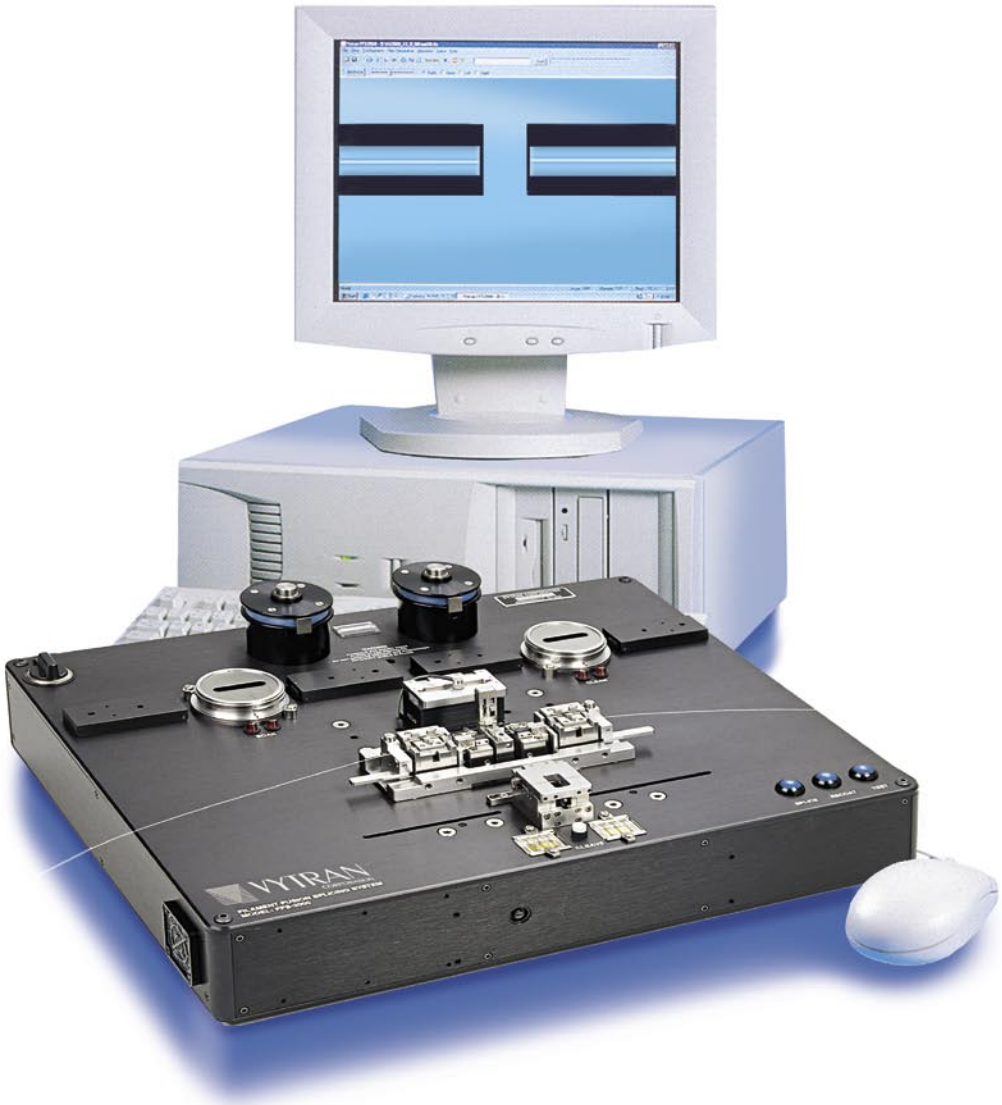
FFS-2000

Filament Fusion Splicing Workstation



An Integrated System for Production and Specialty Fiber Splicing

VYTRAN

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The FFS-2000 System

The **FFS-2000** is a complete workstation with all fusion splicing procedures logically integrated into a single system that can be used to produce consistent splices quickly and efficiently. This third generation Fusion Splicing Workstation uses Vytran's proven filament fusion technology to provide a convenient, reliable method of making high-strength, low-loss splices. New to the FFS-2000 is Vytran's True Core Imaging™ technology, a high-magnification, high-resolution optical imaging system capable of detecting and displaying the inner core structure of a fiber. This technology provides for fast, accurate core alignment and splice loss calculation. Also new is a Windows-based user interface that offers complete configuration and process control, as well as a networkable database for recording all splicing data. With its complete workstation design, enhanced imaging capabilities, and increased programming flexibility, the FFS-2000 is an ideal system for both production and R&D applications.

Standard Features

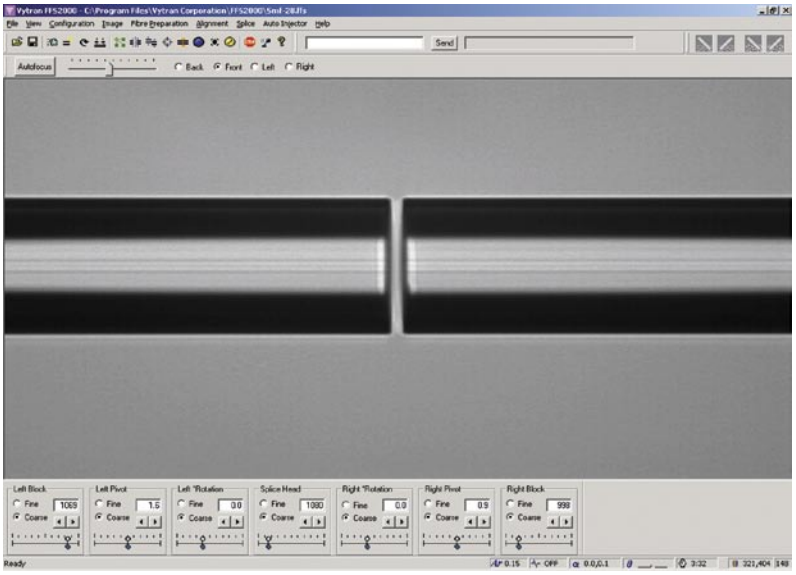
- Fiber coating soaking station
- Thermal coating removal station
- Ultrasonic fiber cleaning station
- Fiber cleaving station
- True Core Imaging™ for automatic fiber alignment and accurate splice loss determination
- Automatic 4-axis positioning system for PM rotation (optional)
- Filament fusion splicing station with automatic post-fusion fire polishing for strength enhancement
- Recoat station for acrylate buffer restoration
- Built-in proof tester/ tension tester (optional)
- Personal computer with Windows GUI and networkable database

The Ideal Workstation

The Process for Precision Splicing

The FFS-2000 incorporates all components and procedures to prepare the fiber for splicing:

- A coating soaking station is available for specific fibers that require a solvent pre-soak to soften the coating prior to stripping.
- A Thermal Mechanical Stripping (TMS) station provides a fast, single-step process for safely removing acrylate coatings while maintaining fiber strength.
- Ultrasonic fiber cleaning removes any coating particles or residue left on the glass surface which could reduce splice strength.
- An automatic fiber cleaver produces a low end angle cleave, important for achieving low loss splices.
- Uniquely designed Fiber Holding Blocks and a Transfer Jig minimize fiber handling by precisely positioning the fiber for each process.

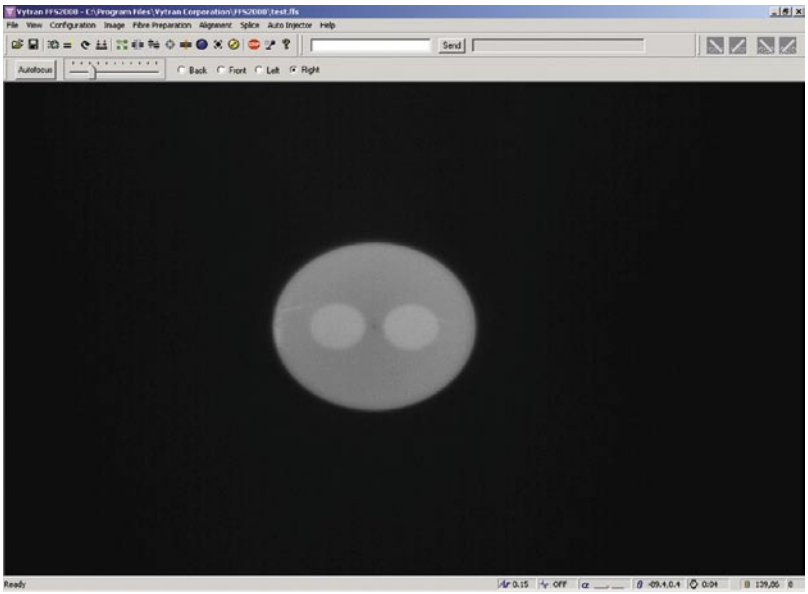


True Core Imaging™

Automatic Alignment

The FFS-2000 uses Vytran's True Core Imaging™ technology, which is a high-magnification, high-resolution optical imaging system that detects and displays a fiber's inner core structure. This technology is used in conjunction with 0.01µm resolution stepper motor controlled X-Y positioners to provide a fully automated system capable of fast and accurate alignment. In addition to the vision-based alignment system, the FFS-2000 can also be interfaced to external test and measurement equipment, such as power meters, spectrum analyzers and polarimeters, to create a fully automated optical assembly station for production and R&D applications.

For Production Splicing



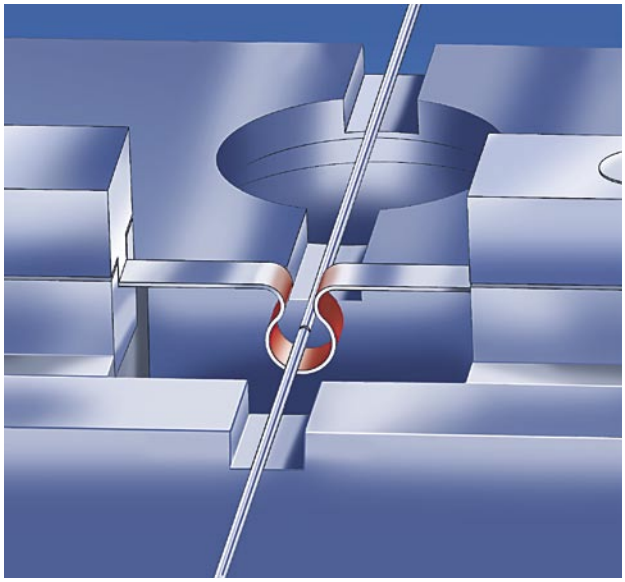
End-View Alignment

PM Rotation (Optional)

The FFS-2000 offers an optional 4-axis positioning system for fully automated alignment of polarization-maintaining fiber. Rotary fiber holding fixtures are stepper motor driven for absolute positioning of the fiber to .01˚. This system also offers the choice of active splicing with external feedback or fully automated blind splicing using Vytran's End-View Alignment technology.

Filament Fusion

Vytran's unique filament fusion technology provides a consistent, reliable method of making high-strength low-loss splices. Precise control of the fusion process is achieved by purging the splice region with an inert gas and using a tungsten filament to supply the thermal input necessary for fiber fusion. Because the fusion heat source is isolated from the environment, filament fusion splicing is not dependent upon ambient conditions. A controlled environment in combination with constant power control circuitry ensures repeatable performance splice after splice.



Filament Fusion Splicing

Fire Polishing

Vytran's patented fire polishing process significantly increases splice strength through a rapid post-fusion heat treatment of the splice region. When a fusion splice is made, silica will evaporate off of the hot center region of the splice and condense on either side of the joint where the fiber is cooler. The condensed silica deposits act as a surface flaw, lowering splice strength. The fire polishing process removes or minimizes the deposits, thereby improving splice strength. In addition, the fire polishing process provides core diffusion capabilities that can be used to adiabatically expand the mode field diameter of a fiber. Through this thermally expanded core (TEC) process, extremely low-loss fusion splices between markedly dissimilar fibers, such as those typically used in WDM applications, can be achieved.

And R&D Splicing

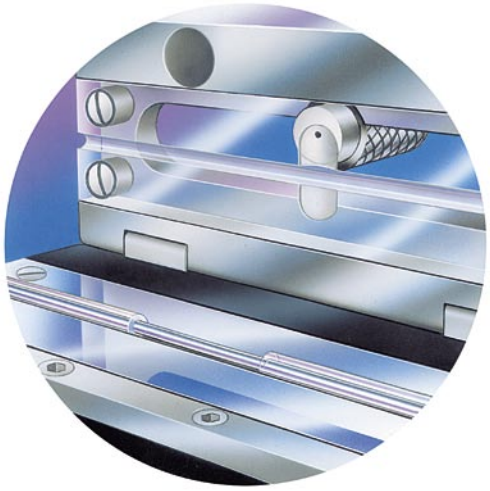
New Technologies For Fusion Splicing

Splice Loss Determination

Vytran's True Core Imaging™ technology is used not only for precise core alignment prior to splicing, but also for splice loss determination after splicing. Because this technology provides a true clear view of a fiber's inner core, an accurate estimation of splice loss can be achieved based on an analysis of the finished splice. Vytran has developed a proprietary algorithm that accurately calculates loss for splicing a variety of similar or dissimilar fiber types.

Recoating

The FFS-2000 includes an optical fiber recoater to restore the protective polymer coating over the fusion splice. The combination of high-strength filament fusion splicing and UV acrylate recoating provides a more reliable alternative to standard heat shrink protection sleeves. The recoat process maintains a near original fiber diameter and delivers a smooth, flexible fusion splice that can be handled or tightly coiled as if no splice were present.



Optical Fiber Recoating

Proof Testing (Optional)

The optional built-in proof tester/tension tester provides a convenient way to ensure the long-term reliability of every fusion splice. The completed splice is clamped between two mandrels and a load is automatically applied to the fiber by rotation of one of the mandrels. The load can be taken up to a pre-determined level and released (proof test mode), or can be continually increased to determine breaking strength (tensile test mode). By selecting a proof test level approximately three times higher than the applied service load on the splice, the long term reliability of the splice can be assured.

FFS-2000 Specifications

Overall

Size:	17.0" x 13.9" x 5.0" (432 x 353 x 127 mm).
Weight:	26 lbs (11.8 kg).
Power:	12V DC. External power supply provided with universal AC input.
Operating System:	PC-based with Windows® interface.

Fiber Prep

Soaking Station:	Solvent pre-soak station available for "hard" coatings.
Coating Stripper:	Thermal mechanical stripping process for high-strength coating removal.
Fiber Cleaner:	Ultrasonic cleaning that maintains fiber strength.

Splicing

Fusion Method:	Filament Fusion.
Fusion Temperature:	Constant power control for consistent fusion process.
Alignment Method:	Fully automated by True Core Imaging™ or external feedback.
X-Y Fiber Positioning:	Stepper motor controlled (0.01µm resolution).
Z Fiber Feed:	Stepper motor controlled (0.125µm resolution).
Fiber Viewing:	Real time image processing system viewed directly on computer monitor.
Strength Enhancement:	Automated post-fusion fire polish step for high strength splicing.
Loss Estimation:	True Core Imaging™ technology for accurate loss calculation.

PM Rotation Option

Rotation Alignment:	Fully automated by End-View Alignment technology or external feedback.
Rotation Drive:	Stepper motor controller (0.01˚ resolution).
Rotation Travel:	190˚ left and right sides.

Recoating

Recoat Mold:	Quartz.
Recoat Diameter:	280µm standard: custom sizes available.
UV Source:	Four (4) tungsten halogen lamps.

Proof Testing

Maximum Tension:	20 pounds (9.1 kg).
Mandrel Size:	2" diameter (51 mm).
Accuracy:	+/- 2%

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