FBP PROBE MICROSCOPE AND HP2-SERIES SYSTEM

Probe and system with integrated power meter and patch cord microscope

USER MANUAL

ZP-PKG-0542
REV 0

JDSU

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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.

TABLE OF CONTENTS

JDSU FIBER INSPECTION SOLUTIONS

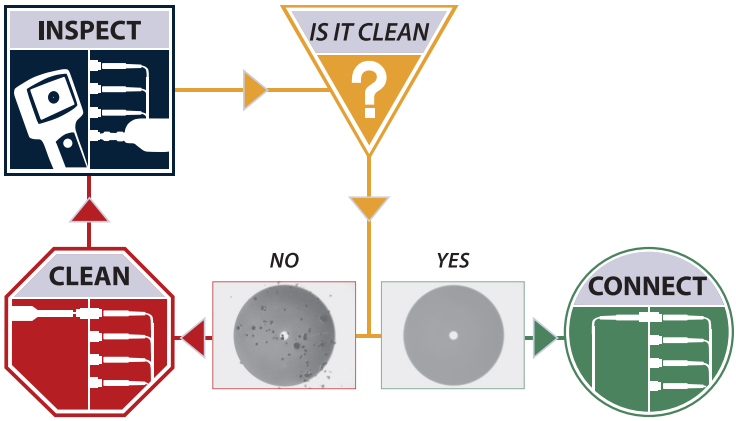
1

INSPECT *BEFORE* YOU CONNECT℠

CONTAMINATION IS THE #1 REASON FOR TROUBLESHOOTING 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

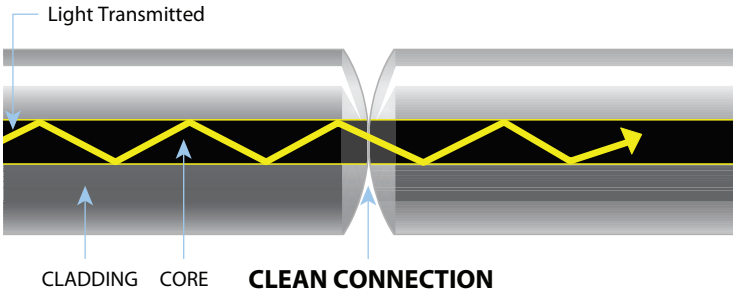
By implementing a **SIMPLE yet IMPORTANT** process of proactive visual inspection and cleaning, you can prevent poor signal performance and equipment damage.



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**

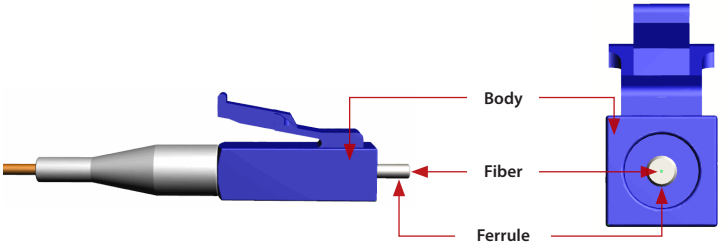
FIBER OPTIC CONNECTORS

2

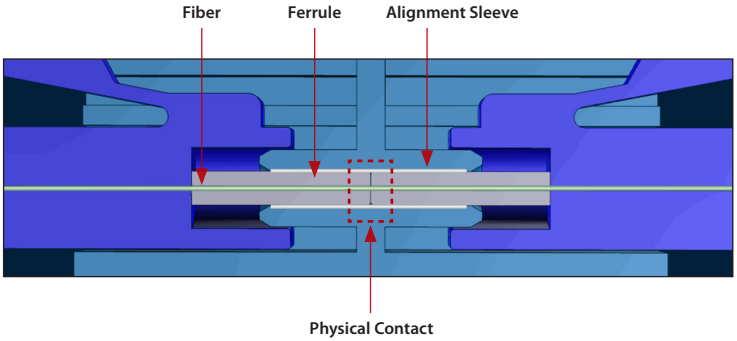
Key Terms and Concepts

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:

Fiber Connector
(Simplex)



Fiber Connection
(Simplex)



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.

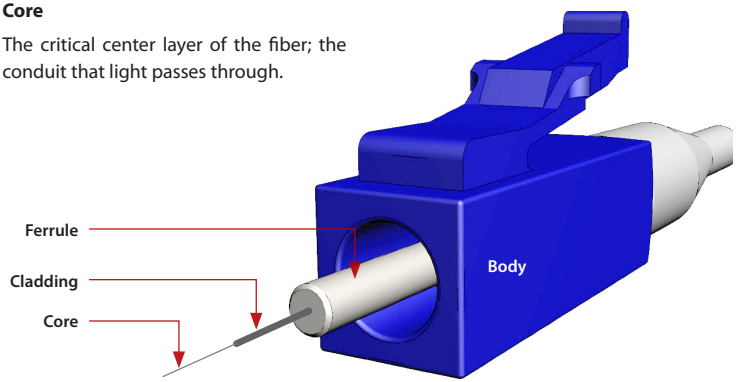
Fiber

Cladding

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

Core

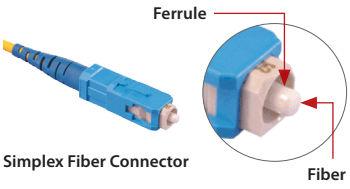
The critical center layer of the fiber; the conduit that light passes through.



Simplex and Multi-fiber Connectors

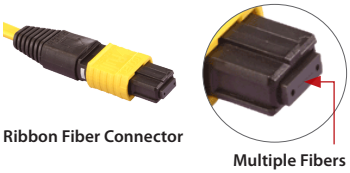
Simplex Fiber Connector

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®).



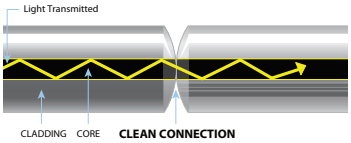
Contamination

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.

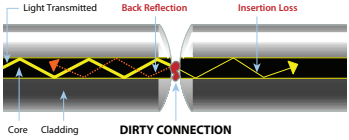
When dirt particles get on the core surface the light becomes blocked, creating unacceptable insertion loss and back-reflection. Furthermore, those particles can permanently damage the glass interface, digging into the glass and leaving pits that create further back-reflection if mated. Also, large particles 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.

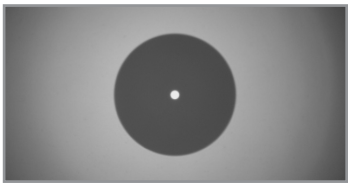
CLEAN CONNECTION



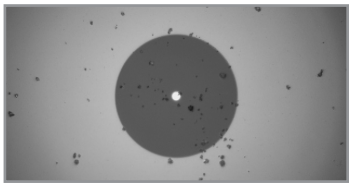
DIRTY CONNECTION



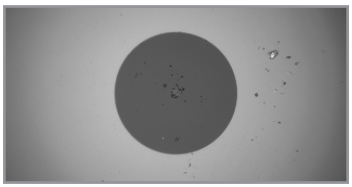
CLEAN FIBER



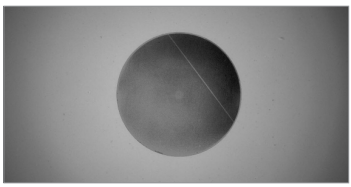
DIRT / CONTAMINATION



PITS / CHIPS



SCRATCH

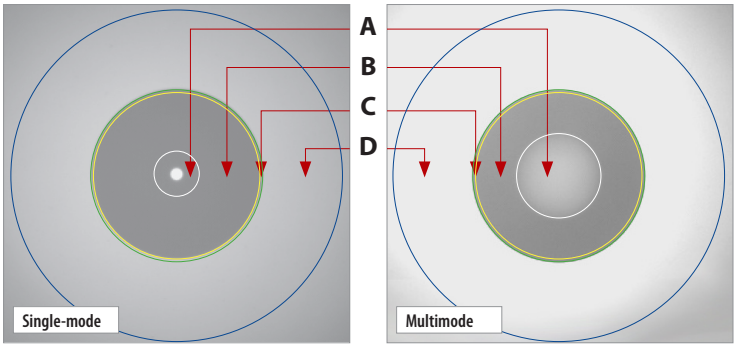


Zones

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 ≤ 3 µm none > 3 µm	no limit < 2 µm 5 from 2 – 5 µm none > 5 µm
C. ADHESIVE Zone (120–130 µm)	no limit	no limit
D. CONTACT Zone (130–250 µm)	no limit	none ≥ 10 µm

Multimode

ZONE NAME (Diameter)	**SCRATCHES**	**DEFECTS**
A. CORE Zone (0–65 µm)	no limit ≤ 5 µm 0 > 5 µm	4 ≤ 5 µm none > 5 µm
B. CLADDING Zone (65–120 µm)	no limit ≤ 5 µm 0 > 5 µm	no limit < 2 µm 5 from 2 – 5 µm none > 5 µm
C. ADHESIVE Zone (120–130 µm)	no limit	no limit
D. CONTACT Zone (130–250 µm)	no limit	none ≥ 10 µm

FBP PROBE MICROSCOPE

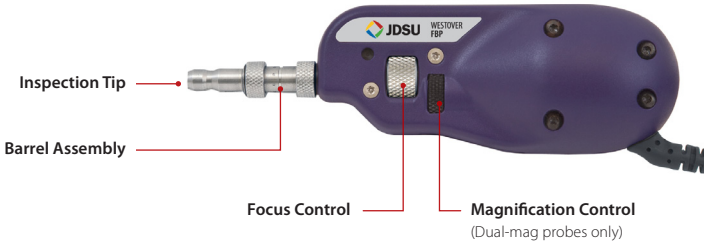
3

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.

Specifications

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
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

FBPT INSPECTION TIPS AND 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, pigtails).* 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

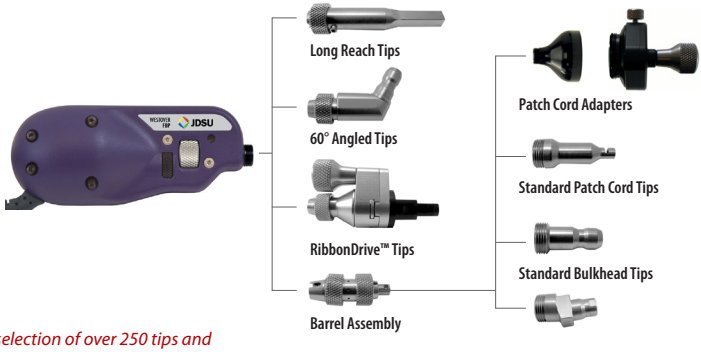
Alignment Guides

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 RIBBONDRIVE 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 and 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).*

HP2-SERIES FIBER INSPECT AND TEST SYSTEM

5

Introduction The new JDSU HP2-series (with integrated patch cord microscope) inspection and test systems combine fiber inspection and optical power measurement into a single seamless handheld device. The result is a significant increase in workflow efficiency and a decrease in total inspection and test time.

HP2--P4 Features**

- **Fiber end face inspection and optical power testing with the same device**
- Integrated functions and features eliminate switching between multiple devices
- Instantly inspect fiber when power level is low
- Significantly reduces time for fiber inspection and testing
- 3.5-inch TFT LCD to view clear, crisp, detailed images of fiber end faces with optimum resolution
- Integrated patch cord microscope (PCM) for dedicated patch cord inspection
- PCM eliminates need for changing inspection tips, prevents misrouting, and protects patch cords
- Ergonomically designed to fit comfortably in hand while in use
- Easy-to-use, simple operation

Components and Functions

Power Meter Operation Controls/Display

Univ. Push-Pull input for Power Meter

Patch Cord Microscope (PCM) Input
(Dedicated patch cord inspection)

A/B Switch
(Toggles between patch cord [PCM] and bulkhead [probe] fiber views)

Focus Control for PCM

3.5-in TFT LCD Screen

GripSwitch *(backside)*

Power and Low Battery LEDs

Brightness Control

Hanging Hook

4-pin FBP Probe Input

12VDC Power Input

Power Mode Selector

Table Stand

Battery Installation

The HP2 display is powered by eight AA batteries (either NiMH rechargeable or alkaline) or by the 100–240VAC/12VDC power supply.

1. Insert eight AA batteries into the battery pack.
2. Align the *positive* and *negative* ends (contacts) on the bottom of the battery tray to their respective ends inside the display and insert the tray into the compartment on the top left-hand side of the display.
3. Replace the cover to the locked position, and conceal the battery pack securely.

Note: *NiMH rechargeable batteries cannot be recharged inside the HP2 display. They must be removed from the display unit and charged with a battery charger.*

Low Battery Indicator

When the batteries are low on power, the display screen will automatically turn off and the **Low Bat LED** indicator will illuminate. The batteries will need to be replaced.

Connecting FBP Probe

1. Locate the 4-pin *female* input on the right-hand side of the display.
2. Align the notch-key configuration of the *male* end of the probe microscope to the *female* end of the display unit and attach; screw in to tighten and secure.

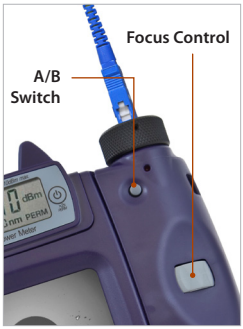
Integrated Patch Cord Microscope (PCM)

The HP2 display is powered by eight AA batteries (either NiMH rechargeable or alkaline) or by the 100–240VAC/12VDC power supply.

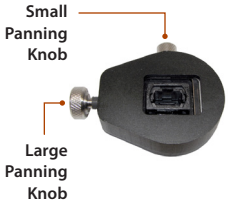
1. Select the appropriate patch cord adapter and install onto the PCM.
2. Insert/attach the patch cord into the adapter on the PCM input.
3. Use the ***power mode selector*** to select either *ON* or *GripSwitch*.
4. Verify that the PCM fiber view is selected *(press the A/B Switch to toggle between probe and PCM fiber views).*
5. Use the ***focus control*** to adjust the focus on the fiber end face image.

If using FMAE ribbon/multi-fiber adapters:

- The *large* panning knob on the adapter should be facing front, aligned vertically with the A/B switch and set in a fixed position.
- Use the *small* panning knob to center the fibers vertically on the display.
- Use the *large* panning knob to pan horizontally across the connector surface.



FMAE Ribbon Adapter



FMAE Adapters for PCM

Patch cord adapters allow the inspection of different types of fiber optic connectors. Three common configurations include:

Note: *Visit our web site for a complete list of FMAE adapters.*

FMAE-U25
(Universal 2.5 mm)

FMAE-U12
(Universal 1.25 mm)

FMAE-MTPA
(MTP/MPO Single-mode)

Improved Workflow with PCM

With the integrated PCM, inspecting the bulkhead with the probe and the patch cord with the PCM can be achieved with a push of a button.

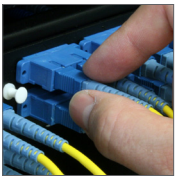
1 **INSPECT** PATCH CORD

2 ACTIVATE PROBE

3 **INSPECT** BULKHEAD

4 **CONNECT**



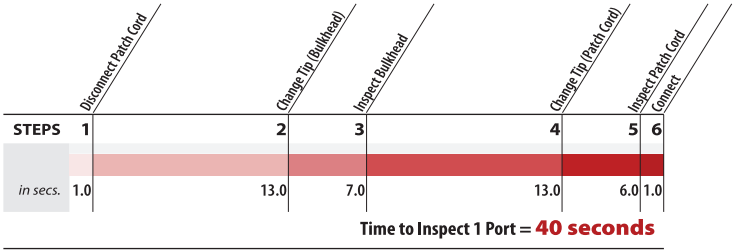



Benefits of 2-Microscope System

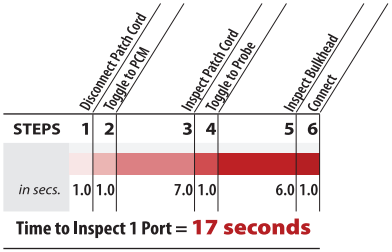
- Reduce inspection time by more than 50 percent
- Inspect the bulkhead with the probe and the patch cord with the display
- No more changing, mishandling and misplacing inspection tips for the probe
- Inspect 1 port/channel at a time and prevent mis-routing
- Ensure patch cords stay clean by *parking* it in the patch cord microscope before connecting

Inspection Time Trial (Average)

Traditional Display



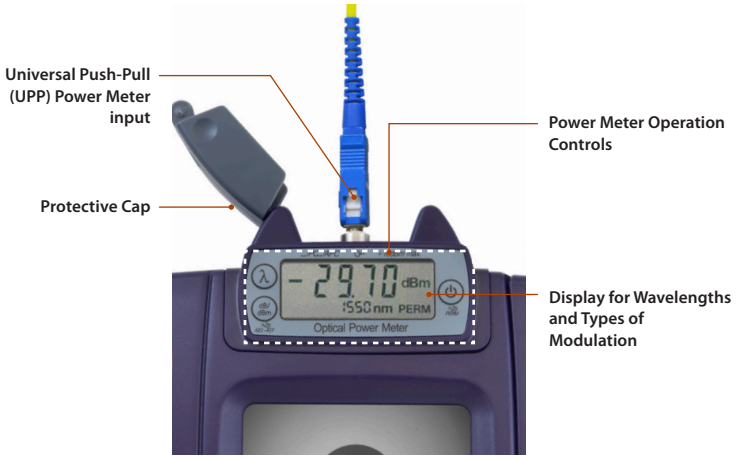
Display with PCM



Integrated Power Meter Features

- Easy-to-use, straightforward operation
- Reliable basic functionality for optical testing
- Suitable for all single-mode and multimode applications, such as LAN, TELECOM, CATV, and DWDM testing
- Universal Push-Pull (UPP) interface for 2.5 mm and 1.25 mm connectors
- Use with JDSU light source to detect modulation frequency and identify individual fibers
- TWINtest and Auto-λ (with JDSU light source)

Power Meter Controls



dBm/dB

- **SHORT KEY PRESS:** Switches between absolute and relative power level display
- **LONG KEY PRESS:** Stores a reference power level

λ

- Sets the calibrated wavelength; five possible wavelengths.

⏻

- **SHORT KEY PRESS:** Brief operating mode
- **LONG KEY PRESS *(hold for 2 secs)*:** Permanent operating mode

Power Meter Display Indicators

REF	Reference level transfer
BAT	Low battery indicator
AU	Indicates AUTO wavelength mode
-29.70	Current power level
LO	Too low for power level range
HI	Too high for power level range
1300nm	Calibrated wavelength
dBm	Absolute power level unit
dB	Relative power level unit
PERM	Permanent operating mode

Measuring Modulated Light

The power meter detects light signals modulated at standard frequencies of 270Hz, 330Hz, 1kHz, and 2kHz. If one of these frequencies is detected, it appears in the display.

Using different modulation frequencies, you can detect a particular fiber in a fiber bundle.

HP2-**-P4 Display Specifications

Dimensions	185 x 150 x 60 mm (7.3 x 5.9 x 2.4 in)
Weight	760 g (26.8 oz) with 8 x AA alkaline batteries
Video display	88.9 mm (3.5-in) TFT LCD
Power modes	**ON** (continuous ON); **OFF; GRIPSWITCH** (power save mode)
Connector	4-pin Hirose™ for FBP probes
Power source	8 x AA batteries or AC power adapter (100–240 VAC/9V DC/500mA)
Horizontal FOV (200X Probe)	550 µm
Horizontal FOV (400X Probe)	350 µm
Warranty	1 yr

HP2-**-P4 Power Meter Specifications

Display range	
» **HP2-60-P4**	–65 to +10 dBm
» **HP2-80-P4**	–50 to +23 dBm
Max. permitted input level	
» **HP2-60-P4**	+10 dBm
» **HP2-80-P4**	+23 dBm
Standard wavelength settings	850, 980, 1300, 1310, 1490, 1550, 1625 nm
Intrinsic uncertainty(1)	±0.20 dB (±5%)
Linearity[1] **(-50 to +5 dBm)**	±0.06 dB
Wavelength range	780 to 1650 nm
Wavelength and modulation	270Hz, 330Hz, 1kHz, 2kHz
» **HP2-60-P4**	
1300, 1310, 1490, 1550, 1625 nm	–50 to +10 dBm
850, 980 nm	–45 to +10 dBm
» **HP2-80-P4**	
1300, 1310, 1490, 1550, 1625 nm	–35 to +23 dBm
850, 980 nm	–30 to +23 dBm
Run time	~180 hours (continuous ON)
Optical interfaces	Universal PUSH-PULL (UPP) 2.5mm (DIN, ST, FC, SC, E2000) Universal UPP 1.25mm adapter (LC, MU) - ***sold separately***
Display	LCD, 4-digit
Result display in	dBm, dB
Resolution	0.01 dB

[1] *Under the following reference conditions:–20 dBm (CW), 1300nm ±1nm, 23°C ±3K, 45 to 75% rel. humidity, 9 to 50 µm fiber*

FIBER INSPECTION AND TESTING

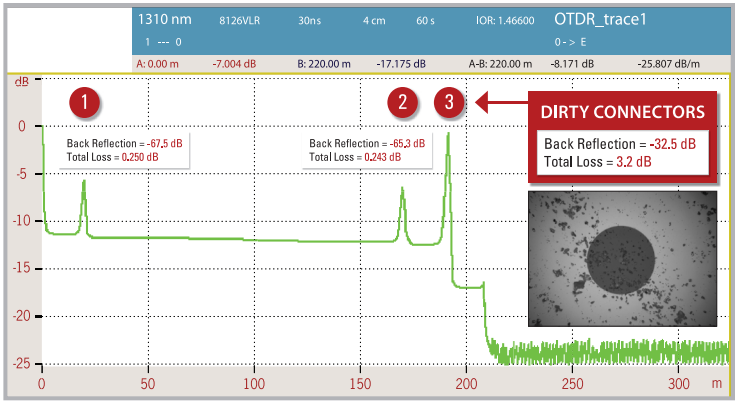
6

Introduction

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, light becomes blocked, creating unacceptable ***insertion loss*** and ***back-reflection***. Furthermore, these contamination particles can permanently damage the glass interface by digging into the glass and leaving pits when mated, causing further signal loss. Damage also occurs when large particles of dirt on the cladding layer and/or the ferrule cause barriers that prevent physical contact, creating air gaps in the connection. These large particles are also known to break apart and migrate across the fiber surface when mated.

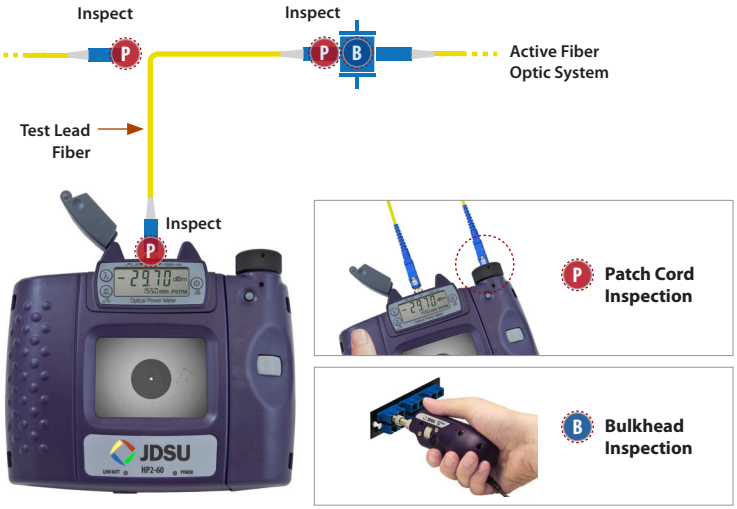
OTDR Trace of Contamination and its Effect on Signal Performance



Absolute Power

The **absolute power level** *(system power measurement)* is the amount of optical power present in the system, measured in **dBm.** The source of this power is the transmitter or transceiver sending information through the system. This test determines whether the signal has enough power to operate the receiver or transceiver at the end of the link.

System Power Measurement



1. Select the connector you are testing and disconnect from the system.
2. **INSPECT**, and if necessary, **CLEAN** both the patch cord and bulkhead ends of the fiber interconnect.
3. **INSPECT**, and if necessary, **CLEAN** both ends of the ***test lead*** fiber.
4. Connect the ***test lead*** connector to the power meter and to the system.
5. Press ⏻ to turn the power meter **ON.**
6. Press λ to select wavelength *(if necessary)*.
7. Press dBm/dB to select **dBm.**
8. The optical power measurement is displayed on the power meter display.

Relative Power

Acquiring **attenuation measurements** *(optical link loss)* on optical components or fiber optic links *(e.g., fiber connectors, cable assemblies, installed fiber optic links)* is done by measuring the **relative power level (dB)** at the far end of the link or device under test.

To measure attenuation, you must:

1. Get a **reference measurement**
2. Get an **attenuation measurement**

Relative power level *(attenuation measurement)* is the amount of power lost *(attenuated)* by the optical link being tested, measured in **dB.** The source of this power is typically a handheld optical light source. This test determines whether the optical link is constructed properly, either as a qualification test or when troubleshooting the network.

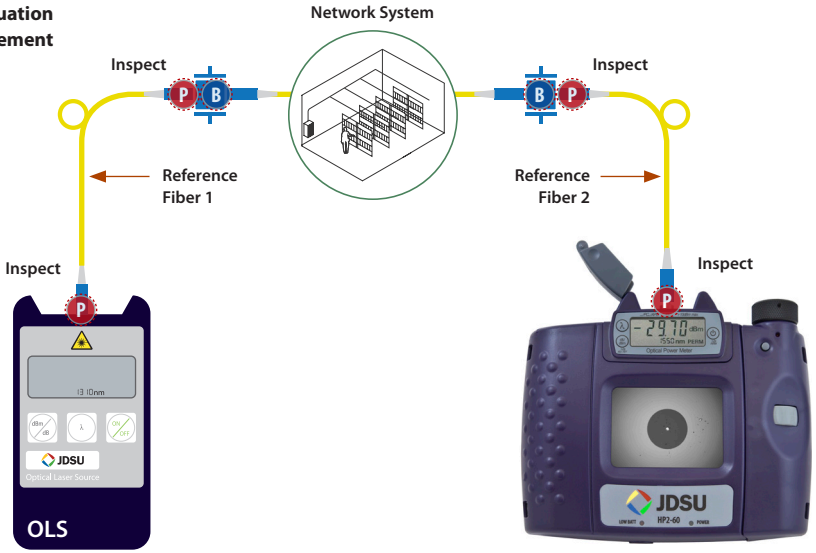
Reference Measurement

1. **INSPECT**, and if necessary, **CLEAN** both the ends of ***reference fiber 1***.
2. Connect the optical light source (OLS) to the power meter using ***reference fiber 1***.
3. Press ⏻ to turn both the power meter and light source (OLS) **ON.**
4. Press λ to select wavelength *(if necessary)*.
5. Press and hold **dBm/dB** until a reference level of **0.00 dB** is displayed on the power meter display. ***For attenuation measurement, go to next page.***

   Note: **REF** *will flash briefly on the power meter to indicate that the reference level is saved.*

   Note: **DO NOT** *disconnect the* ***reference fiber*** *from the light source (OLS).*

Attenuation Measurement



1. Disconnect the power meter from ***reference fiber 1***.
   Note: **DO NOT** *disconnect* ***reference fiber 1*** *from the light source (OLS).*
2. **INSPECT**, and if necessary, **CLEAN** all ends of the system port.
3. Connect ***reference fiber 1*** to the system port.
4. **INSPECT**, and if necessary, **CLEAN** both ends of ***reference fiber 2***.
5. **INSPECT**, and if necessary, **CLEAN** the fiber at the far end of the optical link.
6. Connect ***reference fiber 2*** to the system port.
7. Press ⏻ to turn both the power meter and light source (OLS) **ON.**
8. Press λ to select wavelength *(if necessary)*.
9. The **attenuation measurement** *(insertion loss)* of the optical link is displayed on the power meter.

APPENDIX A KITTED SOLUTIONS

The JDSU PRO kits (FIT-S205-PRO, FIT-S215-PRO) are specially designed to provide all the essential fiber handling tools in an easy to use platform that optimizes user workflow.

CLEAN: *Patch cord and bulkhead*

Visual Fault Locator: *Locate damage and troubleshoot fiber*

INSPECT: *Bulkhead inspection with probe*

TEST: *Power measurement*

INSPECT: *Dedicated patch cord inspection*

A/B Switch: *Toggle between probe view and patch cord view*

Neck strap for hands-free operation

Probe input

Fiber Utility Boot organizes all components in one place

Kit Contents

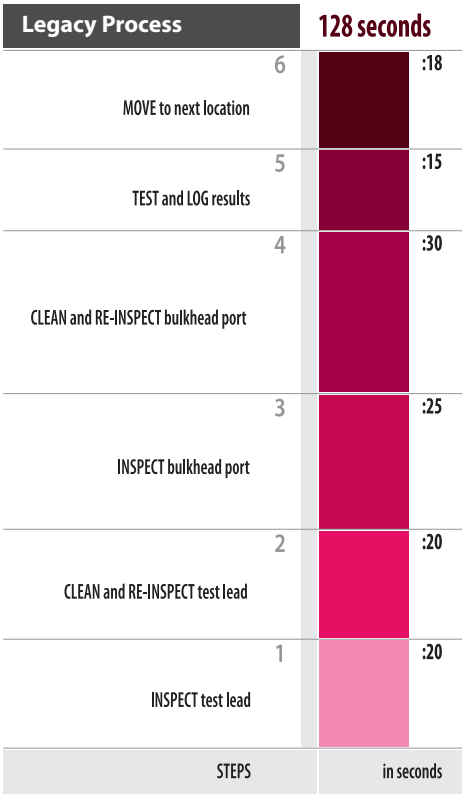
- FIT-HP2-**-P4 system
- FBP probe microscope
- Visual fault locator
- Cleaning tools/materials
- Tips and adapters
- Hands-free utility boot
- Carrying case

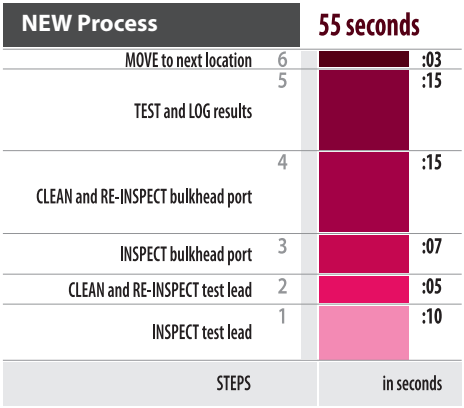
Benefits

- Facilitates best practices for handling fiber
- Maintain portability with hands-free design
- Inspect, clean, and test with a single system in less than half the time of other methods

APPENDIX B TIME STUDY

Average time required to INSPECT, CLEAN, and TEST 1 port.

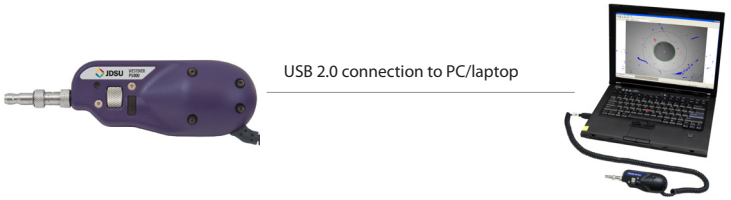




APPENDIX C JDSU VIDEO PROBE INSPECTION SYSTEMS

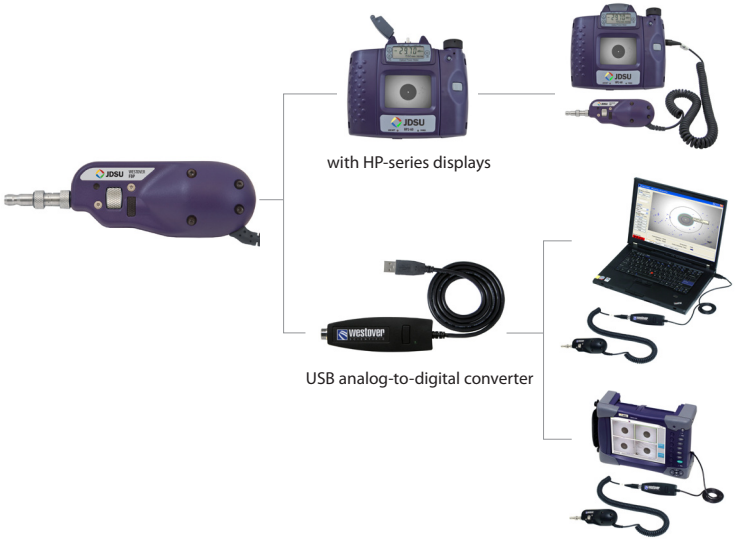
Digital Video Probe

The **Westover 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, or HP-series)* or to a PC/laptop or JDSU test platform *(T-BERD/MTS, FST)* via a **USB analog-to-digital converter**.



Test and Measurement Regional Sales

NORTH AMERICA	LATIN AMERICA	ASIA PACIFIC	EMEA	www.jdsu.com/inspect
TEL: 1 866 228 3762	TEL: +1 954 688 5660	TEL: +852 2892 0990	TEL: +49 7121 86 2222	
FAX: 1 301 353 9216	FAX: +1 954 345 4668	FAX: +852 2892 0770	FAX: +49 7181 86 1222	

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