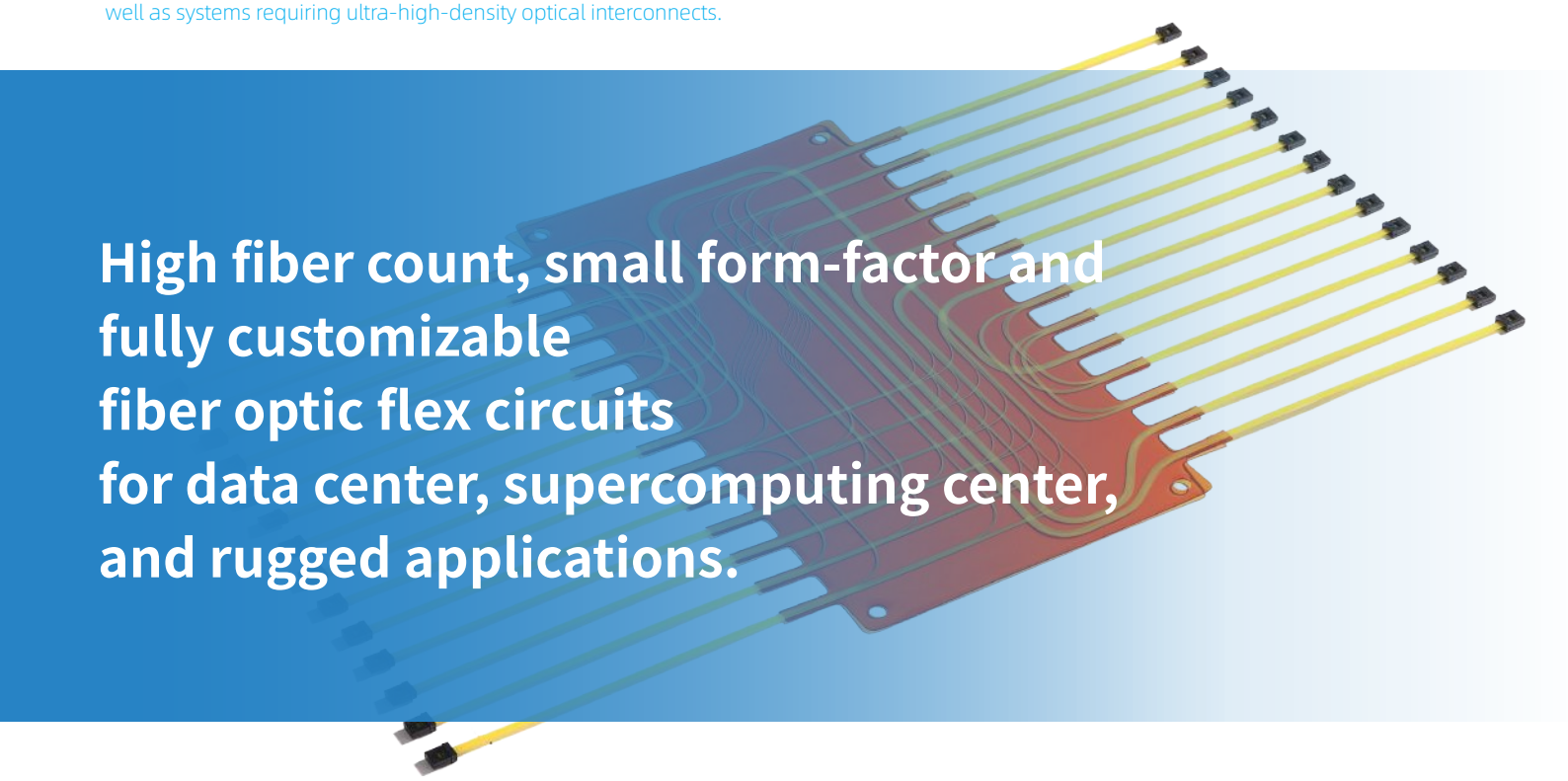
Fiber Optic Flex Circuit

We provide high-density fiber optic channel routing on a flexible substrate, designed for both card-to-card and backplane applications, as well as systems requiring ultra-high-density optical interconnects.



High fiber count, small form-factor and fully customizable fiber optic flex circuits for data center, supercomputing center, and rugged applications.

In today's communication industry, the demand for smaller, lighter, and faster solutions continues to grow, driving the widespread adoption of fiber optics, especially in advanced systems. Meeting these demands requires high-density, robust, and versatile cable assemblies that offer design engineers the flexibility to maximize performance within minimal space.

The Fiber Optic Flex Circuit (FOFC) addresses the need for effective cable management, enabling optimal airflow and efficient routing within communication systems. It provides a streamlined solution for routing fiber from board-to-board, shelf-to-shelf, or within narrow and irregular spaces, ensuring organized and compact fiber pathways.

Flexibility is the key to simplifying system designs. The FOFC can be customized to support virtually any routing configuration, whether point-to-point, shuffle, or set patterns, tailored to meet specific application requirements.

Each FOFC is fabricated based on precise design files and technical specifications, ensuring a compact and efficient fiber network layout. Constructed from high-quality polyimide and conformal coating adhesives, it delivers reliable protection for the fiber, meeting the rigorous demands of industrial and aerospace environments.

Applications

- Aerospace
- Telecommunications (Hubs, Servers Routers, Switches)
  - Optical cross-connect (OXC)
  - Card to card
  - Intra-rack fiber management
  - High density fiber management
  - Flexible optical harness, breakouts and shuffles
  - CPO Optoelectronic integrated package
  - Backplane interconnection assemblies

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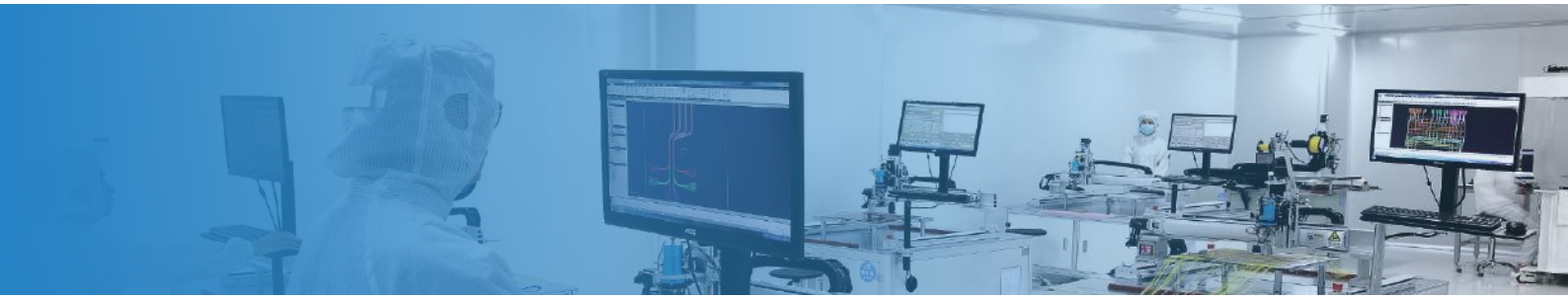
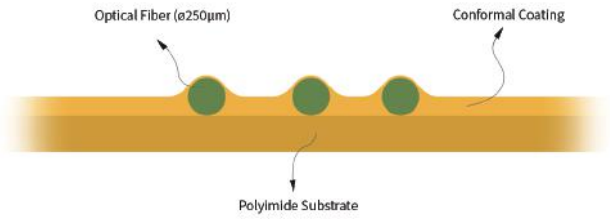
Fiber Optic Flex Circuit
Product Structure



Structure

The flexible optical fiber circuit consists of four key components: adhesive substrate, optical fiber, coating, and termination connectors. Each of these elements can be customized to meet specific requirements, including substrate size, shape, fiber type, channel count, fiber routing options, connector type, and optical cross-relationships.

Our flex circuits can be terminated with a wide variety of industry-standard connectors, ensuring compatibility and reliability. All flex circuits produced at T&S undergo rigorous testing, providing system designers with a dependable plug-and-play solution. Additionally, unterminated flex circuits are available, allowing customers to add optical termination at a later date.



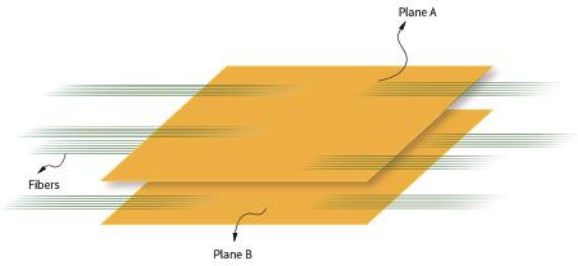
Circuit sizes range from a few millimeters in width to large, complex flat sheets measuring up to 1240 square inches（800mmx1000mm).

Flex Circuit Stacking

The number of optical channels in a single-layer flex circuit can range from just a few to hundreds or even thousands. By utilizing stacking techniques, the channel count can be easily expanded, with two primary stacking methods available:

1. Physical Stacksing

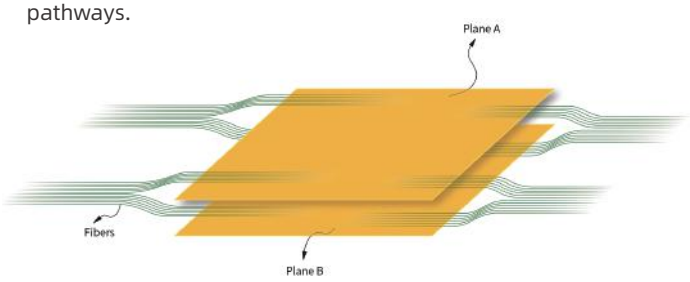
To maintain flexibility, it's generally recommended to keep the number of stacked layers to fewer than five. However, if higher channel density is required, flex circuits with five or more stacked layers can also be provided.



Two-layer physical stacking

2. Integrated Stacking

For complex fiber routing scenarios, where precise cross-connections are needed, integrated stacking offers a more effective solution. This approach treats all layers as a unified structure, enabling a more intricate re-arrangement of fibers across layers to accommodate sophisticated optical pathways.



Two-layer Integrated stacking

These stacking techniques provide flexible options to meet diverse application needs, whether the focus is on maximizing fiber density or achieving advanced cross-connections in high-performance systems.

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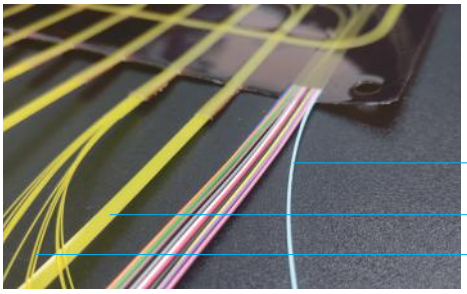
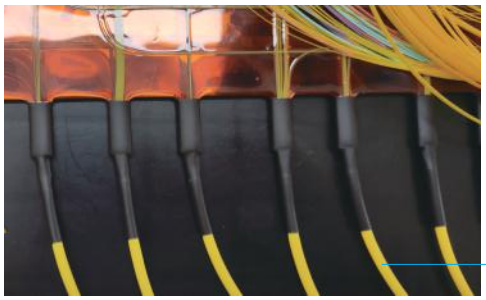
Fiber Optic Flex Circuit
Product Structure and Performance

Leading-out Forms

Different applications necessitate various leading-out forms. We currently offer the following options, and additional customized types are available upon request.





Features

Simulation and Optimization Suggestions

The software simulates and calculates fiber-laying losses and other key influencing factors to provide practical optimization suggestions for original optical routing design.

Position Accuracy

Fiber positioning accuracy on the substrate is maintained at ±0.01 mm.

Customization

Substrate size & shape
Bypass holes and positioning holes
Fiber route
Connector termination

Hash Tests

Comprehensive testing over 1000 hours includes:
1. Temperature and Humidity Test: 85℃ / 85% RH
2. Thermal Cycle Test
3. High Temperature /Low Temperature Storage Test
ΔIL≤0.3dB in Rapid-Rate Thermal Cycle Test (Change Rate: 10℃/min)

Specification

Termination

MTP, MPO, MT ferrules
LC, SC and other connectors
VSFF Connector: MXC, MMC, MDC, CS, SN

Materials

Fibers: Single-mode, multimode
Fiber Diameter: 250μm and specialized fibers
Optical Fiber Protection: Conformal coating
Substrate: Polyimide

Operating Temperature

-40°C to +85°C

Size

Maximum size: 800 mm X 1000 mm
Substrate size tolerance:± 3mm

Optical Performance

<0.1dB loss (excluding connector losses)

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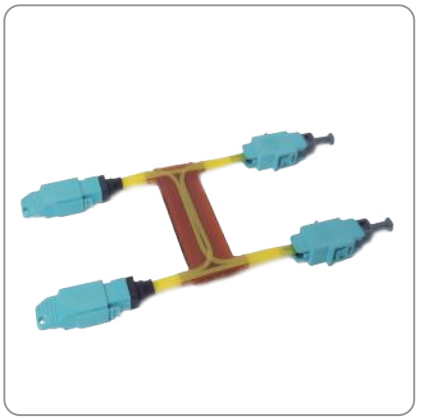
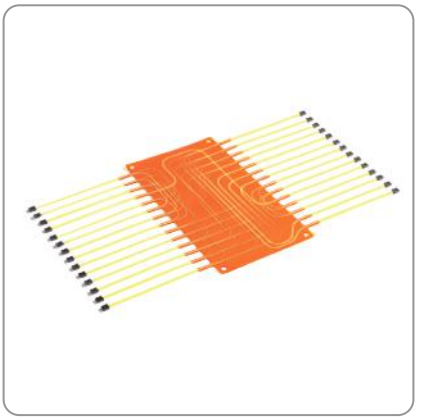
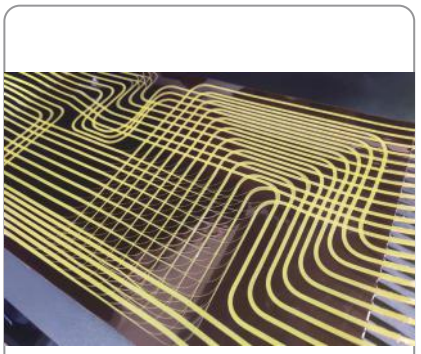
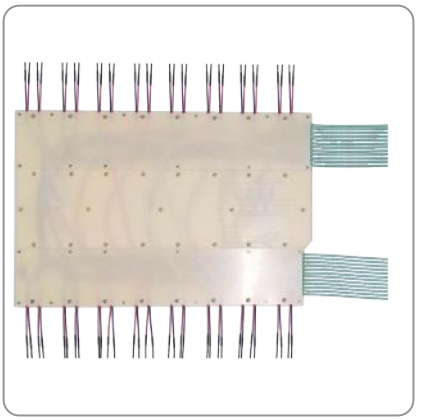
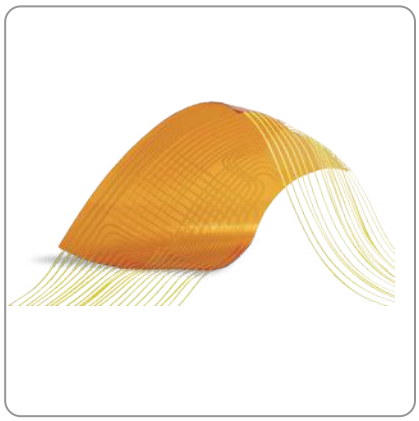
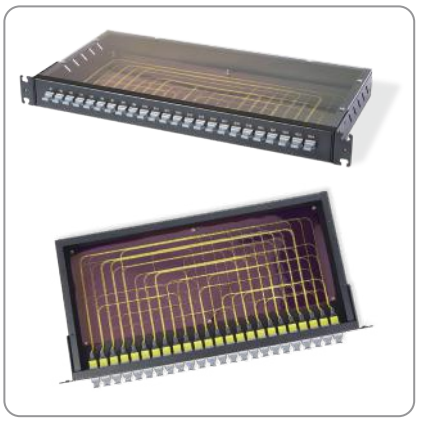
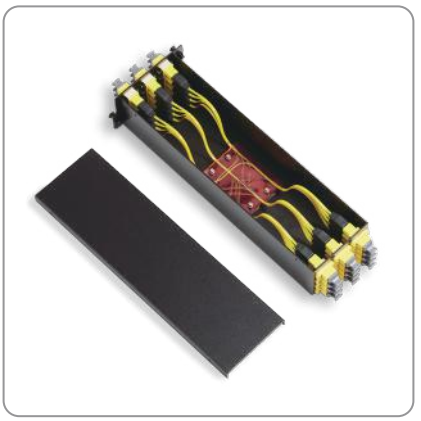
Fiber Optic Flex Circuit
Product

Product Forms and Configurations

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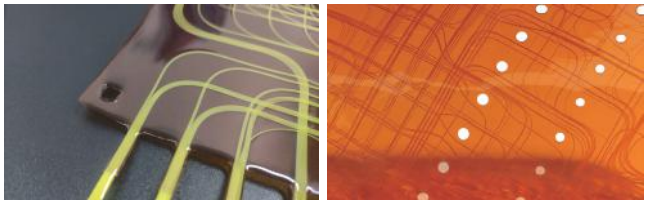
Fiber Optic Flex Circuit

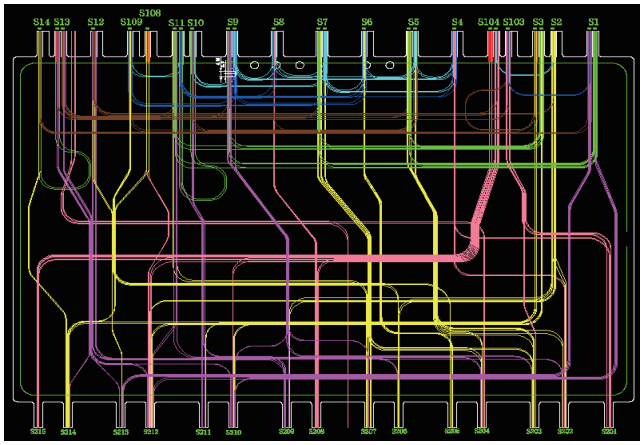
Optical Fiber Routing Software

Advanced Fiber Routing Software for Complex Circuitry Design

T&S's patented fiber routing software empowers designers to create highly complex fiber circuitry designs with precision and efficiency. Equipped with a set of strict design rules and advanced algorithms, this tool supports nearly any fiber routing scheme, accommodating diverse substrate shapes and specific fiber positioning requirements.



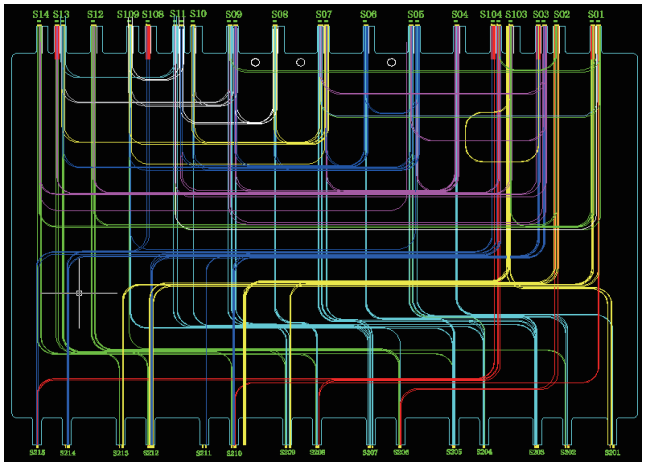
Prescriptive fiber bypass holes and positioning holes



Manual Design

The software's fiber management capabilities effectively handle micro-bending, macro-bending, and crossover stress in intricate routing configurations, significantly enhancing the long-term reliability of the fiber network and minimizing signal attenuation.

Delivering optimal designs in just minutes, this software dramatically boosts efficiency and improves production yields compared to traditional manual design methods. By reducing the uncertainties of manual processes, it ensures more consistent and reliable results. Additionally, its simulation function enables customers to further refine and optimize their initial optical routing designs, leading to superior performance in complex fiber systems.



Software-Generated Design

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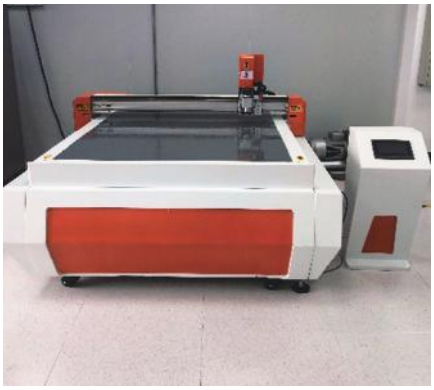
Fiber Optic Flex Circuit
Production and Equipment

T&S has successfully delivered tens of thousands of customized flex circuits to customers across diverse industries. Our strong delivery capabilities, exceptional product quality, and dependable technical support have helped us maintain stable, long-term partnerships. With our in-house engineering team developing core production equipment, we continuously upgrade and refine these systems to enhance product performance and production efficiency.



Substrate Cutting Machine

Fiber Optic Routing Machine

Glue Spraying Machine

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