

Circuitree

Weighing the Pros and Cons

of Internet-Based
Business Relationships



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Flex Circuit Versus Rigid PCB Rules and Methods

Q: *I was tasked with generating a drawing for a flex circuit we want to have fabricated. Do I use the same rules and methods used for a rigid PCB drawing?*

A: Some drawing features should be done the same as they would be for a rigid PCB, and other features will be different. I will go through the different features individually:

Notes: The layout of the notes section of a flex circuit drawing should be virtually identical to a rigid PCB drawing. Your first note will generally state that the circuit has been designed per IPC-2223 and should meet the performance requirements of IPC-6013. The next block of notes will usually spell out the different materials to be used in the construction of the flex circuit and the respective IPC specification sheet for each material. When specifying flex circuit materials, it is a good idea to discuss the different options with your flex circuit vendor prior to generating your drawing. The flex circuit manufacturer may have a particular way of processing the circuits that requires the use of a particular material. A good example would be adhesive thickness. If you specify the exact thickness of every adhesive layer, the manufacturer may have to alter its normal processing parameters to ensure good results. This will usually add to the cost because deviating from normal processing can often reduce yields. Sometimes it is better to specify the type of material but leave the thicknesses open for the vendor to choose. You can put an overall maximum thickness on the circuit to ensure that the vendor does not go overboard on adhesive thickness. The remaining notes will define additional attributes and requirements such as stiffener placement, electrical tests, marking, and packaging.

Hole Chart: The hole chart on a flex circuit drawing should be exactly the same as for a rigid PCB.

Isometric Views: Most rigid PCB drawings will not have isometric views because a rigid PCB is, well, rigid. Flex circuits, however, are usually formed prior to installation. An isometric view of the formed flex circuit will show the manufacturer where the bend areas will be located. Having this information will allow the manufacturer to flag a potential problem prior to fabrication. If the flex circuit manufacturer does not know where or how tightly you are forming the circuit, it will not be able to evaluate the design for feasibility prior to fabrication.

Dimensioned Features and Outlines: One of the biggest mistakes made on a flex circuit drawing is placing far too many dimensions that are far too tight. Remember that flex circuits are flexible. Also, flex circuit materials are very dimensionally unstable, making the finished flex circuit dimensionally unstable. This usually does not become a problem in service because flex circuits are flexible. Obviously, if a flex circuit is an inch short of what is called out on the drawing, it is not going to work in most applications. At the same time, most properly designed flex circuits

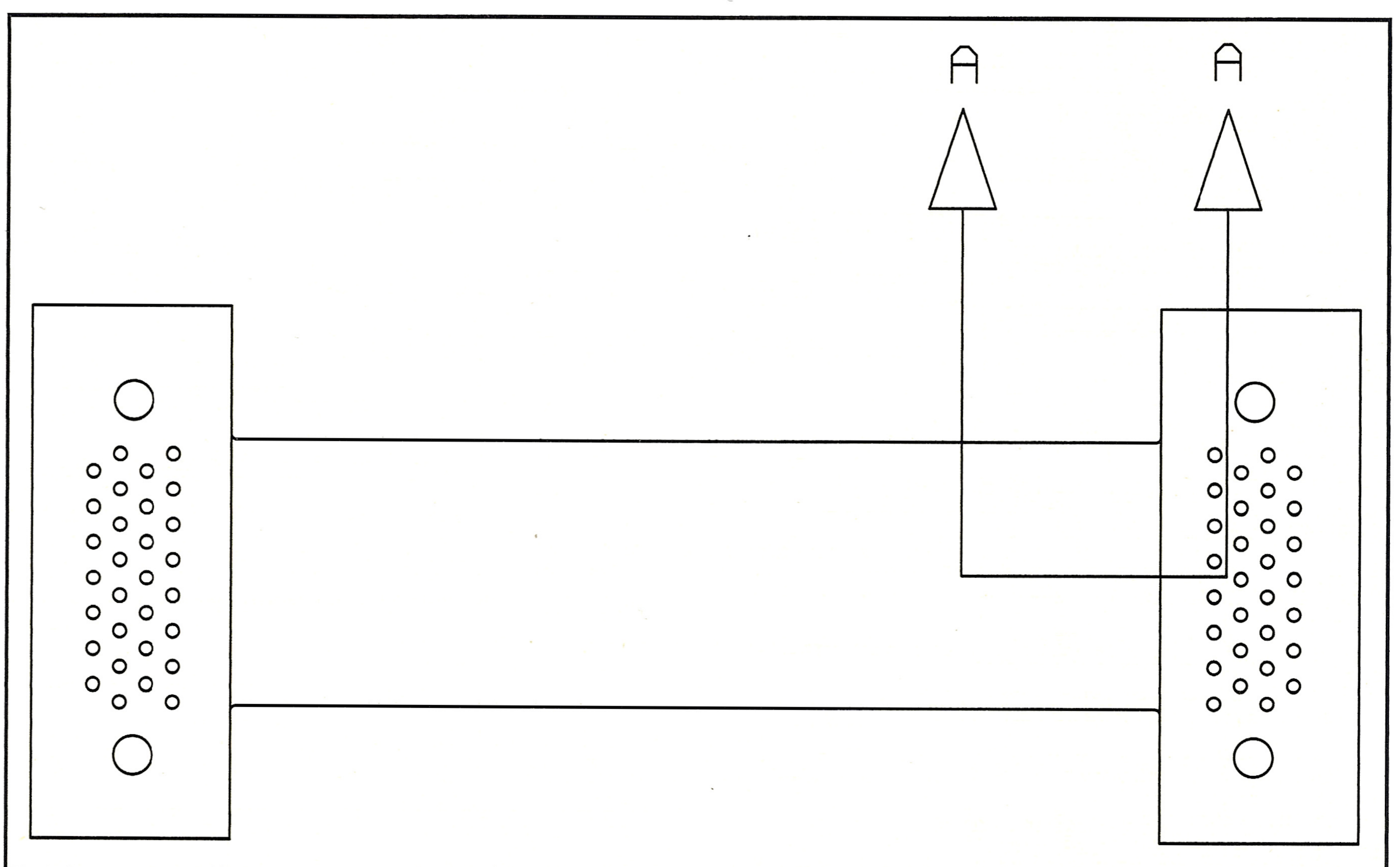
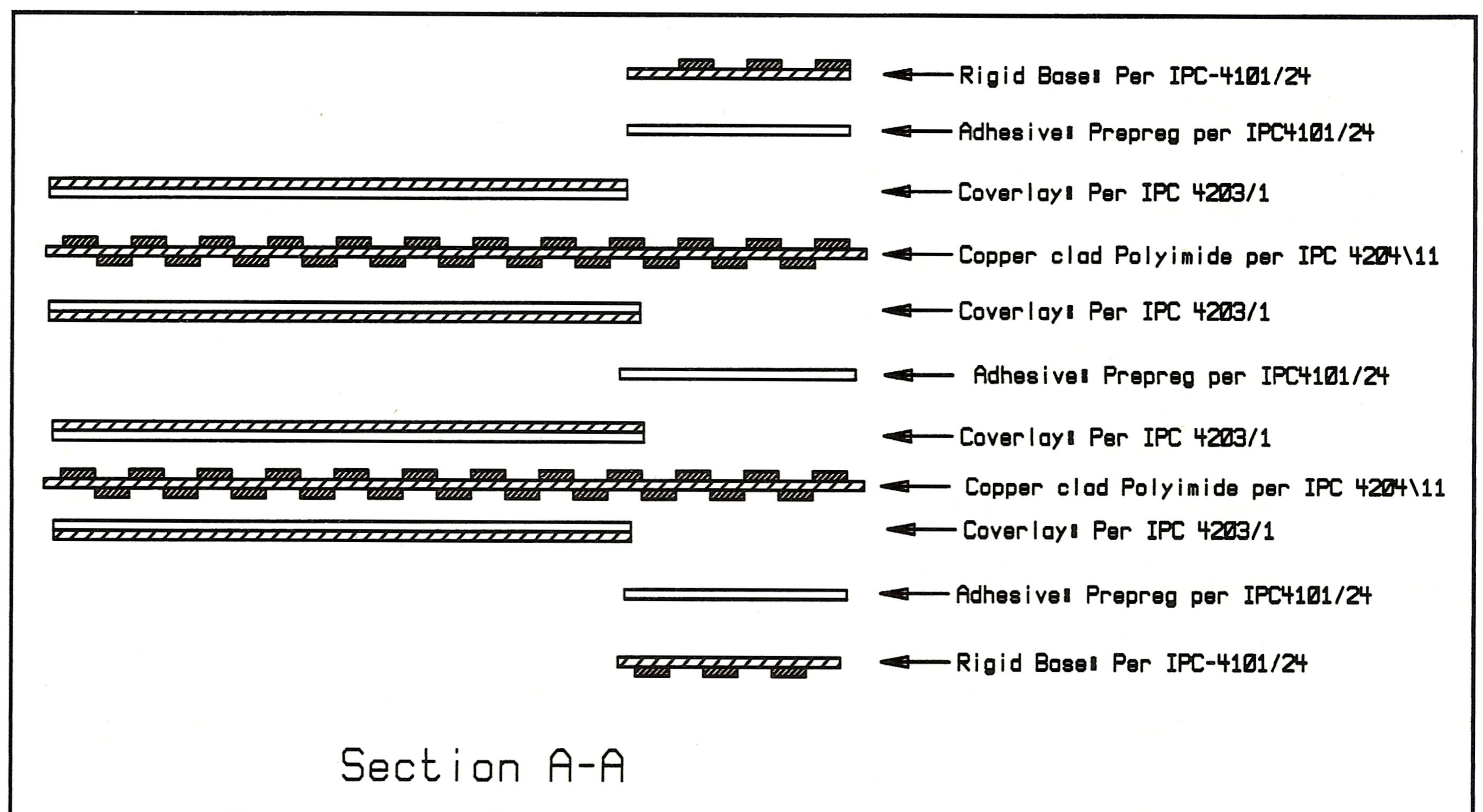


Figure 1 Proper Way to Illustrate a Cross Section

will have a little bit of extra length by design and could be 0.020 in short of nominal and still work just fine. The problem is that most drawings default to the drawing block tolerance, which is usually ± 0.005 in or ± 0.010 in. The bottom line is that if you truly have a critical requirement, put it on the drawing and tolerance it accordingly. Make other dimensions minimums, maximums, or reference. If you have clusters of holes for a connector or component that must be tightly toleranced, dimension each cluster individually to a datum within the cluster. Remember that every dimension on your drawing will be verified against your Gerber data by the manufacturer prior to fabrication, and all discrepancies will need to be resolved before any work can begin. Also, if a first article inspection is required on the flex circuits, each and every one of the drawing notes and dimensions will have to be verified and recorded. Most design software packages make it very easy to drop in dimensions with just a couple of mouse

clicks. Each mouse click will have an associated cost, and you should ensure that you are getting value from everything you are paying for.



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Cross-Sectional View: This feature may not be included on a lot of rigid PCB drawings, but it is very important to include it on flex drawings. It is basically mandatory on rigid-flex drawings. In this view, you will show the material stack up. Different

materials in the cross section should be flagged to reference the drawing note covering each material. For rigid-flex constructions, the cross section should be shown at a rigid-to-flex transition area so unbonded areas can be shown (Figure 1).

Artwork/Drill Layers: If you choose to include artwork and drill layer pages on your drawing, they can be done the same as on a rigid PCB drawing.

Additional Features: All remaining features and views can be placed into your drawing just as you would do on a rigid PCB drawing. But each time you place a requirement on those features, ask yourself, "Am I really getting value for what I will be paying for this requirement, or am I just adding empty cost?" ■

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