

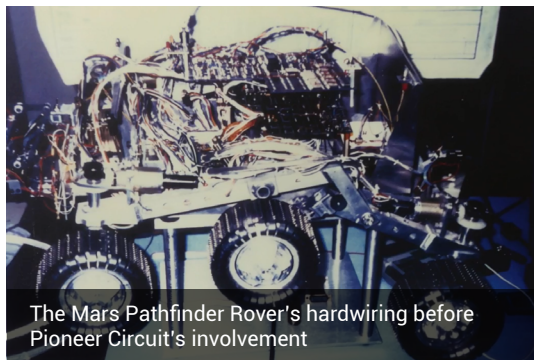
PATHFINDER CASE STUDY

PIONEER CIRCUITS SUPPORTS MARS ROVER MISSION

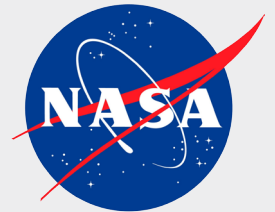
CHALLENGE

The Pathfinder challenge was to design a complex rigid flex part that was compact and light enough to fit inside of the rover, but reliable enough to survive for weeks in the harsh Mars environment.

The Mars Pathfinder Rover mission was having issues because it was too big and too heavy, with about 1.5lbs of hardwiring, to function properly. All of the necessary hardwiring for the Pathfinder was too messy and unable to fit inside of the rover. This kind of hardwiring is inefficient as well as ineffective because it is time consuming to connect the components together, poses the risk for human error in assembly, and can potentially come apart, especially in the harsh Martian environment that the rover was to exist in. JPL came to Pioneer Circuits to see if we could design a solution to help make the Pathfinder mission possible again.



The Mars Pathfinder Rover's hardwiring before Pioneer Circuit's involvement



"Congratulations! Pioneer Circuits has demonstrated to be a quality supplier for the NASA robotic space programs, like the Mars Exploration Rover program. We would like to recognize your efforts of sustaining effective quality controls throughout your organization."

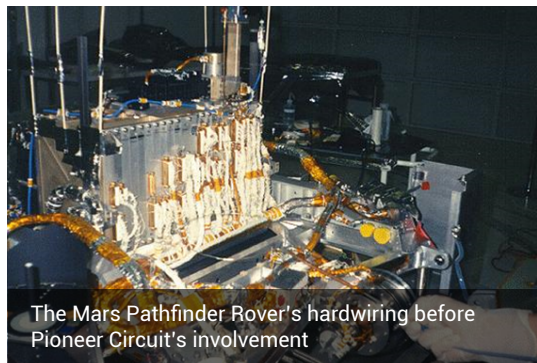
- ARVIN LLAMZON
JPL/NASA TEAM

SOLUTION

Pioneer Circuits was to design and manufacture a 30-layer rigid flex pcb that no other vendor across the United States and Europe was able to accomplish.

The final 30-layer assembly utilized copper clad glass supported polyimide, copper clad flexible polyimide film, glass supported polyimide prepreg and acrylic adhesive. The part was ultimately a 7-sublamination, multi-layer large rigid flex pcb that no one had ever successfully built. Through concurrent engineering, Pioneer Circuits was able to build a compact 87g pcb capable of powering the rover and withstanding the harsh Martian environment.

Working through concurrent engineering, Pioneer Circuits provided the upfront support necessary to understand how to build a solution for the rover. Because Pioneer Circuits manufactures and assembles our parts, we were able to help with the design from an experienced manufacturing perspective, saving the Pathfinder team time and money in the process.

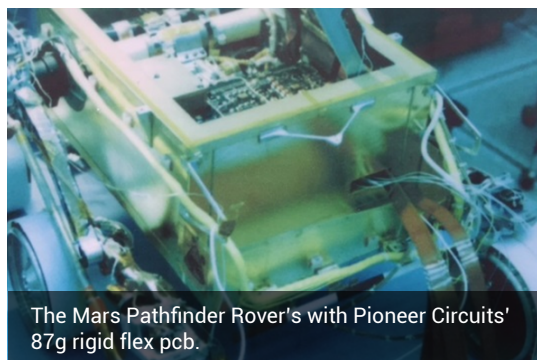


The Mars Pathfinder Rover's hardware before Pioneer Circuit's involvement

IMPACT

Pioneer Circuits' 30-layer pcb made the Pathfinder mission possible again.

The final assembly was only 13% of the original hard-wiring's weight and proved its reliability by surviving for 90 days with the rover, 3 times as long as its original mission goal. This made the mission very successful and began the rover heritage that Pioneer Circuits is still a part of to this day.



The Mars Pathfinder Rover's with Pioneer Circuits' 87g rigid flex pcb.

INDUSTRY

NASA's JPL is the leader in United States robotic space exploration. Pioneer Circuits has proven the reliability of our products by delivering parts that are able to withstand even the harshest conditions of the Mars Environment in JPL's Mars Exploration missions.

TECHNOLOGY USED

The Pathfinder Rover utilizes Pioneer's advanced, 30 layer rigid-flex pcb of copper clad glass supported polyimide, copper clad flexible polyimide film, glass supported polyimide prepreg, and acrylic adhesive.

SERVICES USED

JPL utilized Pioneer Circuits' concurrent engineering services to help with their design.

ABOUT THE PATHFINDER

The Pathfinder Rover is the famous Mars exploration vehicle featured in the movie, The Martian with Matt Damon. The Pathfinder Rover landed on Mars on July 4th, 1997. The rover ended up lasting twice as long as its 30-day mission goal and captured the imagination of the world.