Backplanes and other thick-format boards can endure significant Signal Integrity (SI) disturbances as a result of the unused portions of through-holes and vias that extend past their last connected layer. Known as “stubs,” these unused portions result in reflections, capacitance, inductance and impedance discontinuities – losses that become critical as propagation speeds increase.

A simple and effective method for managing these stubs is Backdrilling. Backdrilling is a Controlled Depth Drilling (CDD) technique that removes stubs with conventional numerically controlled (NC) drill equipment. It can be applied to any type of board where stubs cause SI degradation, with minimal design and layout considerations.

Decreasing via stub length by backdrilling significantly reduces a particularly problematic form of signal distortion called deterministic jitter. Because Bit Error Rate (BER) is strongly dependent on deterministic jitter, any reduction in deterministic jitter by backdrilling will significantly reduce the overall BER of the interconnect – often by many orders of magnitude. Other key advantages to backdrilling PTH vias include less signal attenuation due to improved impedance matching, increased channel bandwidth, reduced EMI/EMC radiation from the stub end, reduced excitation of resonance modes and reduced via-to-via crosstalk.
A second CDD technique for managing stubs is the formation of plated blind vias which prevent stubs from forming altogether. Blind Via Formation is possible at a much lower cost than multiple laminated build-up methods and achieves many of the same SI benefits.

Blind Via Formation is limited by the throw of copper-plating baths to a maximum aspect ratio of 1:1. However, it can be used in conjunction with Backdrilling in thicker board types for more complete stub management, or even by itself in thinner board types where a 1:1 aspect ratio is sufficient to eliminate the desired degree and percentage of stubs. This method produces the same improvement in SI as Backdrilling where similar lengths of stub are eliminated.

As one the world’s largest manufacturers of high-technology PCBs, Sanmina-SCI has significant experience in the design and production of boards using Backdrilling and/or CDD blind vias. We offer these capabilities throughout our fabrication sites in the United States and worldwide, providing design for manufacturability (DFM) support for our customers in pre-design and layout phases to ensure a smooth integration of these technologies to the production process.