

The Problem:

Our client produces a mainframe computer used in many mission critical applications such as Internet and banking network hubs or where extreme computing power is required. It consists of a center-plane board, 16 system boards, 2 support boards, 2 controller boards, a primary and secondary power shelf, and 16 fan trays with 2 fans each for dissipating the 13.2 kW of heat generated during operation. Our client needed a test rack that would function as a regular production system but allow them to quickly load and unload center-plane boards for functional testing.

The Solution:

A test stand was constructed using a framework of off-the-shelf aluminum extrusion parts and about 75 custom sheet metal parts, machined parts and cable harnesses. In addition, a custom cart was designed and built to facilitate loading and unloading the 35 layer center-plane boards, that weigh about 60 pound each with their $\frac{3}{4}$ " thick aluminum backing plate. The cart was made using the same off-the-shelf aluminum extrusion framework and a custom 30° ramp made from 4 pieces of low coefficient of friction UHMW Polyethylene.

To test a center-plane board, the operator loads it onto the cart and manually verifies that none of the thousands of connector pins on either side of the board are bent, and that there are no power to ground shorts. The cart is then rolled over and locked to the test stand and the center-plane board is tipped upright and slid along the bottom rail of the cart until it engages the cam follower guides at the front of the test stand. The handles of the heavy center-plane board are then removed and the board is slid the rest of the way into the test stand. At this point the board is completely supported by the center-plane transport mechanism, and the operator rotates two levers at the front of the test stand 90° . This moves the transport mechanism and board onto two $\frac{1}{2}$ " diameter locating pins and locks the board in place for testing. Finally, the operator connects power to the board, and engages all of the system boards, support boards and controller boards using their built-in 4" long ejector/engagement levers. Overall, loading or unloading a center-plane board into the test stand for functional testing takes about 5 minutes and requires only one operator. To load a center-plane board into a production computer housing would take more than an hour and would require two individuals.

