



EN1740 Computer Aided Visualization and Design

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Last Time:

- Measuring within Pro/E
- 2D representation
 - Orthographic projection
 - 3rd Angle vs. 1st Angle
- Creating engineering drawings

Tonight:

- Standards and practices governing engineering drawings



Applicable drafting standards

- ASME Y14.5-2009 governs 2D representation of mechanical components
 - Standard provides a method of communicating designs efficiently minimizing confusion
 - Standard governs dimensions applied to 2D only
 - ASME Y14.41 defines dimensioning in 3D CAD files
- *NO STANDARD CAN BE COMPLETELY DEFINE EVERY TYPE OF COMPONENT OR SCENARIO*
 - Understanding standard provides a structure for creating clear, concise and effective drawings



Purpose

- 2D drawings provide location and size for the features contained in a component
 - Originally, this was the *only* tool available to do this
 - Components needed to have every feature highlighted
 - Currently, 2D representations set the stage to highlight critical dimensions and tolerances
- Drawings accomplish their mission through the use of dimensions, dimensioning schemes, tolerances, notes, symbols, etc.



Drawing and Dimensioning Checklist

- Location and Size of all (critical) features
- Extension (Witness), Dimension and Leader lines within standard
- Proper Arrowheads and Character size
- Unidirectional Dimensions
- Scale noted on drawing
- Conventions for applied units
- Dimensioning scheme expresses Design Intent
- Dimension placement within standard
- Necessary notes have been applied
- Use of language is minimized



Location and Size

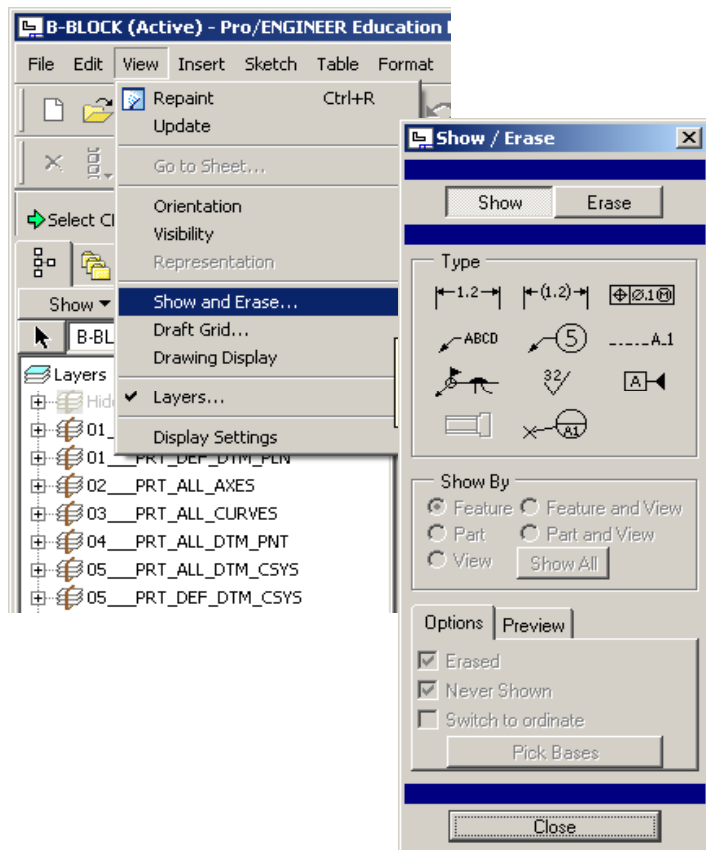
- Most basic function of engineering drawing
- Features must be located and sized in all three dimensions
- Some locations are implied (e.g. through holes)

Fig. 3-1, B. A. Wilson, GD&T App. And Intr., 2010



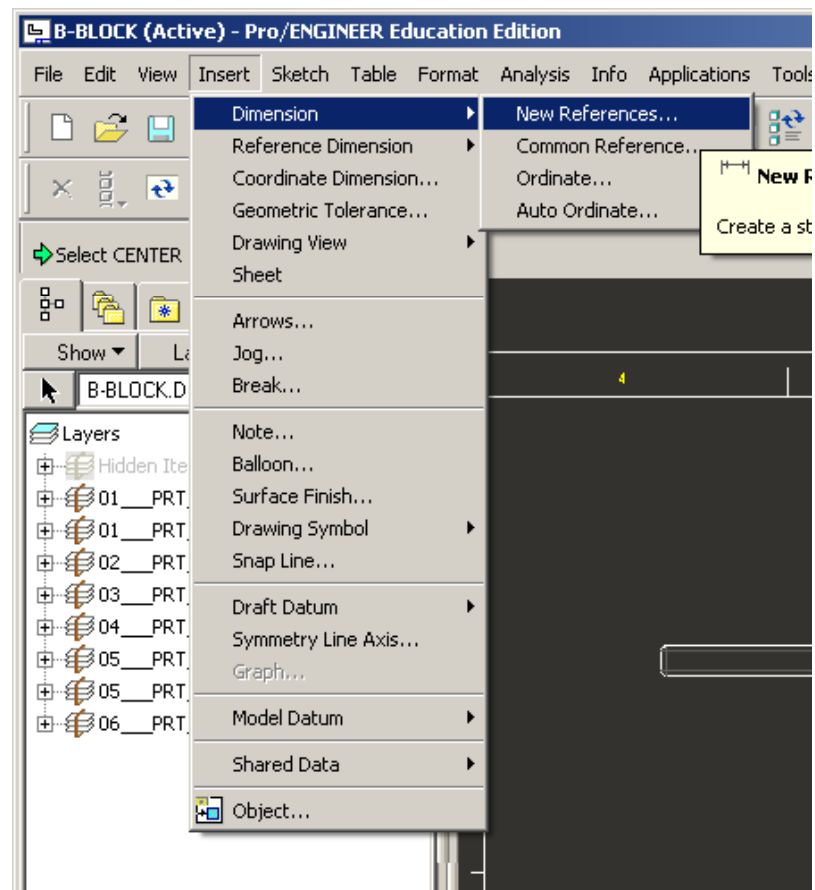
Pro/E will create dimensions in two ways

Driving vs. Driven dimensions



Driving dimensions are created in part files and shown using the Show/Erase dialog

Driven dimensions are created from Insert menu





Pro/E will create dimensions in two ways

Driving vs. Driven dimensions

Driving Dimensions

- Used to create 3D solid model
- Can be modified in the drawing file to change part geometry
- Can be shown though feature is no longer there! (Be careful)

Driven Dimensions

- Essentially “dumb” => only knows drawing references
- It is possible to grab incorrect references and represent incorrect dimensions!
(Be careful)



Line types

Object, Dimension, Extension and Leader Lines

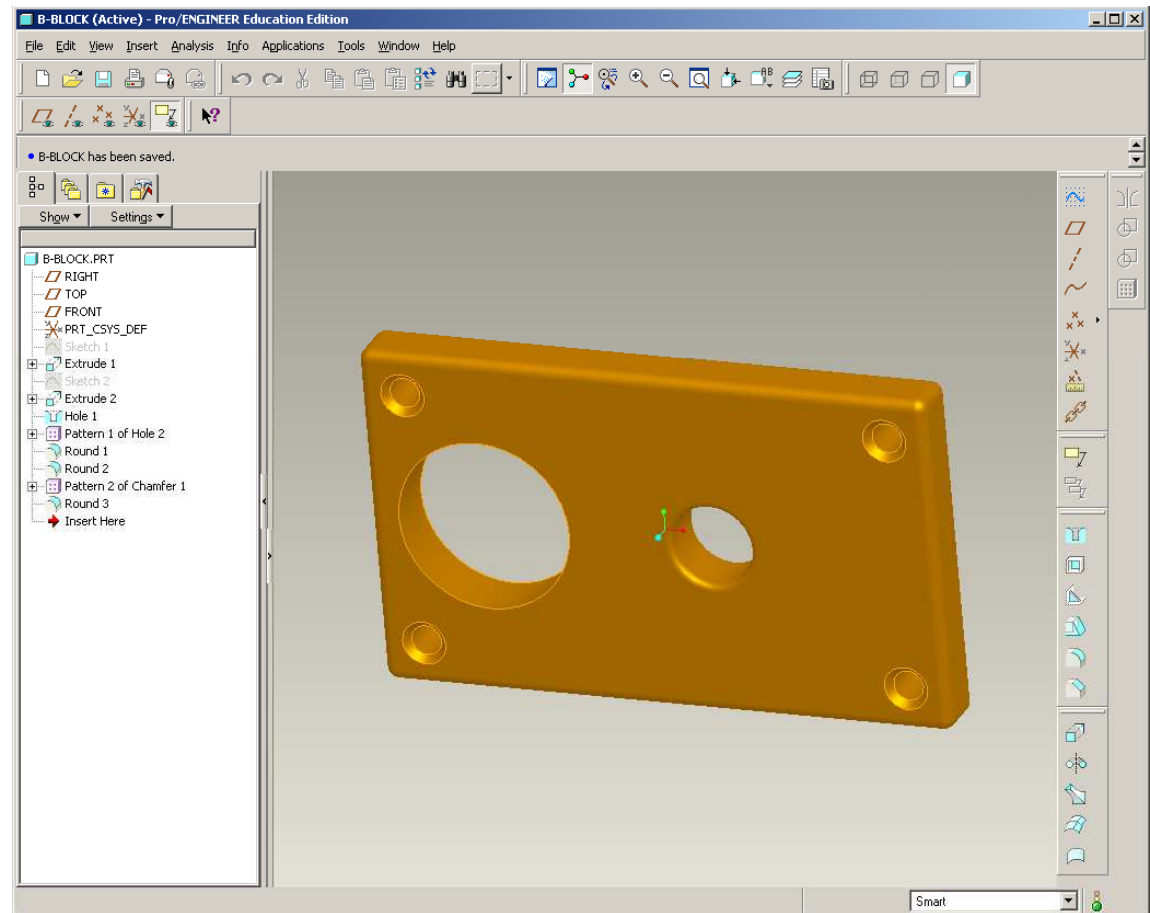
- Object lines
 - Define part geometry
 - Medium line weight
- Dimension lines define size
- Extension lines point to feature
- Leaders draw focus of notes
 - These three are of thin line weight
- Both APPEARANCE and APPLICATION of these lines can be controlled by Pro/E
 - APPEARANCE can be automated
 - APPLICATION...not so much. This is up to the engineer.

***Fig. 3-2, B. A. Wilson, GD&T App.
And Intr., 2010***



EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

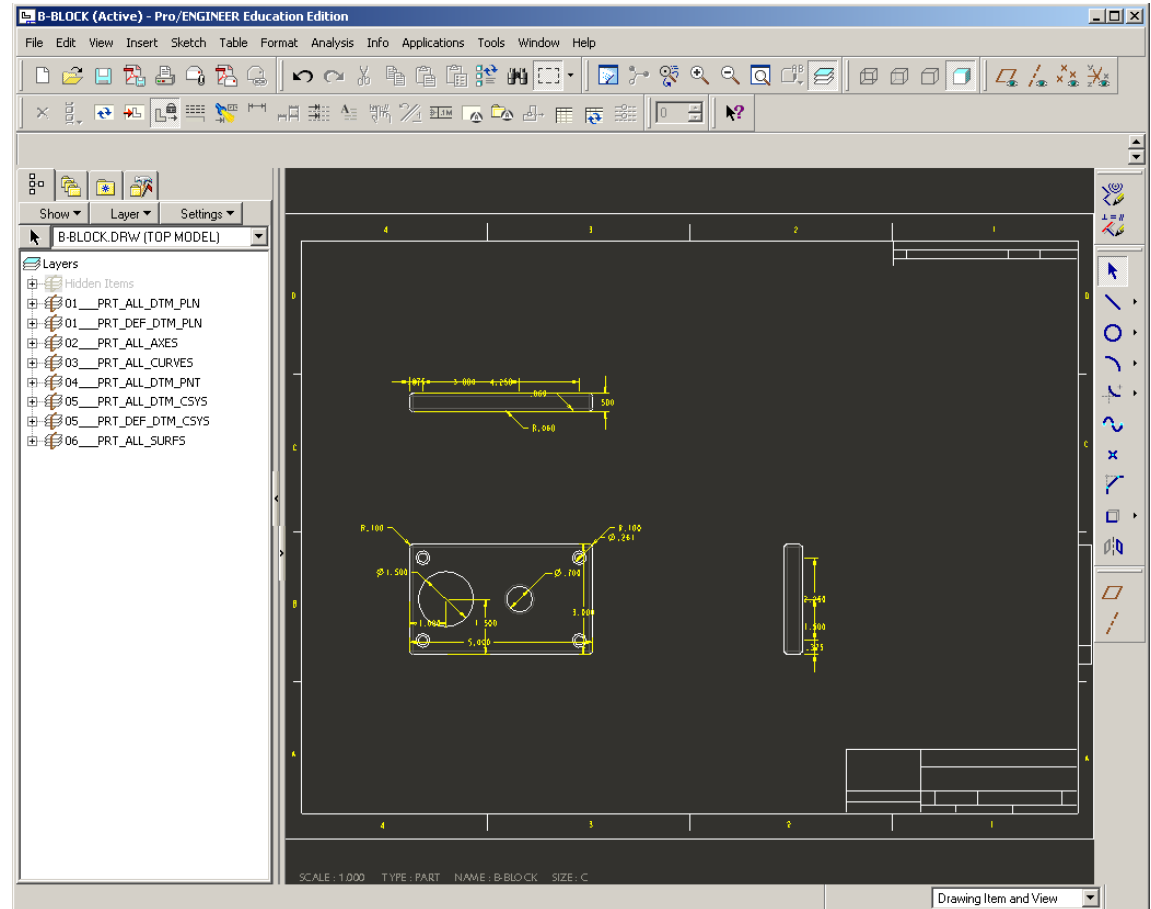
- Open b-block.prt or download from Supporting Materials section of webpage
- Create a new drawing for this part (File > New > Drawing, etc.)





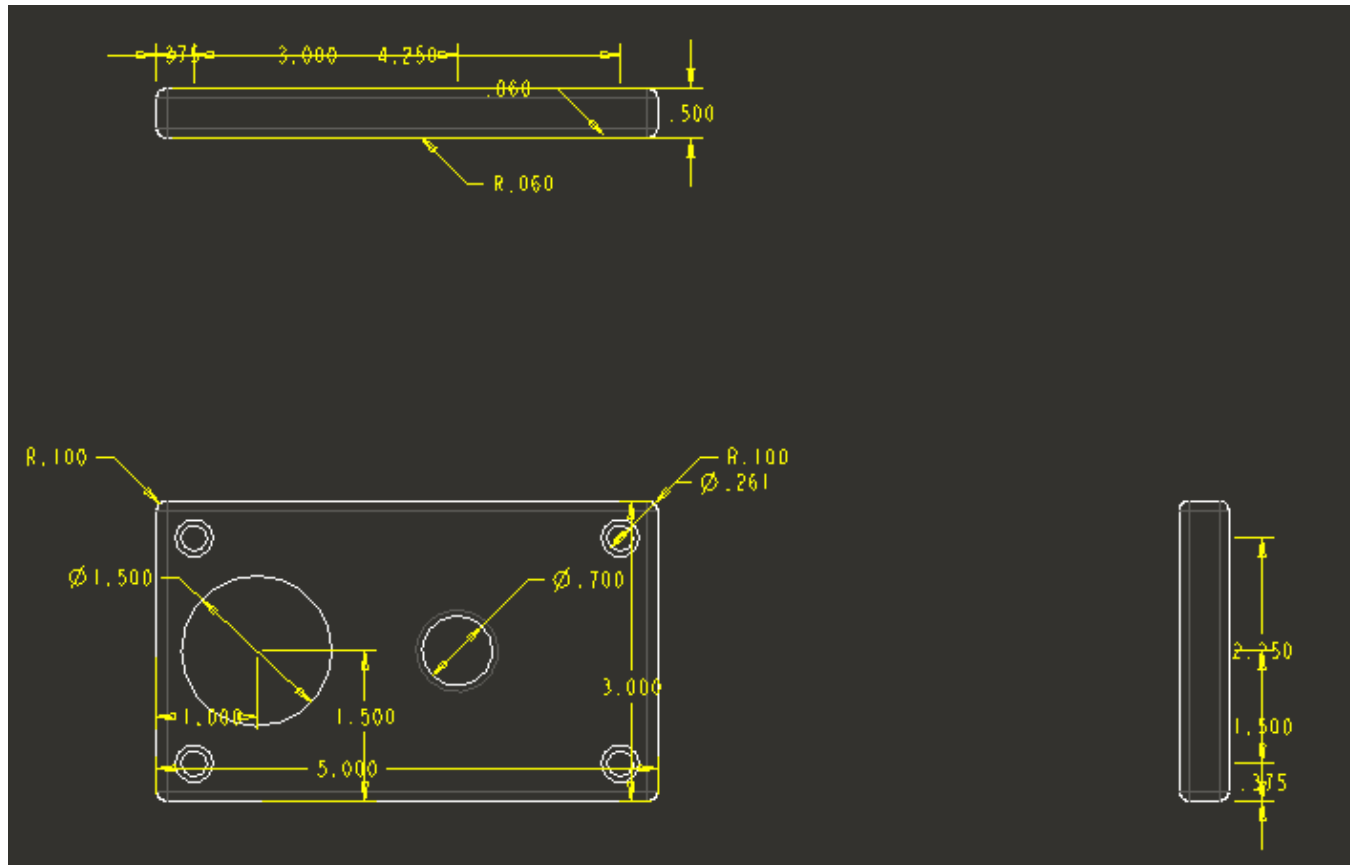
EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

- Create *FRONT*, *RIGHT* and *TOP* views
- Show All dimensions for all views





EXERCISE – Format Extension, Dimension, Leaders and Arrowheads



What's wrong with this picture?



EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

Proper extension spacing

- Space from object
 - .03in minimum
 - .06in recommended
- Space past dimension lines
 - Approx. .125in

*Fig. 3-2, B. A. Wilson, GD&T App.
And Intr., 2010*



EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

Proper dimension spacing

- Space from object
 - .4in minimum
 - .5in recommended
- Space between dimensions
 - .24in minimum
 - .38in recommended

Fig. 3-3, B. A. Wilson, GD&T App. And Intr., 2010



EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

Arrowheads

- Should be filled

Text

- All text should now be .125in

Leaders

- Avoid awkward placements

Units

- For inches no leading zero
- Number of decimals should correspond to “title-block tolerances”

***Fig. 3-5, B. A. Wilson, GD&T
App. And Intr., 2010***



EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

General Dimension Guidelines (Wilson, 2010; ASME Y14.5-2009)

- Dimension where feature contour is shown
- Dimension between views
- Dimension off the views (outside object).
- Dimension with consideration to Design Intent
- Create logical arrangement of dimensions
- Stagger dimension values.
- Avoid dimensioning to hidden lines.

Pro/Engineer's display of dimension violated all of these

Good idea, but beyond the course

- *Consider the fabrication processes and capabilities*
- *Consider the inspection processes and capabilities*



EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

Don't double dimension.

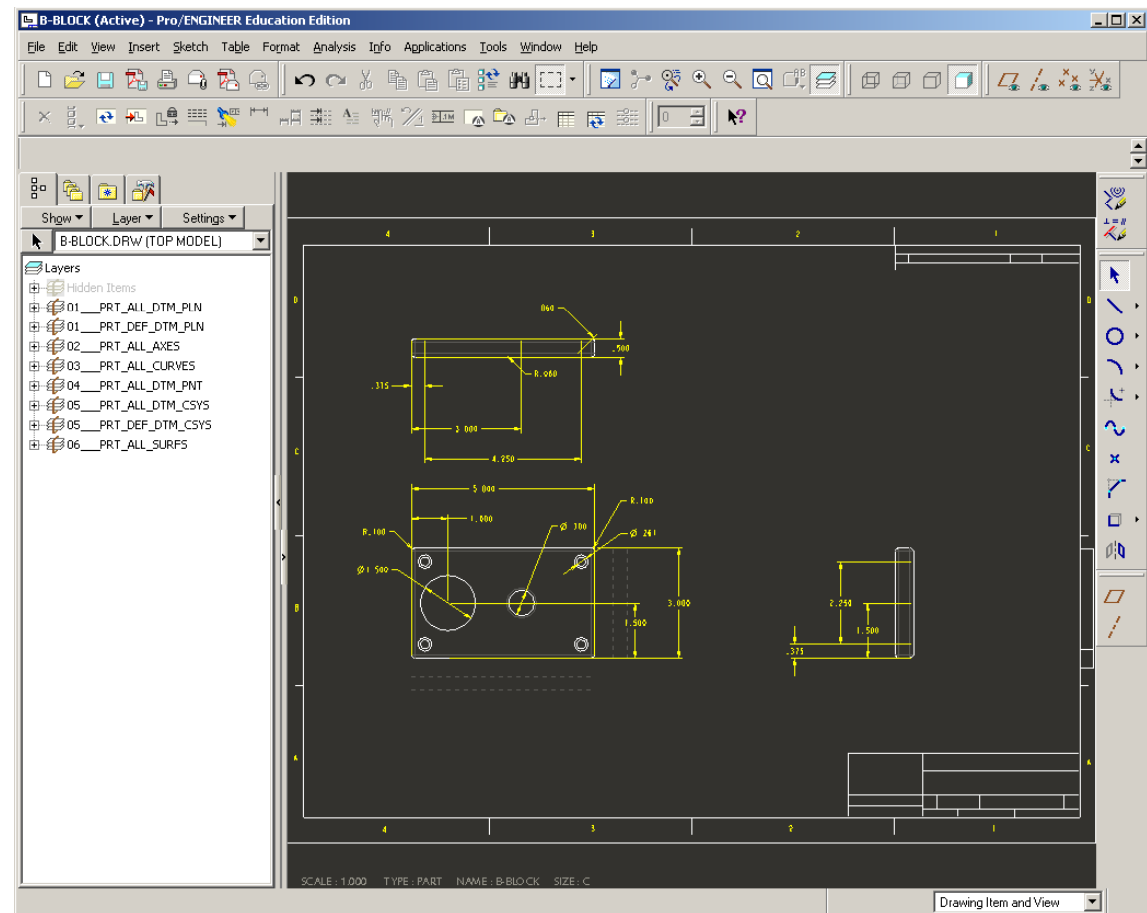
- *Wilson provided an example of an exception to this rule.*
- ***Just say NO!***

Fig. 3-31, B. A. Wilson, GD&T App. And Intr., 2010

EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

Back to work – Start by moving dimensions where they should go.

- *Off object*
- *Between views*

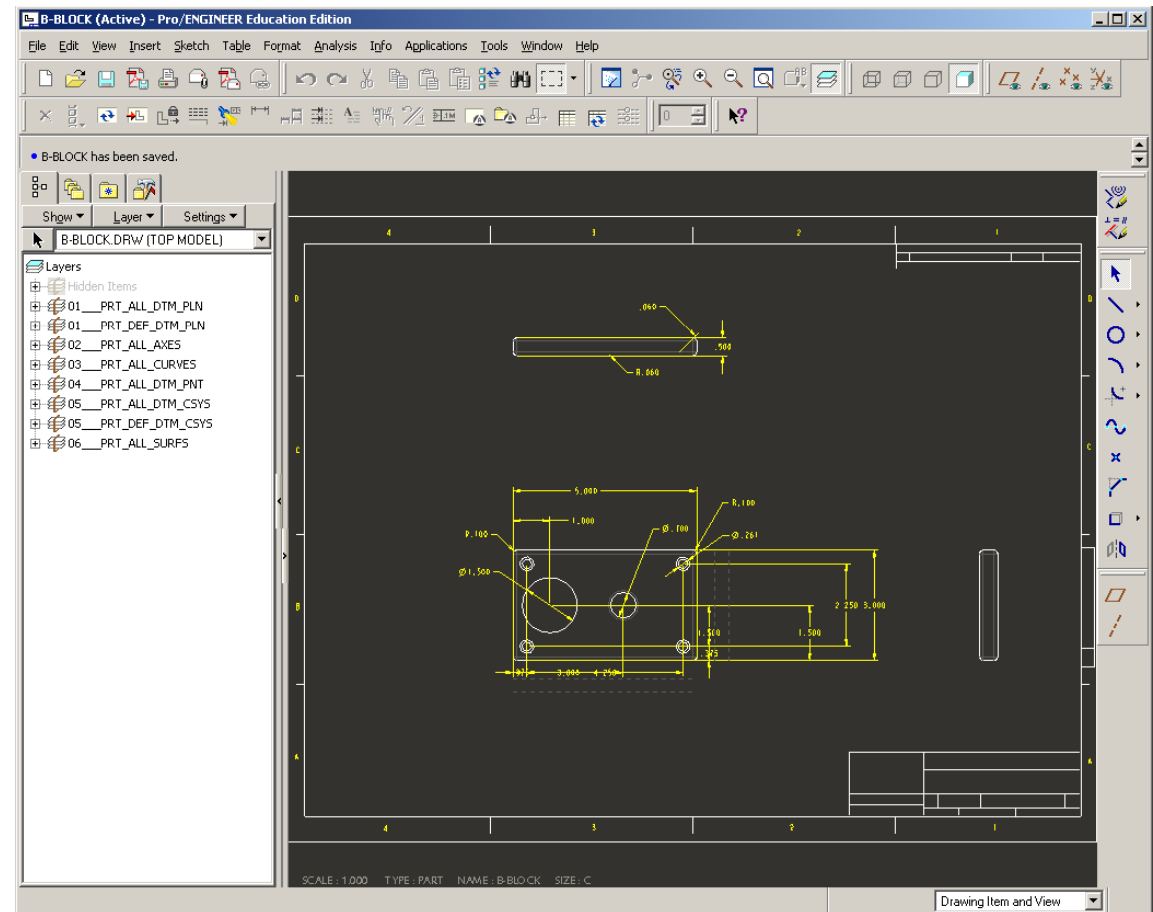


EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

A number of dimensions are not referencing feature contour – *Not Good*

Move these to FRONT VIEW

*RMB > Move Item to View >
Select Item > Select View*

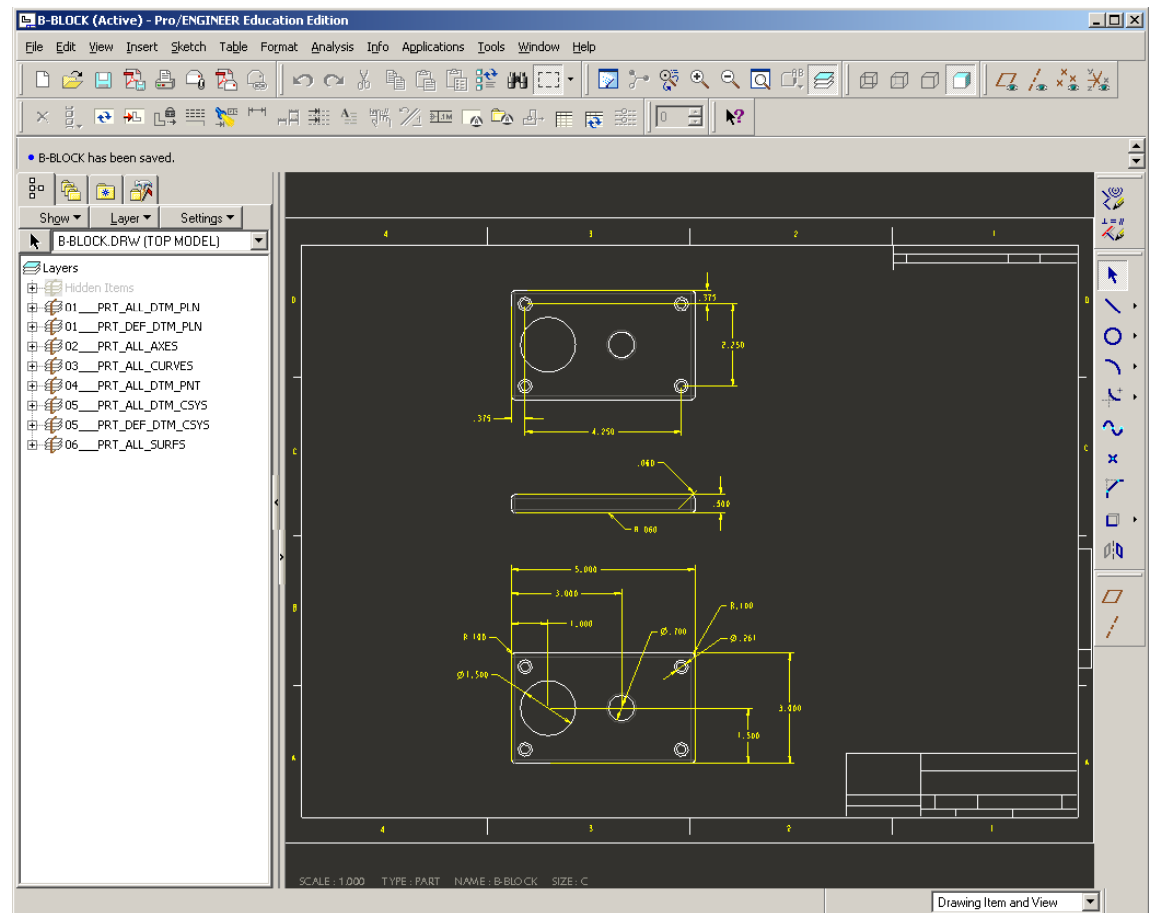




EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

FRONT view is a very crowded house at this point

- Delete *RIGHT* view > No benefit
- Create *BACK* view projected from *TOP*
- Move some dimension from *FRONT* to *BACK* view

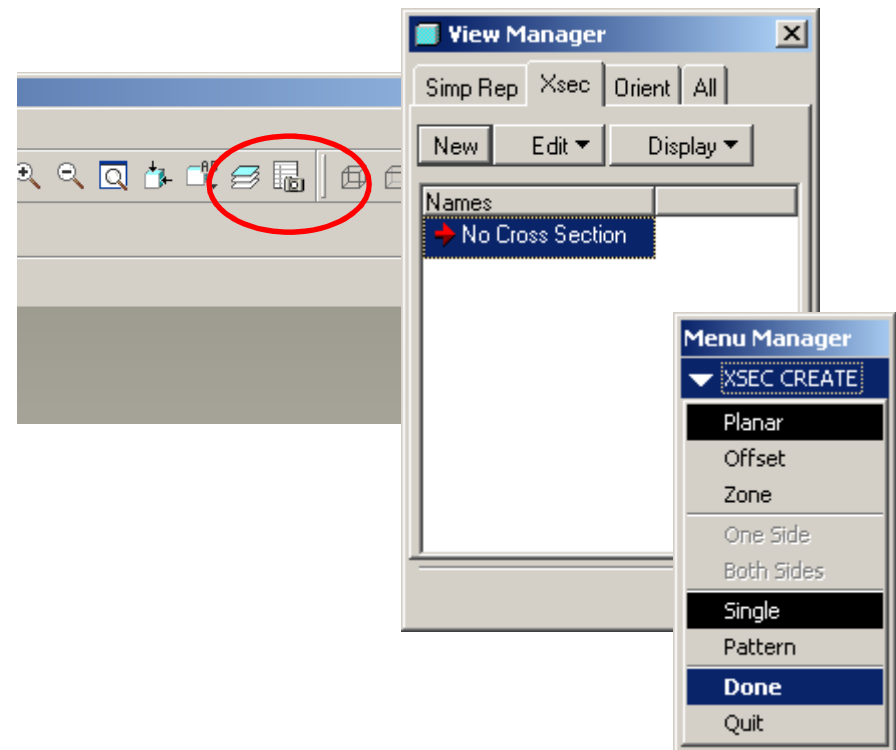




EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

TOP view would actually be useful as an X-SEC (review from last time)

- Go to part file
- Create Datum Plane Offset 1.500 offset from *TOP* datum plane
- From View Manager Xsec > New > Name section A > Select New Datum Plane

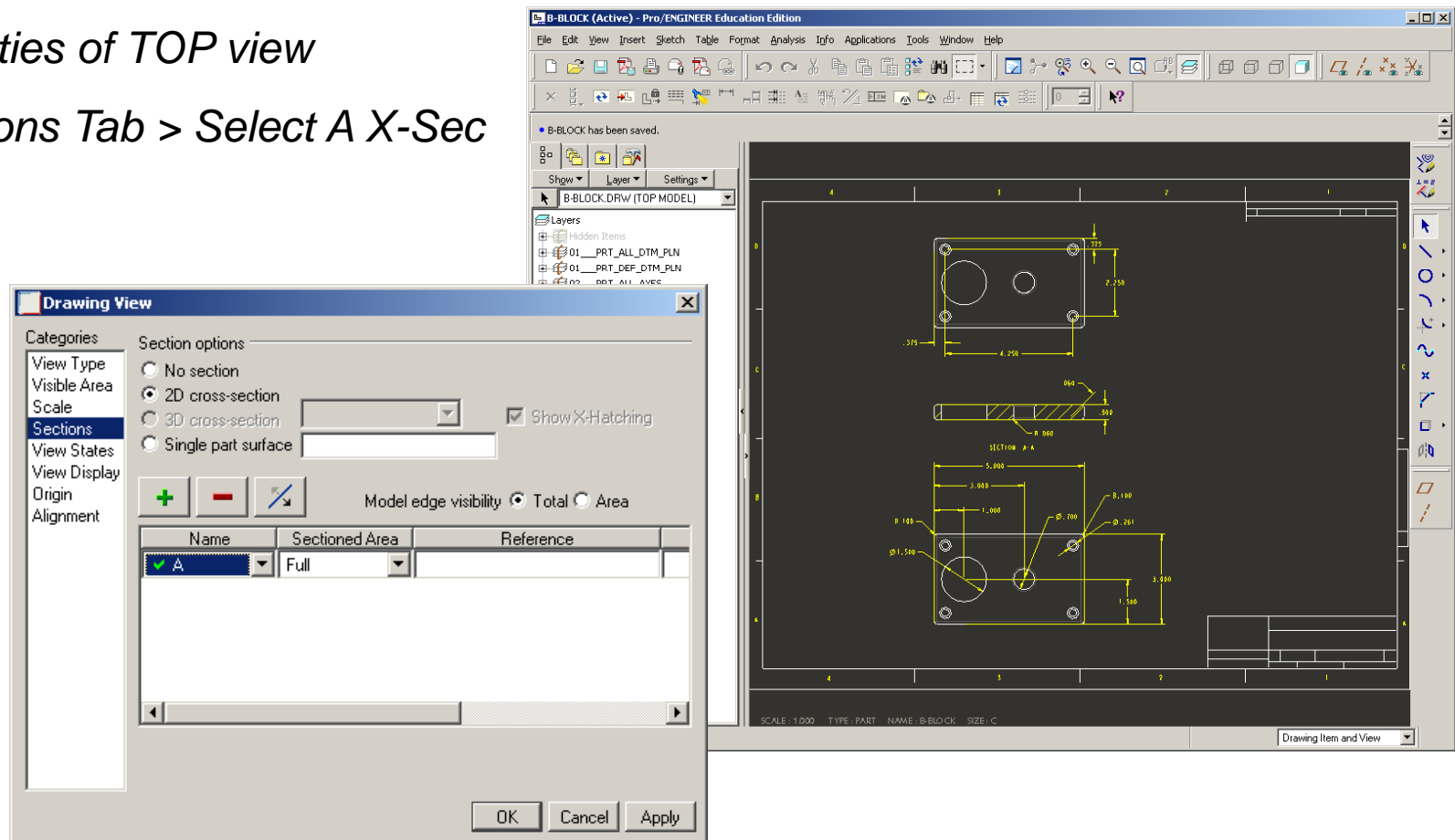




EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

Back to Drawing

- *Edit Properties of TOP view*
- *From Sections Tab > Select A X-Sec*

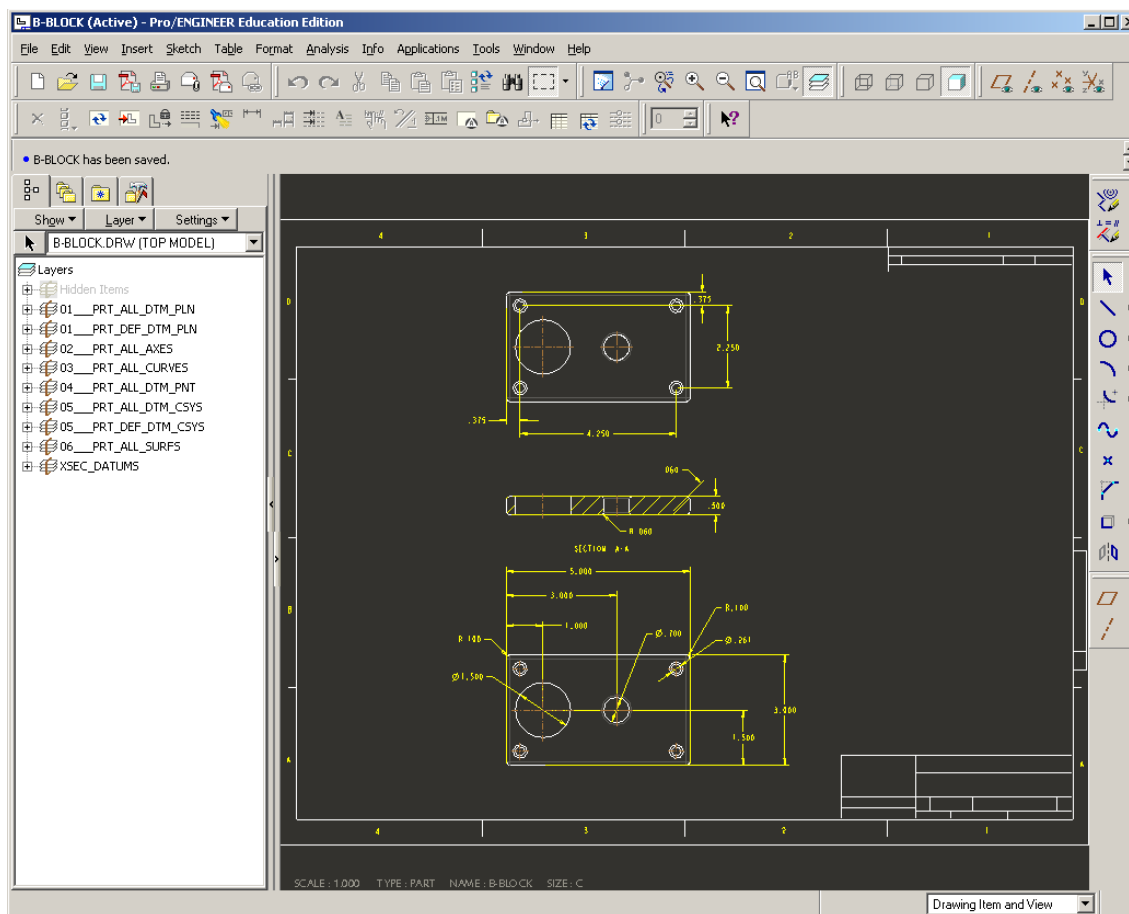




EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

*Show Axes to give
Extension lines something
to grab to*

- *View > Show and Erase >
Select Axes Icon > Show All
> Select to Keep > OK*





EXERCISE – Format Extension, Dimension, Leaders and Arrowheads

*Clip Witness Lines to
create necessary
clearances*

