xLM 3D Library for a Part/Model to assign/map it to the selected component within the layout
- The above options are *only* available if a component that is selected has no 3D model associated



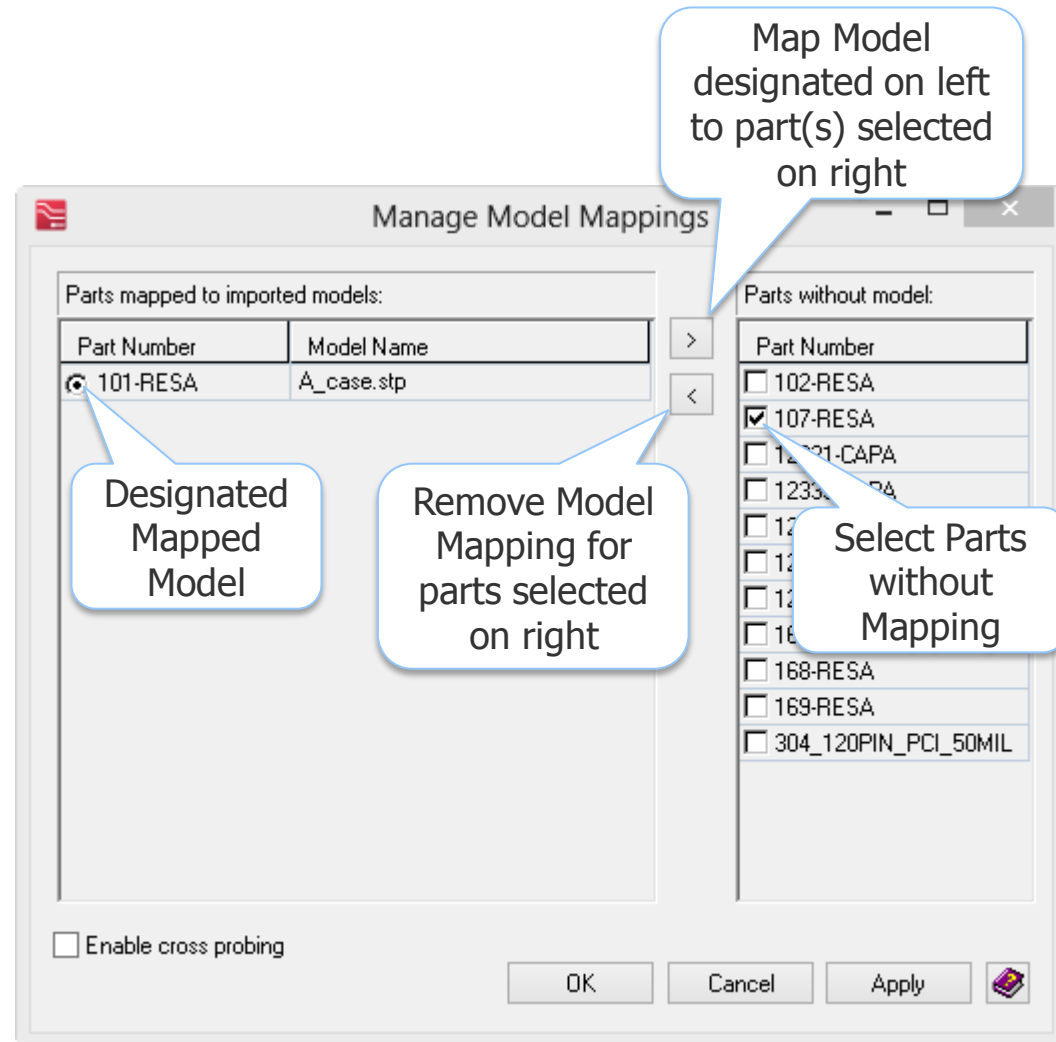
Updating Models

- Customers using the *Library Managed (xLM)* flow, when models are updated within the library environment, the **Update Models** feature allows the designer to propagate library model updates to the design



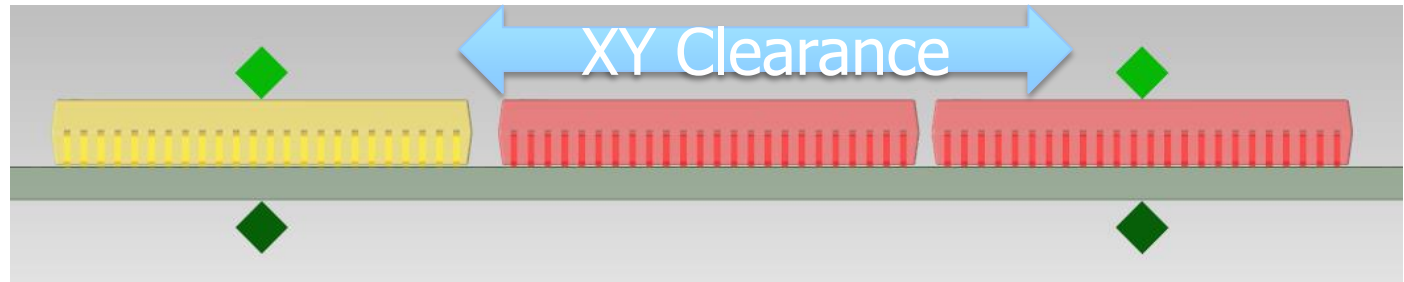
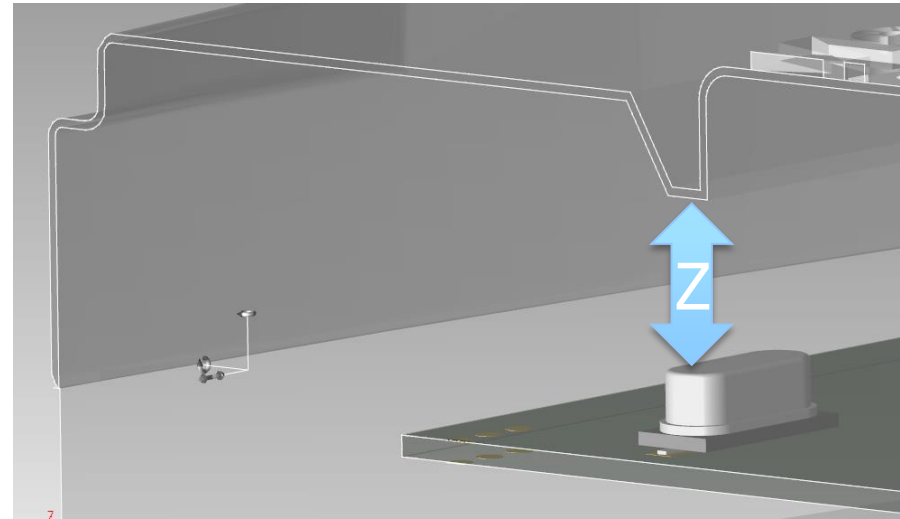
Managing Design Models

- Once a 3D model has been imported to a design, the mapping and alignment criteria can be reused and applied to other parts without models
- This dialog also allows users to remove existing model mapping from a part



3D Clearances

- *Xpediton 3D Designer* supports user defined Minimum and Optimal clearances, as well as independent XY and Z clearance rules
- Color coded 3D violations
 - Less than Minimum (Red)
 - Between Minimum and Optimal (Yellow)



3D Clearance Constraints

- Within *Constraint Manager*, either from the Schematic or Layout, the user can define general **3D Clearances**
 - Independent *Minimum* and *Optimal* clearances with color
 - Independent XY versus Z clearances
 - Blank clearance fields means no Online or Batch Checking
 - Zero “0” clearance entry means to allow touching

The screenshot displays the '3D Clearances' dialog box and the 'Constraint Manager' menu. The dialog box is a table with columns for 'Clearances', 'Minimum XY (th)', 'Minimum Z (th)', 'Optimal XY (th)', and 'Optimal Z (th)'. It lists three clearance types: 'Any to Any', 'Component to Assembly', and 'Component to Board Edge'. Below the table is an 'Add Clearance...' button with a dropdown menu showing various clearance categories. To the right, the 'Constraint Manager' menu is open, showing a list of constraint types with '3D Clearances' highlighted at the bottom.

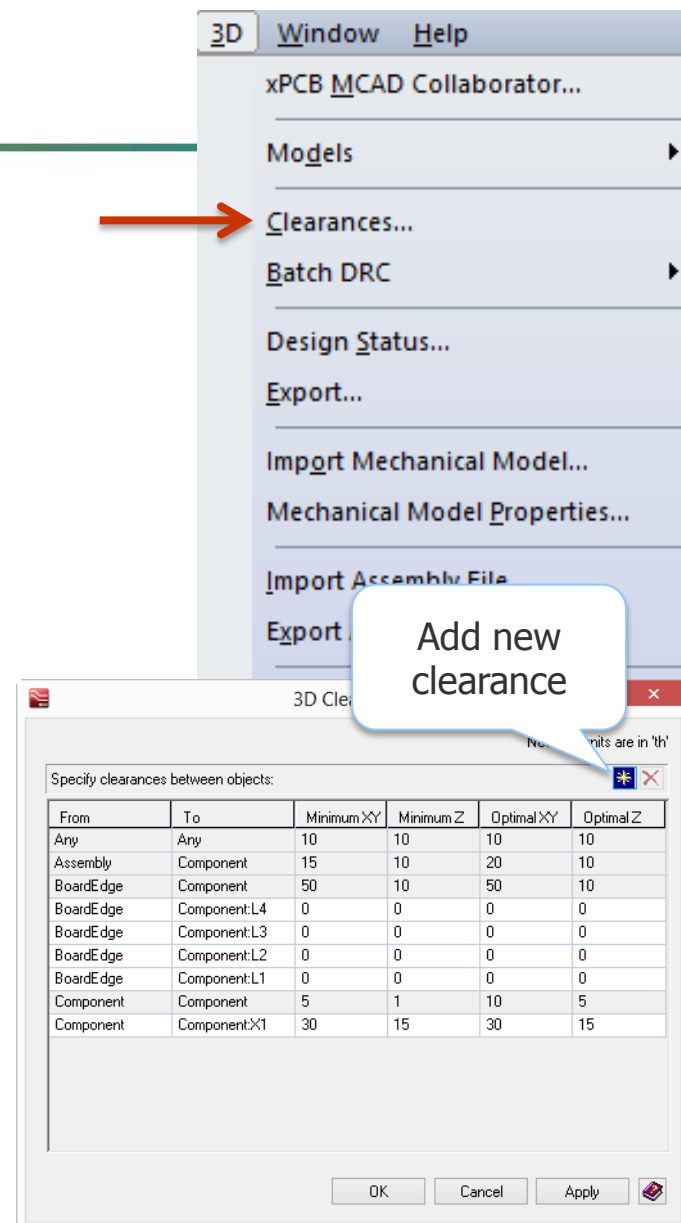
Clearances	Minimum XY (th)	Minimum Z (th)	Optimal XY (th)	Optimal Z (th)
Any to Any	5	2.5	10	5
Component to Assembly	7.5	5	10	5
Component to Board Edge	0	0	10	5

Add Clearance...
Active Board to Assembly
Bond Wire to Assembly
Bond Wire to Board Edge
Bond Wire to Component
Bond Wire to PCB Assembly
Component to Component
Component to Mechanical
Component to PCB Assembly
Mechanical to Assembly
Mechanical to Mechanical
Mechanical to PCB Assembly
PCB Assembly to Assembly
PCB Assembly to PCB Assembly

Constraint Manager Menu:
Clearances
Constants and Variables
Via Assignments...
Apply Constraint Template...
Constraint Definitions...
Constraint Groups...
Assign Package Type Clearances...
Reset to Master...
General Clearances...
Class to Class Clearance Rule...
Z-Axis Clearances
Z-Axis Class to Class Clearance Rule...
3D Clearances

3D Clearance Overrides

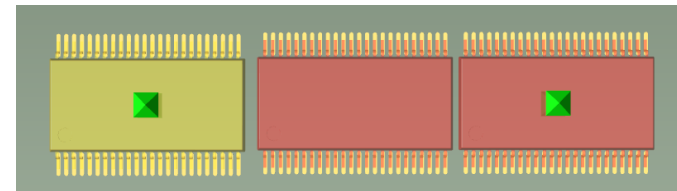
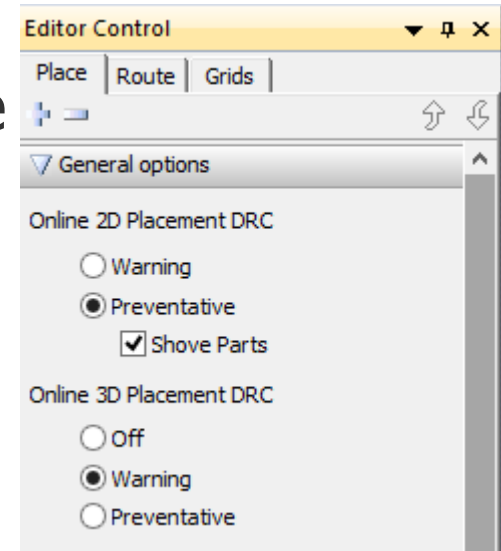
- The **Clearances** option allows the designer to see what clearances have been assigned within *Constraint Manager* as well as define some instance specific clearance overrides
 - Displays general object-to-object clearances that have been defined in *Constraint Manager* (read only)
 - Allows input of new object-to-object clearances not defined in *Constraint Manager*
 - Allows input of specific instance object override clearances based on selected models within the layout



Online 2D/3D Placement DRC

- When Components are moved in the *3D View*, both 2D and 3D clearance checks are performed based on the **Online 2D/3D Placement DRC** settings located in the *Editor Control*

- Both 2D and 3D Online DRC checks are done when new part location is chosen
- Combinations of settings can be defined
 - Warning for 2D, Preventative for 3D, or visa versa
- Dynamic 3D clearance checking when part is attached to cursor and moved
- Violations in 3D will be color coded
 - Less than Minimum (Red)
 - Between Minimum and Optimal (Yellow)

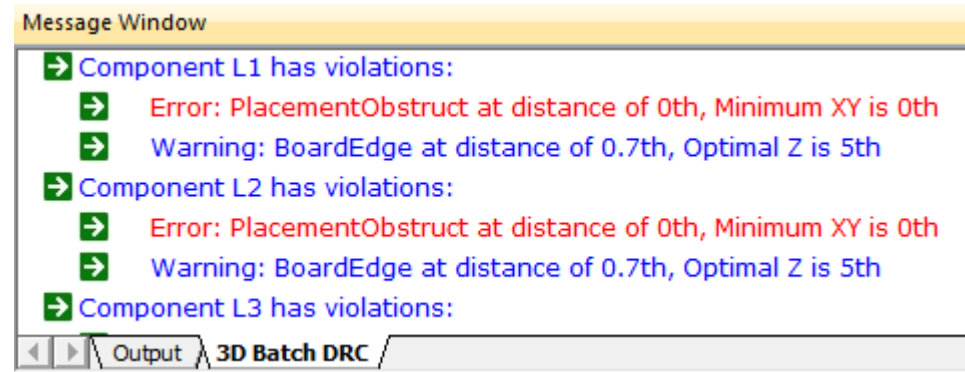
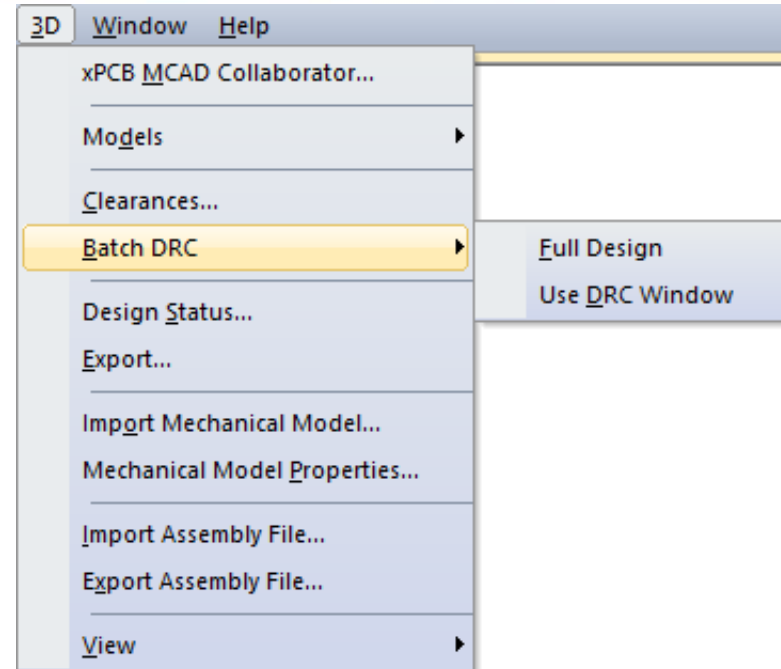


3D Batch DRC

- **Batch DRC** does a full check of the 3D Clearances defined in *Constraint Manager* and the *Clearances* dialog to validate the 3D design

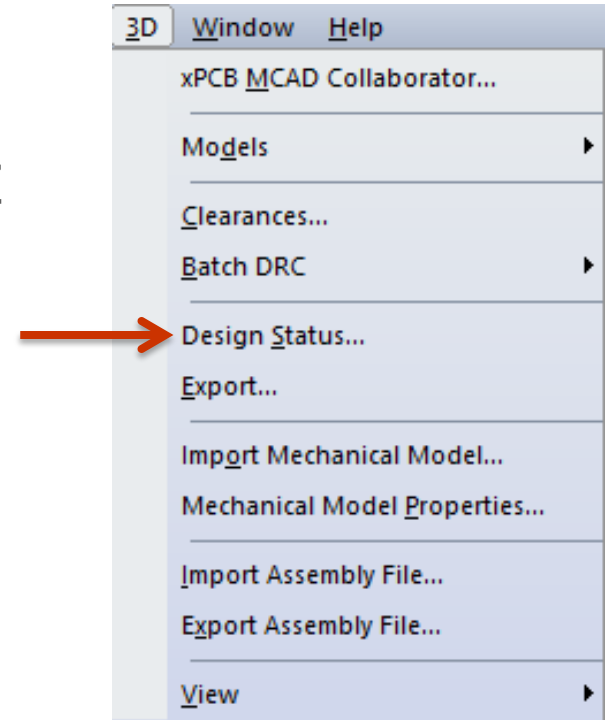
- Results from 3D *Batch DRC* are displayed in the *Message Window* and are cross probable back to the graphical violation site

- The **Use DRC Window** option is enabled when a *DRC Window* exists within the design file



3D Design Status

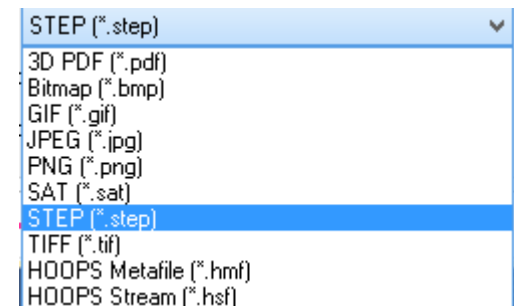
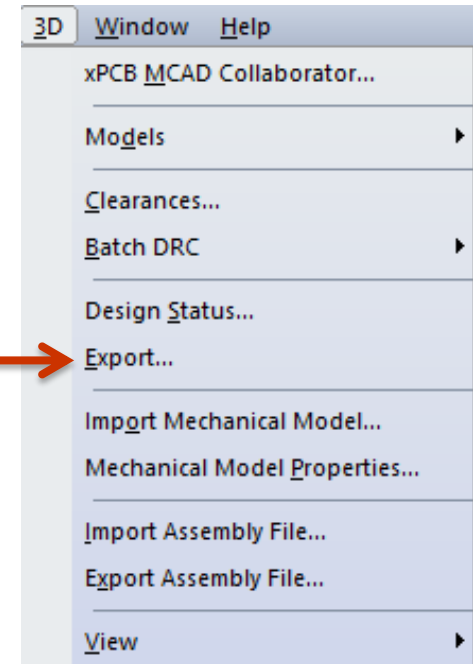
- The **Design Status** provides pertinent information about the 3D environment
 - *Design Z Extents* displays the max/min Z distance used in the design
 - *Part models found* lists the number of part models found and the mapping between *Part Numbers* and *3D Models*
 - *Part models not found* lists the *Part Numbers* within the design that do not have 3D models associated



3D Exports Supported

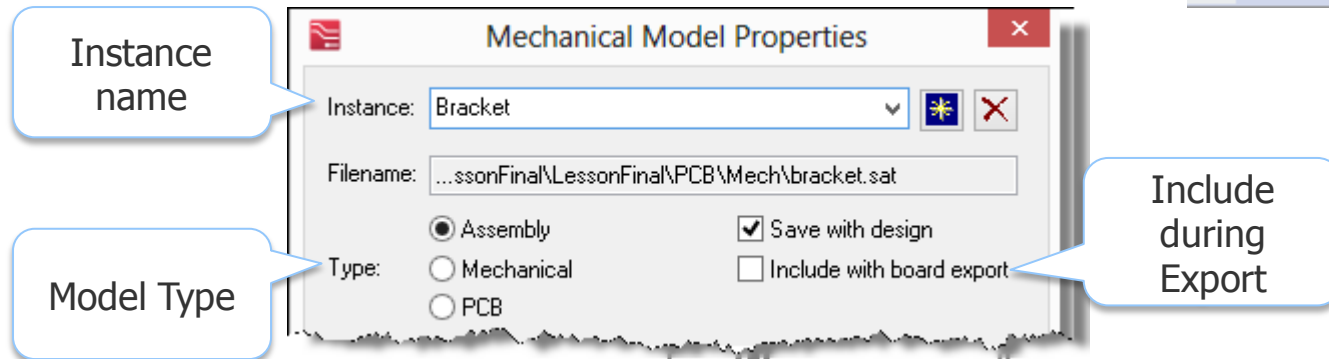
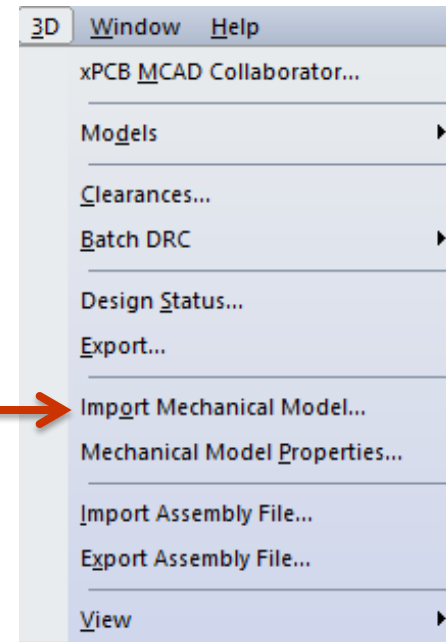
■ **Export** allows the 3D PCB to be written to a file based on typical formats

- 3D Model Formats: 3D PDF, SAT, STEP
 - 3D PDF Requires additional licenses
- Graphic Formats: Bitmap, GIF, JPEG, PNG, SAT, TIFF, HOOPS Metafile (*.hmf*) and Stream (*.hsf*)
- Option available to include imported mechanical items with the exported PCB



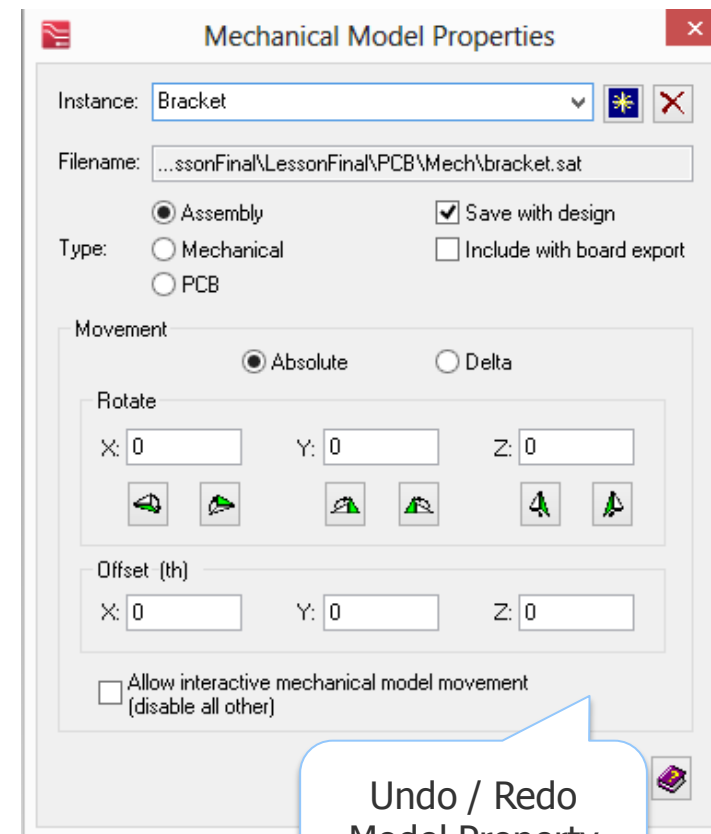
Importing Mechanical Models

- The **Import Mechanical Model** option allows users to browse for a STEP or SAT file and imported it into the 3D design
 - Once imported, the *Mechanical Model Properties* dialog allows users to assign the model an *Instance* name, model *Type* or save location
 - In addition, users can choose if the imported mechanical model will be included during future exports of the 3D board model



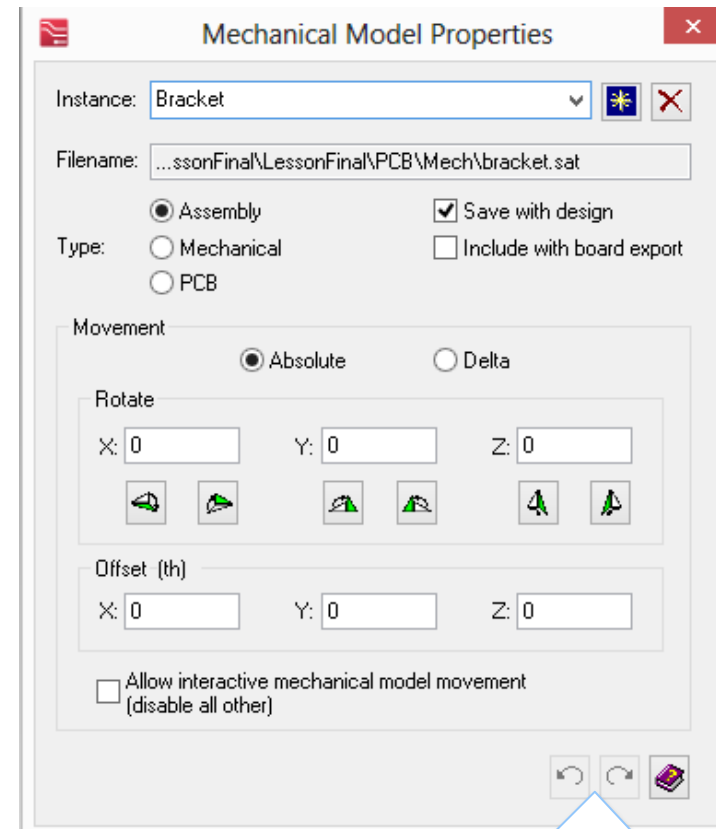
Mechanical Model Properties Dialog

- For *Imported Mechanical Models* users have the ability to define/display a number of model properties using the *Mechanical Model Properties* dialog
 - **Instance:** Unique name of the model within the 3D Layout environment
 - **Filename:** Location of imported model file
 - **Type:** Category of Model
 - ⊙ **Assembly** – Mechanical type enclosure
 - ⊙ **Mechanical** – Heat Sink, board stiffener, etc.
 - ⊙ **PCB** – PCB Solid Model (e.g., daughter card)
 - ☒ **Save with design** – enable if model should be loaded when *3D View* is opened
 - ☒ **Include with board export** – enable if model should be included during exports
 - **Movement:** Rotate & Offset movement controls
 - ⊙ **Absolute** ⊙ **Delta**
 - ☒ **Allow interactive model movement** – enable to allow cursor drag movement for model. **Shift + LMB** double click on mechanical model overrides disabled option setting



Mechanical Model Manipulations

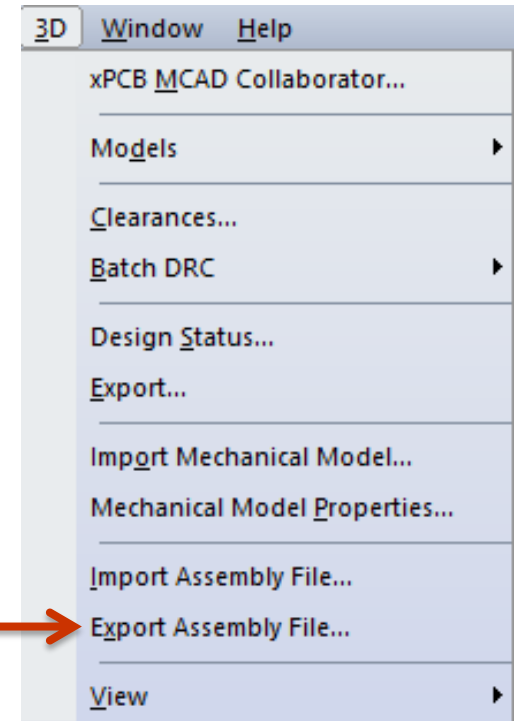
- One of the *Mechanical Model Properties* dialog main purpose is to provide users movement control of imported mechanical models within the 3D Layout
 - Location changes by either *Absolute* or *Delta* keyin values
 - User controlled option to *Allow interactive mechanical model movement* with mouse
 - Keyboard Accelerators during model movement:
 - **x** = rotate 90 about x axis
 - **y** = rotate 90 about y axis
 - **z** = rotate 90 about z axis
 - **Ctrl + LMB Drag**, copy selected assembly and drag to new position
 - **Shift + LMB Drag**, suppress online 3D DRC while dragging



Undo/Redo
Mechanical Model
Properties &
movement changes

Export Assembly File

- *Xpediton 3D Designer* allows users to export all design imported mechanical models into a single **Assembly File** (*<filename>.assy*)
- The *Assembly File* contains each model's file path\name, model scale, user defined *Instance* name, XY&Z rotations, XY&Z origin position and model type. This feature allows users to then imported this *Assembly File* later or to share with others to restore the models and their positions.
- *Assembly File* format example:

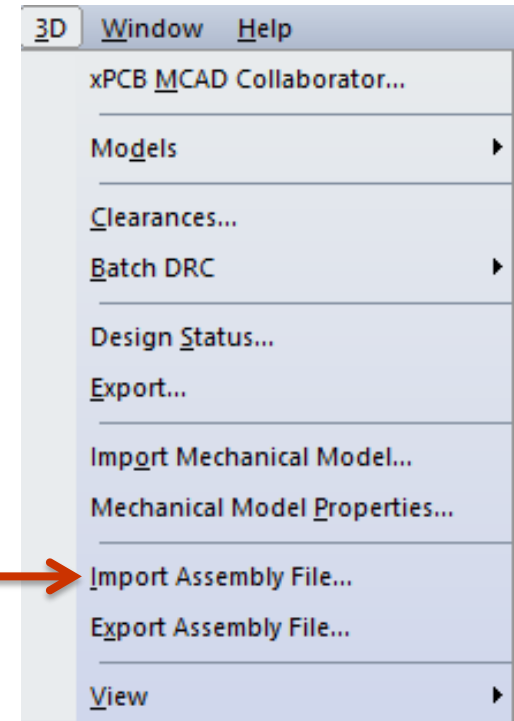


```
Assembly      "Mech\top_enclosure_logo.sat" 1.000000
Instance      "SplitBodyEnclosure_Top" 0.000000, -0.000000, 0.000000, 53.976776, 36.248444, 17.636318 Assembly

Assembly      "Mech\bottom_enclosure.sat" 1.000000
Instance      "SplitBodyEnclosure_Bottom" 0.000000, -0.000000, 0.000000, 53.935570, 36.249937, 17.645133 Assembly
```

Import Assembly File

- *Xpediton 3D Designer* allows users to import a previously saved mechanical models **Assembly File** (*<filename>.assy*)
- The *Assembly File* contains each model's file path\name, model scale, user defined *Instance* name, XY&Z rotations, XY&Z origin position and model type. This feature allows users to import multiple models at their previously defined positions at one time.
- *Assembly File* format example:

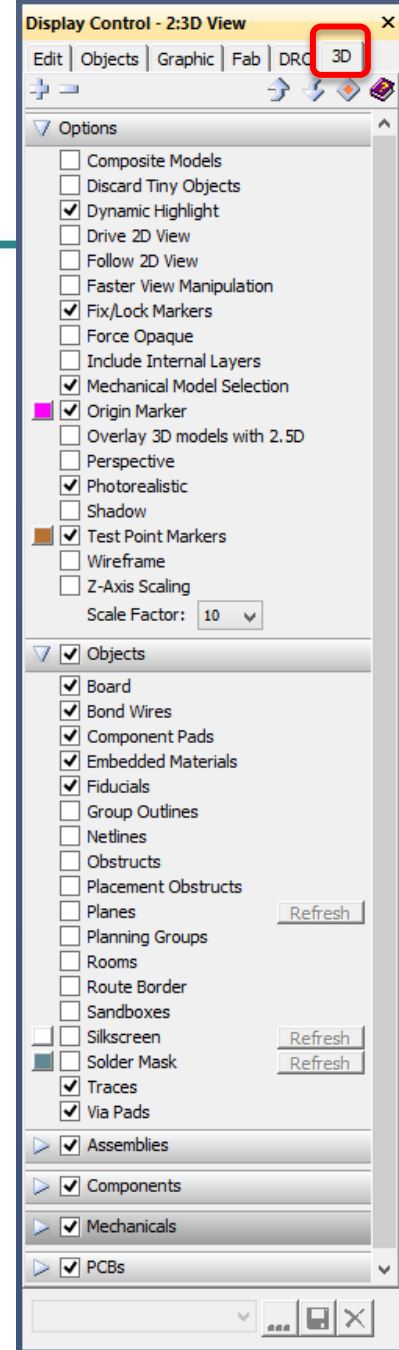


```
Assembly      "Mech\top_enclosure_logo.sat" 1.000000
Instance      "SplitBodyEnclosure_Top" 0.000000, -0.000000, 0.000000, 53.976776, 36.248444, 17.636318 Assembly

Assembly      "Mech\bottom_enclosure.sat" 1.000000
Instance      "SplitBodyEnclosure_Bottom" 0.000000, -0.000000, 0.000000, 53.935570, 36.249937, 17.645133 Assembly
```


3D Display Control

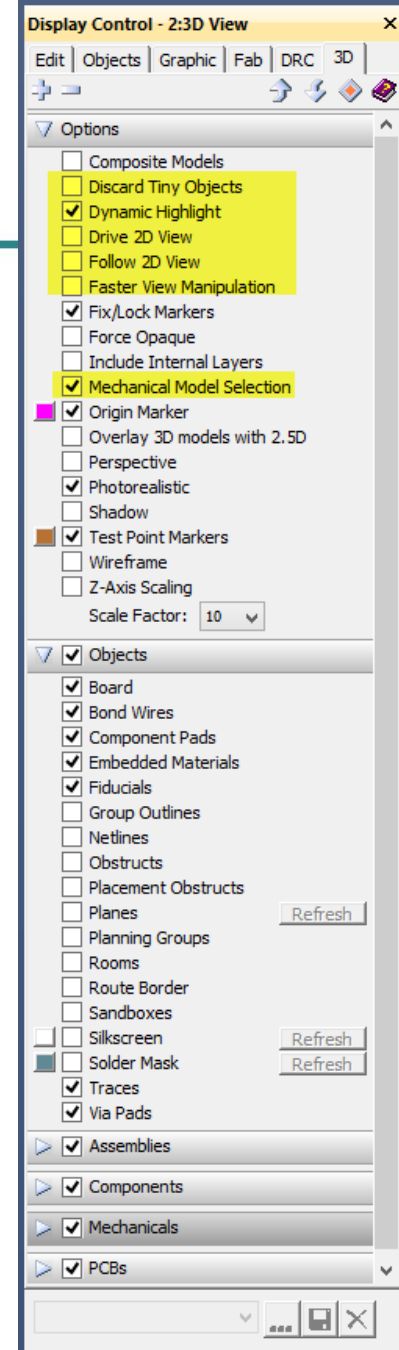
- When a 3D View is active, the *Display Control* will include a 3D tab providing exclusive control of the *3D View*
 - 3D Section Definitions:
 - **Options:** Provides user control of the different 3D viewing options
 - **Objects:** Provides 3D visibility control of the objects displayed within the *3D View*
 - **Assemblies, Components, Mechanicals and PCBs:** These sections allow the user to control individual and group visibility of the design imported 3D *Assembly*, *Mechanical* and *PCB* models, as well as component models mapped and aligned to land patterns



3D Display Control (cont.)

■ Frequently used **Options** features:

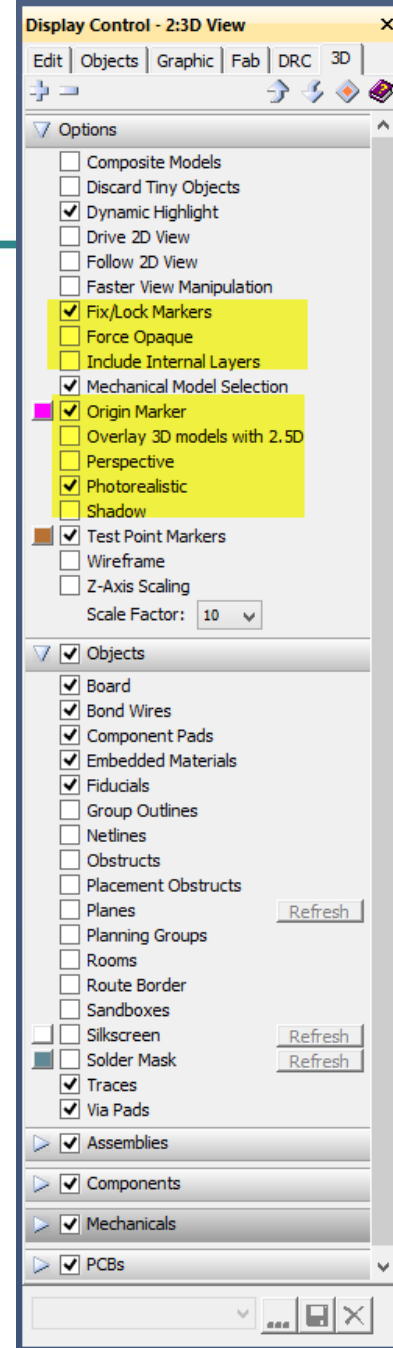
- ☑ **Mechanical Model Selection:** Enables graphical selection of imported 3D models
- ☑ **Discard Tiny Objects:** Helps improve performance on large PCB designs
- ☑ **Dynamic Highlight:** When hovering over 3D model with cursor, it is dynamically highlighted
- ☑ **Drive 2D View:** As *3D View* focus changes, 2D view is automatically synchronized
- ☑ **Follow 2D View:** As 2D view focus changes, *3D View* is automatically synchronized
- ☑ **Faster View Manipulation:** Automatically toggles objects off during many view manipulations and helps improve performance on large PCB designs



3D Display Control (cont.)

■ Frequently used **Options** features (cont.):

- ☑ **Fix/Lock Markers:** Displays purple *Fixed* and *Locked* diamond model markers
- ☑ **Force Opaque:** Displays PCB in *3D View* solid without transparency
- ☑ **Include Internal Layers:** Loads the Trace/Plane and Vias for internal route layers
- ☑ **Overlay 3D models with 2.5D:** Graphical shows the difference in 2.5D cell and 3D model
- ☑ **Perspective:** Enables perspective graphical viewing
- ☑ **Photorealistic:** Enables photo realistic graphical view instead of basic color hues seen in 2D view
- ☑ **Shadow:** Displays PCB shadowing

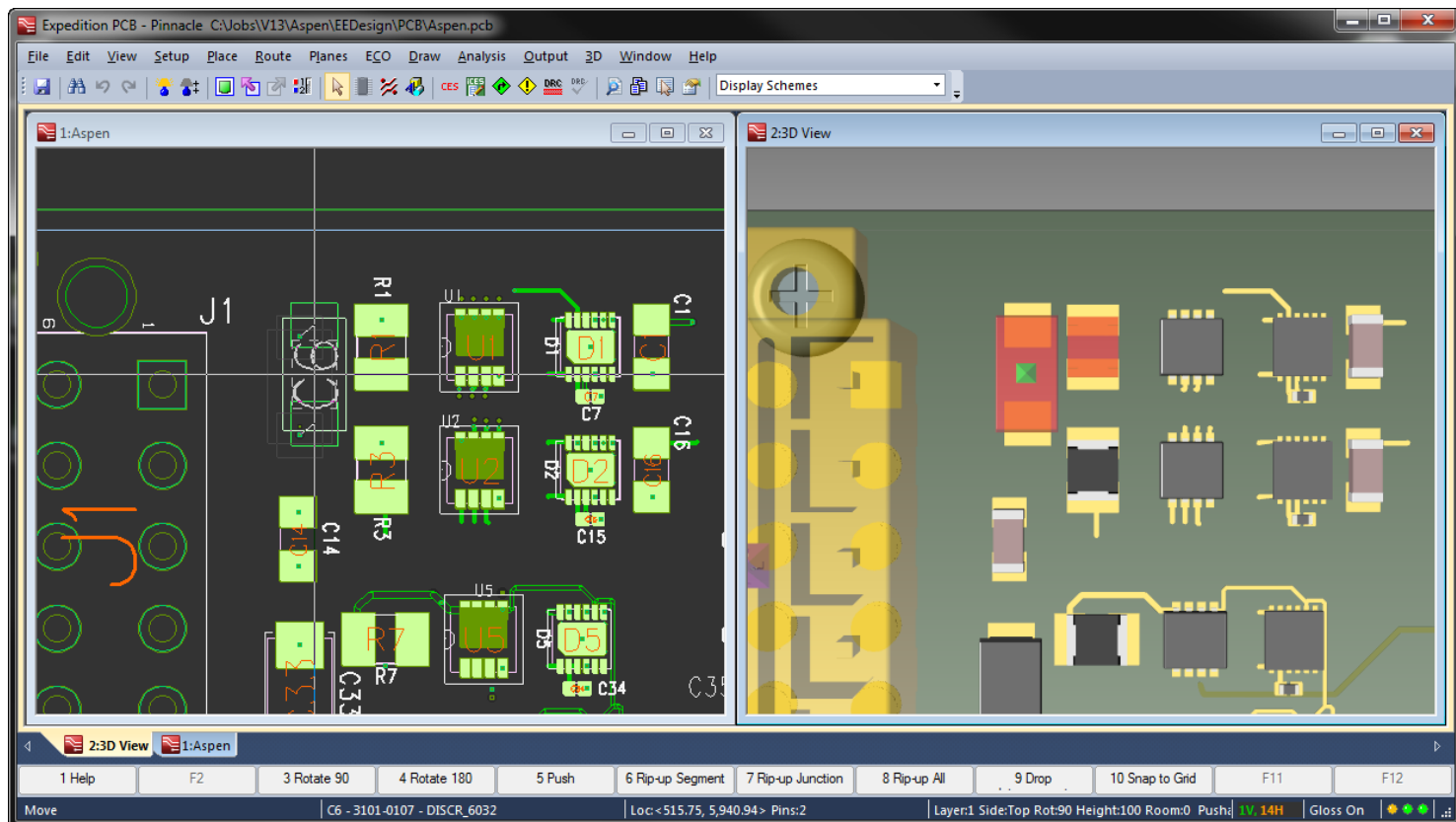


3D Hole Display

- By default all Mounting Holes, Contours and Cavities are displayed as 3D cutout from the 3D Solid Board Model. Other holes for Components and Vias will not be displayed by default unless the user enables the Scaling Factor within Display Control.
 - Scaling factor when enabled allows the user to increase the boards thickness allowing holes to be better visualized.

2D ⇌ 3D View Tracking

- These options allow the designer to synchronize the 2D and 3D views based on pan/zoom actions in each view

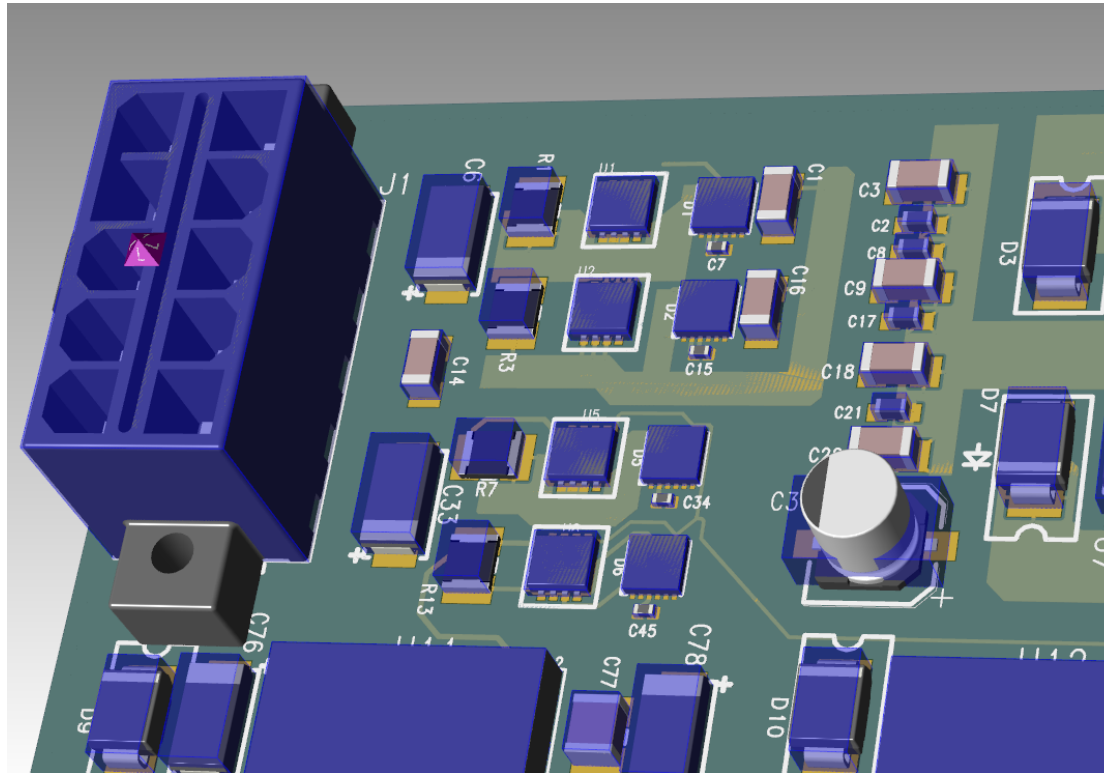


Performance Improvement Features

- *Display Control* options **Discard Tiny Objects** and **Faster View Manipulation** improves performance on large PCB designs during pan/zoom and tilt operations. Based on the zoom level, the software will automatically remove from the view small objects that don't require extensive detail, thus improving the graphics performance of the system.
 - Testing has shown by enabling these options on large designs, especially when zoomed out, will boost the graphics performance by orders of magnitude

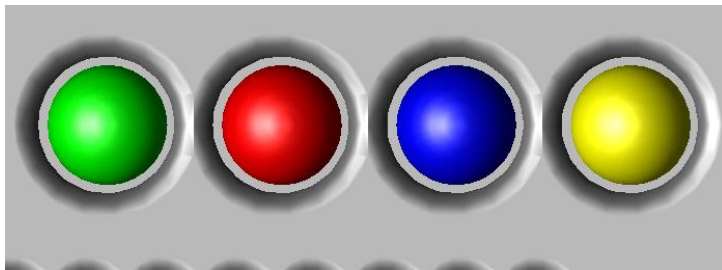
Overlay 3D models with 2.5D

- This *Display Control* feature provides the designer with the ability to visually check the 3D model with the 2.5D model (extruded 2D *Place Outline*) and the land pattern

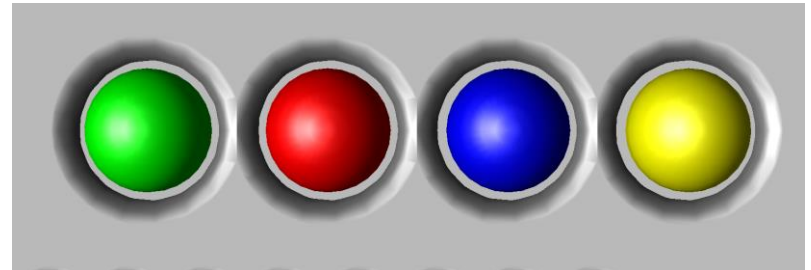


Perspective Viewing

- When the human eye views a scene, objects in the distance appear smaller than objects close up - this is known as a *Perspective* view. The **Perspective** definition in the *3D View* displays distant objects smaller to provide additional realism. Non-perspective viewing ignores this effect which can allow for more accurate measurements.
 - When performing measurements or model alignments, it's best to disable (turn OFF) the *Display Control Perspective* view option



Non-perspective

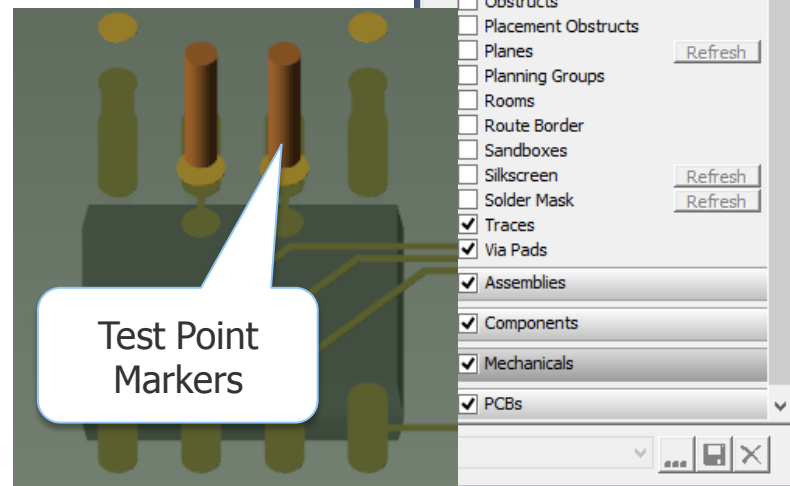
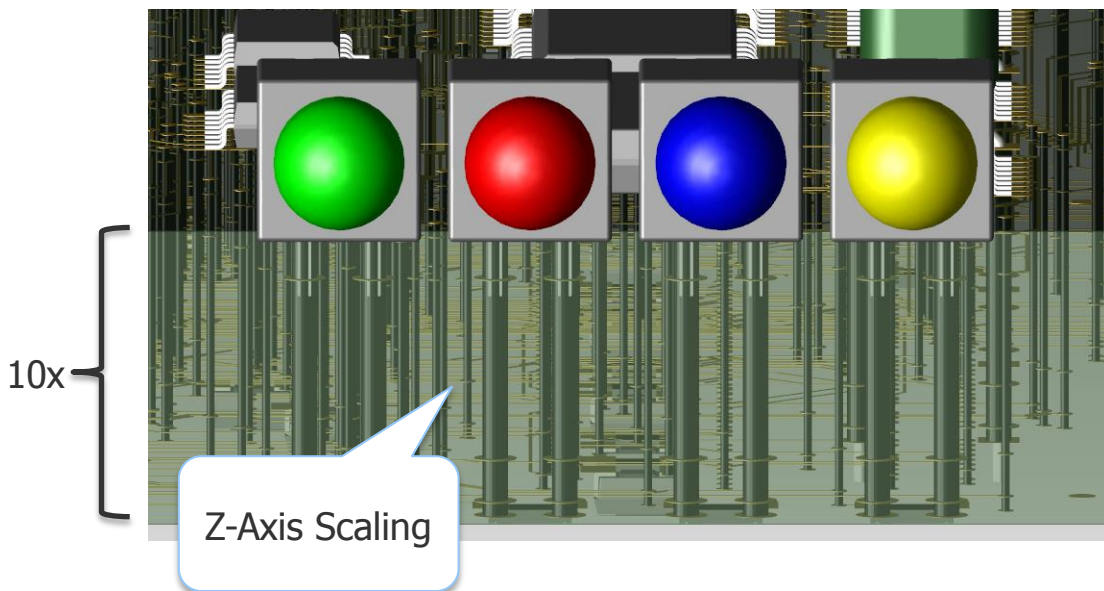
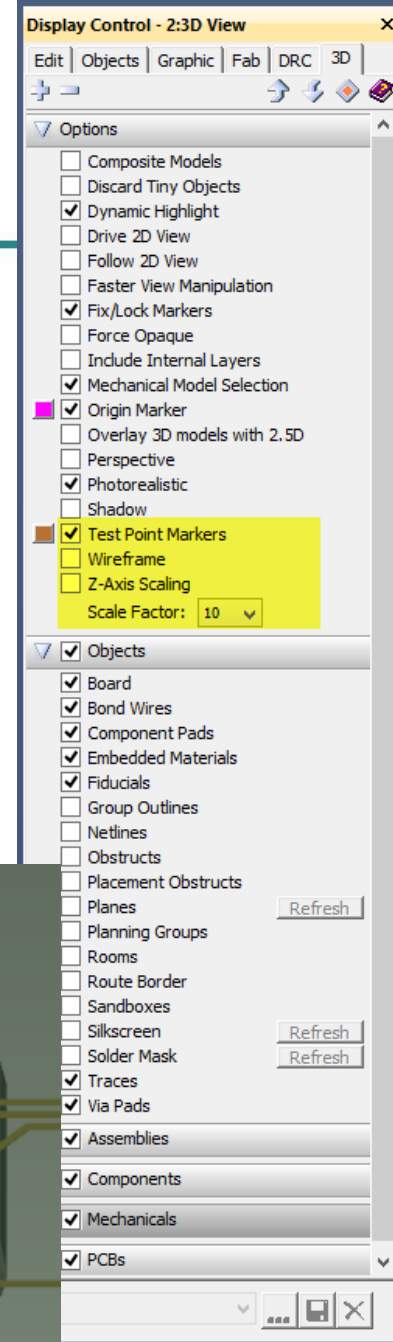


Perspective

3D Test Points & Z-Axis Scaling

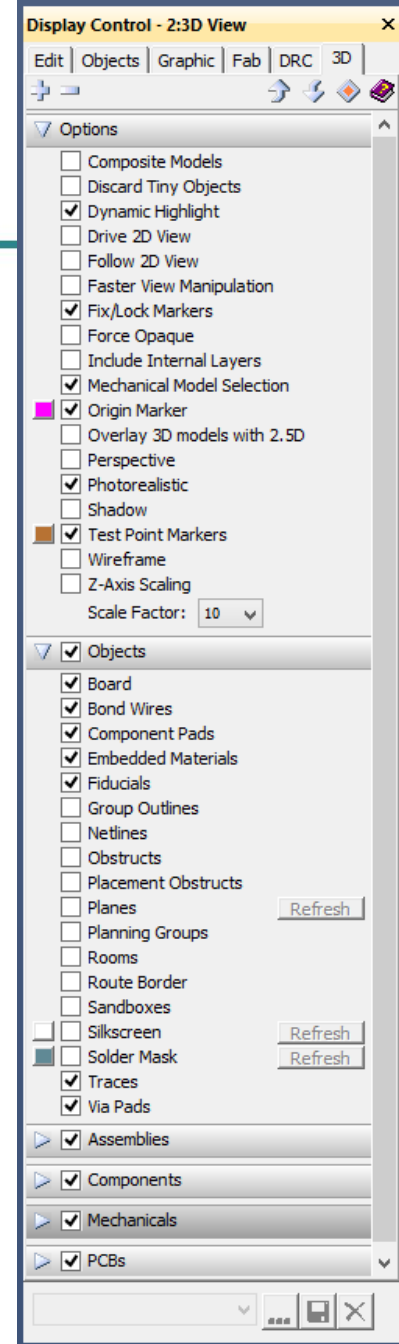
■ Additional **Options** features:

- ☑ **Test Point Markers:** Displays graphical marker over pads with test points
- ☑ **Wireframe:** Enables a wireframe graphical view
- ☑ **Z-Axis Scaling:** Scales the Z-axis of the board making it easier to visualize internal layer structure



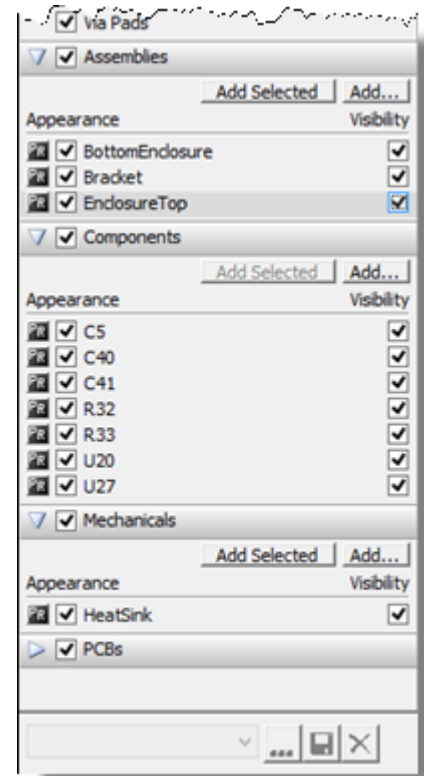
3D Object Display Controls

- The Objects sections lists out different objects within the PCB data model for which users can control (On/Off) in the *3D View*
 - ☑ **Silkscreen**: controls the display and color of the *Generated Silkscreen* graphics in the *3D View* created by the *Silkscreen Generator* within the 2D environment
 - ☑ **Solder Mask**: controls the display and color of the “mask” as seen on the physical board
- *Planes, Silkscreen, and Solder Mask* objects are not dynamically updated when changes occur in the 2D view, thus a **Refresh** button has been provided to manually update these objects within the *3D View*



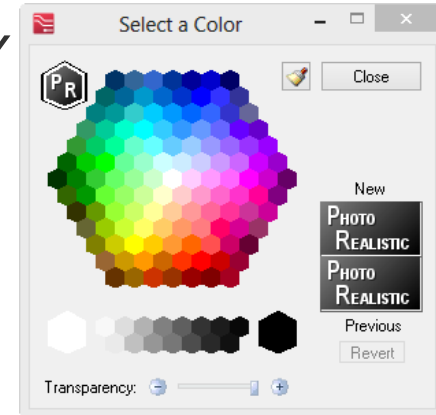
Advanced 3D Display Controls

- **Assemblies, Components, Mechanicals, and PCBs** sections allow additional graphical control of visibility and color of individual object types by adding them to the *Display Control* dialog
 - **Add Selected** button: This option adds *3D View* selected object types to their respective section in the *Display Control*
 - **Add...** button: Opens object type dialog that lists all *Assemblies, Components, Mechanicals, or PCBs* within the design so that users can manage respective object types using pick list
 - **Appearance** checkboxes, left column on *Display Control*, controls color display of individual objects. The *PR* icon designation means *Photo Realistic*, however when icon is selected a color override can be defined
 - **Visibility** checkboxes, right column on *Display Control*, controls visibility of objects



Assemblies and Component Visibility

- For each 3D model type added to the *Display Control*, users can individually manage each model's appearance
 - Modify model color or transparency
 - Toggle the display On/Off by model

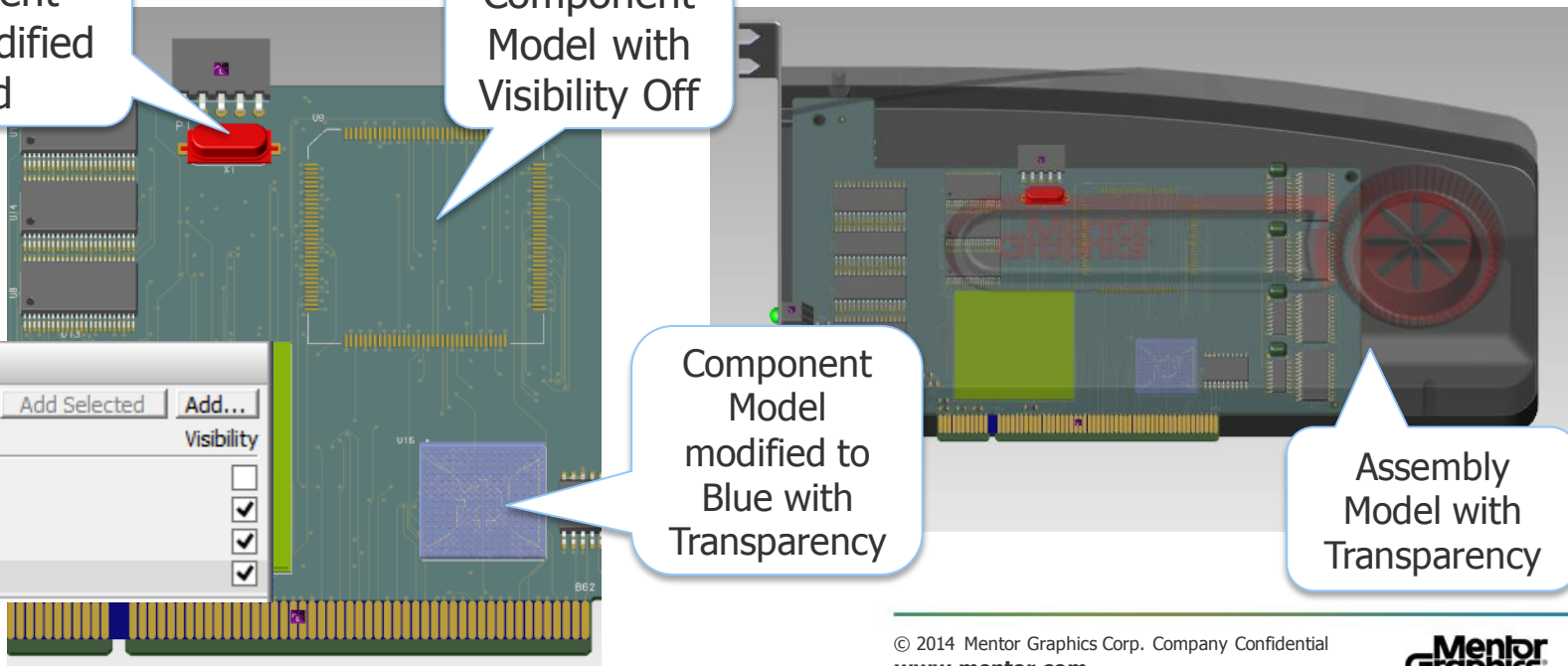
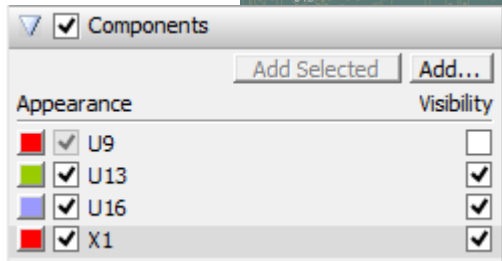


Component Model modified to Red

Component Model with Visibility Off

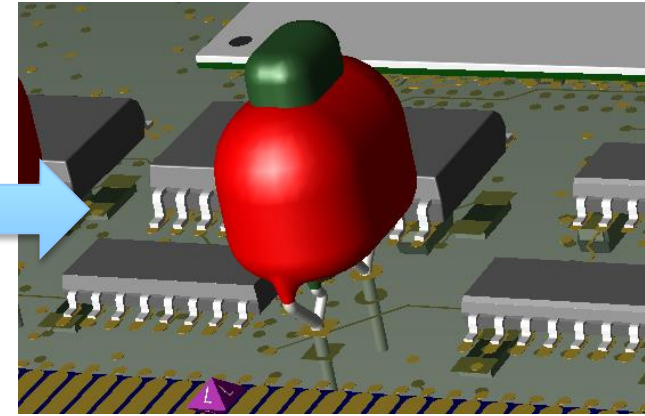
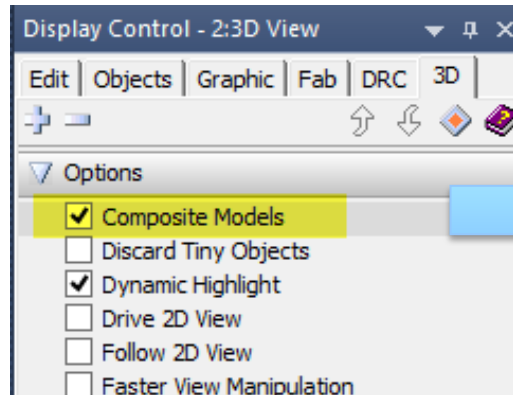
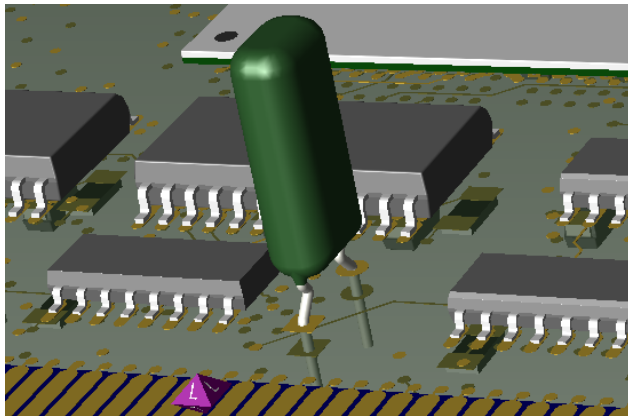
Component Model modified to Blue with Transparency

Assembly Model with Transparency



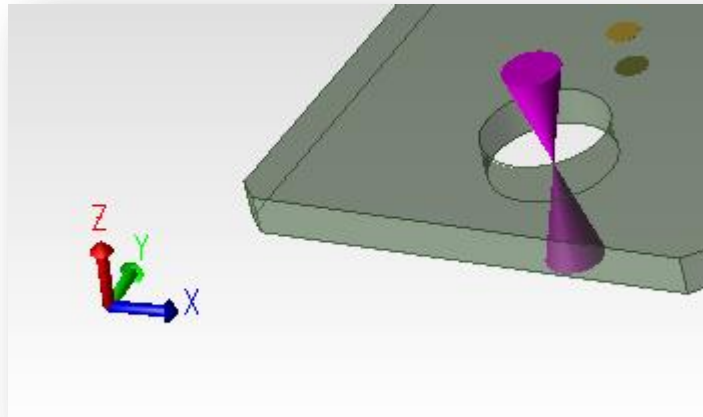
Composite Models

- *Xpediton 3D* allows the xDM librarian to map multiple manufacturing parts to a single component allowing the designer to take into account differences with 3D models from each manufacturer. The *Composite Models* option provides designers with alternate case scenarios.
 - The *Display Control* **Component Models** option will update the *3D View* to display and allow DRC using multiple models that have been mapped within the library



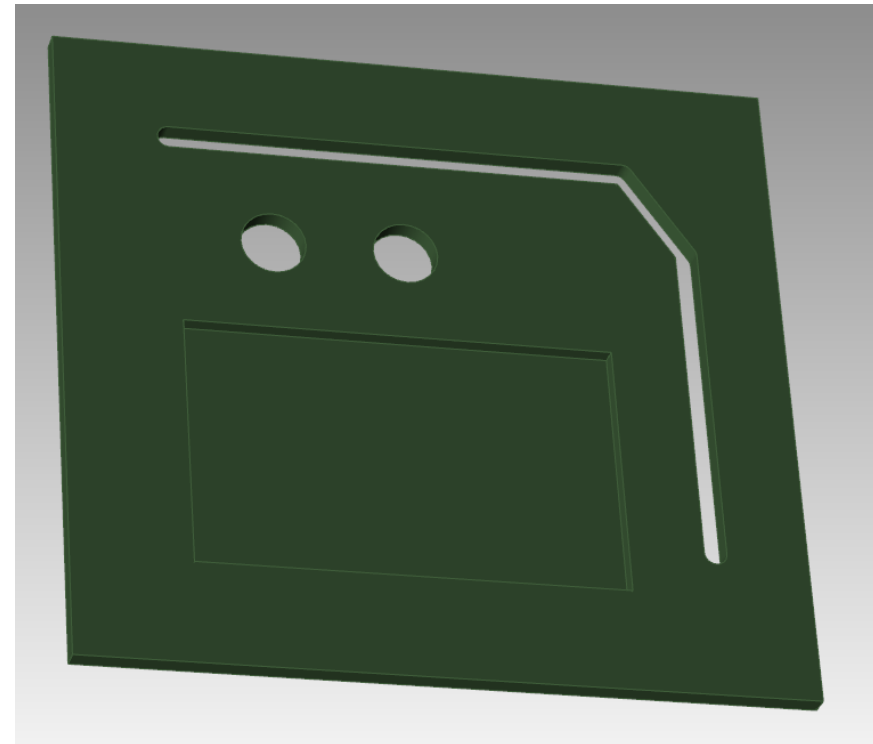
Special 3D Display Objects

- The *Xpedition 3D View* will display two special objects:
 - The *3D Origin* is always defined at the same XY position as within the 2D environment. However, the Z-Axis=0 location will always be set at the bottom of the PC board. The *3D Origin* is designated in the *3D View* using a special set of cones shown at the XY&Z origin location.
 - The *3D View's* XYZ view perspective can always be seen in the lower left corner of the design using the **3D Triad**. The *3D Triad* may also be selected and used to manipulate the viewing angle.



Contours, Mounting Holes and Cavities

- One of our main objectives for 3D was to provide users an accurate representation of various PC board features, therefore *Contours*, *Mounting Holes* and *Cavities* are all supported in precise detail
- Due to this supported detail, it is very important that *Contour Types* be correctly defined
 - **Internal Contour's** are cut outs in the board area
 - **Board Contour's** are ignored, but if a *Board Contour* is made in the board area, it can cause issues when being sub-tracked

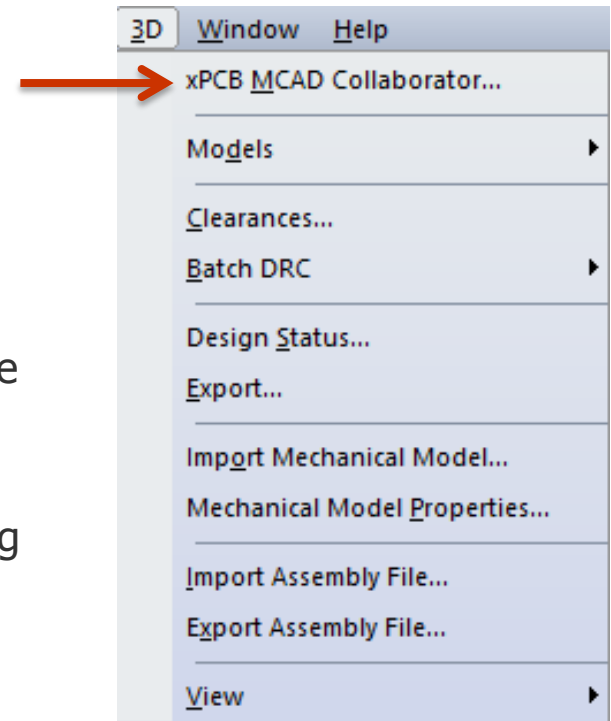


MCAD Collaborator (EDMD)

- *MCAD Collaborator* is integrated within *Xpedition 3D Designer* allowing real time collaboration with a mechanical system

- Requires *MCAD Collaborator* license
- Event monitor alerts ECAD of MCAD changes
- Provides real-time previews and animation to ensure users avoid physical interferences between Boards, Components and Enclosures
- Ensures correct alignment across connectors, mating parts, holes and apertures

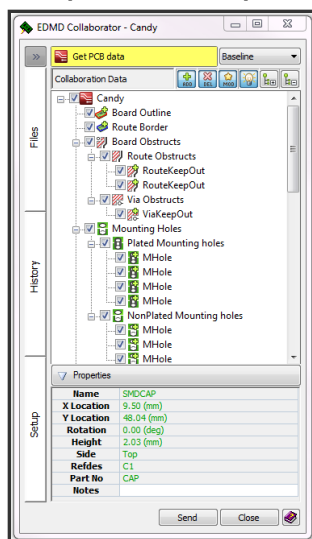
- MCAD Partners currently supporting ProSTEP iVIP EDMD Collaboration



MCAD Collaborator Overview

■ New GUI Key Features

GUI – User View
Expand/Collapse

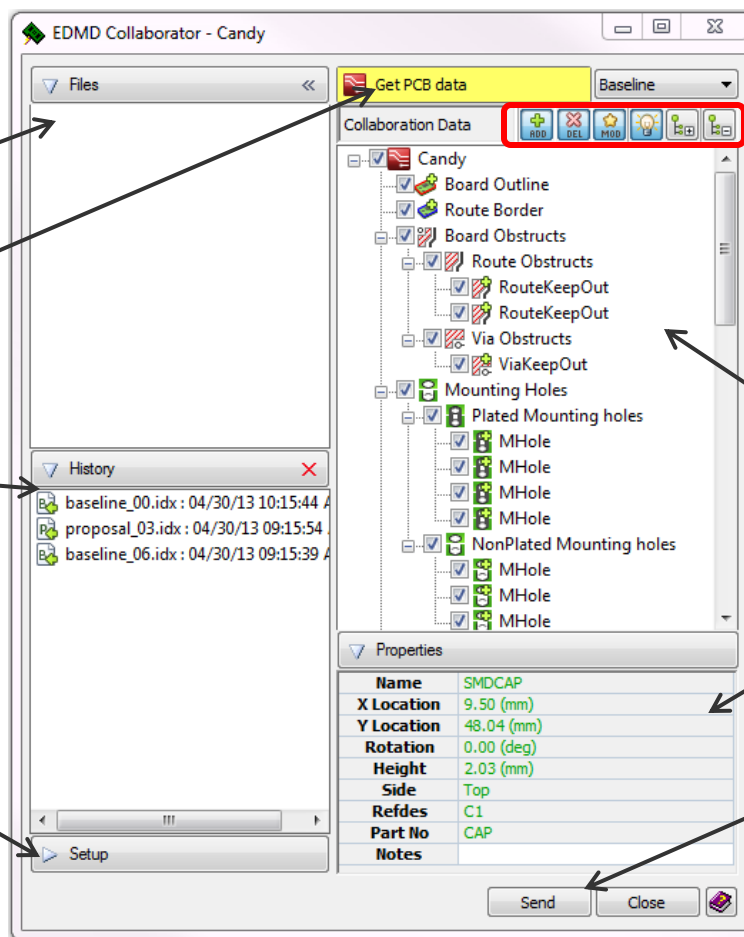
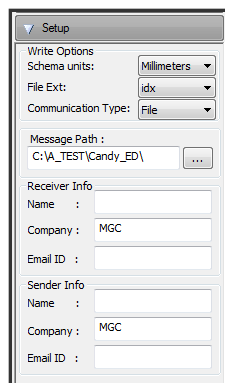


File Watcher
Pane

Get PCB Data
and Modification
Notification

File History Pane
Receive/Sent

Setup
Collaboration
Preferences



Transaction
File Type
Baseline, Proposal
or Response

Tree Display
Options
Data Types,
Highlighting, and
Tree Expand/Collapse

Collaboration
Data Pane

Properties Pane

"State" Aware
Send or Apply

3D Space Mouse Support

- In order to provide optimal user input into *Xpedition 3D Designer*, 3DConnexion Space Mouse hardware will be supported to make the manipulation of the *3D View* as efficient as possible





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