

# OZ Optics Limited

## Fiber Optic Test Equipment

June 2016

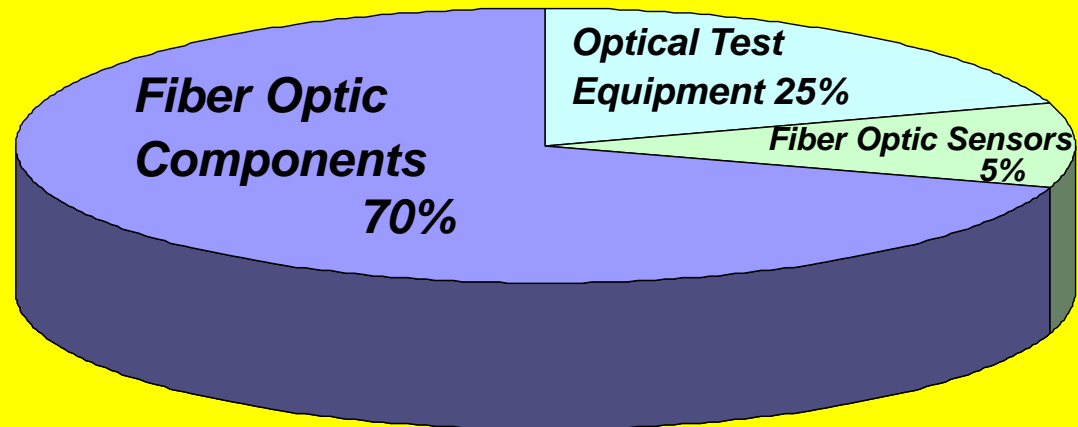
# Company Profile

- *Company founded in 1985;*
- *Corporate headquarters located in Ottawa, Canada;*
- *Manufacturing facility in Ottawa/Canada, Izmir/Turkey, and Jiaxing/China*
- *Seven Product Groups: **Laser-to-Fiber Delivery Systems, High Power Fiber Optic Components, Polarization Maintaining Products, Attenuators, Opto-Electronic Packaging, Test Equipment, Fiber Optic Sensor Systems***
- *Sales offices in California and Jiaxing (Near Shanghai)*



# Company Profile

## ➤ *Three Product Groups:*



➤ *Over 1,000 products*

➤ *Leading Edge R&D*

# OZ Optics Products



**OZ Optics**

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Global Leader in Fiber Optic Products since 1985

## Polarization Maintaining Fiber Optic Components

Patent Numbers: USA 7058275, 7095931, 7295731, China 1672073



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## High Power Fiber Optic Components

Patent Numbers: Canada 2494133, USA 7058275, 7095931, 7295731, China 1672073



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## Fiber Optic Attenuators for SM, PM, and MM Fibers

### Digital Variable Attenuators



- 0.00B to 30.00B Attenuation Range
- 0.00B to 1000W Power Handling
- 1000mWatt

### Electrically Controlled Variable Attenuators



- 0.00B to 30.00B Attenuation Range
- Up to 2 Watts Power Handling
- 1000mWatt

### MEMS Variable Attenuators



- 0.00B to 30.00B Attenuation Range
- Small Size, Low Cost, Low Power Consumption
- 1000mWatt

### SM / PM / MM Fiber Pigtailed Inline Variable Attenuators



- 0.00B to 30.00B Attenuation Range
- 0.00B to 1000W Power Handling
- 1000mWatt

### Single/Multi Channel Miniature Variable Attenuators



- Compact, Low Noise, Small Form Factor
- 1000mWatt
- 1000mWatt

### Reflective Style Variable Attenuators



- 0.00B to 30.00B Attenuation Range
- 0.00B to 1000W Power Handling
- 1000mWatt

### Air Gap Variable Attenuators



- 0.00B to 30.00B Attenuation Range
- 0.00B to 1000W Power Handling
- 1000mWatt

### Plug Type Fixed Attenuators



- 0.00B to 30.00B Attenuation Range
- 0.00B to 1000W Power Handling
- 1000mWatt

### Attenuating Fiber Patchcords



- 0.00B to 30.00B Attenuation Range
- 0.00B to 1000W Power Handling
- 1000mWatt



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## Laser & Laser Diode to Fiber Delivery Systems

### Laser to Fiber Couplers



### Bare Fiber Adaptors with Magnetic Clips



### Bulkhead Receptacles



### Pigtail/Receptacle Style High/Low Power Collimators/Focusers



### High/Low Power Patchcords



### WDM/RGB Combiners



### OCT Modules and 2 micron Components



### OEM Laser Diode to Fiber Couplers



### Turnkey, Ultra Stable Laser Modules



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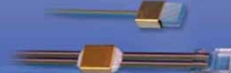
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## Fiber Optic Components for Optoelectronic Packaging

Hermetically Sealable Patchcords with Glass or Metal Solder



Single Channel



Multi Channel



Metalized Fibers



PM/SM/MM Fiber Pigtailed V-Groove Arrays



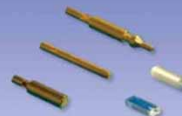
Polarization Measurement System for V-Grooves



Tapered / Lensed Fiber Polished / Laser Shaped



Glass Solder Preforms



Fiber Optic Ferrules



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## Fiber Optic Test Equipment



Polarization Extinction Ratio Measurement Systems



Power Meters with Smart Detector Heads



Broadband Digital Variable Attenuators



Optical Fiber Length Meters



High Power Visual Fault Locators  
Fiber Optic Stable Sources



Inline Optical Power Monitors/Meters



Laser Diode Sources  
Single/Multiwavelength



Fiber Optic Smart Patchcords



Fiber Optic Fault Finders



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# Product Innovation



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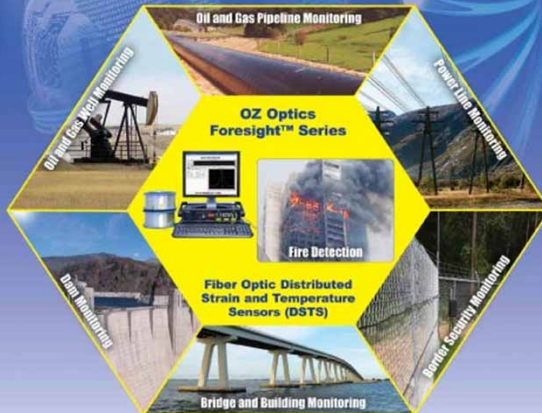


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## Fiber Optic Distributed Strain and Temperature Sensors

USA Patent Numbers: 7499151, 7599047

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 100 km sensing range
- Uses standard telecommunication fiber to minimize costs



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## Fiber Optic Fault Finder for Optical Network Safeguard™

- Monitors and reports network health status in real time, 24 hours/day, 365 days/year
- Lowers network operating and maintenance expenses
- Reduces revenue loss due to fiber plant outages
- User friendly interface via various wireless interfaces (Wi-Fi, GPRS), USB, or RS-232
- Reports fault location, giving GPS coordinates with time stamp
- Early alert and outage reports via cellular phone, email, IM, SMS, or text messaging



OZ Guard Automated Test Solution



Remote Monitoring a WDM Network



Remotely Accessible/Wireless Fault Finders



GPS Locator



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# Product Innovation



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## 2 micron Fiber Optic Components for PM and SM Fibers

Fiber Optic Patchcords

Fused Couplers / Taps / Beam Splitters / Combiners

Fiber Pigtailed Laser Diode Sources

Pigtail / Receptacle Style Collimators / Focusers

Polarizers

Manual / Electrically Controlled Variable Attenuators

Isolators



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## Fiber Optic Products for OCT Applications

OCT Modules

Manual / Electrically Controlled Broadband Variable Attenuators

Manual / Electrically Controlled Fiber Optic Delay Lines

Manual / Electrically Controlled Polarization Controllers

Fiber Pigtailed Broadband SLED Sources

Fiber Collimators / Focusers

Broadband Fused Couplers



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# Company Profile

Over 330 employees worldwide:

- 200 in Ottawa and US
- 50 in Turkey
- 80 in China

*OZ Canada*



*OZ China*



*OZ Turkey*

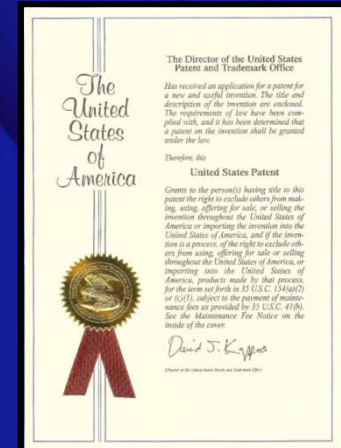
# Company Profile

***OZ Optics is lead by an experienced team:***

- **Ömür Sezerman, Chairman, President & CEO**
  - Founder and CEO since inception (30 years)
- **Zahide Sezerman, VP of Human Resources**
  - With OZ Optics since inception (30 years)
- **Garland Best, VP of Components Division**
  - 23 years at OZ Optics
- **Gordon Youle, VP of Test Equipment Division**
  - 16 years at OZ Optics
- **Sarah Miller, Controller**
  - 2 years at OZ Optics
- **Metin Sezerman, General Manager of OZ Turkey**
  - 14 years at OZ Optics
- **Bing Li, General Manager of OZ Optics China**
  - 11 years at OZ Optics

## Company Profile

- ISO9001:2008 certified
- Broad patent portfolio
- Advanced proprietary processing technology





# Company Profile

➤ *Using our strong direct sales and distributors, we address the following markets:*



# Company Profile

➤ *OZ Optics has resellers and distributors in over 30 Countries & Regions and over 10,000 customers globally:*



*Australia*



*France*



*Japan*



*Spain*



*Austria*



*Germany*



*Netherlands*



*Switzerland*



*Belgium*



*Greece*



*Luxembourg*



*Sweden*



*Brazil*



*Hong Kong*



*Norway*



*Taiwan*



*Canada*



*India*



*Poland*



*Thailand*



*China*



*Ireland*



*Portugal*



*Turkey*



*Czech Rep.*



*Israel*



*Singapore*



*United Kingdom*



*Denmark*



*Italy*



*South Korea*



*United States*



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# In-House Production Capabilities

- Experienced and well-trained staff in following fields:
  - optical, mechanical, electronics & software

*CNC Machine Shop*



*AR Coating*



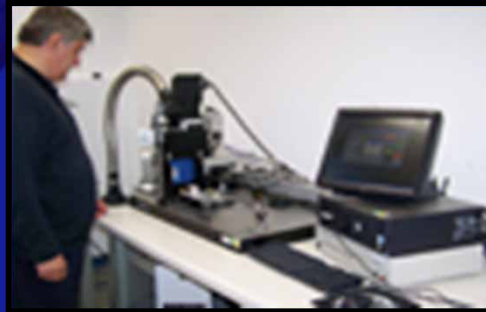
*Femtosecond Laser Lab*



*Clean Room*



*Laser Conditioning/Cleaving*





# Branch Network



# Facility – Ottawa Headquarters

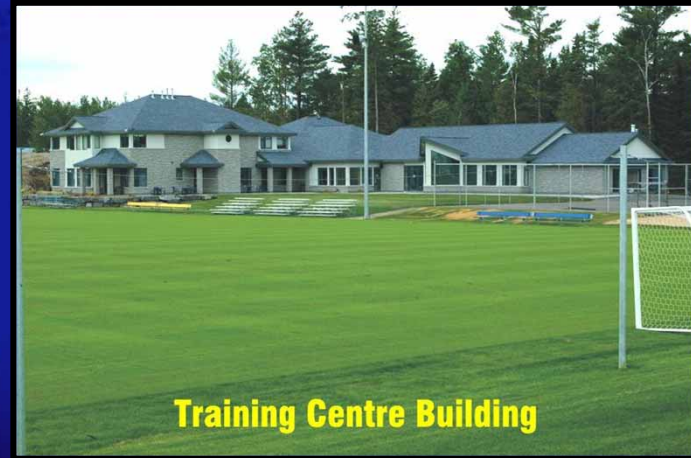
- 60,000 sq ft. – Manufacturing and R&D Facilities
- 15,000 sq ft. – Admin, Sales and Marketing
- 15,000 sq ft. – Training and Fitness Facility
- R&D, Product Design, Engineering, Final Assembly & QA



# Facility – Ottawa Headquarters



**Production Area**



**Training Centre Building**



**Meeting Room**



**Swimming Pool**



# OZ Optics – Turkey Factory

- Since 2000
- 33,000 sq ft. Manufacturing Facility
- Located in Free Trade Zone
- Low Tax Rates
- Sub Component Parts Manufacturing



# OZ Optics – China Factory

- Operational since 2009
- 2000 sq meters
- Cost Effective Manufacturing
- High Quality Labor
- Low Cost Procurement
- Supply Chain Integration
- Subcomponent Part Manufacturing



# OZ China Facility

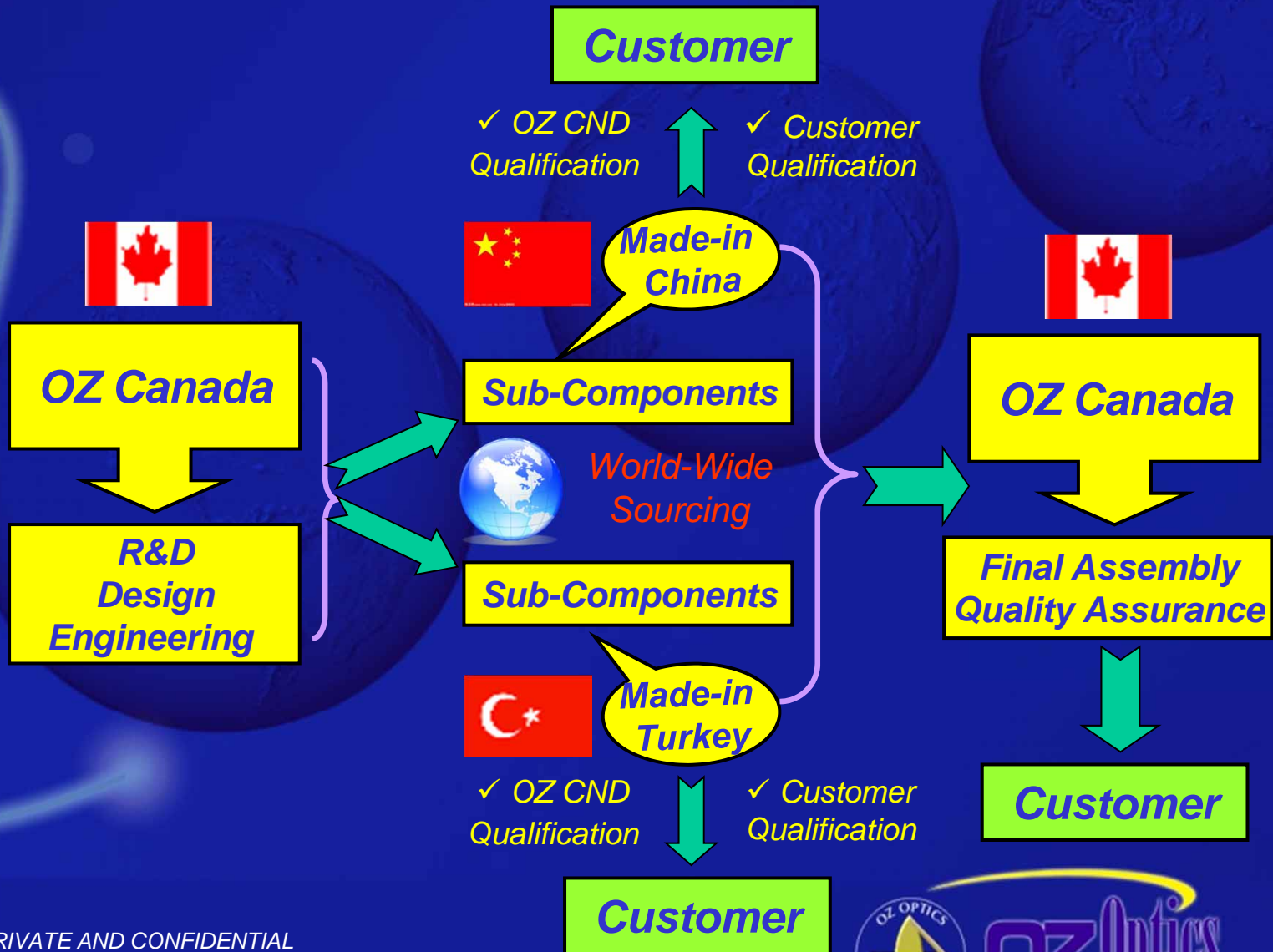
Jiaxing, China

- Located in Economic Development Zone
- 500 sq meters – Admin, Sales and Marketing
- 1500 sq meters – Manufacturing Area
  - 100 sq meters – Class 10,000 Clean Room
  - 100 sq meters – ESD Working Area





# Manufacturing Strategy



# Industry Standards

All products manufactured are in strict accordance with international industry standards:

➤ *Telecordia Compliance*



➤ *CE Compliance*



➤ *RoHS Compliance*



➤ *ISO 9001:2008 Certified (China, Turkey and Canada)*

➤ *Controlled Goods Directorate Registered*

# Core Competencies

- *Pioneer in Polarization Maintaining (PM) Components*
- *Leader in Wavelength Flattened, High Power & Low PDL Components*
- *Leader in High Power Fiber Optic Delivery Systems*
- *Custom Test Equipment, Including Polarization Test Equipment and FTTH Equipment*
- *Widest Range in Attenuator Product Offering*
- *Fiber Optic Distributed Strain and Temperature Sensors*
- *Complete product line for OCT applications & 2 Micron*



# Leading Technology

- **High Power Isolators**
  - power handling > 50W
  - low loss, low cost turnkey solution



High Power Free Space and Pigtailed Isolators

- **Pioneer in Polarization Maintaining (PM) Components**
  - wavelength flattened
  - high power & low PDL
  - PM test equipment



Polarization Maintaining Patchcords

Distributed Strain and Temperature Sensors



- **Fiber Optic Sensor**
  - fast and simultaneous measurement of strain & temp
  - large structure health monitoring

High Power Collimators/Focusers



- **Leader in High Power Fiber Optic Delivery Systems**
  - specializes in custom design



## OUR VISION

- *Be the preferred Supplier of choice*
- *Capture and expand market share*
- *Maximize shareholder value*

## OUR MISSION

- *To become the leading provider of innovative optical products to telecom and non-telecom sectors*

## OUR CORE VALUES

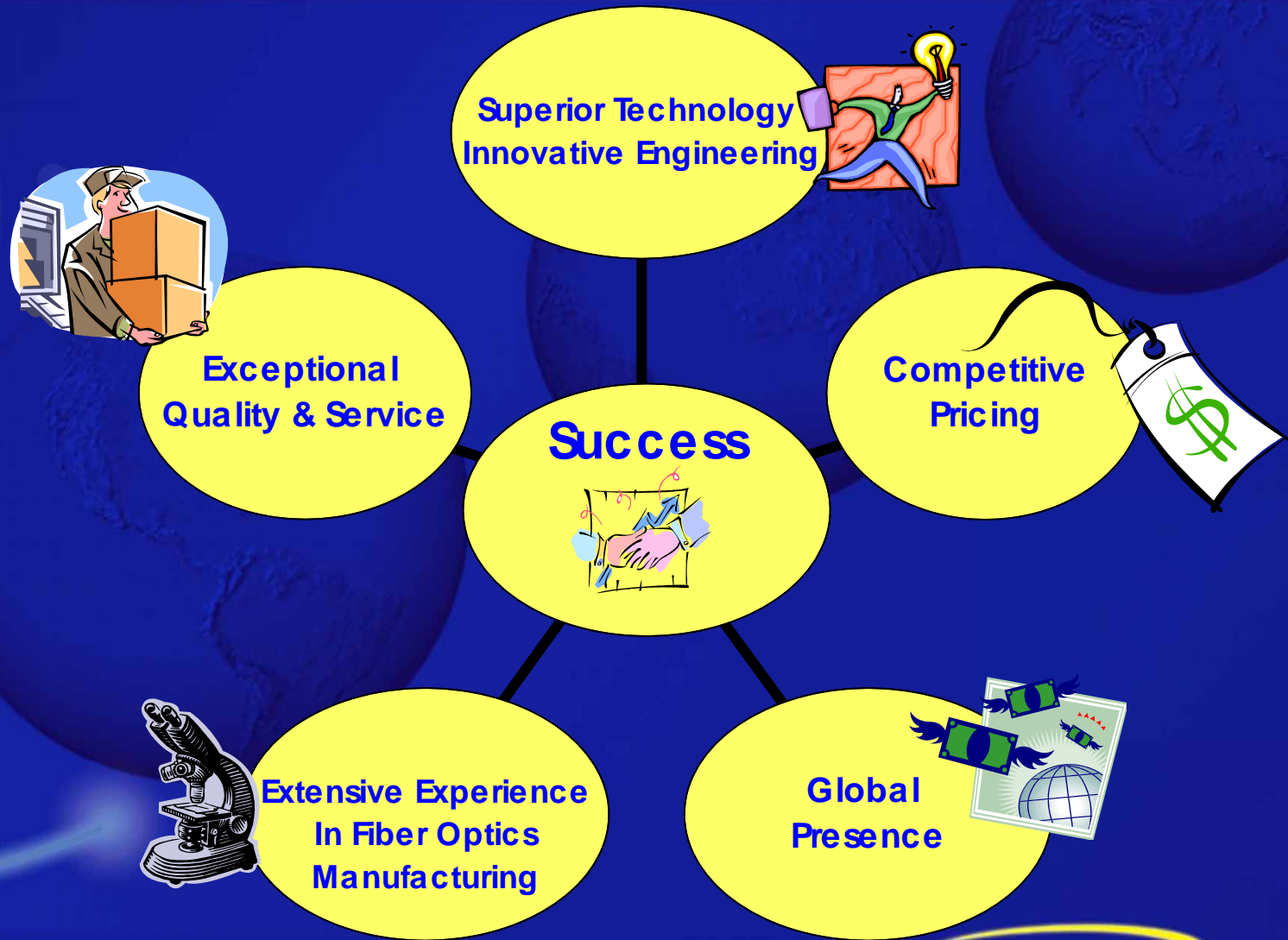
- *Leadership*
- *Teamwork*
- *Boldness*
- *Commitment*
- *Innovation*
- *Rewards*

## OUR QUALITY POLICY

- *Provide our Customers with a competitive advantage, leveraging performance, price and delivery, through a continuous process of Quality advancement in all areas of our Company*
- *Communicate effectively to our Customers, Suppliers and Shareholders our commitment to Quality and continuous improvement*
- *Promote opportunities of professional development for all members of our Company through education, training and personal challenge*

**Ömür Sezerman**  
**President**

# Competitive Advantage





# Fiber Optic Test Equipment

**OZ Optics offers a wide range of standard test equipment, as well as a range of specialized equipment for polarization related measurements**

## **Features:**

- Many types of optical sources are offered
- Fixed and tunable filters are available
- A variety of types of optical power meters are available
- Instruments for measuring polarization are offered
- Fixed or Variable Delay Lines for Polarization Compensation are offered

# Fiber Optic Test Equipment

## Recent additions to the OZ line of Test and Measurement Equipment Includes:

- Benchtop Fiber length meter
- Benchtop Backreflection Meter for Visible and Near Infrared
- Benchtop ER Meter with touch screen display
- Non-Contact High Power Visible Fiber Optic Fault Finder
- High speed polarization controller and scrambler
- Bandwidth Tunable Variable Filter
- Optical Power Meters with Multi-Channel Smart Detectors
- Smart patchcords for in-line monitoring
- Optical Time Domain Reflectometers / Fault Finders
- OEM laser diode sources

# Fiber Optic Test Equipment

Many types of interfaces to OZ Optics instruments are offered, including:

- USB - standard (for speed and ease of use)
- RS-232 - standard on Legacy products
- SPI - for embedded systems
- GPIB - for multi-instrument environments
- Wireless - for remote access

Custom interfaces are also available.



# Polarization Extinction Ratio Meters

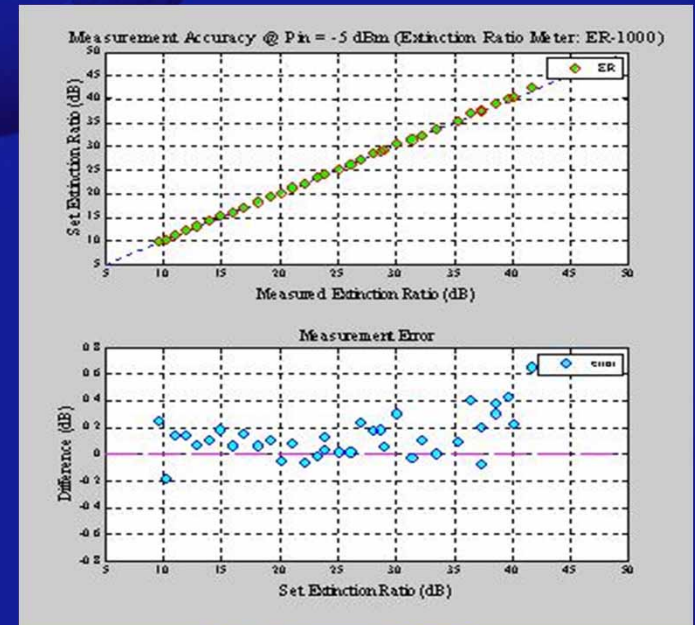
- Measure up to 40dB Extinction Ratio
- 0.3 Degree Angle Resolution
- Up to 2 Watts with removable fix no filters
- Broadband wavelength: 400-2050 nm
- USB or RS-232 interfaces available



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# Benchtop Polarization Extinction Ratio Meter

- Automatically Positions Fiber for Optimum Power
- Measures Angles to within  $1^\circ$
- Measures up to 50dB ER and up to 2W
- Color touch screen display
- Removable receptacle



# Highly Stable Polarized Sources

- As Good as 40dB Extinction Ratio
- Pigtail & Receptacle Versions
- 375 nm to 2050 nm Wavelengths( no isolator for <600 nm)





# Fiber Optic Polarized Sources

- As Good as 40dB Extinction Ratio
- Pigtail & Receptacle Versions
- 635nm to 2050 nm Wavelengths



# Polarization Measurement System for WGMove FIM Fiber Assemblies

- Automatically Positions Fiber for Optimum Power
- Measures Angles to within  $1^\circ$
- Measures up to 40dB ER



# Polarization Measurement System for V-Groove PM Fiber Assemblies

- Automatically Positions Fiber for Optimum Power
- Measures Angles to within  $1^\circ$
- Measures up to 40dB ER





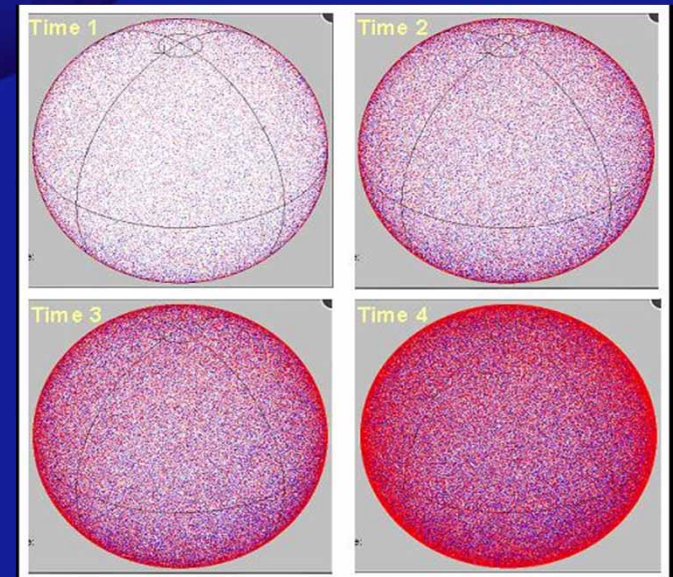
# Electrically Driven Polarization Controllers

- **Continuous Control of Polarization**
- **No Insertion Losses or Return Losses**
- **> 100 Hz Response Speed**
- **Low activation loss**



# High-Speed Polarization Controller-Scrambler Optical Module

- Continuous Control of Polarization
- No Insertion Losses or Return Losses
- Response speed up to 30 kHz
- Inline and Low activation loss
- Compact and PCB mountable



# Polarization Dependent Loss Emulator

- 0.05dB To 10dB Polarization Dependent Loss
- Fixed Or Manually Variable PDL
- Broad Wavelength Range, Compact, And Low Cost
- PMD Free optional (  $<0.1$  ps)
- Very low wavelength dependence





# Highly Stable Laser Diode Source

- Stable to  $\pm 0.001\text{dB}$  @ 1550 nm with FC/APC
- 375nm to 2050 nm Wavelengths ( no Isolator for <600 nm)
- Built in TE Cooler and Isolator



# Light Sources

- Stable to  $\pm 0.01\text{dB}$ , LED, LD Source @ 1550 nm with FC/APC
- 635nm to 2050nm Wavelengths
- TE Cooled Versions Available with OZ-X000 and HIFOSS styles



# Laser Diode/LED Source

- 1, 2, or 3 wavelengths in one unit
- Selectable power levels
- Continuous or modulated output
- MM, SM, or PM versions available
- Long battery life (more than 40 hours)





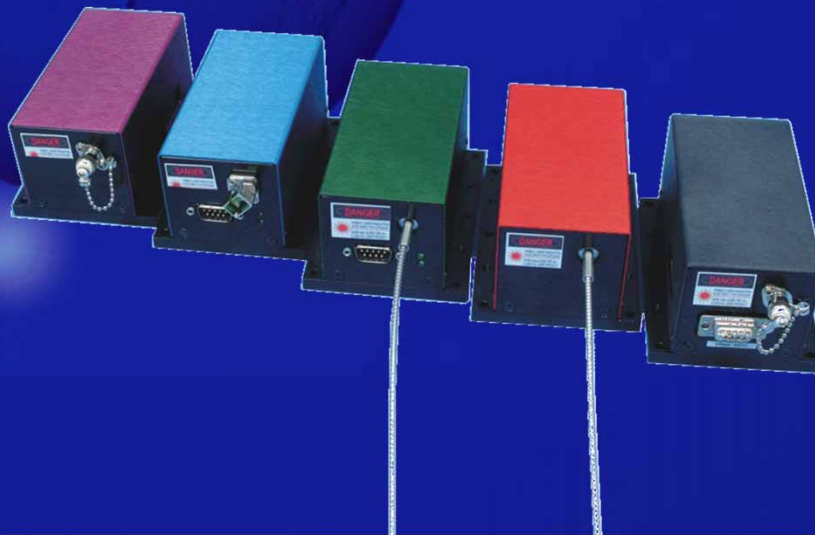
# Laser Diode/LED Source

- Insertion loss measurement
- Fiber identification using internal modulation
- Splicing and connection testing
- FTTX/PON
- Quality assurance



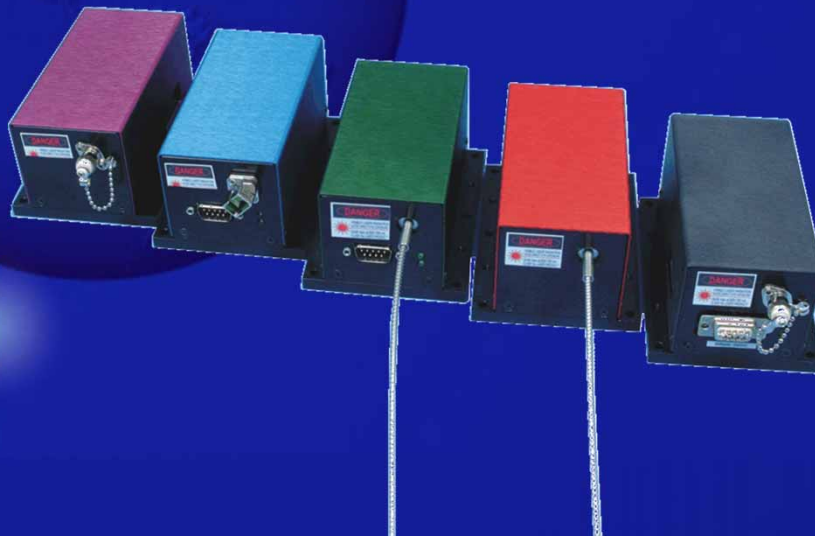
# Ultra Stable OEM Laser Diode Source

- Output powers to  $> 100$  mW
- Power stability to better than 0.025 dB \* depending on the wavelength
- Wavelength stability to  $< 0.1$  nm
- Wavelengths from 375 to 2100 nm available
- External modulation to 50 MHz available



# Ultra Stable OEM Laser Diode Source

- Multimode, Singlemode, or PM fiber versions
- Free Space, Pigtail or receptacle styles
- Guaranteed lifetime 18 months or 5000 hours
- Power control via external analog voltage
- Custom versions available





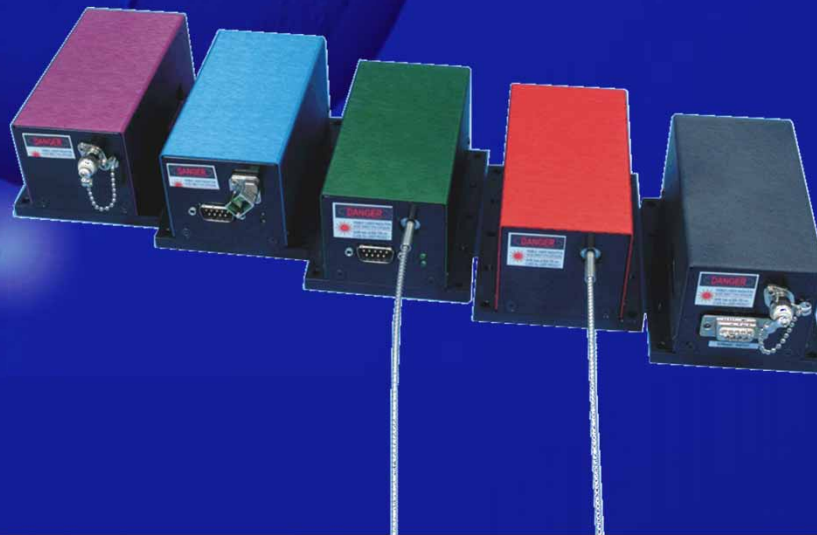
# Ultra Stable OEM Laser Diode Source

- Multimode, Singlemode, or PM fiber versions
- Free Space, Pigtail or receptacle styles
- Guaranteed lifetime 18 months or 5000 hours
- Power control via external analog voltage
- Custom versions available



# Ultra Stable OEM Laser Diode Source

- Insertion loss or attenuation measurement
- High power or remote fiber delivery system
- Materials evaluation and testing
- Life science illumination
- Laser scanning microscopy
- Red/Green/Blue illumination systems



# Ultra Stable Narrow Linewidth Source

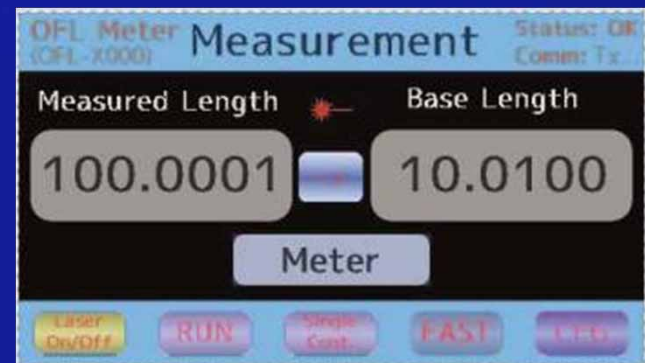
- 1550nm narrow and single longitudinal
- Single mode, or PM fiber versions
- Selectable peak wavelength on C-band:ITU-T, DWDM
- Pigtailed or receptacle styles
- Low RIN and High SMSR
- Wavelength tunable and power modulation options are available





# Benchtop Fiber Length Meter

- Measures lengths from a few mm up to 500 m
- No dead zone. Can measure fibers less than 1 cm long
- Better than 2 mm resolution and  $<0.1\%$  measurement error
- Works with singlemode, multimode, polarization maintaining and specialty fibers
- Color touch screen display



# Backreflection Meter

- Sensitive to – 70dB
- 1300/1550nm Dual Wavelength Source
- Also Measures Insertion Losses
- RS-232 or USB Interfaces available



# Benchtop Backreflection Meter for Visible & Near Infrared Wavelengths

- Sensitive to – 70dB
- Wide wavelength offering for special applications: 635-1625nm
- Built in Broadband SLED for improved stability
- Optional Insertion Loss measurement capability
- Color touch screen and USB Interface available



# Digital Variable Reflectors

- **Test Sensitivity to Backreflection**
- **-1.5dB to -60dB Backreflection**
- **RS-232 or USB Interfaces available**



**ozOptics**

[www.ozoptics.com](http://www.ozoptics.com)



# Digital Variable Attenuators

- 0.01dB Resolution, Fast Response Time
- 0.6dB to 60dB Attenuation Range
- Low PDL and High Power Capability
- RS-232 or USB Interface
- Wavelength Flatness in L, C, S Band



**ozOptics**

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# Digital Tunable Filters

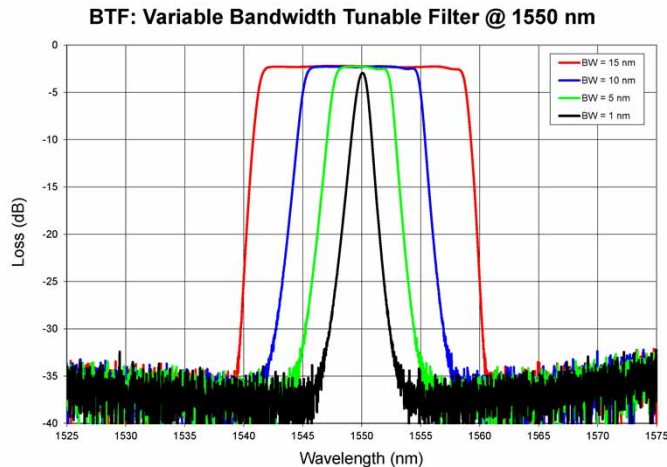
- **< 1.2nm Line Width, 0.1nm Resolution**
- **50nm Tuning Range, Fast Response Time**
- **RS-232 or USB Interfaces available**



**ozOptics**  
www.ozoptics.com

# Manually Adjustable Polarization Insensitive Variable Bandwidth Tunable Filters Module

- 45 nm tuning range with 1 to 18 nm continuously adjustable bandwidth
- Independently tunable both wavelength and bandwidth (Flat-top), polarization insensitive
- High out-of-band suppression
- SM, PM and Multimode version



# Polarization Maintaining Fiber Switch

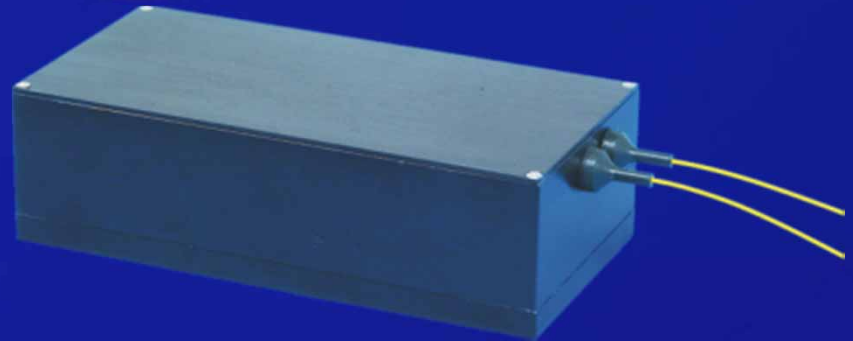
- **> 20 dB Polarization ER**
- **Latching and Non-Latching versions**
- **< 0.6 dB loss**
- **Now offering MEMS based 1 x N optical Switches (Non-Latching)**





# Differential Polarization Delay Lines

- **Varies the Delay Between Two Polarizations**
- **$\pm 50$  psec Delay, 0.1 psec Resolution**
- **$< 1.2$  dB Losses over the Delay Range**



**ozOptics**  
www.ozoptics.com

# Variable Optical Delay Lines

- **Motor Driven Version is Available**
- **Over 300ps Delay Range, < 1dB IL**
- **As Fine as 0.003ps Resolution**



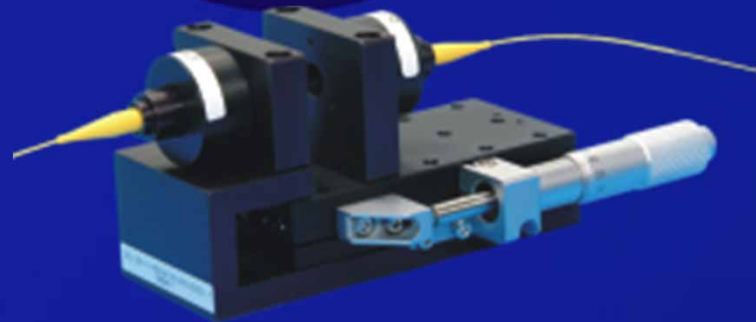
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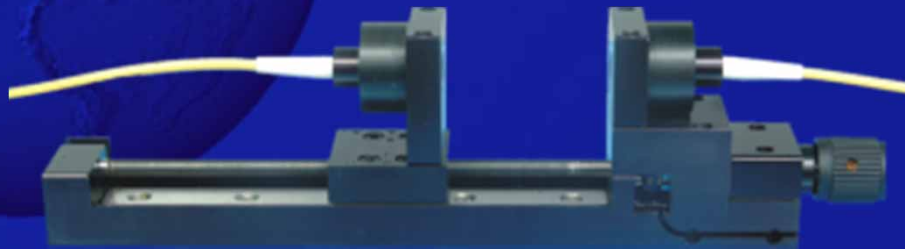
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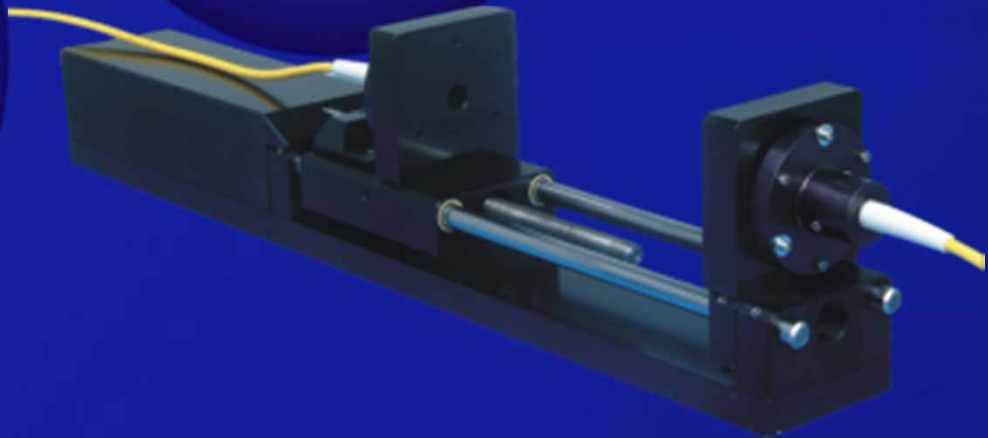
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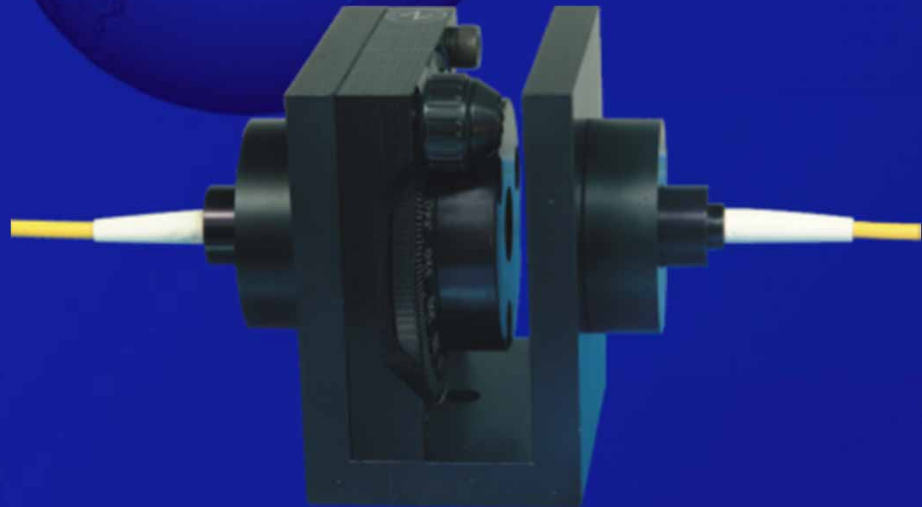
# Polarization Rotators / Analyzers

- **Motor Driven Version is Available, 1dB IL**
- **Fiber to Fiber & Fiber to Photodiode Versions**
- **-40, -50, -60dB Backreflection Levels**



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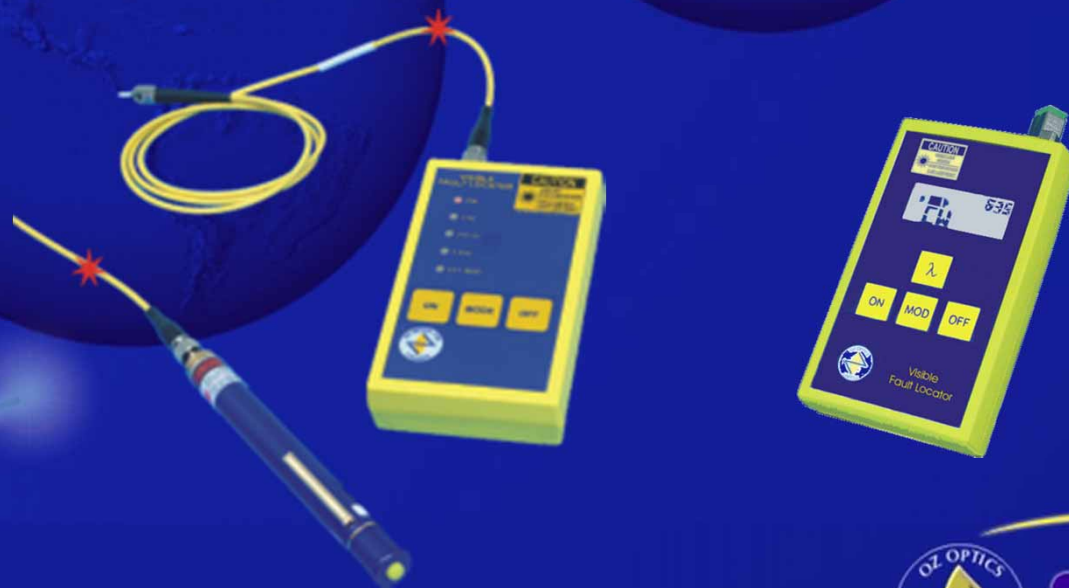
# Non Contact High Power Visible Fiber Optic Fault Finder

- High Visibility
- Higher Output up to 30mw
- Available with 520nm (green) or 635nm (red)
- Non-contact fiber and suitable with bare fiber adapter



# Pen & Pocket Size Fault Locators

- Detect Breaks in Fiber Optic Cables
- Use as an End-To-End Fiber Identifier, 635nm
- Up to 30mW (Bench-top version)
- Up to 40 hours of battery operation





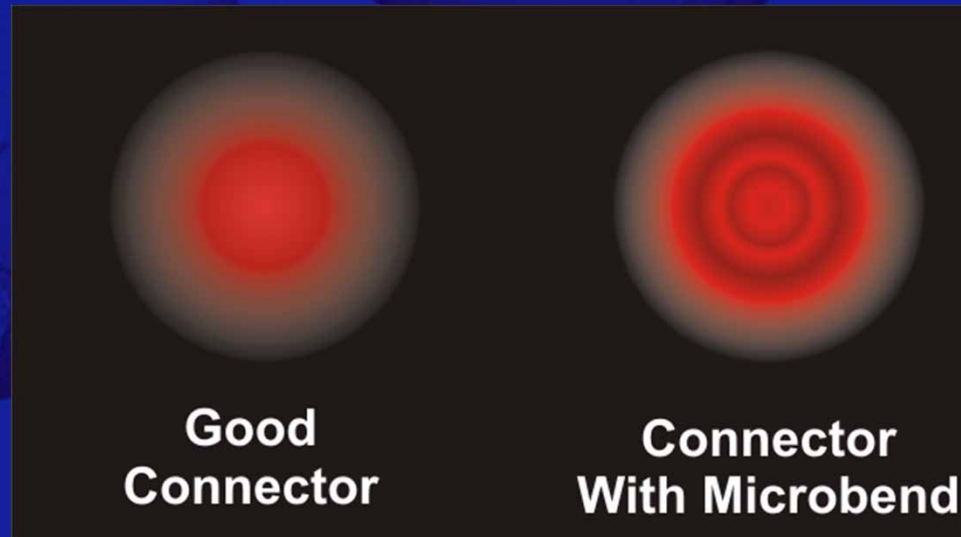
# Pen & Pocket Size Fault Locators

- Detect Breaks in Fiber Optic Cables
- Use as an End-To-End Fiber Identifier, 635nm
- 0.5 mW for pen-sized version



# Pen & Pocket Size Fault Locators

- **Detect Breaks in Fiber Optic Cables**
- **Use as an End-To-End Fiber Identifier, 635nm**
- **Up to 30mW, Inexpensive**



# Power Meter with Smart Detector Heads

- 85dB Dynamic Range, Fast Response Time
- 400 - 2050nm Wavelengths (not calibrated for > 1700nm), Built-in Attenuator
- Dual Detector Head Capability
- RS-232 or USB Interfaces available



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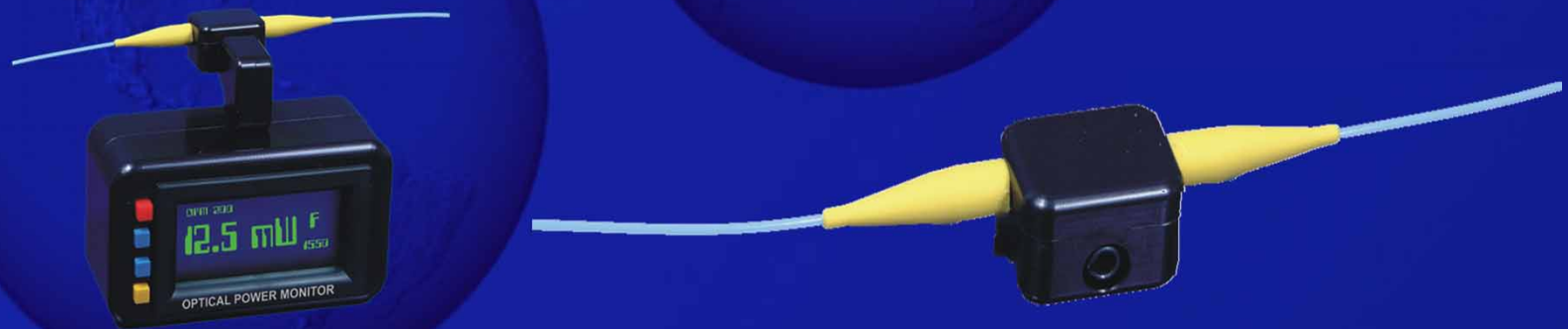
# Smart Detector Head Accessories

- Integrating spheres for high power measurements
- Optical filters
- Attenuators
- Lenses
- Custom designs



# Inline Optical Power Meter/Monitor

- Calibrated Power Meter
- Wide Wavelength Range, up to 2 Watts Power
- SM and PM Fiber Versions





# Mini Power Meter

- **Calibrated Power Meter**
- **Measures up to 10 mW**
- **Small size**
- **Low Cost**
- **Good for FTTX applications**



# Handheld Optical Power Meter

- Wide dynamic range
- Wide wavelength range
- Long battery life
- Interchangeable optical connectors
- RS-232, GPIB, and USB Interfaces available



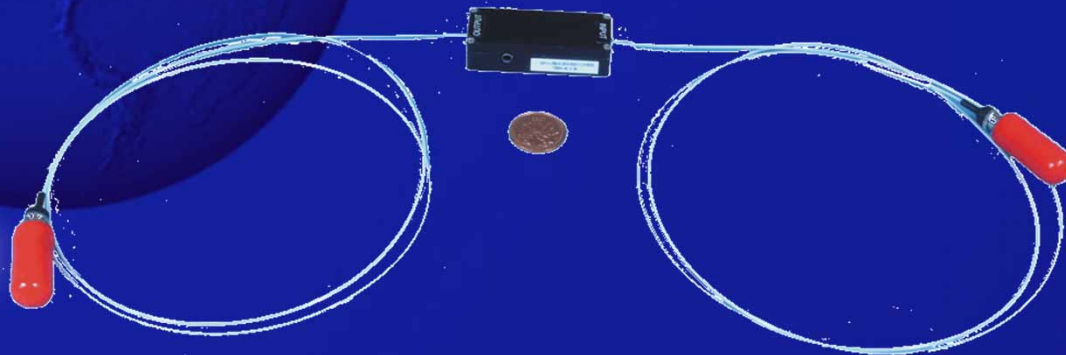
# Handheld Optical Power Meter

- **Fiber optic assembly and testing**
- **Quality control**
- **Network installation**
- **Component and system troubleshooting**
- **Education**



# Smart Patchcord

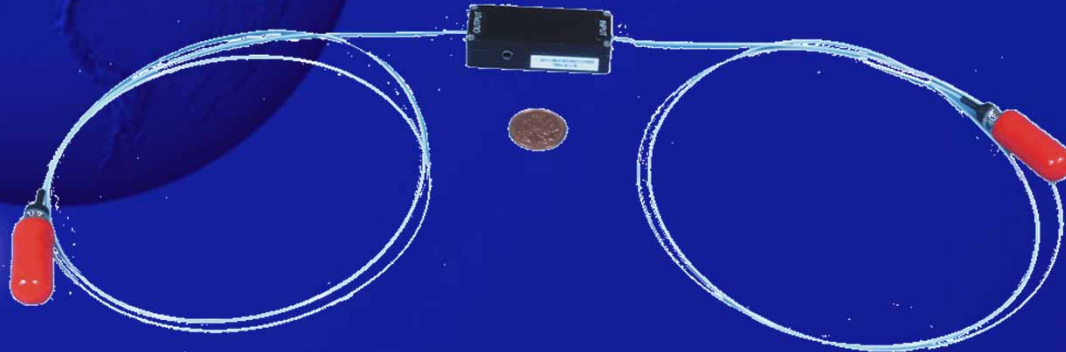
- Low cost
- Miniature size
- Continuous fiber – no interruptions to optical path
- RS-232, USB, or wireless communications
- High power handling





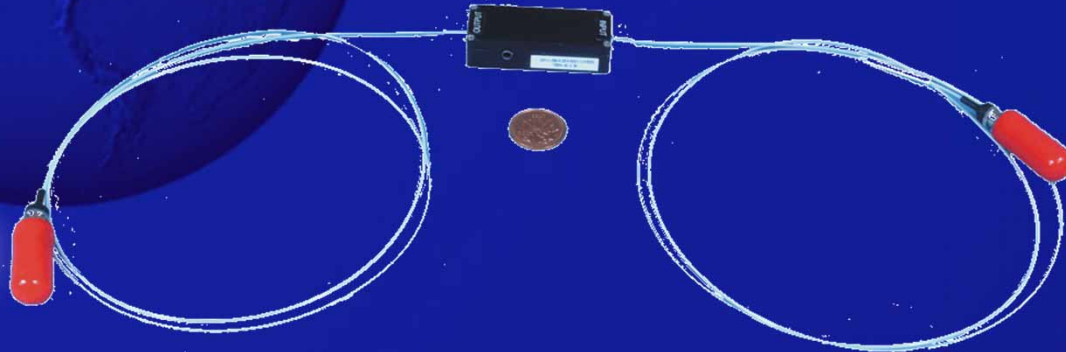
# Smart Patchcord

- Low insertion loss and return loss
- Specialty fiber and PM versions available
- High extinction ratios for PM versions
- Versions available for any wavelength



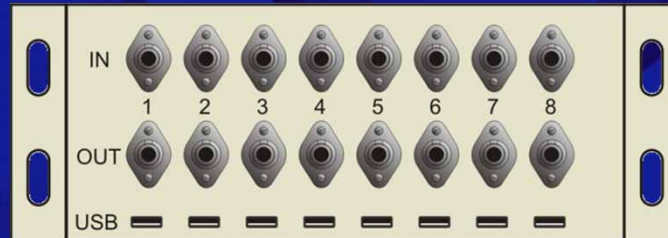
# Smart Patchcord

- **Monitoring in FTTX networks**
- **Channel balancing in WDM systems**
- **Dynamic amplifier gain monitoring**
- **Polarization stabilization**
- **PMD compensation**
- **Real-time in-line test and measurement**



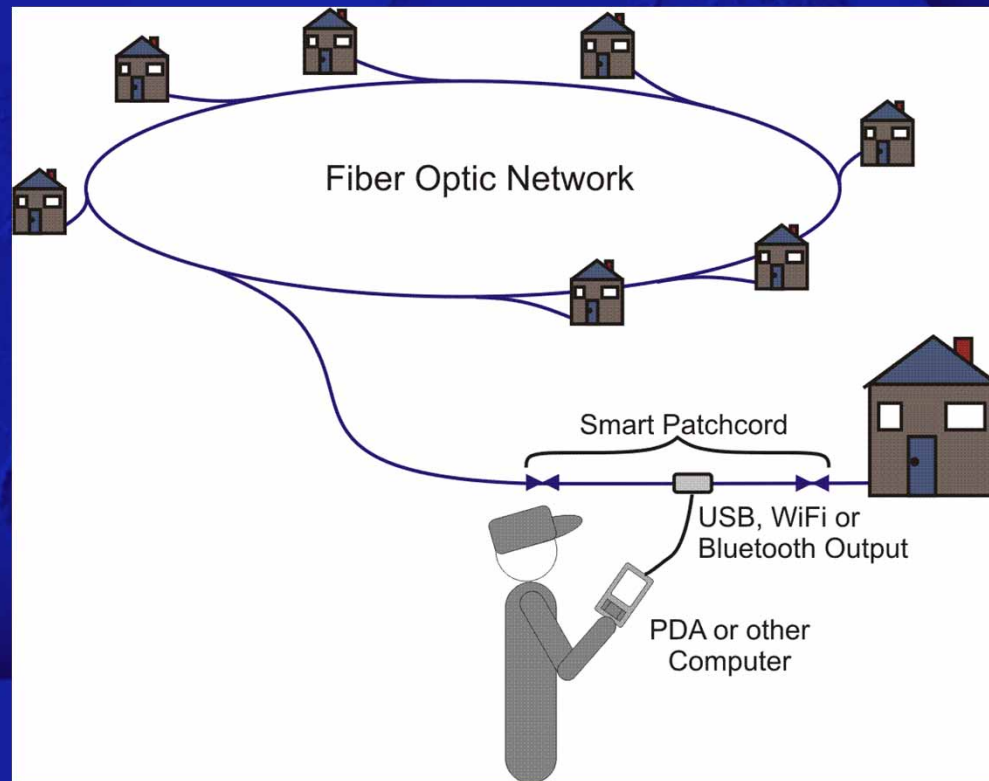
# Smart Patchcord

- **Monitoring in FTTX networks**



# Wireless Fiber™ (Smart Patchcord)

- Monitoring in FTTX networks





# OZ- Guard™ Fiber Optic Fault Finder

- Provide continuous real-time fiber optic health monitoring for your network.
- Automatic determination of faults
- Transforms data into actionable information
- Sends time and location stamped alerts via email, SMS and IM
- Escalates alarms until problem solved



# Polarization Dependant Loss Test Sets

- **Broadband & Wavelength Sweep Capability**
- **Insensitive to Input Power Drift**
- **Fast Measurements**
- **0.001dB Resolution**



# Polarization Dependant Loss Test Sets

- **Broadband & Wavelength Sweep Capability**
- **Insensitive to Input Power Drift**
- **Fast Measurements**
- **0.001dB Resolution**



# Environmental Test Set

- Long Duration Testing for Reliability Studies
- Multiple Wavelength Configurations
- Insertion Loss
- Optional ORL or PDL Measurements





# Custom Designs

- **OZ Optics welcomes the opportunity to provide custom designs. Our optical and electronics expertise can solve tough test and measurement problems.**
- **Custom software for specialized monitoring and control applications can also be provided.**

# OZ Optics

*Your solution provider for existing and next generation  
fiber optic components and test equipment*

*Please Contact Our Sales Dept:*

Tel: 613-831-0981 ext 3370

Toll Free: 1-800-361-5415

Email: [sales@ozoptics.com](mailto:sales@ozoptics.com).

# OZ Optics

*Thank You for Choosing OZ!*

