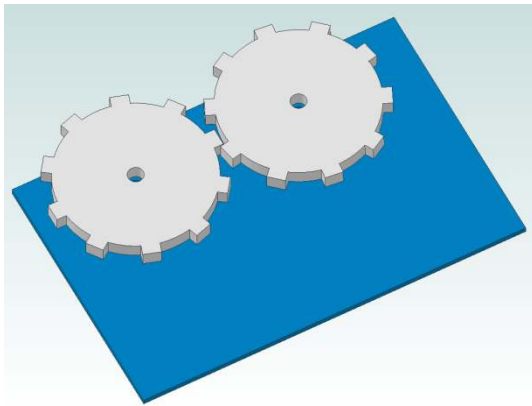# Absolute versus Incremental Dimensions
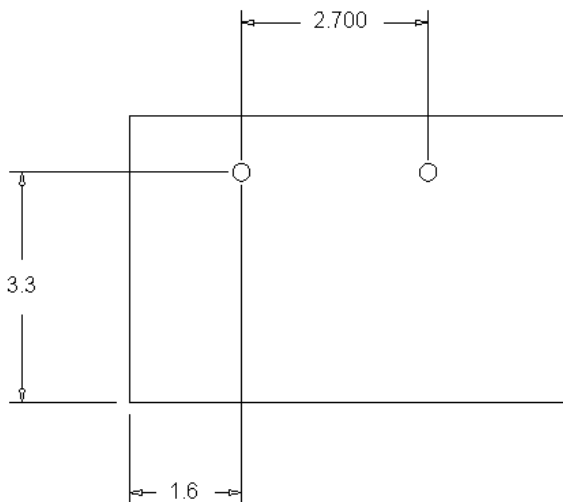
Putting your effort where it does the most good.

By R. G. Sparber

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I have two gears attached to a plate. In order for the gears to turn smoothly, the distance between them must be precisely set. Yet the location of the two gears on the plate is not nearly as critical.

Here is the shop drawing for the plate. I need the distance between gear centers to be 2.700 ±0.001". Yet I only need to place the first hole 3.3± 0.1" up from the lower left corner and 1.6 ± 0.1" over. Implied in the drawing is that the second hole is at the same distance up from the bottom left corner as the first hole.

The bottom left corner is my absolute zero point. The left hole has been specified with respect to this corner so is an example of using an absolute

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dimension. My second hole is specified relative to my first hole so is an example of using an incremental dimension.
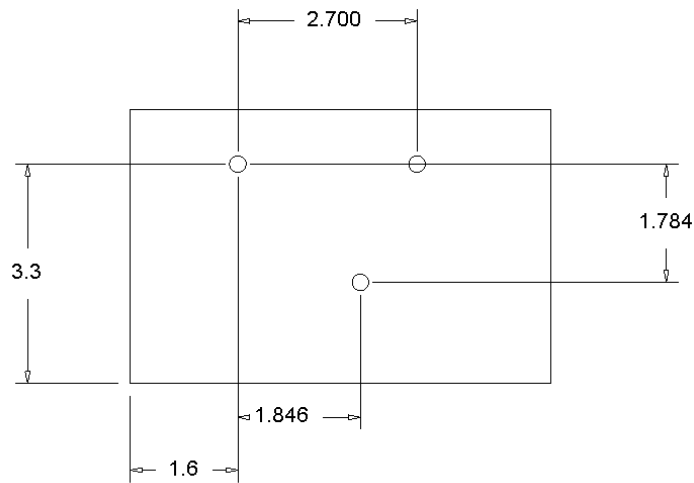
If I needed to add another gear, it too would be using an incremental dimension. I would locate it with respect to that first hole and have the same tight tolerance of ± 0.001".

In this way each of the gears would correctly mesh. Yet the entire cluster of three gears would be located ± 0.1" from the bottom left corner, the absolute zero point.
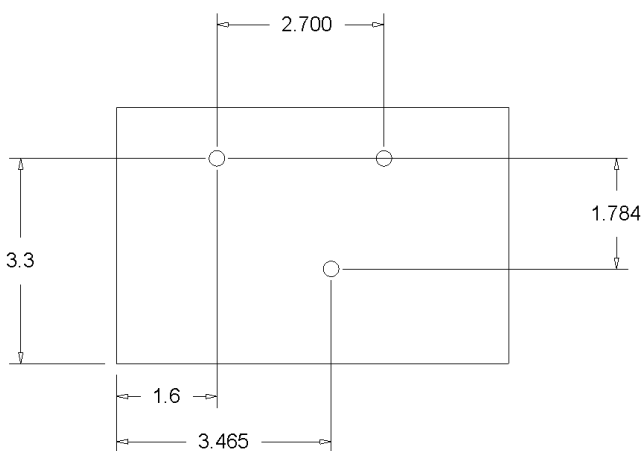
Look what happens if I have a senior moment and use the bottom left corner to locate the horizontal position of my new gear.

The top left hole need only be located 1.6 ± 0.1" from my reference corner while the bottom hole must be 3.465 ±0.001" from that same corner. This means that the distance **between** these two holes is essentially ±0.1" rather than the needed ±0.001". My third gear will likely jam even though I held its position to within ±0.001".

The key thing to understand is that I can define one feature with a generous tolerance while defining other features *relative* to this first feature with a tight tolerance. In this way I spend my effort where it matters.

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