Polarization Maintaining, High Power Fiber Optic Components, Laser & Laser Diode to Fiber Delivery Components, Fiber Optic Attenuators, Fiber Optic Components for Optoelectronic Packaging

Patent Numbers: USA 7058275, 7067993, 7095931, 7295731, 7431513, 7499151, 7599047, 8090233, 8107782, 9568307, 9696141, 10329196, EPO 1527363, 2110651, CANADA 2494133, 2495223, 2496661, 2574702, 2590968, 2629446, and CHINA ZL03818458.3
Polarization Maintaining Fiber Optic Components

1. Polarization Maintaining Patchcords
   - Up To 30 dB Polarization Extinction Ratios
   - <0.3 dB IL, Up To -60 dB Backreflection
   - FC/APC, FC/PC, SC, LC, MU, ST, E2000

2. Planar Light Circuit Splitter (PLCS)
   - Polarization And Singlemode Fiber Versions
   - Broad Bandwidth
   - 1x2, 1x4, 1x8, 1x16, 1x32 Available

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   - Polarization And Singlemode Fiber Versions
   - Broad Bandwidth
   - 1x2, 1x4, 1x8, 1x16, 1x32 Available

4. Polarization Maintaining Fused Couplers
   - Low Cost, Miniature Size
   - 50/50 To 99/1 Splitting Ratios
   - Ideal For Taps For Power Monitoring

5. Polarization Maintaining Splitters
   - Splits Polarized Light Into 2 PM or SM Fibers
   - 0.6 dB IL, -40, -50, -60 dB Backreflection
   - 1x2 And 2x2 Versions Available

6. Polarization Dependent Loss Emulators
   - 0.05 dB To 1 dB Polarization Dependent Loss
   - Fixed Or Manually Variable PDL
   - Broad Wavelength Range, Compact, And Low Cost

7. Polarization Maintenance Splitters
   - Splits Light Into Two Polarizations
   - 0.6 dB IL, -40, -50, -60 dB Backreflection
   - 1x2 And 2x2 Versions Available

8. PM Fiber Circulators
   - 0.7 dB Typical Insertion Loss
   - 532 nm To 2000 nm Wavelength Range
   - Up To 30 dB Extinction Ratios

9. Polarization Rotators / Analyzers
   - Greater Than 30 dB Extinction Ratios
   - -40, -50, -60 dB Backreflection Levels
   - 1 dB IL Fiber-Fiber And Fiber-Photodiode Versions

10. Variable Optical Delay Lines
    - 400–2000 nm Wavelength Range
    - Up To 600 ps Delay, 0.003 ps Resolution
    - < 1.2 dB Losses Over The Delay Range

11. Fiber Pigtailed Polarizers
    - Up To 30 dB Extinction Ratios
    - 0.6 dB Insertion Loss, Low Cost, Compact
    - -40, -50, -60 dB Backreflection Levels

12. Teledonia Qualified
    - In-Line Optical Taps/Monitors
    - 400 nm To 2000 nm Wavelength Versions
    - High Sensitivity, Large Dynamic Range

13. Teledonia Qualified
    - In-Line Optical Taps/Monitors
    - 400 nm To 2000 nm Wavelength Versions
    - High Sensitivity, Large Dynamic Range

14. All Fiber Polarization Controllers (Manual)
    - Compact Size, Easy-To-Use
    - No Intrinsic Insertion Losses Or Return Losses
    - Works With Any Singlemode Fiber

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Laser to Fiber Couplers
> 60% Coupling Efficiency For SMF & PMF
Low / High Power Versions Up To 100 W
180 nm To 2000 nm Wavelengths

Laser to Fiber Couplers with Adjustable Focus
Up To 95% Coupling Efficiency For SMF & PMF
SMF, MMF & PMF Versions
0.1 Micron Resolution In Focus Adjustment

Adjustable Fiber Collimators/Connectors
Use For Adjustable Focusers And Couplers
Super & Angled FC/PC, And SMA905 Connectors
SMF, MMF & PMF Versions

Delivery Systems for Flow Visualization
Uniform Intensity Along The Line
< 1.0 Linewidths, 10° To 60° Fan Angles
Cross Targets Also Available

Fused Fiber Collimators
Low Insertion Loss
Low Backreflection
Over 1 kW Power Handling

Fused Fiber Optic Couplers
Low Insertion Loss
Up To 95% Coupling Efficiency For SMF & PMF
SMF, MMF & PMF Versions

Precision Fiber Collimator/Focuser Arrays
High Density, Small Footprint
Low Insertion And Backreflection Loss
High Polarization

Turnkey OEM Laser Diode Sources
Wavelength Range: 375 nm To 2000 nm
Externally Modulatable
Red, Green, Blue Combiner Versions Available

Alignment Kits & Tools
Polarization Tool Aligns In Seconds
Alignment Kit Simplifies Laser To Fiber Coupling
Video/USB Demonstrates The Coupling Process

Fiber to Photodiode Couplers
>70% Coupling Efficiency, SMF, MMF & PMF
-40 dB, -50 dB, -60 dB Backreflection
Low Cost, Rugged And Compact Size

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Fiber Optic Attenuators

Inline Variable Attenuators
- 0.6 dB to 60 dB Attenuation Range SMF, PMF & MMF
- Up to 2 W Power
- Fast Wavelength Response
- < 0.01 dB PDL
- Meets Telcordia Specifications

Electrically Controlled Attenuators
- 0.6 dB to 60 dB Attenuation Range SMF, PMF & MMF
- Maintains Attenuation With Power Off
- Up to 2 W Power
- Low Cost
- High Speed
- Rugged And Compact Size

Reflective Style Variable Attenuators
- 0.01 dB Resolution, SMF & MMF Versions
- -40 dB, -50 dB, -60 dB Backreflection

Reflective Style Motor Driven Attenuators
- 0.8 dB - 60 dB Attenuation Range
- Up to 2 W Power Handling
- SMF, PMF & MMF
- High Speed
- Rugged And Compact Size

MEMS Variable Attenuators
- Compact And Inexpensive
- Single Channel Up to 40 Channel Versions
- Low Loss, Large Attenuation Range

Pigtail And Receptacle Styles
- SMF, PMF & MMF Versions
- Designed To Kill Backreflection in Unused Ends
- 50 dB Return Loss
- 1300/1550 SM Fiber Only
- Ultra, FC/PC And SC Connectors

Digital Variable Attenuators
- 0.01 dB Resolution, Fast Response Time
- 0.6 dB to 60 dB Attenuation Range
- Computer / USB Port / Battery Option

Loopback Style Fixed Attenuators
- Mode Independent Attenuation
- Rugged, Compact Housing
- SMF & MMF Versions

Attenuating Fiber Patchcords
- Up to 2 Watts Power Handling
- Low PDL
- SM, PM Fiber Versions
- Very Low Cost
- Small Size

Plug Type Fixed Attenuators
- < -50 dB Backreflection, SMF & MMF
- -1 dB to -25 dB Attenuation, 1300 & 1550 nm Only
- Low Cost
- Rugged And Compact Size

Fiber Optic Terminators
- Designed To Kill Backreflection in Unused Ends
- 50 dB Return Loss, 1300/1550 SM Fiber Only
- Ultra, FC/PC And SC Connectors

Removable Neutral Density Attenuators
- Mode Independent Attenuation
- Pigtail And Receptacle Styles
- SMF, MMF & PMF Versions

Rack Mount Electrically Controlled Variable Attenuators
- High Power Up to 2 Watts
- Up to 60 dB Attenuator Range
- 350–2050 nm Wide Wavelength Range

OEM Motor Driven Variable Attenuators
- 0.6 dB to 60 dB Attenuation Range SMF, PMF & MMF
- Maintains Attenuation With Power Off
- Up to 2 W
- Low Cost
- High Speed
- Rugged And Compact Size

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Fiber Optic Connectors, Patchcords and Components for Optoelectronic Packaging

**Hermetically Sealable Patchcords with Metal Solder (Single/Multi Channel)**

- Meets Telcordia Specifications, Up To 16 Channels
- SMF, MMF & PMF Versions
- Customer Specific OEM Designs

**PM Fiber Pigtailed V-Groove Assemblies**

- Up To 48 Fibers In Single Array
- 127, 250, 400 And 500 Micron Spacings

**Bare Fiber Adaptors with Magnetic Clip**

- FC, ST, LC, SC, SMA, E2000, MU Available
- 80 Micron – 1000 Micron Hole Sizes

**V-Groove Substrates**

- Up To 96 Fiber Substrates
- Better Than 0.5 Micron Accuracy
- Use With Either UV Or Thermal Epoxies

**Soldering Station Inductive Systems**

- Used For Hermetic Sealing
- Easy-To-Use
- Custom Jigs Are Available

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**Hermetically Sealable Patchcords with Glass Solder (Single/Multi Channel)**

- No Metalization Required, Up To 16 Channels
- Meets Telcordia Specifications, SMF, MMF & PMF
- Customer Specific OEM Designs

**Fiber Pigtailed V-Groove Arrays**

- Up To 96 Fibers In A Single Array
- 127, 250, 400 And 500 Micron Spacings
- SM, MM, And PM Fibers

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**Tapered/Lensed Fibers**

- As Small As 2.0 Micron Spot Sizes
- Circular And Oval Spot Profiles
- Custom OEM Designs, Metalized Versions

**Glass Solder Preforms**

- Solders Glass Directly To Metal
- Ideal For Hermetic Sealing, Device Packaging
- Circular And Oval Preform Shapes

**Precision Fiber Collimator/Focuser Arrays**

- High Density, Small Footprint
- Low Insertion And Backreflection Loss
- High Extinction Ratio

**Bulkhead Receptacles**

- Available For FC, LC, ST, SMA, SC, FCI/APC
- Angled AT&T-ST And Angled SC
- Designed For Free Space Use, Compact Size

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**Metalized Fibers**

- SMF, MMF & PMF Versions
- Ideal For Hermetic Component Packaging
- Cleaved Fiber Endfaces, Masked Regions

**PM Stress Rods Aligned To 0.5 Degrees**

- Miniature Size Ideal For Packaging

**Cylindrical And Rectangular Shapes**

- Custom Shapes And Hole Sizes

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**Precision Fiber Collimator/Focuser Arrays**

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**Solders Glass Directly To Metal**

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- Circular And Oval Preform Shapes

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High Power Fiber Optic Components

- High Power Directional Taps/Power Monitors
  - Up To 10 Watts Power Handling
  - SM, PM And Specialty Fiber Versions
  - Available For 320 nm To 2000 nm

- High Power Wavelength Division Multiplexers
  - 0.8 dB Insertion Losses, 65 dB Isolation
  - Up To 2 Watt Power Handling
  - -40 dB, -50 dB, -60 dB Backreflection

- High Power Bulkhead Receptacles/Sleeve
  - thru Adapters with Safety Interlocks
  - High Power Handling
  - Contact, Temperature, Proximity Sensors
  - Fiber To Air And Fiber To Fiber Versions

- High Power Free Space Splitters
  - Source to Fiber Type
  - Up To 100 Watts Power Handling
  - Available Wavelengths From 400 nm To 2000 nm

- High Power Fiber Optic Shutters with Safety Interlocks
  - Up To 100 Watts Power Handling
  - Fiber-Fiber And Source-Fiber Versions
  - Available For 180 nm To 2000 nm Wavelengths

- High Power Free Space Splitters
  - Fiber to Fiber Version
  - Up To 100 Watts Power Handling
  - Available Wavelengths From 400 nm To 2000 nm

- High Power Optic Coatings
  - High Power AR, Beamsplitter, Dichroic Coatings on Fibers, Micro Optics, Lenses, Plates, Prisms etc.

- High Power Antireflection (AR) and Highly Reflective (HR) Coated Fiber Ends
  - HR, R>98%, AR < 0.3%
  - 350 nm To 2000 nm Wavelength Coatings

- OZPEN CO Cleaning Unit for High Power Components
  - Designed To Clean Small Surfaces
  - Superior To Other Cleaning Methods
  - Quick Dry And Solvent-Free Cleaning Process

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Miscellaneous Fiber Optic Components

- **OCT Module/Components**: Complete Module Or Separate Components Such As Broadband Isolators, Sources, Attenuators, Collimators, Fused Splitters, Delay Lines
- **2000 nm Components**: Fiber Pigtailed Sources Isolators, Attenuators Fused Splitters, Collimators
- **Fiber Optic Termination Kits**: For FC, LC, ST, SMA Or SC Connectors Contains All The Necessary Polishing Films, Tools, Epoxies And Accessories
- **Fiber Optic Educational Kits**: Teaches Basics Of Fiber Optics Easy-To-Use, Affordable Wide Range Of Labs Available
- **Ferraday Mirrors and Rotators**: Used In EDFA, Tunable Lasers, Etc. 0.7 dB Typical Insertion Loss -40, -50, -60 dB Backreflection
- **Fiber Optic Shutters**: Up To 100 W Optical Power SMF, PMF & MMF Fast Response Time Ideal For Safety Interlocks
- **Pin Gauges for Fiber OD Measurements**: Easy-To-Use, Low Cost 124–128 Micron Gauges Available Individual Or 5-In-One Gauges
- **Vacuum Feedthroughs**: Singlemode And Multimode Versions Easy To Install And Use, Compact And Rugged Gas Leak Rate 10⁻⁸ sec/sec
- **Compact RGB Engine/Combiner**: Combine Up To 5 Visible Wavelengths In One Fiber Compact Size High Power Handling
- **Bare Fiber Adaptors with Magnetic Clip**: Very Easy To Hold Bare Fibers FC, ST, LC, SC, SMA E2000, MU Available 80 Micron – 1000 Micron Hole Sizes
- **Universal Connectors/Hybrid Patchcords**: Less Than 0.5 dB Insertion Loss Ultra, Super, Angled FC/PC, LC, SC, ST & SMA Low Cost, Rugged And Compact Size
- **Sleeve Thru Adaptors**: Available For FC, ST, SMA, SC And LC, MM Less Than 0.3 dB Insertion Losses Patch Panel Mountable, Duplex Styles
- **Air Gap Variable Attenuators**: Very Compact Size Patch Panel Mountable FC/PC And ST Connector Styles

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Laser Diode Power Combiners
Up To 45% Coupling From Each Diode
-40, -50, -60 dB Backreflection SMF, PMF & MMF
Can Combine Equal / Different Wavelengths

Fiber Optic Fixed Filters
400 nm To 1600 nm Wavelengths, SMF & PMF
-40 dB, -50 dB, -60 dB Backreflection
Filters Can Be Fixed Or Removable

Fiber Diode Power Combiners
Continuous Control Of Polarization
Negligible Insertion And Return Losses
Up To 2 kHz Response Speed

Fiber Reflectors
Low Loss, Compact Design
400–2000 nm Wavelengths Available
Partial Reflectors Are Available

Motor Driven Variable Bandwidth Tunable Filters
45 nm Tunable Range
Flat Top Filter Shape
Polarization Insensitive

Electrically Controlled Fabry-Perot Tunable Filters
Tuning Rate Up To 25 kHz
Narrow Bandwidth
Low Insertion Loss

Benchtop High Speed Polarization Controllers
Continuous Control Of Polarization
Negligible Insertion And Return Losses
Up To 2 kHz Response Speed

Benchtop Polarization Extinction Ratio Meters
Measures Up To 60 dB
450–2400 nm Wide Wavelength Range
0.5° Angle Accuracy

Connector Video Microscopes
Easy-To-Use
Up To 400x Magnification
LC, FC, SC, E2000 Or Other Custom Connectors

Connector Cleaning Units
Easy-To-Use
Low Cost
2.5 mm, 1.25 mm, Custom Design Connectors

Polarization Measurement System for V-Grooves
Measures Polarization Angle To ± 0.5 Degrees
Measures Extinction Ratios Up To 40 dB
Measures Relative Power (650 Hz Sample Rate)

600 ps Reflector Style Manual Variable Delay Lines
400–200 nm Wavelength Range
Up To 600 ps Variable Delay Line
Low Insertion Loss

600 ps Reflector Style Delay Lines with Servo Motor
400–200 nm Wavelength Range
Up To 600 ps Variable Delay Line
Low Insertion Loss

PM Fiber Optic Switches
Repeatability < ±0.05 dB
1x2 Miniature Reliable Switching Mechanism
Low Loss < 0.6 dB, High ER > 20 dB

Motor Driven Variable Bandwidth Tunable Filters
45 nm Tunable Range
Flat Top Filter Shape
Polarization Insensitive

Manually Tunable Variable Bandwidth Filters
45 nm Tunable Range
Polarization Insensitive
Flat Top Filter Shape

Electrically Controlled Fabry-Perot Tunable Filters
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Low Insertion Loss

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Connector Video Microscopes
Easy-To-Use
Up To 400x Magnification
LC, FC, SC, E2000 Or Other Custom Connectors

Connector Cleaning Units
Easy-To-Use
Low Cost
2.5 mm, 1.25 mm, Custom Design Connectors

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