

FBP PROBE MICROSCOPE

Handheld video probe microscope for fiber inspection

USER MANUAL



ZP-PKG-0332
REV 3



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Patents RibbonDrive Tips: US Patent No. 6,751,017 / 6,879,439
CleanBlast: US Patent No. 7,232,262

Tested Equipment All pre-qualification tests were performed internally at JDSU, while all final tests were performed externally at an independent, accredited laboratory. This external testing guarantees the unerring objectivity and authoritative compliance of all test results. JDSU's Commerce and Government Entities (CAGE) code under the North Atlantic Treaty Organization (NATO) is 0L8C3.

FCC Information Electronic test equipment is exempt from Part 15 compliance (FCC) in the United States.

European Union Electronic test equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment. This unit has been tested and found to comply with the limits for a Class A digital device.

Independent Laboratory Testing This unit has undergone extensive testing according to the European Union Directive and Standards.

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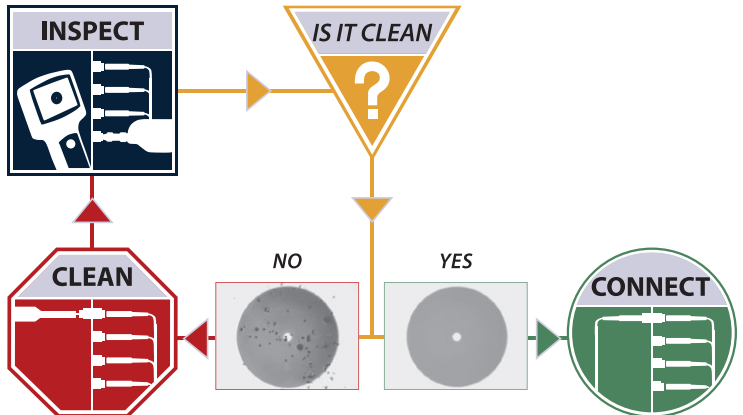
JDSU FIBER INSPECTION SOLUTIONS

1

INSPECT *BEFORE* YOU CONNECTSM

CONTAMINATION IS THE #1 SOURCE OF TROUBLESHOOTING in optical networks. A single particle mated into the core of a fiber can cause significant back reflection, insertion loss, and equipment damage. Visual inspection is the only way to determine if fiber connectors are truly clean before mating them.

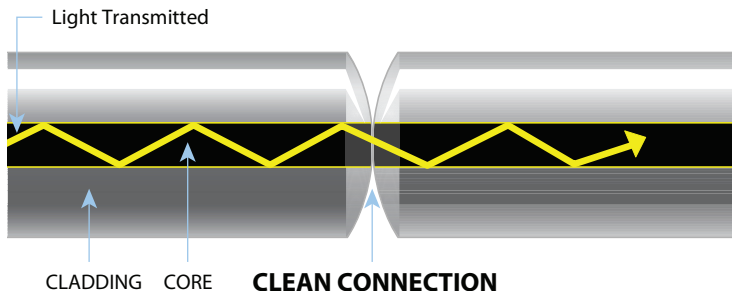
Simple Solution By implementing a **SIMPLE yet IMPORTANT** process of proactive visual inspection and cleaning, you can prevent poor signal performance and equipment damage.



Good Fiber Connection

There are **3 basic principles** that are critical to achieving an efficient fiber optic connection:

- 1. Perfect Core Alignment**
- 2. Physical Contact**
- 3. Pristine Connector Interface**



Today's connector design and production techniques have eliminated most of the challenges to achieving **core alignment** and **physical contact**. What remains challenging is maintaining a **pristine end face**.

JDSU Fiber Inspection and Cleaning Solutions

The JDSU video fiber inspection probe and handheld display system is used to quickly and easily inspect connector end faces, which ultimately minimizes loss and optimizes test conditions. Westover FBP-series video probes, available in digital or analog and single or dual-magnification (200/400X) models are high-performance, handheld microscopes designed for inspecting both *female* (bulkhead) and *male* (patch cord) connectors, as well as other optical devices. The probe microscope can also be combined with a USB converter module to inspect connectors via compatible test platforms and PC/laptop. Our versatile systems offer a wide range of configurable solutions that can meet the demands of any application.

Benefits of Proactive Inspection

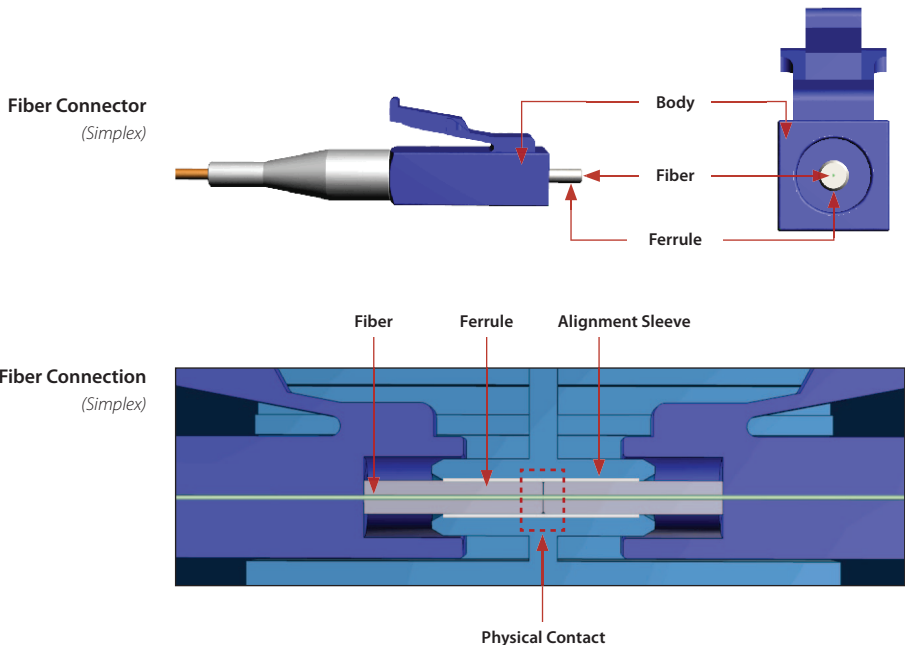
- **Reduce Network Downtime**
- **Reduce Troubleshooting**
- **Optimize Signal Performance**
- **Prevent Network Damage**

FIBER OPTIC CONNECTORS

2

Key Terms and Concepts

Fiber connectors enable fiber-to-fiber mating by aligning the two optical fibers. Fiber connectors come in various types and have different characteristics for use in different applications. The main components of a fiber connector are detailed below:



Body Houses the ferrule that secures the fiber in place; utilizes a latch and key mechanism that aligns the fiber and prevents the rotation of ferrules of two mated connectors.

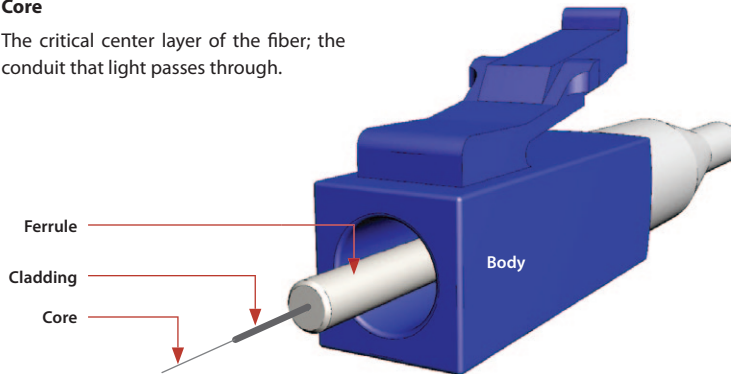
Ferrule Thin cylinder where the fiber is mounted and acts as the fiber alignment mechanism; the end of the fiber is located at the end of the ferrule.

Fiber Cladding

Glass layer surrounding the core, which prevents the signal in the core from escaping.

Core

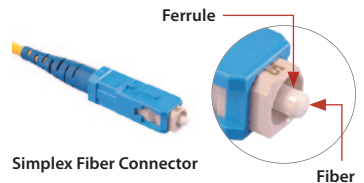
The critical center layer of the fiber; the conduit that light passes through.



Simplex and Multi-fiber Connectors

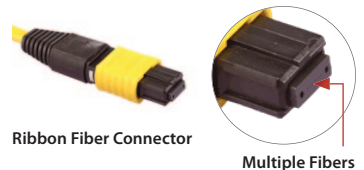
Simplex Fiber Connector

A simplex fiber connector contains a single fiber located in the center of the ferrule. Common types include SC, LC, FC and ST.



Multi-fiber Connector

A multi-fiber/ribbon fiber connector contains multiple linear fibers (4, 8, 12, 24, 48 or 72) in a single connector to provide high-density connectivity. The most common configuration is MPO (also called the MTP®).

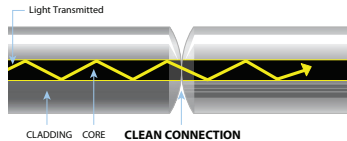


Contamination **Dirt is everywhere**, and a typical dust particle (2–15 μm in diameter) can significantly affect signal performance and cause permanent damage to the fiber end face. Most field test failures can be attributed to dirty connectors, and most of them are not inspected until the problem is detected, *after* permanent damage has already occurred.

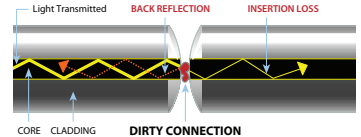
When dirt particles get on the core surface the light becomes blocked, creating unacceptable insertion loss and back-reflection. Furthermore, those particles can permanently damage the glass interface, digging into the glass and leaving pits that create further back-reflection if mated. Also, large particles of dirt on the cladding layer and/or the ferrule can introduce a barrier that prevents physical contact and creates an air gap between the fibers. To further complicate matters, loose particles have a tendency to migrate.

Scratches are typically created during polishing, cleaning or mishandling fiber connectors. Scratches that touch the core are problematic because they create back reflection.

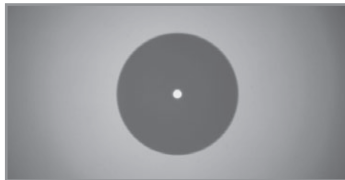
CLEAN CONNECTION



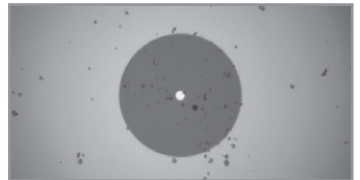
DIRTY CONNECTION



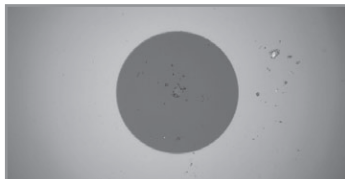
CLEAN FIBER



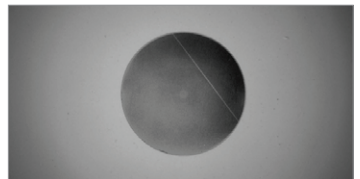
DIRT / CONTAMINATION



PITS / CHIPS



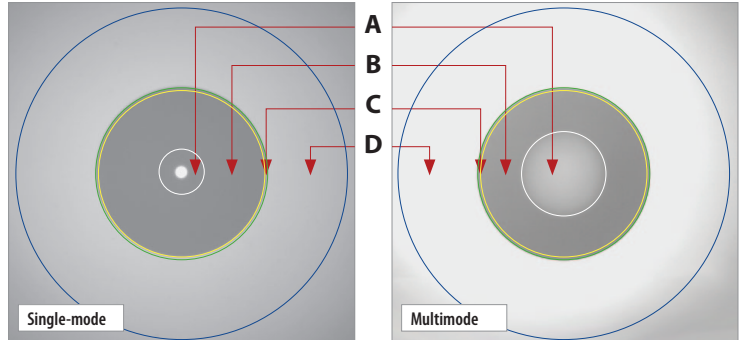
SCRATCH



Zones are a series of concentric circles that identify areas of interest on the connector end face. The inner-most zones are more sensitive to contamination than the outer zones.

Zone Overlays

- A. Core
- B. Cladding
- C. Adhesive/Epoxy
- D. Contact/Ferrule



Acceptance Criteria **ACCEPTANCE CRITERIA** are a series of failure thresholds that define contamination limits for each zone.

The tables below list the **ACCEPTANCE CRITERIA** standardized by the **International Electrotechnical Commission (IEC)** for single-mode and multimode connectors as documented in *IEC 61300-3-35 Ed. 1.0*.

Single-Mode

ZONE NAME (Diameter)	SCRATCHES	DEFECTS
A. CORE Zone (0–25 μm)	none	none
B. CLADDING Zone (25–120 μm)	no limit $\leq 3 \mu\text{m}$ none $> 3 \mu\text{m}$	no limit $< 2 \mu\text{m}$ 5 from 2–5 μm none $> 5 \mu\text{m}$
C. ADHESIVE Zone (120–130 μm)	no limit	no limit
D. CONTACT Zone (130–250 μm)	no limit	none $\geq 10 \mu\text{m}$

Multimode

ZONE NAME (Diameter)	SCRATCHES	DEFECTS
A. CORE Zone (0–65 μm)	no limit $\leq 5 \mu\text{m}$ 0 $> 5 \mu\text{m}$	4 $\leq 5 \mu\text{m}$ none $> 5 \mu\text{m}$
B. CLADDING Zone (65–120 μm)	no limit $\leq 5 \mu\text{m}$ 0 $> 5 \mu\text{m}$	no limit $< 2 \mu\text{m}$ 5 from 2–5 μm none $> 5 \mu\text{m}$
C. ADHESIVE Zone (120–130 μm)	no limit	no limit
D. CONTACT Zone (130–250 μm)	no limit	none $\geq 10 \mu\text{m}$

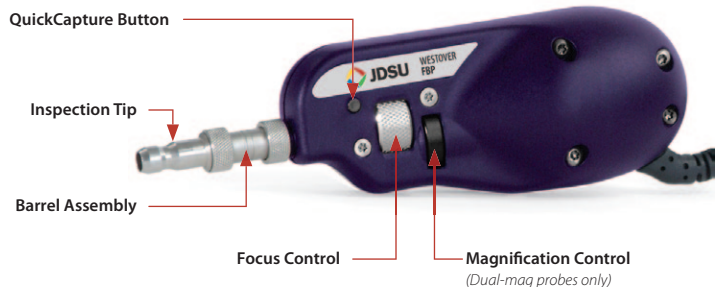
FBP PROBE MICROSCOPE

3

Introduction JDSU's **Westover FBP Series Probe Microscopes** are portable video microscopes used to inspect fiber optic connectivity. While most fiber microscopes are limited to inspecting “male” connectors, JDSU's FBP Probe is designed to inspect both simplex and multi-fiber (ribbon) types of both *male* and *female* connectors as well as optical devices, such as transceivers. The probe is specially designed to fit and operate comfortably and easily in-hand, allowing the user to inspect hard-to-reach connectors that are installed on the backside of patch panels or inside hardware devices. This eliminates the need to disassemble hardware devices prior to inspection.



Controls The basic design of the **Westover FBP** probe microscope incorporates an imaging system, integrated light source, video camera, focus mechanism and magnification control. The probe is fully assembled and is powered by the display device. The only assembly required by the user is the connection to the display device and installation of the appropriate barrel assembly and/or the inspection tip. The FBP analog probe is equipped with a 4-pin circular Hirose™ connector with notch-keys, which allows for a secure and firm latch-lock connection to the display device.



Focus Control The *focus control* on the probe allows the user to adjust focus manually of the live fiber end face image on the display.

Magnification Control The *magnification control* (available only on dual-magnification probes) allows the user to switch between LOW and HIGH magnifications of the fiber end face image.

QuickCapture Button The QuickCapture button (available only on QuickCapture probes) allows the user to instantly capture the fiber end face image on the PC/laptop display when using USB analog-to-digital converter. This unique one-hand, one-motion feature makes the inspection and analysis process less demanding by allowing the user more mobility. All analog QuickCapture probes are equipped with a 6-pin connector.

**FBP Probe
Specifications**
(Analog)

Dimensions	140 x 46 x 43 mm (5.5 x 1.8 x 1.7 in)
Weight	180 g (6.3 oz)
Optical magnification	200X, 400X, 200/400X
Focus control	Adjustable, in-probe
Cord length	240 cm (94-in)
Connector	4-pin Hirose™ male
Camera type	1/3-in CMOS Sensor
Video output	NTSC or PAL
Light source	Blue LED, 100,000+ hour life
Lighting technique	Coaxial
Power source	From the display device or USB module

**Digital P5000 Probe
Specifications**

Dimensions	140 x 46 x 43 mm (5.5 x 1.8 x 1.7 in)
Weight	110 g (3.9 oz)
LOW-Mag field-of-view (FOV)	Horizontal: 714 µm Vertical: 535 µm Diagonal: 892 µm
HIGH-Mag FOV	Horizontal: 460 µm Vertical: 345 µm Diagonal: 575 µm
Live image	800 x 600; 15 fps
Connector	USB 2.0 (with latch lock)
Cord length	183 cm (6-ft)
Focus control	Adjustable, in-probe
Camera sensor	1280 x 1024 black and white; 1/3-in (1.27 cm) CMOS
Resolution	Better than 1 µm
Light source	Blue LED, 100,000+ hour life
Lighting technique	Coaxial
Power source	USB port

Connection to Analog Displays



HD1, HD2, HD3, and HP3-60-Series Displays

1. Connect and thread the probe to the 4-pin female input on the display.

Note: All JDSU HD-series analog displays are equipped with a 4-pin probe input. A separate converter (FBPP-DPAC1) is required for use with 6-pin probes.

Connection to JDSU Test Platforms or PC/Laptop



USB 1.1 Converter

1. Connect and thread the probe to the 4- or 6-pin female input on the USB 1.1 converter.
2. Insert the USB 1.1 converter into an open USB port on the PC/laptop or test platform.

Connection to Video Monitor



Video Output Module

1. Connect and thread the probe to the 4-pin female input on the video output module.
2. Connect the video output module to the video monitor.

Direct Digital Connection to PC/Laptop



P5000 Digital Probe (USB 2.0)

1. Insert the USB connector to an open USB port on the PC/laptop.
2. Squeeze both sides of the latch lock mechanism on the USB head to release.

**USB 1.1
Analog-to-Digital
Converter**

The FBP probe microscope connects to the JDSU optical test platforms or to a PC/laptop via a USB digital converter. Simply connect the FBP probe to the module and plug the USB connection in an open USB port. The USB module, like the probe, offers an optional QuickCapture™ button to instantly capture the fiber end face image on the display. For use with a PC/laptop, a fiber analysis program (FiberChek) is included on a CD and requires software/hardware installation. No additional software is needed to interface with these JDSU test platforms: T-BERD, MTS, or TestPad.

The USB analog-to-digital converter is available in either a 4-pin or 6-pin configuration. The FBPP-USB3 connects to a standard 4-pin FBP probe, while the FBPP-USB1 model connects to a 6-pin FBP probe equipped with an integrated QuickCapture™ button used to instantly capture fiber end face images.



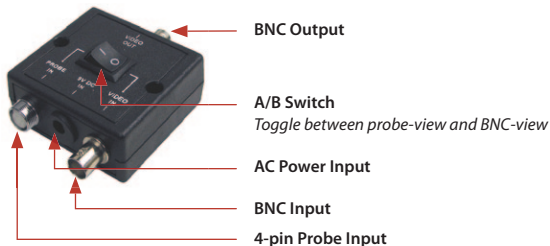
**USB 1.1 Converter
Specifications**

Dimensions	150 x 580 x 180 mm (5.9 x 22.8 x 7.1 in) with 3-ft USB cable
Weight	80 g (2.8 oz)
Power	5V, 500mA from USB port
USB type	USB 1.1
Compatible test platforms and devices	T-BERD 6000, T-BERD 8000, FST-2802, FST-2310, and other test units with a USB port; Windows®-based PC/laptop

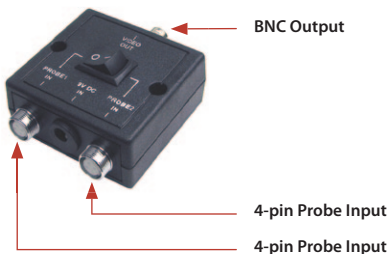
Video Output Module

The Video Output Module allows the connection of a 4-pin FBP probe to a BNC monitor with a secondary input for an additional BNC connection (FBP-VO1) or a 4-pin FBP probe (FBP-VO2). The **A/B Switch** enables the user to toggle between the primary input view to the secondary input view. Two holes on the sides allow the unit to be securely attached to a flat surface. The module is powered by a AC power supply (*included*).

FBP-VO1



FBP-VO2

**Video Output Module Specifications**

Dimensions	6.1 x 2.5 x 8.1 cm (2.4 x 1.0 x 3.2 in)
Weight	140 g (4.9 oz)
Video output	NTSC or PAL
Power	9V, 300mA (110 and 240VAC)
Input	FBP-VO1: One 4-pin probe w/ dedicated connector and one BNC FBP-VO2: Two 4-pin probes w/ dedicated connector
Output	BNC

FBPT INSPECTION TIPS & ADAPTERS

4

Introduction JDSU's comprehensive selection of over 250 precision, stainless-steel fiber inspection tips and adapters will inspect every connector and application. Our unique optics architecture and design provide true versatility and adaptability, and are designed and engineered for consistent and accurate inspection. These connector-specific and universal inspection tips are interchangeable, which allow the probe to interface with different types of fiber connectors.



Barrel Assembly The **barrel assembly** houses the objective lens and works in conjunction with a number of tips.

Note: Certain tips are equipped with integrated optics and do not require a barrel assembly (e.g., Long Reach Tips [FBPT-LC-L], Angled Tips [FBPT-SC-A6]).



FBPP-BAP1



FBPP-BAP2



FBPP-BAP3



FBPT-SC (Bulkhead)

Standard Tips (Bulkhead and Patch Cord)

Standard bulkhead tips allow the user to inspect the fiber end face on the *female* side of the bulkhead (*e.g., inside hardware devices or on the back side of patch panels*).



FBPT-U25M (Patch Cord)

Standard patch cord tips allow inspection of *male* ends of a fiber connection (*e.g., patch cords, pigtailed*). Universal tips include the **FBPT-U25M**, compatible with 2.5 mm ferrules (*e.g., FC, SC, ST*) and the **FBPT-U12M**, used to inspect 1.25 mm ferrules (*e.g., LC, MU*).



FBPT-LC-L

Long Reach Tips

Long reach tips have a 1/2-in longer reach than standard tips, and allow the user to inspect the fiber end faces in tight, hard-to-reach spaces.



FBPT-SC-APC

APC Tips

APC tips are designed with an angle that complements the end face of an APC polish fiber connector. This allows the entire fiber image to stay in focus during inspection.



FBPT-SC-A6

Angled Tips

Angled tips, identified by "A6," are angled 60 degrees to allow easy maneuvering and inspection of hard-to-reach locations such as transceivers on a printed circuit board (PCB) or bulkheads located in tight spaces.



FBPT-MTPA

RibbonDrive™ Tips

JDSU's patented RibbonDrive tips are specialty tips that allow inspection of high-density, multifiber array connectors that are mounted within a bulkhead adapter. Each tip mates securely with connectors using a precision-keyed mating adapter interface. The patented *panning knob* allows the user to view each fiber individually in the linear array.



FBPT-A801-2-001-R

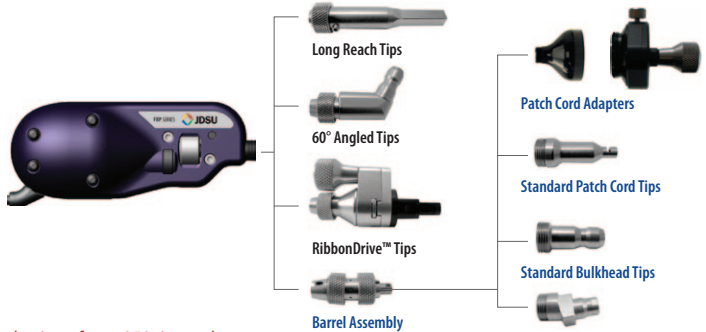
Alignment Guides

Alignment guides enable the inspection of various military and aerospace connectors that use a plug and receptacle design. In addition to providing an alignment channel for sockets, these alignment guides work in conjunction with a barrel assembly to prevent the pins from breaking.

**FMA Adapters**















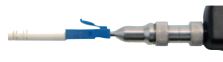




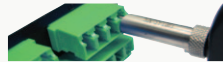


FMA Adapters provide optimized inspection for *male* connector ends and are ideal for inspecting patch cords with multi-fiber ribbon and APC polish connectors. FMA adapters can be utilized by a probe microscope with a universal flare adapter (**FBPT-UFMA**).















**FBPT Tip
Installation Guide**














JDSU offers a comprehensive selection of over 250 tips and adapters that will inspect every connector and application. Visit our web site for a complete list of inspection tips and adapters.

FBPT STANDARD INSPECTION TIPS (common tips shown)

CONNECTOR TYPE	INSPECTION TIP	APPLICATION	DESCRIPTION
 SC/UPC	FBPT-SC 		Inspect SC/UPC connectors through a bulkhead.
	FBPT-U25M 		Inspect 2.5 mm UPC patch cord connectors.
 SC/APC	FBPT-SC-APC 		Inspect SC/APC connectors through a bulkhead.
	FBPT-U25MA 		Inspect 2.5 mm APC patch cord connectors.
 LC/UPC	FBPT-LC 		Inspect LC/UPC connectors through a bulkhead.
	FBPT-U12M 		Inspect 1.25 mm UPC patch cord connectors.
	FBPT-LC-L 		Inspect LC/UPC connectors through a bulkhead with 1/2-in longer reach.
 LC/APC	FBPT-LC-APC 		Inspect LC/APC connectors through a bulkhead.
	FBPT-U12MA-SF 		Inspect 1.25 mm APC patch cord connectors.

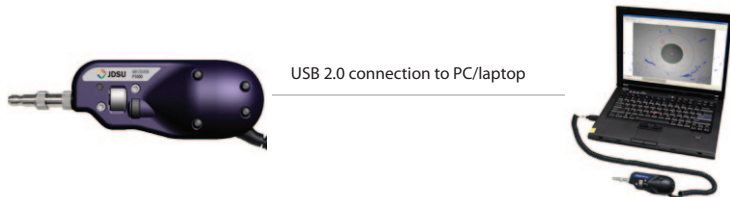
FBPT STANDARD INSPECTION TIPS			
CONNECTOR TYPE	INSPECTION TIP	APPLICATION	DESCRIPTION
ST/ UPC 	FBPT-ST 		Inspect ST/UPC connectors through a bulkhead.
	FBPT-ST-A6 		Inspect ST/UPC connectors through a bulkhead at a 60-degree angle.
FC/ UPC 	FBPT-FC 		Inspect FC/UPC connectors through a bulkhead.
FC/ APC 	FBPT-FC-APC 		Inspect FC/APC connectors through a bulkhead.
E2000/ APC 	FBPT-E2000 		Inspect E2000/APC connectors through a bulkhead.

FBPT MULTI-FIBER RIBBONDRIIVE INSPECTION TIPS			
CONNECTOR TYPE	INSPECTION TIP	APPLICATION	DESCRIPTION
MTP®/UPC 	FBPT-MTP 		Inspect MTP®/UPC connectors through a bulkhead.
MTP®/APC 	FBPT-MTPA-L 		Inspect MTP®/APC connectors through a bulkhead (long reach).
MTP® Patch Cords 	FMA-MTPA & FBPT-UFMA 		Inspect MTP®/UPC or APC patch cords (MTP®/APC inspection shown).
	FCLT-MTP-MA 		Inspect MTP®/UPC or APC patch cords (MTP®/APC inspection shown).

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JDSU Video Probe Inspection Systems

Digital Video Probe JDSU's **P5000** digital probe microscope connects directly to PC/laptops via a USB 2.0 connection, and operates with **FiberChek2™**, an advanced software that determines the acceptability of optical fiber end faces through advanced automated inspection and analysis.



Analog Video Probe JDSU's **Westover FBP** analog probe microscopes connect directly to **Westover HD DISPLAYS** (*HD1, HD2, HD3, HP3-60*) or to a PC/laptop or JDSU test platform (*T-BERD/MTS, FST*) via a **USB analog-to-digital converter**.



JDSU CleanBlast™ Systems

JDSU's **CleanBlast** system is an advanced, non-contact fiber cleaning instrument that provides a fast, effective, repeatable and cost-effective (**less cost per clean than conventional cleaning methods at under \$0.01 per clean**) solution for removing loose dirt and debris from optical connectors. It uses a highly filtered stream of pressurized gas to create a high flow rate jet consisting of specially formulated cleaning solvent that blasts across the surface of the fiber with nearly 100% effectiveness. Precision cleaning tips and adapters are also available for multiple configurations and connector types, allowing users to optimize their cleaning efficiency and performance. The CleanBlast system also includes an input for an optional probe microscope, as well as a video output that can be connected to an external monitor or to a mounted LCD.

Portable CleanBlast



Bench-top CleanBlast



Features & Benefits

- Provides rapid, controlled, and repeatable cleaning and removal of contamination from fiber end faces
- Utilizes a precise **non-contact air-solvent-air** stream to blast, remove and dissolve contamination
- Faster, more effective, and less cost per clean than other conventional cleaning methods
- Precision cleaning tips and adapters available to clean various types of *male* and *female* fiber connectors, including SC, FC, LC, ST, E2000, MPO, MPX, MT, MTP®, transceivers, etc.
- Inputs for optional video probe microscope and LCD display for fiber inspection
- Multiple system configurations for different applications

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