

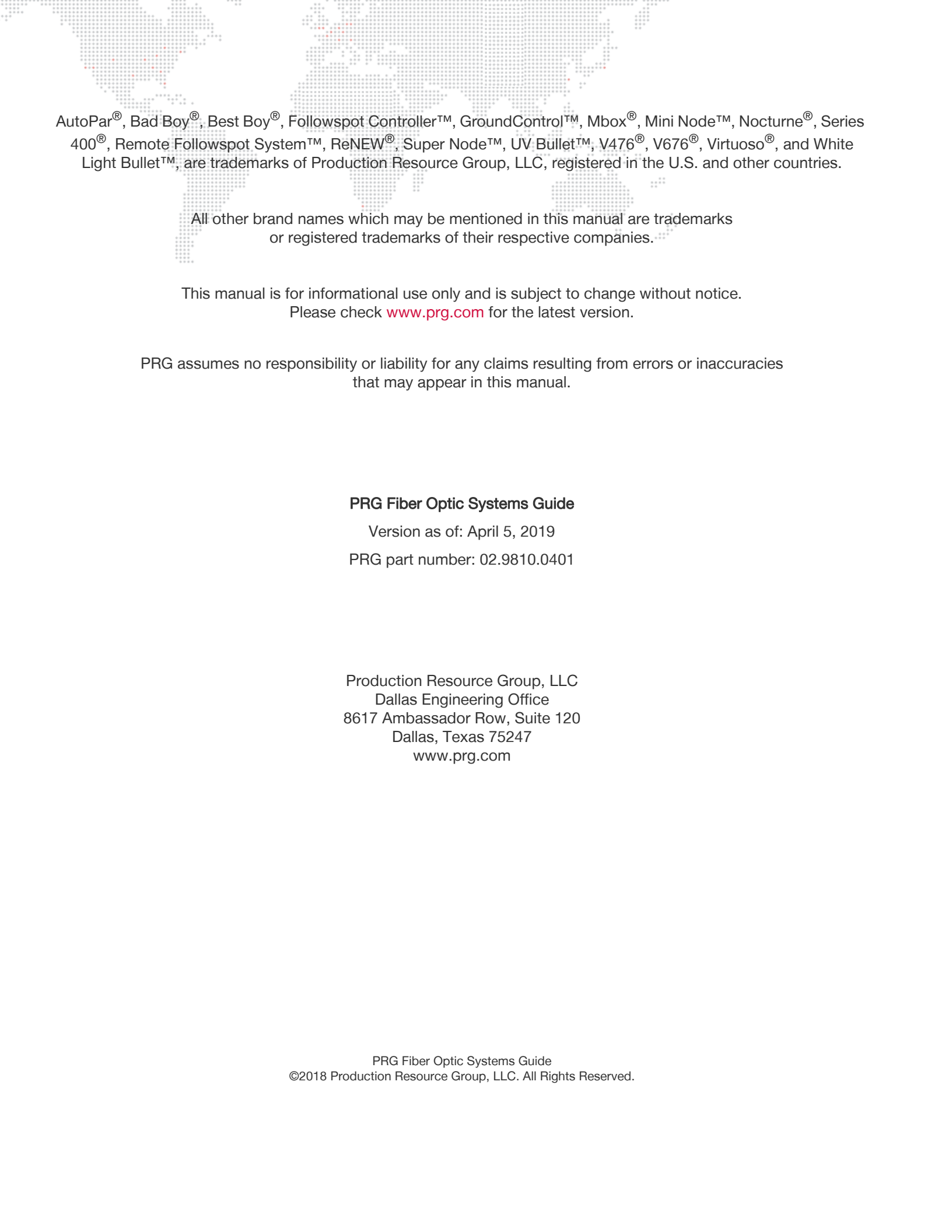


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PRG FIBER OPTIC SYSTEMS GUIDE

FIELD SERVICE & SHOP SERVICE

APRIL 2019 BETA VERSION



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PRG Fiber Optic Systems Guide

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FOREWORD

Safety Notice

It is extremely important to read ALL safety information and instructions provided in this manual and any accompanying documentation before installing and operating the products described herein. Heed all cautions and warnings during installation and use of this product.

Safety symbols used throughout this manual are as follows:



CAUTION advising of potential damage to product.



WARNING! advising of potential injury or death to persons.

GENERAL INFORMATION PERTAINING TO PROTECTION AGAINST LASER RADIATION AND INJURY TO PERSONS CAN BE FOUND BELOW.

WARNING! INSTRUCTIONS FOR GENERAL PROTECTION WHEN WORKING WITH FIBER OPTICS

- 1) Wear safety glasses with side shields and protective gloves when working with Fiber Optic cables. Treat fiber optic splinters the same as you would treat glass splinters.
- 2) Keep all food, beverages, and other consumables out of the work area. Do not chew gum. If fiber particles are ingested they can cause internal hemorrhaging.
- 3) Never look directly into the end of fiber cables until you are certain that there is no light source present and energized. Use a fiber optic power meter to make certain the fiber is dark. When using an optical tracer or continuity checker, look at the fiber from an angle at least 6 inches away from your eye to determine if the visible light is present.
- 4) Work on a black work surface as it helps to find fiber scraps; also make sure to work in a well-ventilated area.
- 5) Wear disposable PPE to minimize fiber particles on your clothing. Fiber particles on your clothing can later get into food, drinks, and/or be ingested by other means.
- 6) Contact lens wearers must not handle their lenses until they have thoroughly washed their hands.
- 7) Put all cut fiber pieces in a properly marked container for disposal. Thoroughly clean your work area when you are done.
- 8) Do not smoke, chew, vape while working with or cleaning fiber optic systems.

For more safety and protection information on working with Fiber Optic cables and accessories, please visit the [Fiber Optic Association Safety website](#), which includes a link to lectures, videos, and other Fiber Optic safety information.

Revision History

This manual has been revised as follows:

Version	Release Date	Notes
REV A0	10-31-2018	Initial release.
REV B0	4-05-2019	Reformatted, links added, internal substructure updated for flow



INTRODUCTION

About This Manual

This manual provides testing, troubleshooting, maintenance procedures, and illustrations for the following equipment:

- + PRG Fiber Optic Systems

Additional Documentation

For more information about PRG Networking Systems, refer to the following manual:

- + PRG Lighting Systems Networking Guide (02.3004.1000.0)

For more information regarding Neutrik components and procedures, visit the [Neutrik Data Products](#) website.

Customer Service

For technical assistance, contact the PRG International Service Center or contact your nearest PRG office. Contact information for all PRG office locations can be found on our website at www.prg.com.

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214-638-2125

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For additional resources and documentation, please visit our website at: www.prg.com



1.

INTRODUCTION TO NEUTRIK FIBER OPTICS

This chapter introduces the user to Neutrik Fiber Optic components and configurations. This should be read by both Field Service users and Shop Service users.

- + INTRODUCTION TO FIBER OPTICS
- + COMPONENTS
- + CLEANING, INSPECTION TOOLS, AND SPARE PARTS
- + CONFIGURATION
- + EQUIPMENT HANDLING

INTRODUCTION TO FIBER OPTICS

What is Fiber Optic Communication?

The term "Fiber Optic" refers to data transmission technology using light traveling through thin, highly transparent strands of optical fibers. These fibers are typically glass, surrounded by several protective layers of cable jacket.

Why Use Fiber over Copper?

Electrical Interference

Fiber Optics are immune to Electromagnetic Interference due to signal sent as light rather than current. With fiber optic pathways, there is no worry of data interference when running alongside high voltage power.

Distance

Fiber Optics allow for greater transmission distance than traditional copper cabling. Whereas a Cat5e cable carrying gigabit signal can only go 328ft/100m (MA networks recommend 229 ft/70m), a MM DUO Fiber Optic Cable can reach distances over 2,000 feet (609m). Maximum distances vary based on signal type, fiber type, equipment source, and connection points.

Fiber Types

Multimode fiber:

50 or 62.5 microns wide. Used with laser or LED sources typically at 850nm or 1300nm. Cost-effective, but cannot go longer lengths compared to Singlemode fiber. Multimode fiber is relatively easy to terminate and does not require as much handling care as Singlemode -- Multimode fiber is not as sensitive to bends in the cable as single mode.

Singlemode fiber:

8-9 microns. Used with laser sources at 1310nm to 1550nm. Due to its smaller core size, construction and care is more precise than Multimode. More costly than Multimode, but can go longer distances than Multimode. Greater attention must be taken to ensure Singlemode fiber connectors remain contaminant free. Singlemode fiber is also very sensitive to bends in the cable; tight bends can affect data transmission.

Fiber Terms

PC, "Physical Contact"

"Physical Contact (PC) connections are characterized by the physical mating of two optical fibers. Precision ceramic ferrules are typically utilized for PC connections. A PC connection is accomplished by terminating the optical fiber into a precision ceramic ferrule. Epoxy is used to affix the fiber into the ferrule. The tip of the ceramic ferrule is polished in a precise manner to ensure that light enters and exits at a known trajectory with little scattering or optical loss. Polishing the terminated ceramic ferrule is a critical process in Physical Contact fiber optic connectors."

All opticalCON QUAD and DUO cables at PRG utilize PC connections.

Fiber Cleaning

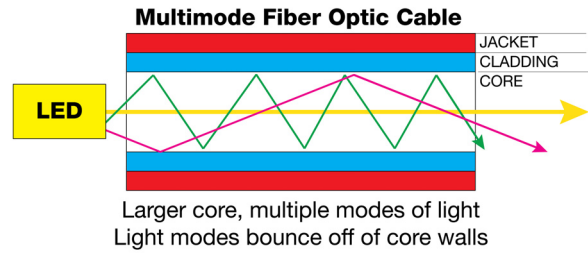
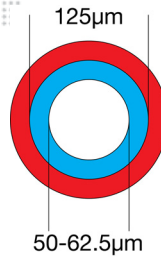
Dirty connectors are the contributors to connection issues. Contamination interferes with the beam of light coming through the fiber. Up to 50% of network issues can be linked to dirty connectors causing connection issues. It is just as important to clean the Fiber cables as it is to clean the chassis to which the cables connect. When cables are connected to a coupler or chassis, the internal fiber ferrules are spring-compressed against each other.

Preferred Vendors for Fiber Cleaning Tools

- + Specialized Products Company
www.specialized.net
- + TecNec Distributing
www.tecnec.com
- + MarkerTek
www.marketertek.com

Multimode vs. Singlemode Fiber

Multimode fiber allows multiple modes of light to travel through it, and is usually LED-based. MM fiber is good for short distances comparatively; the light travels down the cable by bouncing off of the walls of the core. See an example in **Figure 1-1**.



Singlemode fiber allows a single mode of light to travel through it, and is usually laser-based. The core is considerably smaller than that of Multimode, and the light is aligned to travel more down the center of the fiber. Very long distances can be covered with Singlemode fiber.

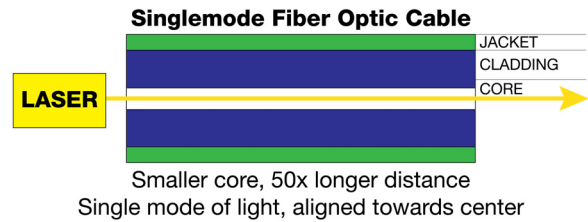
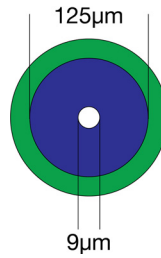
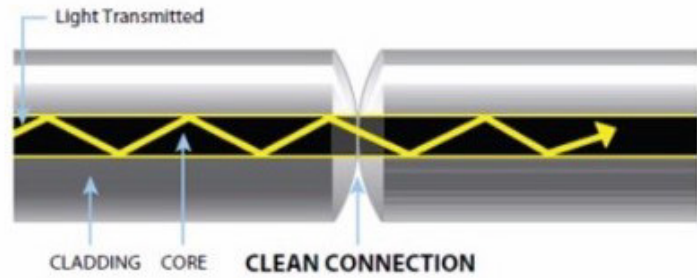


Figure 1-1: Multimode vs Singlemode Fiber

Clean Fiber Connections

The image on the right in **Figure 1-2** is an example of a clean connection; the fiber is perfectly aligned, physical contact is made, and fiber surfaces are clean.



This is a good example of why fiber must be clean -- fiber connections actually have physical contact, so cleanliness is paramount in having good signal.

Figure 1-2: Detail View of a Clean Fiber Connection

Dirty Fiber Connections

The image on the right in **Figure 1-3** is an example of a dirty connection; the fiber has contamination on the end face which results in back reflection, insertion loss (light loss), and potential damage to the opposite connection.

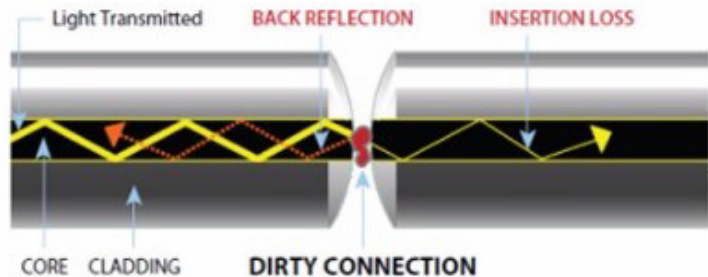


Figure 1-3: Detail View of a Dirty Fiber Connection

COMPONENTS

Cable Types

PRG manufactures fiber cables using the Neutrik® opticalCON ADVANCED connection system. opticalCON quad core armored fiber cable should be used for extreme duty applications, and in cases where four fibers increase operational efficiency. Dual core field fiber cable should be used for standard duty fiber applications.

Available terminated cables:

PRG Part No.	Ecode	Description
Extreme Duty Quad		
25.0013.0050	394AF-	FIBER MM OPTICALCON QUAD ARMORED 50' 15M
25.0013.0075	394AH-	FIBER MM OPTICALCON QUAD ARMORED 75' 23M
25.0013.0100	394AJ-	FIBER MM OPTICALCON QUAD ARMORED 100' 30M
25.0013.0125	394AK-	FIBER MM OPTICALCON QUAD ARMORED 125' 38M
25.0013.0150	394AM-	FIBER MM OPTICALCON QUAD ARMORED 150' 45.5M
25.0013.0175	394AN-	FIBER MM OPTICALCON QUAD ARMORED 175' 53M
25.0013.0200	394AO-	FIBER MM OPTICALCON QUAD ARMORED 200' 60.5M
25.0013.0250	394AR-	FIBER MM OPTICALCON QUAD ARMORED 250' 76M
25.0013.0300	394AT-	FIBER MM OPTICALCON QUAD ARMORED 300' 91M
25.0013.0350	394AW-	FIBER MM OPTICALCON QUAD ARMORED 350' 106.5M
25.0013.0600	394AZ-	FIBER MM OPTICALCON QUAD ARMORED 600' 182.5M
25.0013.1000	394BA-	FIBER MM OPTICALCON QUAD ARMORED 1000' 305M
Standard Duty Duo		
25.0014.0005	394B6-	FIBER MM OPTICALCON DUO FIELD 5' 1.5M
25.0014.0010	394B9-	FIBER MM OPTICALCON DUO FIELD 10' 3M
25.0014.0025	394BE-	FIBER MM OPTICALCON DUO FIELD 25' 7.5M
25.0014.0050	394BH-	FIBER MM OPTICALCON DUO FIELD 50' 15M
25.0014.0075	394BI-	FIBER MM OPTICALCON DUO FIELD 75' 22M
25.0014.0100	39425-	FIBER MM OPTICALCON DUO FIELD 100' 30M
25.0014.0125	394BK-	FIBER MM OPTICALCON DUO FIELD 125' 38M
25.0014.0150	394BM-	FIBER MM OPTICALCON DUO FIELD 150' 45.5M
25.0014.0175	394BP-	FIBER MM OPTICALCON DUO FIELD 175' 53M
25.0014.0200	39426-	FIBER MM OPTICALCON DUO FIELD 200' 60M
25.0014.0250	39427-	FIBER MM OPTICALCON DUO FIELD 250' 75M
25.0014.0300	39429-	FIBER MM OPTICALCON DUO FIELD 300' 91M
25.0014.0330	39430-	FIBER MM OPTICALCON DUO FIELD 330' X2 100M REEL
25.0014.0350	3942C-	FIBER MM OPTICALCON DUO FIELD 350' 106.5M
25.0014.0492	3942X-	FIBER MM OPTICALCON DUO FIELD 492' 150M
25.0014.0600	39433-	FIBER MM OPTICALCON DUO FIELD 600' 183M
25.0014.1000	39439-	FIBER MM OPTICALCON DUO FIELD 1000' 305M

Note: All fibers are Multimode, 50/125 um, OM3.



Breakout Components

opticalCON connectors should be used for all connections to be made during daily set-ups. Standard LC patch cords may be used to interconnect within enclosed racks where there is some level of protection and there is no need to make connections daily.

Available breakout panels, boxes, blank modules, and frame kits:

Item	PRG Part No.	Ecode	Description
1	21.9801.0004	3945X-	ASSY, BREAKOUT BOX OPTICALCON
2	21.9801.0003	3945A-	RACK PANEL OPTICALCON B/O QUAD TO DUO X2 1RU
3	55.6755.0003.0	522-200620	FRAME KIT FK-2
4	21.9801.0001	39454-	RACK PANEL UCP MODULE OPTICALCON QUAD X1
5	21.9801.0002	39455-	RACK PANEL UCP MODULE OPTICALCON DUO X2
6	55.6755.2001.0	522-200621	MODULE, BLANK UCPB1
7	25.9801.1000	39574-	FIBER MM SLIM LC-LC DUPLEX TO SIMPLEX X2 3' 1M
8	25.9801.1001	39584-	FIBER MM SLIM LC-SC DUPLEX OM2 3' 1M
9	25.9801.1002	39594-	FIBER MM SLIM LC-ST DUPLEX OM2 3' 1M
10	52.6104.0002.0	39451-	FIBER MM OPTICALCON DUO COUPLER IP65 BLK
11	21.9801.0008	3945G-	RACK PANEL UCP MODULE OPTICALCON QUAD COUPLER

Refer to **Figure 1-4** on the following page for component illustrations.

(Refer to the chart on the previous page for part numbers and descriptions.)

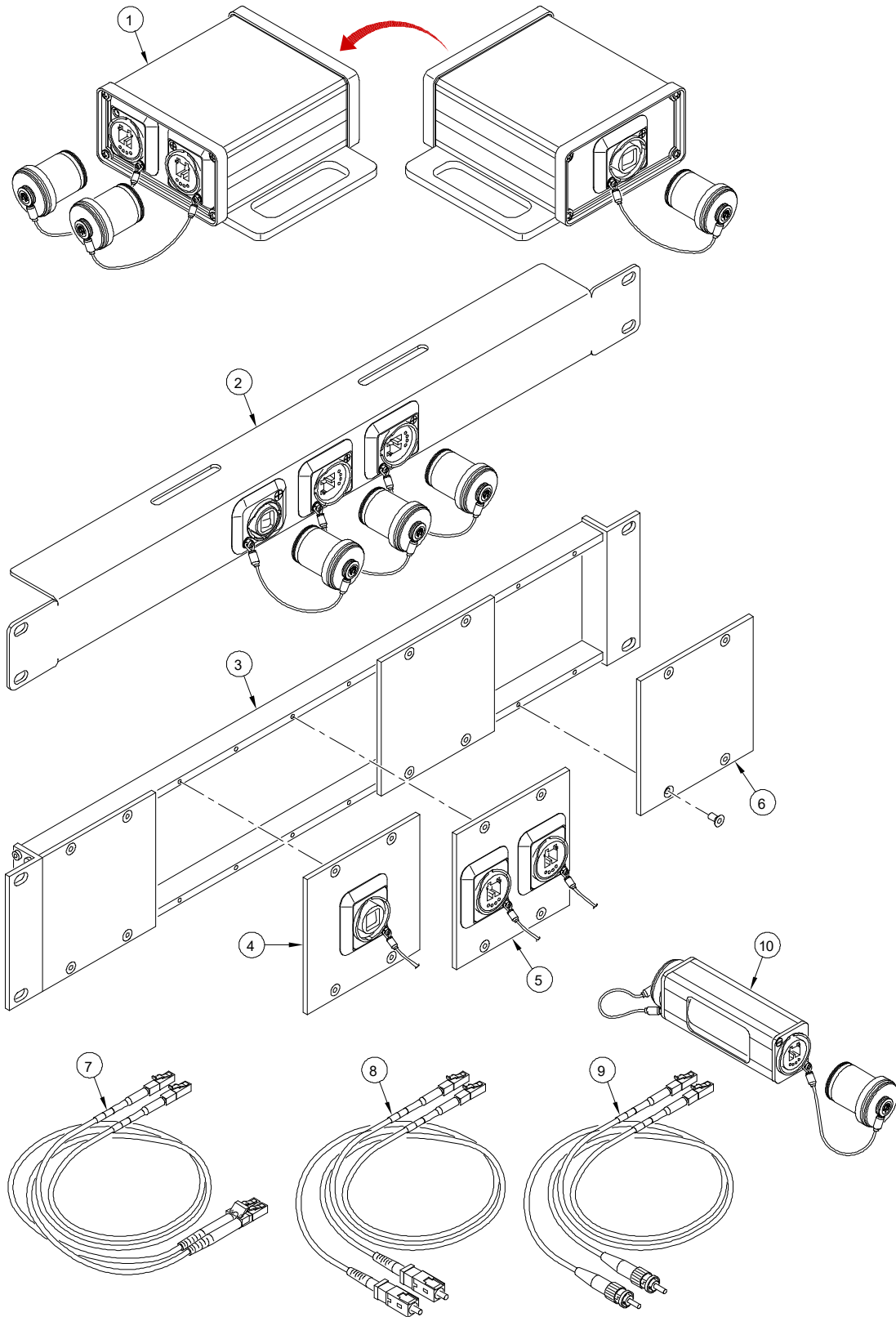


Figure 1-4: Breakout Components

CLEANING, INSPECTION TOOLS, AND SPARE PARTS

Cleaning Tools

The following items are approved for cleaning of PRG Fiber Optic cables and equipment.

IBC Click Cleaner

Available in multiple fiber connector styles (LC shown here in **Figure 1-5**), the IBC Click Cleaner is a compact, effective, and cost efficient method to dry clean fiber optic cables. This click cleaner is required to ship with any fiber.



Figure 1-5: IBC Click Cleaner, LC format

Neutrik opticalCON Service Tool (QUAD and DUO models)

The Service Tool allows for easy fiber connector cleaning and inspecting. This tool prevents possible damage to the fiber and connector; it also significantly decreases time spent on fiber cleaning and inspection.



Figure 1-6: Neutrik opticalCON Service Tool

Chemtronics® ES810 Electro-Wash PX Fiber Optic Cleaner

Precision spray nozzle for safely removing all oils and airborne particles from fiber optic end faces and connectors. Cleaner evaporates quickly, minimizing component downtime. ES810 leaves no residue, is ozone-safe, and flammable. Comes in 5oz aerosol.



Figure 1-7:
ES810 Electro-Wash PX Fiber Optic Cleaner

QbE® Fiber Optic Cleaning Wipes

The QbE product offers a more complete removal of microscopic contaminants without damaging the optical fiber end face. The QbE platform, used with Electro-Wash PX, provides effective QUAD and DUO fiber cleaning.



Figure 1-8: QbE Fiber Optic Cleaning Wipes

Chemtronics® CCK-1 Compact Fiber Optic Cleaning Kit

The CCK-1 kit is a touring version of the Wet/Dry Cleaners, composed of a lint-free wipe pad specialized for fiber optic cleaning, with a cleaning solution in a pen dispenser.



Figure 1-9: Chemtronics CCK-1 Cleaning Kit

Inspection Tools

The following items are approved for inspection of PRG fiber optic cables and equipment.

Lightel Fiber Optic Connector Inspector

The CI-1100 is a portable hand-held video microscope with LCD display for inspecting fiber optic connector end faces. Used for single mode and multimode connectors.

Mfg. P/N CI-1100-A2-TV



Figure 1-10:
Lightel CI-1100 Fiber Optic Connector Inspector

Lightel Extended Tip for LC Female Connectors

Lightel PT2-LC/PC/F-S are short extended tips for LC PC female connectors. This tip allows for inspection into Neutrik QUAD and DUO Chassis without the need to disassemble LC connectors.

Mfg. P/N PT2-LC/PC/F-S

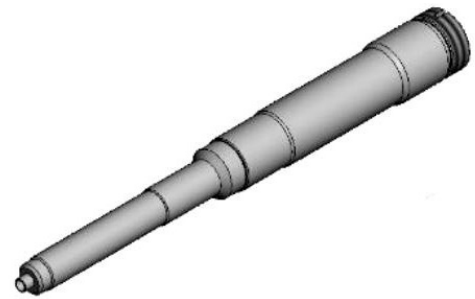


Figure 1-11:
Lightel Extended Tip for LC Female Connectors

Neutrik Fiber Scope with Adaptor

This 200x microscope has a custom 1.25mm Neutrik adapter that fits both the QUAD and DUO fiber housing. The unit is more cost-effective than the video microscope, but requires more care handling fiber. There is also a risk of eye damage if fiber is not disconnected or powered down.

PRG Ecode 52.6106.0001.0

Mfg. P/N 880588



Figure 1-12:
Neutrik Fiber Scope with Adaptor

PRG has compiled a list of recommended tools and equipment for both Field and Shop Service level work.

For FIELD SERVICE kits, please see "[Field Service: Cleaning and Inspection Tools](#)" on page 33.

For the SHOP SERVICE kit, please see "[Shop Service Cleaning Kits](#)" on page 53.

Spare Parts

The following components can be procured for repair and replacement of PRG fiber optic systems.

Front Housing Protection Cover for QUAD Fiber Connectors

PRG P/N 2.530-10369P37
Mfg. P/N SCNO4MX-A



Figure 1-13: QUAD Front Housing Protection Cover

Front Housing Protection Cover for DUO Fiber Connectors

PRG P/N 52.6108.0002.0
Mfg. P/N SCNO2MX-A



Figure 1-14: DUO Front Housing Protection Cover

Protection Cover for opticalCON Receptacle

PRG P/N 52.6106.0001.0
Mfg. P/N SCNO-DFDW-A



Figure 1-15: opticalCON Receptacle Protection Cover

opticalCON QUAD Chassis Connector

PRG Ecode 3945C-
PRN P/N 2.530-104951
Mfg. P/N N04FDW-A



Figure 1-16: opticalCON QUAD Chassis Connector

opticalCON DUO Chassis Connector

PRG Ecode 3944Z-
PRN P/N 2.530-104941
Mfg. P/N N024FDW-A



Figure 1-17: opticalCON DUO Chassis Connector

CONFIGURATION



WARNING! Laser radiation. Do not look directly into fiber optic cable connectors without eye protection!

Cable Lengths and Number of Joins

The total length of fiber possible is dependent on network speed, wavelength of the data carrier, and the number of physical junctions in the cable.

A 1 GB signal will not travel as far as a 100 MB signal in the same type of fiber cable.

There is a difference in the wavelength of the data carrier used in the VIA12 (850nm) and Series 400 (1300nm) Ethernet switches. This difference allows the S400 Switch to drive a 100 MB signal further than the Via 12, but the VIA 12 can distribute a 1 GB signal.

The following table lists the maximum total length allowable based on the number of cables, network speed and type of switch.

# of Cables	1	2	3	4	5	6
# of Couplers	0	1	2	3	4	5
VIA 12, 1 GB (m)	970	970	833	500	167	
VIA 12, 1 GB (ft)	3,182	3,182	2,733	1,640	547	
VIA 12, 100 MB (m)	1,500	1,167	833	500	167	
VIA 12, 100 MB (ft)	4,920	3,827	2,733	1,640	547	
S400, 10 port 100 MB (m)	2,000	2,000	2,000	2,000	2,000	1,000
S400, 10 port 100 MB (ft)	6,560	6,560	6,560	6,560	6,560	3,280

Fiber Polarity

A crucial concept for proper fiber optic installation is that of *polarity*. The polarity of the fiber installation must connect the transmit ports to the receive ports of the fiber transceivers in order to transfer data.

The convention used for duplex fiber connections is as follows:

- + Rx is labeled A (or a)
- + Tx is labeled B (or b)

According to this polarity principle, **A** must connect to **B**, and **B** to **A** at every point in a connection path to ensure there is an overall "twist" end-to-end.

PRG cables will be wired with a twist, such that A>B, B>A (and a>b, b>a in a Quad connector). All cable couplers and breakouts will also follow this convention.

It is imperative that this polarity principle is followed when patching equipment within rack cases, and patching between opticalCON breakout panels using LC fiber patch cords. The convention for LC chassis connectors is for the Transmit, or B(b), connector to be on the left and the Receive, or A(a) connector to be on the right when viewed from the front with the keyways up.

PRG Part No.	Ecode	Description
52.8301.0001.0	A0556-	FIBER MM 1000BASE-SX SFP MINI-GBIC CISCO GLC-SX-MM

Connection to Ethernet Switch

To connect fiber optic to the Pathport VIA 12 Ethernet Switch (model #6740), it is necessary to install Mini GBIC transceivers in the ports on the rear panel. The following drawing shows the preferred Mini GBIC Module Plug and the polarity of the LC connections:

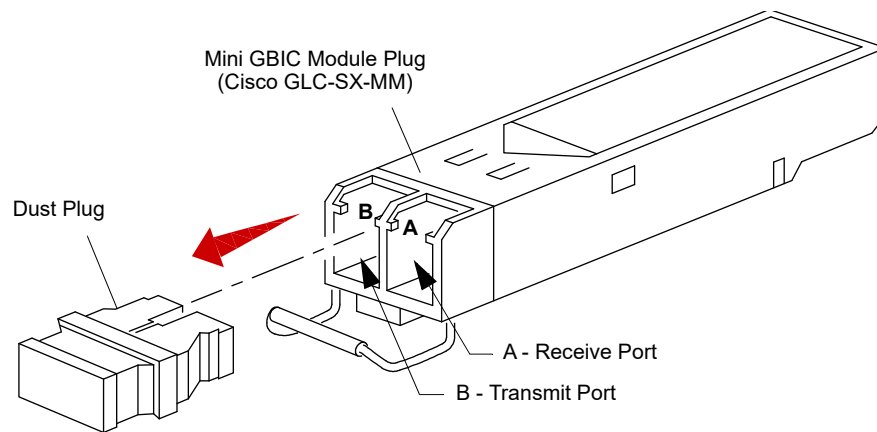


Figure 1-18: Mini GBIC Connector Orientation

Connection Options

The following illustrations show example fiber optic connections.



CAUTION: Due to the narrow spacing between the connector pairs in the opticalCON Quad connector, a slimline type of LC connector must be used. The diameter of the strain relief on the LC connector cannot be greater than 5mm (about 3/16") as shown in the following illustration.

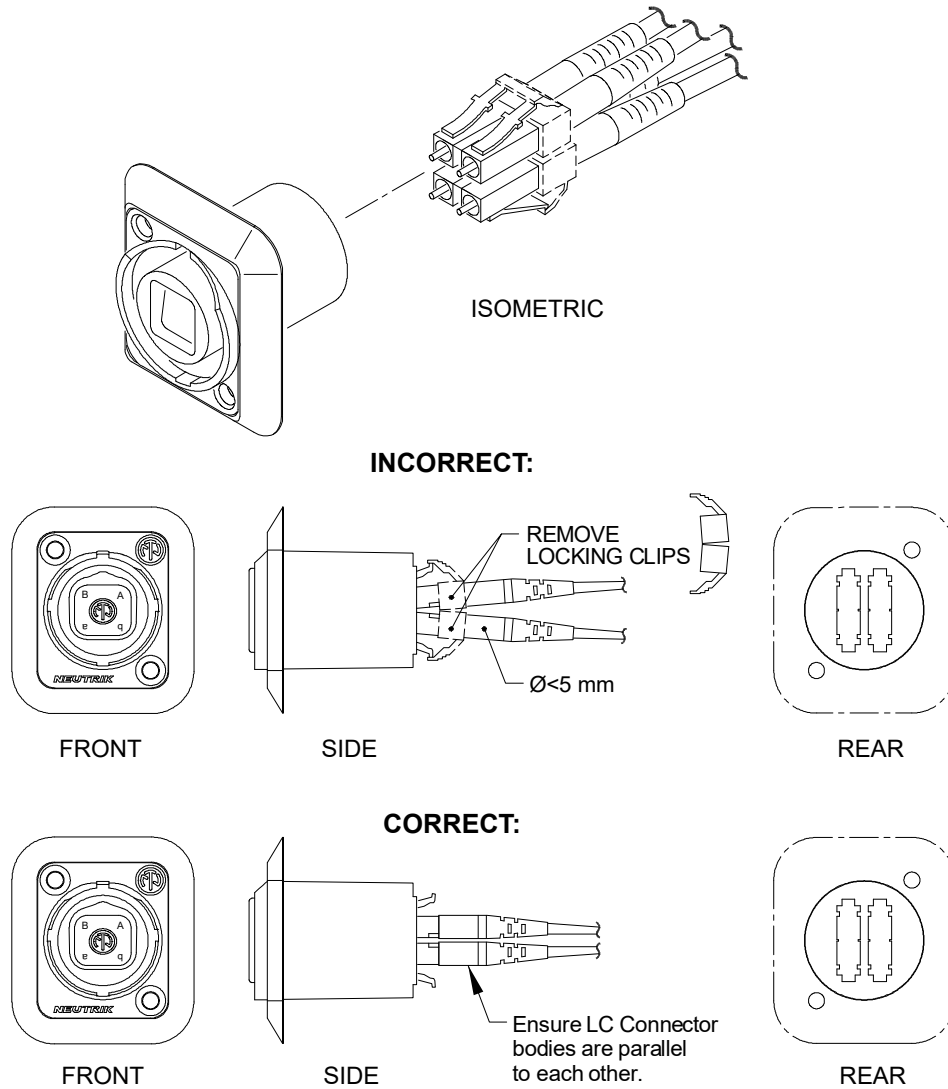


Figure 1-19: LC Connector Detail

The following illustration shows an example of front and rear opticalCON Duo connections.

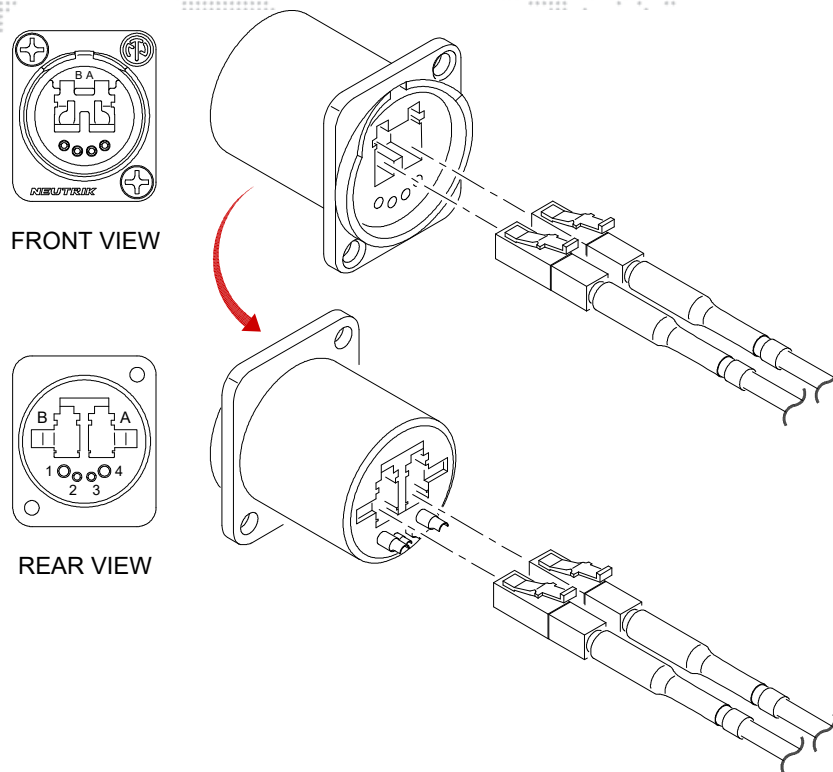


Figure 1-20: Example LC-LC Duplex Connections

Quad Fiber to 2X Duo Options

Refer to "**Breakout Components**" on page 9 for part numbers of the equipment shown below.

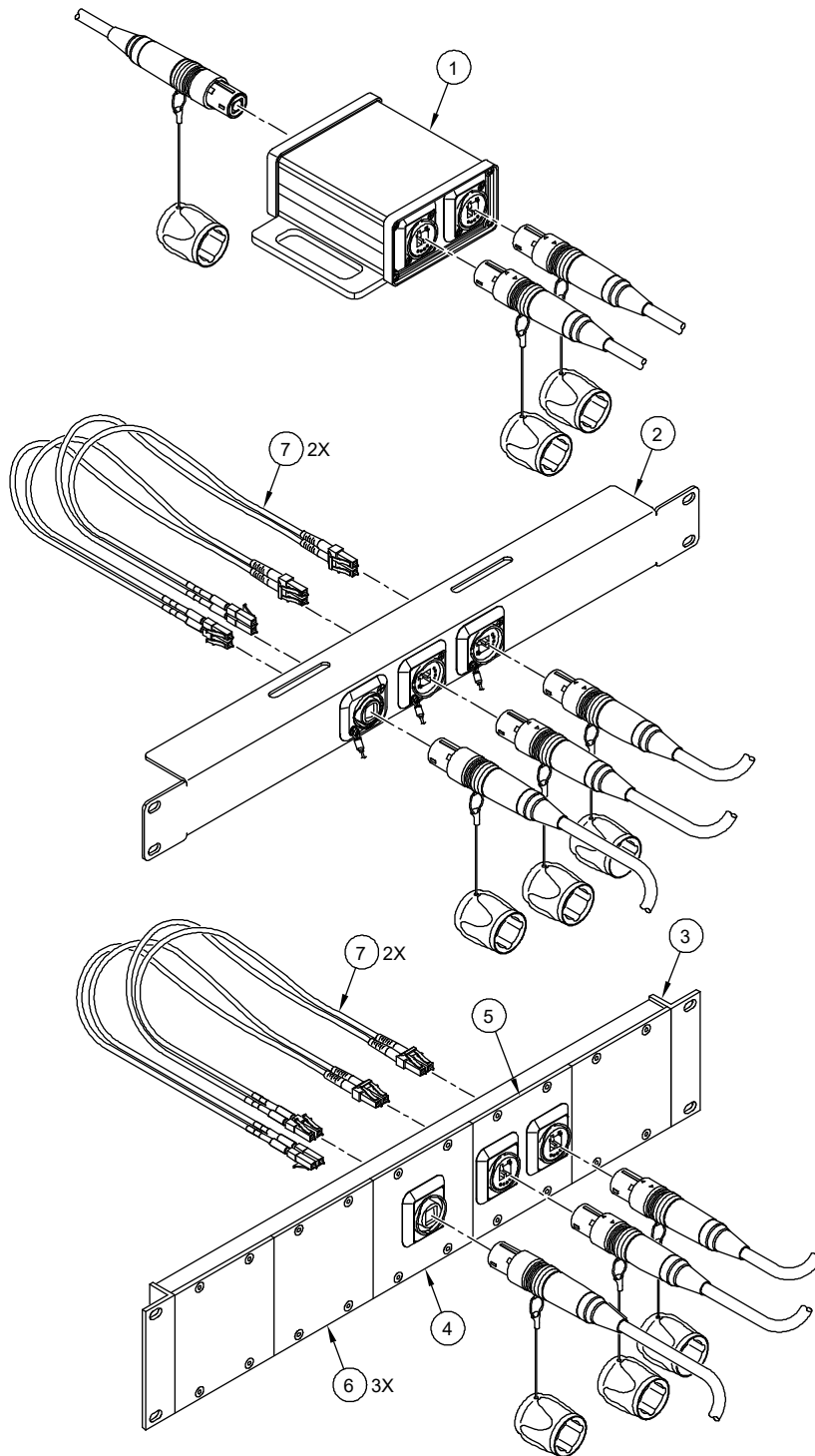


Figure 1-21: Example Quad Fiber to 2X Duo Connections

Quad Fiber to Duo Fiber and LC-LC Options

Refer to "**Breakout Components**" on page 9 for part numbers of the equipment shown below.

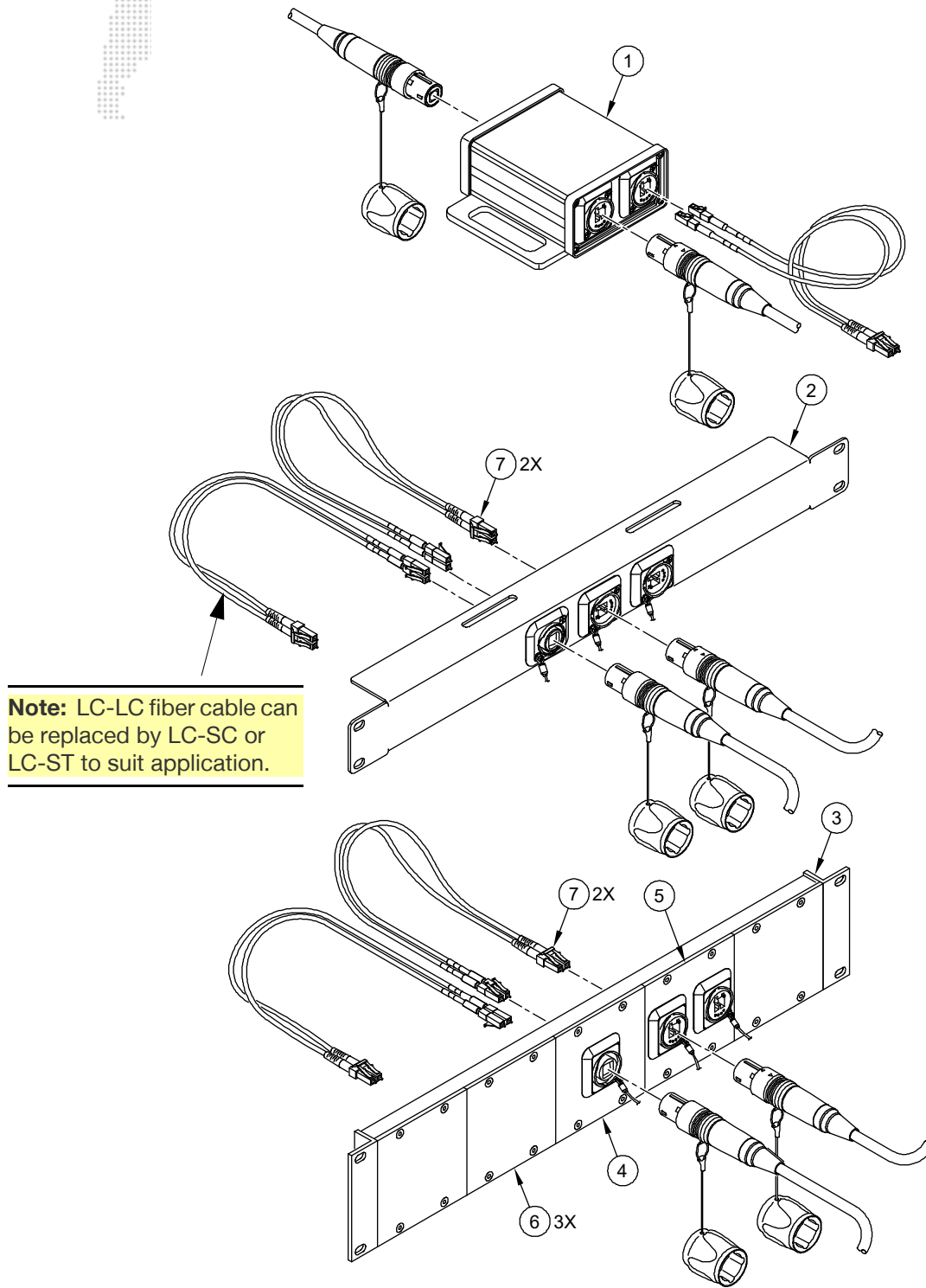
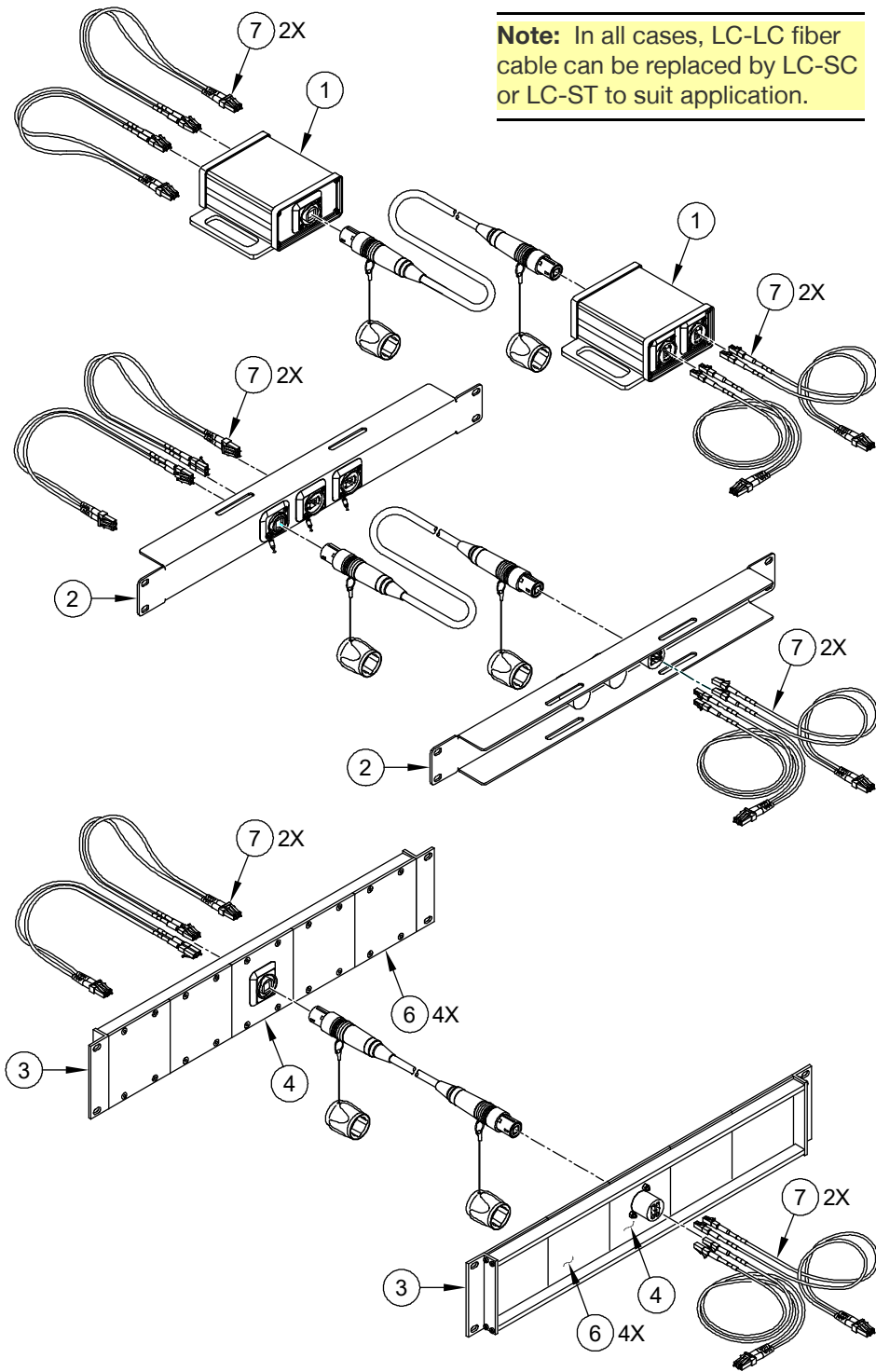


Figure 1-22: Example Quad Fiber to Duo Fiber and LC-LC Connections

2X LC-LC Duplex Via Quad Fiber Options

Refer to "Breakout Components" on page 9 for part numbers of the equipment shown below.



Note: In all cases, LC-LC fiber cable can be replaced by LC-SC or LC-ST to suit application.

Figure 1-23: Example 2X LC-LC Duplex Via Quad Fiber Connections

Quad Fiber to 2X ST Duplex Options

Refer to "**Breakout Components**" on page 9 for part numbers of the equipment shown below.

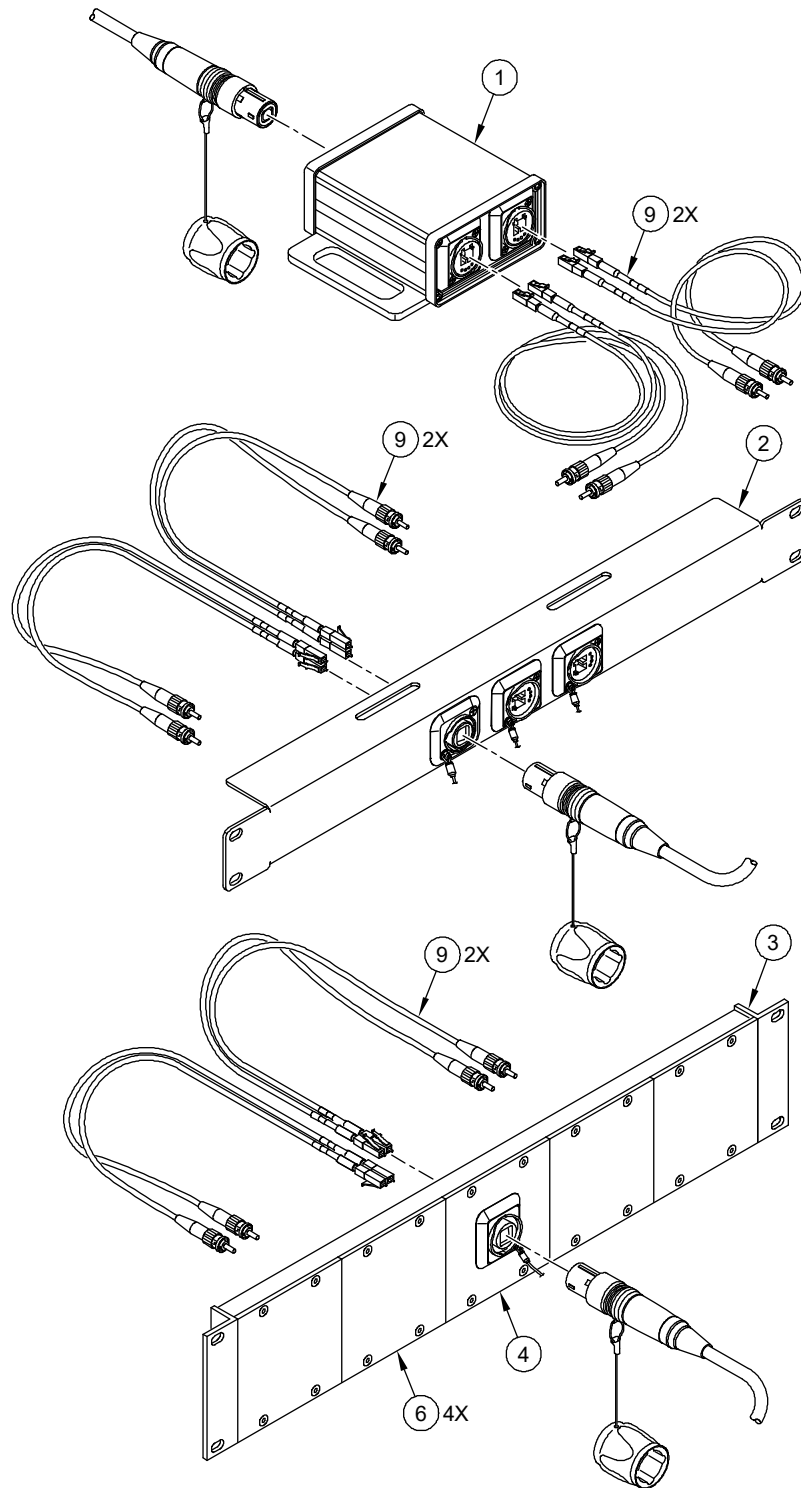


Figure 1-24: Example Quad Fiber to 2X ST Duplex Connections

Quad Fiber to 2X SC Duplex Options

Refer to "Breakout Components" on page 9 for part numbers of the equipment shown below.

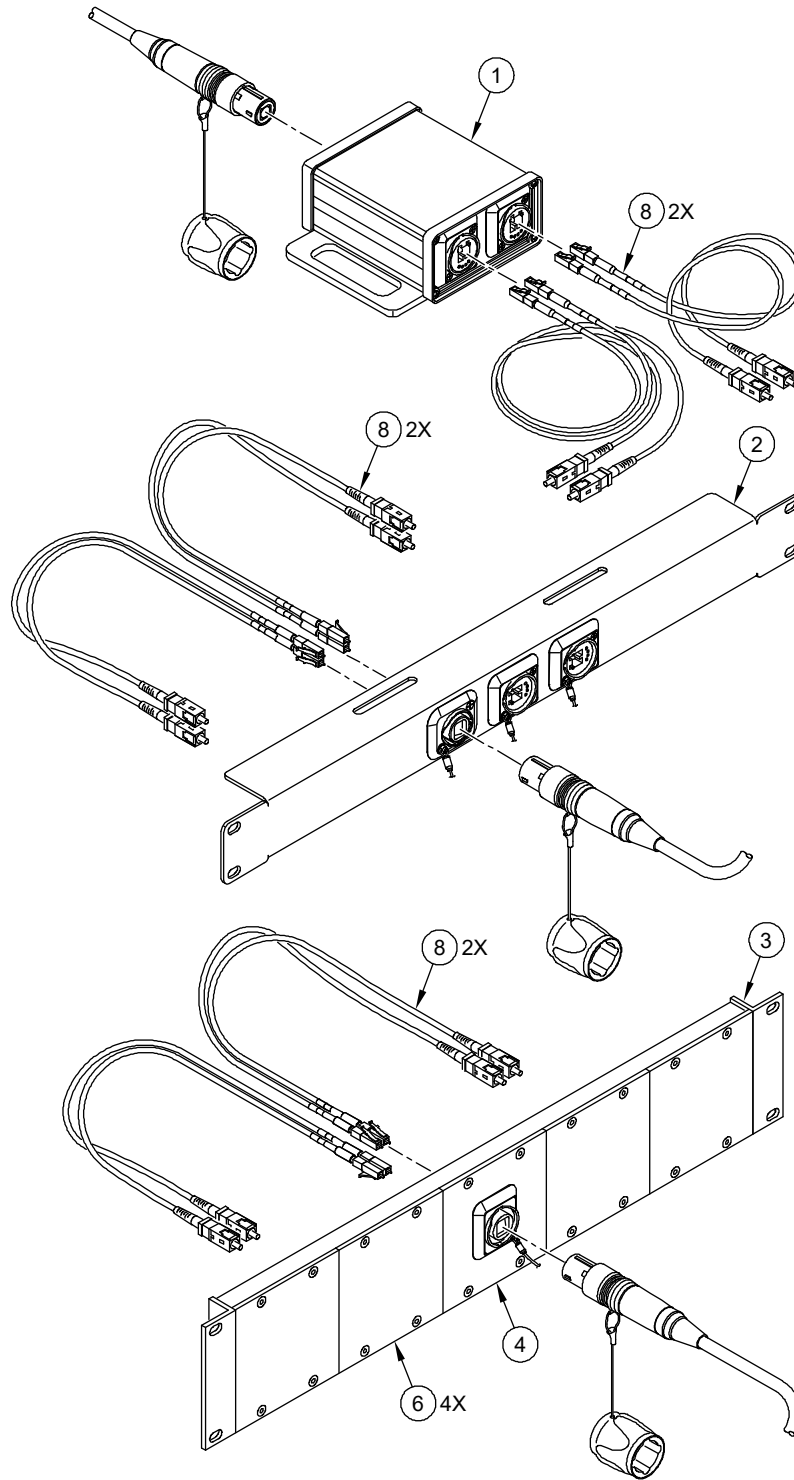


Figure 1-25: Example Quad Fiber to 2X SC Duplex Connections

Duo Fiber to LC Duplex Options

Refer to "**Breakout Components**" on page 9 for part numbers of the equipment shown below.

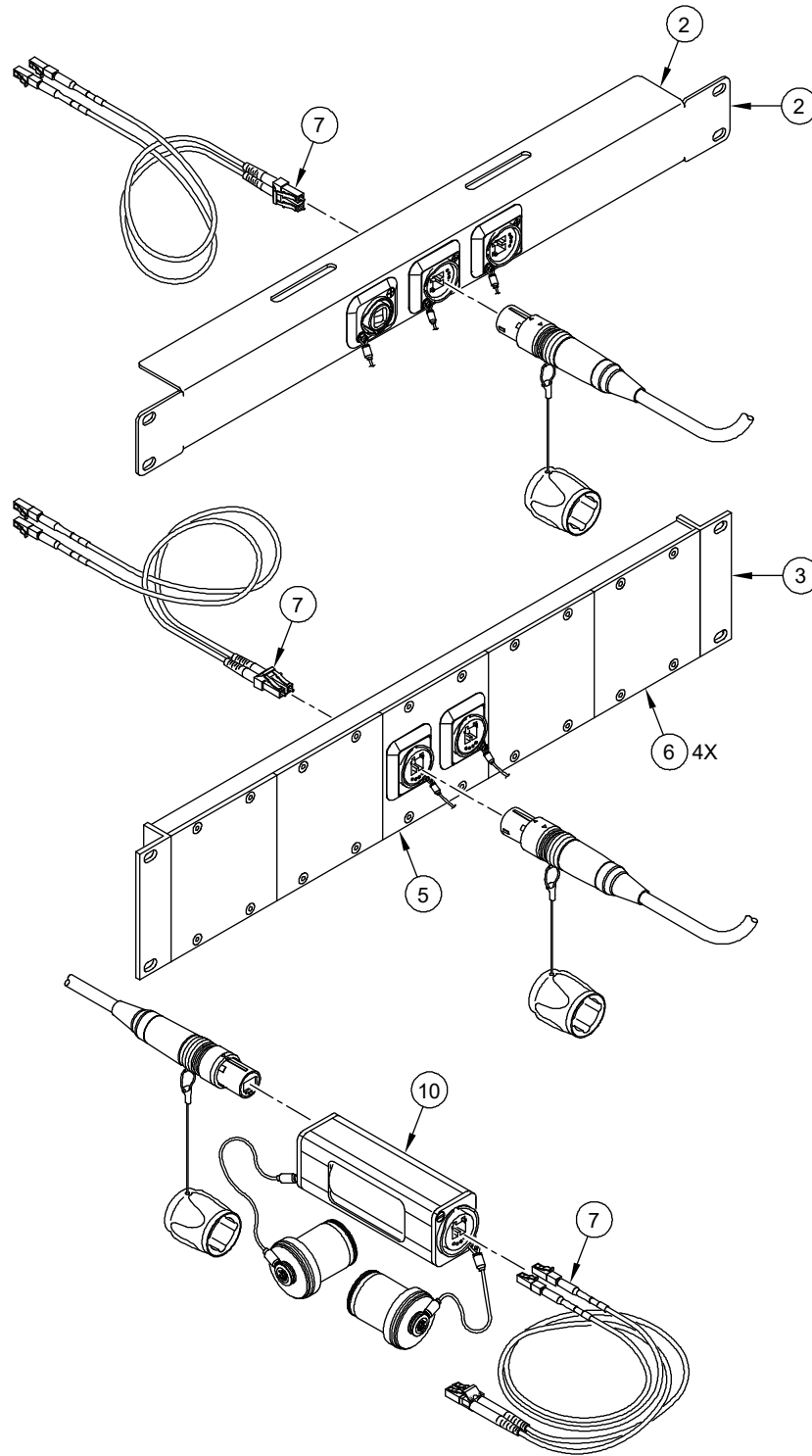


Figure 1-26: Example Duo Fiber to LC Duplex Connections

Duo Fiber to SC Duplex Options

Refer to "[Breakout Components](#)" on page 9 for part numbers of the equipment shown below.

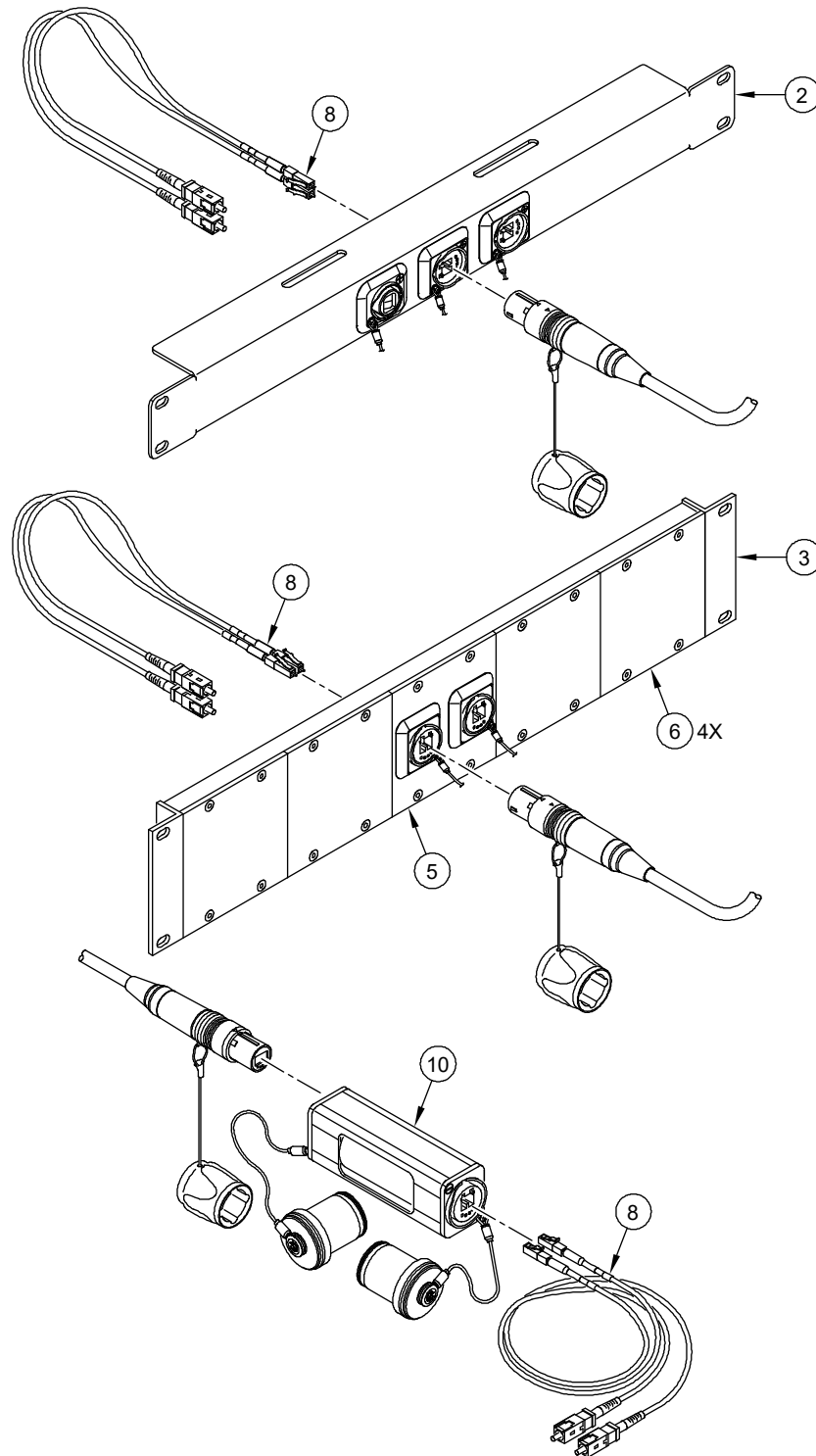


Figure 1-27: Example Duo Fiber to SC Duplex Connections

Duo Fiber to ST Duplex Options

Refer to "**Breakout Components**" on page 9 for part numbers of the equipment shown below.

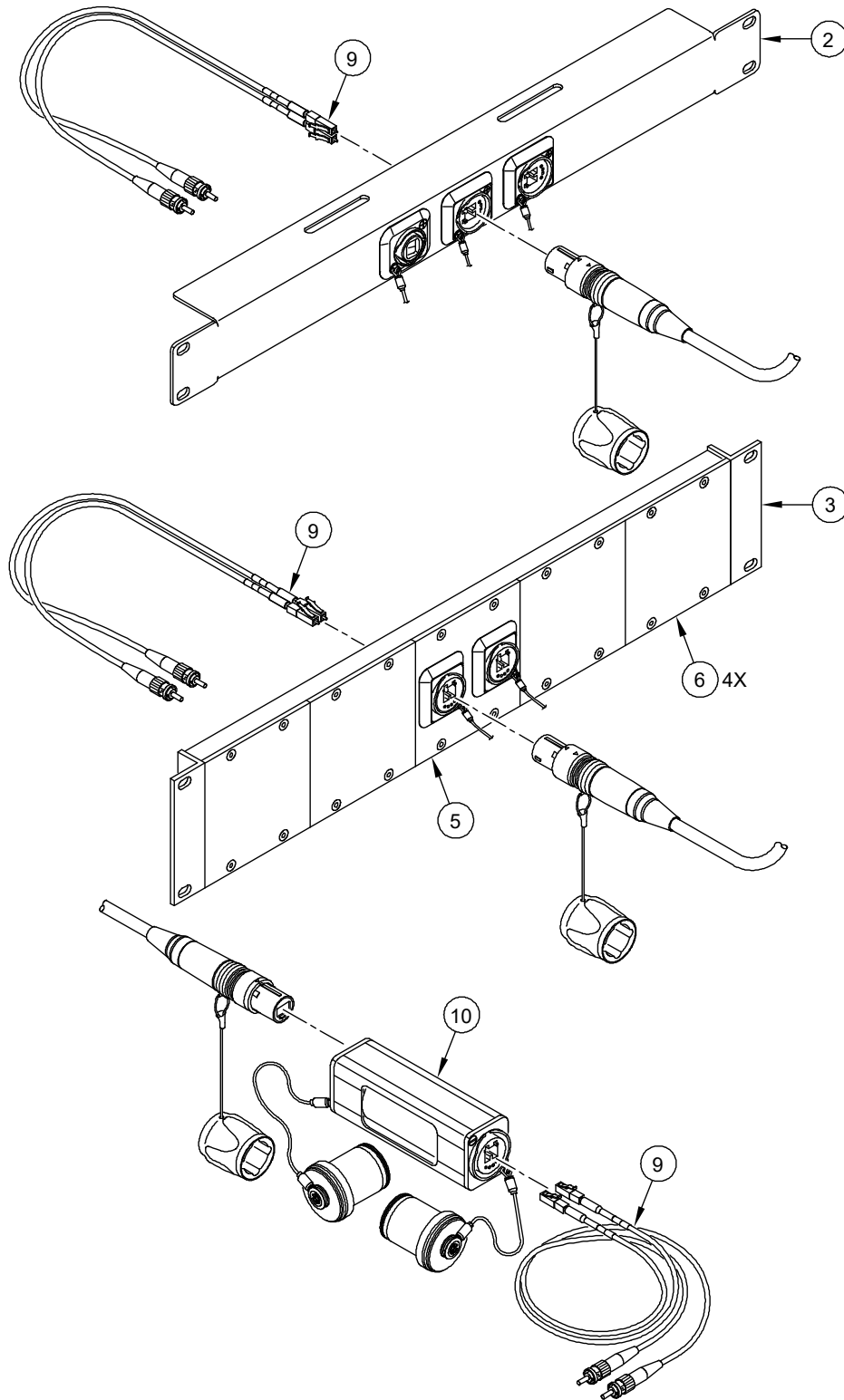


Figure 1-28: Example Duo Fiber to ST Duplex Options

Suggested Layouts

The following illustrations show example fiber optic layouts.

LC patch cords of the correct type can be ordered at orders@prg.com.

Quad to Duo - for Equipment Fitted with opticalCON Duo

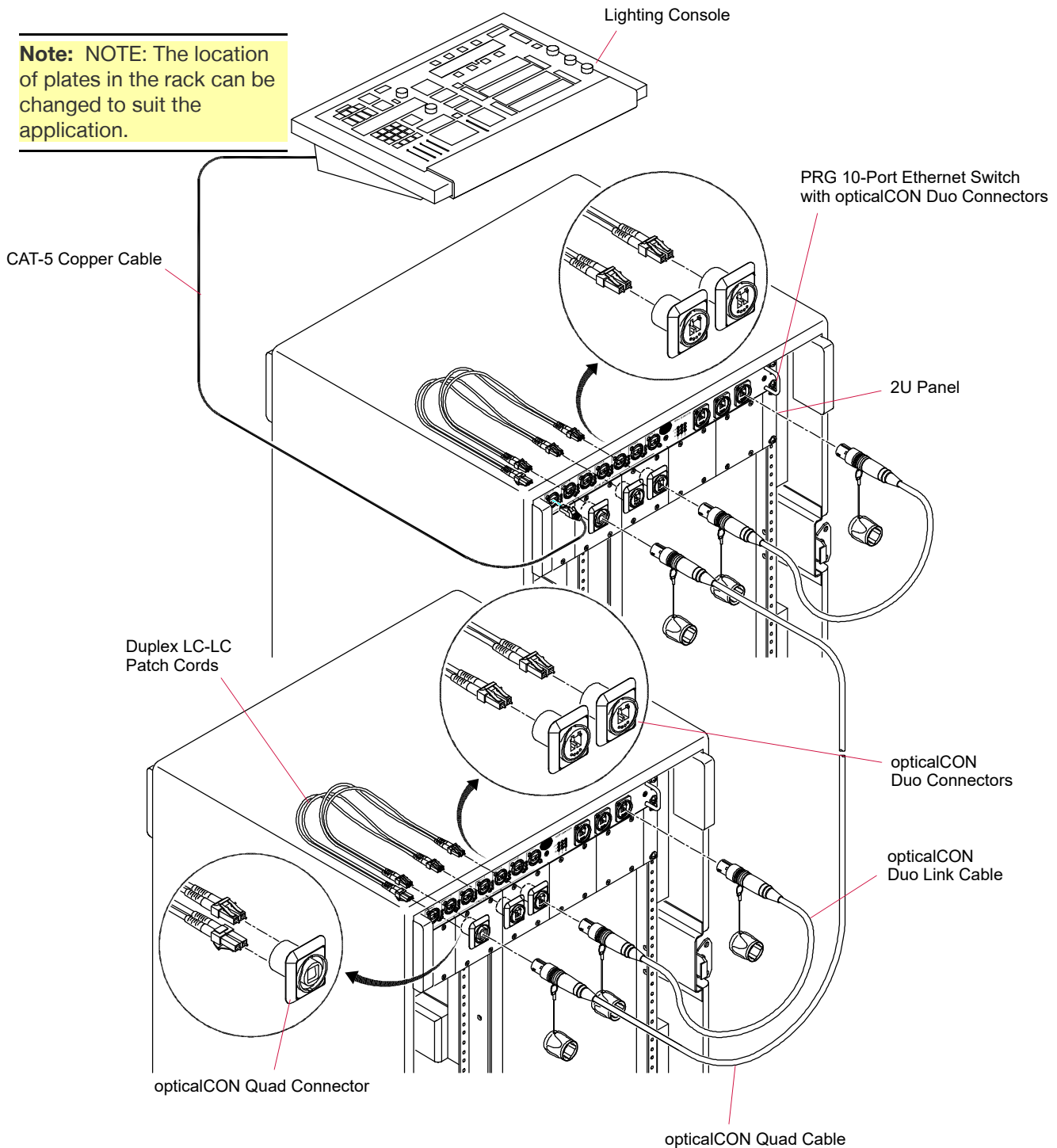
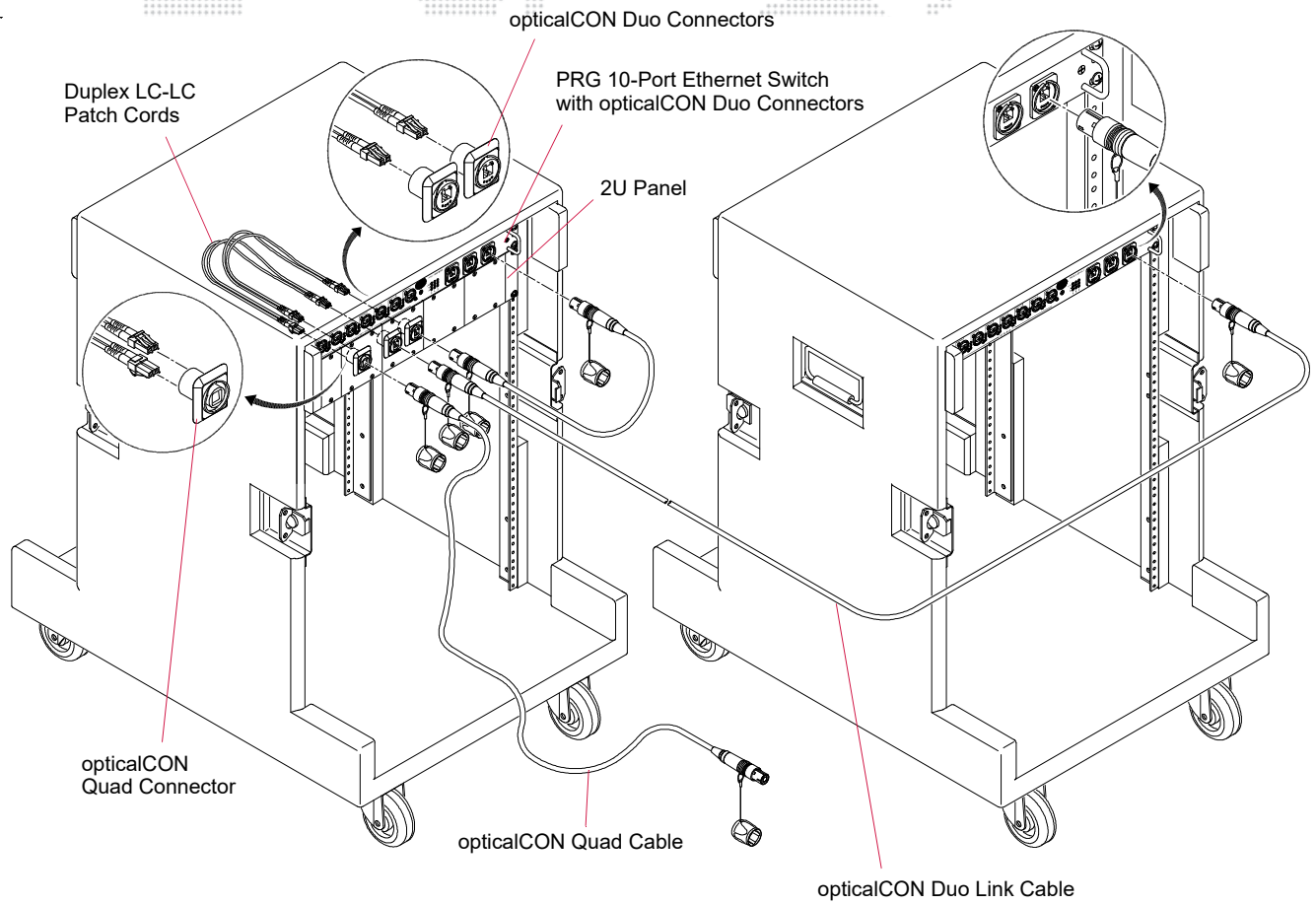


Figure 1-29: Example Quad to Duo Configuration 1

Quad to Duo - for Jumping Between Racks

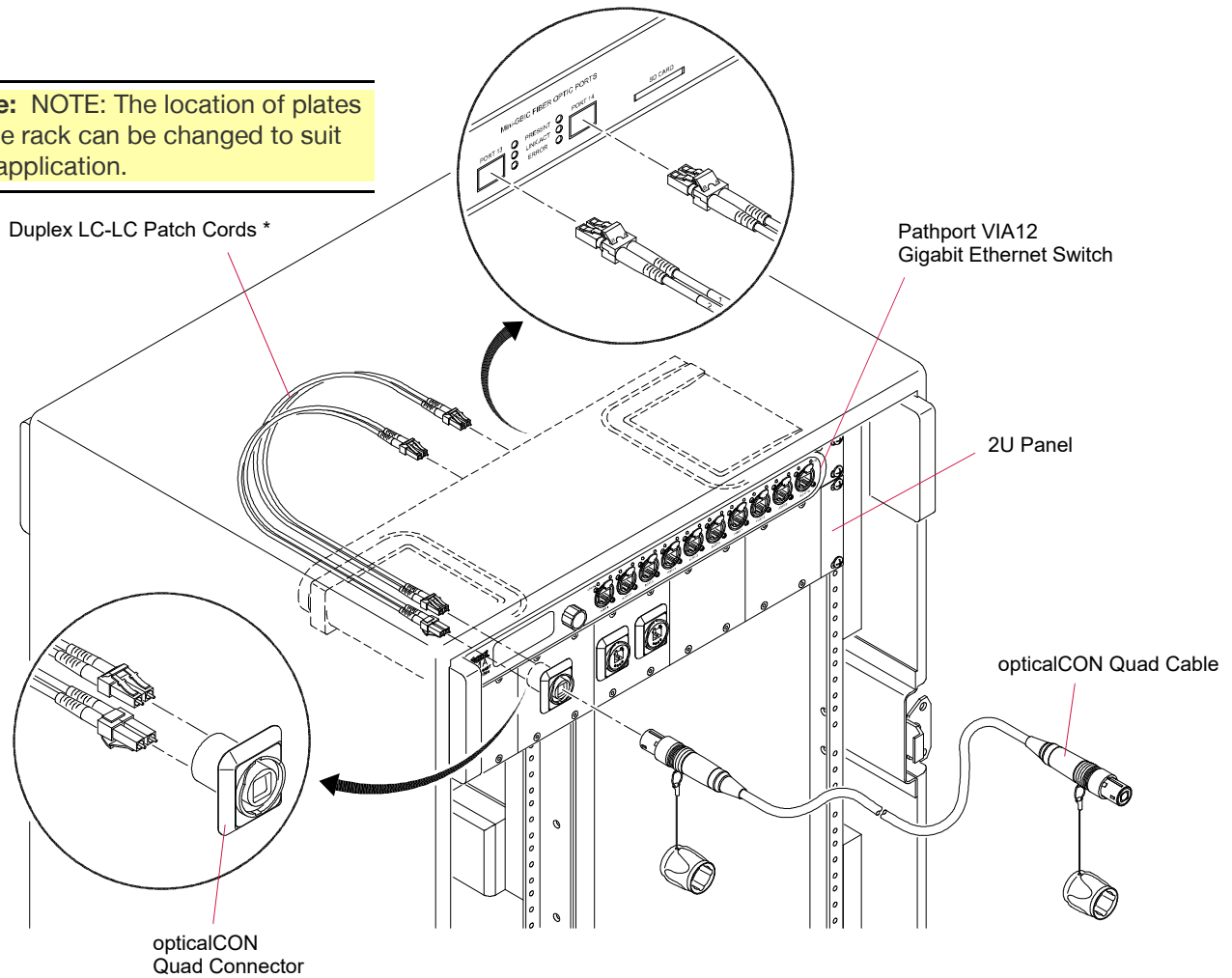


Note: NOTE: The location of plates in the rack can be changed to suit the application.

Figure 1-30: Example Quad to Duo Configuration 2

Quad or Duo to LC/SC/ST Patch Cords, Internal and External

Note: NOTE: The location of plates in the rack can be changed to suit the application.



* The patch cords could also be LC-SC or LC-ST to suit equipment used.

Figure 1-31: Example Quad or Duo Configuration

EQUIPMENT HANDLING

Bend Radius

Fiber optic cable is fragile.

Regardless of the manufacturer, specific handling of fiber optic cables and equipment is absolutely essential to maintain the working life of the fiber. Portable fiber cables by design are built to withstand the rigors of the austere environments in which we're required to operate. Portable fiber optic cables are subject to damage when handled improperly. Our fiber optic cables are built with rugged insulation and jacket material, some with steel wire and Kevlar armoring internally, but even with their cut and crush resistance, certain very important handling rules apply.

PRG Rules for Fiber Optic Cable Handling:

- Rule 1. **AVOID KINKING THE FIBER OPTIC CABLE.**
Kinks in fiber optic cable can almost certainly render that cable unusable.
- Rule 2. Use the "**Last In, First Out**" principle:
Load-ins and load-outs are hard on all cables, especially fiber optic cables, so pay extra attention to them at the show. Load-in your fiber optic cables LAST and load them out FIRST. This will prevent any tangling with other cables and equipment, reducing possible damage.
- Rule 3. Avoid any **twisting, tugging, or hard pulling** on fiber optic cables, which can cause kinking and breakage.
- Rule 4. Avoid a **tight radius** on any bends in the fiber optic run.
Think of a soccer ball - don't bend any tighter than a soccer ball is round.
- Rule 5. If your fiber cable is on a reel, be especially careful **not to allow the reel to spin or freewheel**, and do not let loops fall off the side of the reel. Keep some tension on the reel as you roll the cable from the reel, and do not twist the cable as it comes off the reel. All of these things can result in getting a kink in the cable, which will ultimately result in cable failure.
- Rule 6. **Pull on the cable, NOT the connector.** If you pull the cable by the connector, you're more than likely going to destroy the cable by pulling the connector off the end.

Fiber Looms

When making looms for production, it is highly recommended to loom any fiber cables separately from power or copper cables. Dedicated fiber optic looms separate from other cables reduces the risk of damage from heavy cables, and allows for extra care to be exercised with the fiber loom. Additionally, when securing a fiber loom to a cable pick, do not allow the fiber loom to bundle in with other cable looms in the pick -- attach fiber looms to the pick or motor separately with a dedicated spanset. If your loom has coupler breaks in-line, it is highly recommended to tape or otherwise secure all couplers together to reduce any harsh bends or other damage from occurring.

Remember to observe **Rule #4** when picking fiber optic looms: avoid tight radii on fiber optic cables!

CLEAN Your Fiber

It is mission critical for your fiber optic cables to be clean in order for the light carrying your data to travel through the fiber path. The frequency of need for cleaning the fiber cables depends on several factors, which include but are not limited to atmospheric usage, pyrotechnics, coupler usage, frequency of connection handling, venue types, *et al*.

The field procedures explained in this manual are extremely efficient and have been tested for practical use during all times of a production, including in the middle of a busy load-in. Always keep your fiber clean!

CONNECT Your Fiber

Properly connected Neutrik QUAD and DUO connectors make a solid, locked connection to a coupler or chassis. Once pushed in, a hard 'click' sound should occur, and an additional push should be made to ensure that contact was made. The cap cord, if improperly installed, can get tucked within the connector, causing a potentially bad connection. Additionally, use the least amount of couplers possible - every connection is a potential failure point.



PRG FIBER OPTIC SYSTEMS GUIDE

FIELD SERVICE

- + [FIELD SERVICE: FIBER OPTIC CLEANING](#)
- + [FIELD SERVICE: FIBER OPTIC TESTING & INSPECTION](#)
- + [APPENDIX A: FIBER INSPECTION VISUAL GUIDE](#)



2.

FIELD SERVICE: FIBER OPTIC CLEANING

This chapter introduces the cleaning PRG fiber optic cables and components in the field.

- + INTRODUCTION
- + FIELD SERVICE: CLEANING AND INSPECTION TOOLS
- + FIELD SERVICE: DRY CLEANING PROCESSES
- + FIELD SERVICE: WET/DRY CLEANING PROCESSES



INTRODUCTION

About Fiber Optic Field Service

This chapter in the PRG Fiber Optic Systems manual provides Field Service maintenance information about DUO and QUAD fiber cables and components.

When utilizing fiber optic components and cable runs in PRG productions, it is highly recommended to keep the appropriate one click cleaner of the correct type on your person (LC, LC Dual, ST/SC) and quickly but safely clean each connection before inserting into the appropriate receptacle. Shop Service will clean the fiber products before sending them out on shows, but fiber products are very sensitive to austere environments, and the few seconds it will take to ensure a clean connection prior to installation onsite far outweighs the time that could be wasted on troubleshooting a dirty fiber.

Fiber Show Prep

Prior to installation on site, take a moment to clean both ends of the fiber line being used, and any peripherals or junctions that are used in your system; procedures for both dry cleaning and wet cleaning are found in this chapter.

In addition to keeping clean connections on cable runs and equipment, make sure to observe and practice the "Last In, First Out" rules, as well as making sure to maintain a wide bend radius when using fiber optic cable.

Prior to Maintenance

Before performing any Field Service on fiber optic cables and peripherals:

- + Make sure that you have a clean work surface in the event that you have to open a connector
- + Ensure that your hands are clean before opening connectors.
- + Unless you are using a wet cleaning method and the cleaning chemicals require the use of disposable gloves, it is not recommended to use disposable gloves when cleaning fiber components.
- + Keep all cleaning devices and service tools clean and free of debris. Dirt and debris are the arch enemies of fiber.
- + Use caution when you're working with exposed ferrules in the field. Scratching or forcing tools against the fiber ferrule can and usually will cause damage.

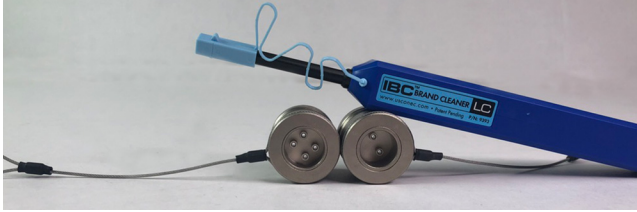
Note: Wet cleaning in the field is to be used as an emergency last resort only.

FIELD SERVICE: CLEANING AND INSPECTION TOOLS

Three groupings of cleaning and inspection tools are recommended for PRG fiber optic operations: The **BASIC** Field Kit, the **ADVANCED** Field Kit, and the **EXTREME** Field Kit.

If you are interested in the **SHOP SERVICE** level kit, please see "[Shop Service Cleaning Kits](#)" on page 53.

BASIC Level Field Kit



Product	Link	Model #	PRG Ecode
IBC One-Click Fiber Cleaner for LC	Click Here	9393	2.575-1006F1
Neutrik FOCD-STD opticalCON DUO Fiber Cleaning Tool	Click Here	FOCD-STD	E900F-
Neutrik FOCD-STQ opticalCON QUAD Fiber Optic Cleaning Tool	Click Here	FOCD-STQ	E900G-

ADVANCED Level Field Kit



Product	Link	Model #	PRG Ecode
IBC One-Click Fiber Cleaner for LC	Click Here	9393	2.575-1006F1
IBC One-Click Fiber Cleaner for LC Dual	Click Here	IBC-LC2	2.575-1006F2
Chemtronics CCK-1 Compact Fiber Optic Cleaning Kit	Click Here	CCK-1	2.575-1006F4
Chemtronics FW2150 Electro-Wash MX Pen for Fiber Cleaning	Click Here	FW2150	
Neutrik FOCD-STD opticalCON DUO Fiber Cleaning Tool	Click Here	FOCD-STD	E900F-
Neutrik FOCD-STQ opticalCON QUAD Fiber Optic Cleaning Tool	Click Here	FOCD-STQ	E900G-
FERRULE INSPECTION			
Neutrik Fiber Optic Scope w/Adapter	Contact Dallas	880588	2.530-104991
SPARE PARTS			
Neutrik SCNO4MX-A Front Housing Protection Cover for Multimode opticalCON QUAD	Click Here	SCNO4MX-A	2.530-10369P37
Neutrik SCNO-FDW-A Protection Cover for D-Series opticalCON Receptacles	Click Here	SCNO-DFDW-A	52.6106.0001.0

EXTREME Level Field Kit



<i>Product</i>	<i>Link</i>	<i>Model #</i>	<i>PRG Ecode</i>
IBC One-Click Fiber Cleaner for LC	Click Here	9393	2.575-1006F1
IBC One-Click Fiber Cleaner for LC Dual	Click Here	IBC-LC2	2.575-1006F2
QbE Fiber Optic Cleaning Wipes, 200-ct Box	Click Here	QbE	
Chemtronics FW2150 Electro-Wash MX Pen for Fiber Cleaning	Click Here	FW2150	
Neutrik FOCD-STD opticalCON DUO Fiber Cleaning Tool	Click Here	FOCD-STD	E900F-
Neutrik FOCD-STQ opticalCON QUAD Fiber Optic Cleaning Tool	Click Here	FOCD-STQ	E900G-
FERRULE INSPECTION			
Lightel Fiber Optic Connector Inspector and Broadcaster Tip Set	Click Here	CI-1100-A2-TV	
Lightel PT2-LC/PC/F-S Short Extended Tip for LC PC Type Female Connectors	Click Here	PT2-LC/PC/F-S	
SPARE PARTS			
Neutrik SCNO4MX-A Front Housing Protection Cover for Multimode opticalCON QUAD	Click Here	SCNO4MX-A	2.530-10369P37
Neutrik SCNO-FDW-A Protection Cover for D-Series opticalCON Receptacles	Click Here	SCNO-FDW-A	52.6106.0001.0
Neutrik NO4FDW-A opticalCON QUAD Chassis Connector	Click Here	NO4FDW-A	2.530-104951

FIELD SERVICE: DRY CLEANING PROCESSES

Dry Cleaning: opticalCON QUAD Cable

The opticalCON QUAD Fiber requires appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged. It is highly recommended to utilize the Neutrik Fiber Service Tool to perform cleaning.



WARNING! Disconnect fiber or power down source. Invisible laser radiation can be harmful if viewed directly.

Tools and Supplies:

IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393

Suggested: Neutrik Fiber Quad Service Tool, PRG P/N 2.530-104996, Neutrik P/N: FOCD-STQ

Optional: Fiberscope (Video Scope or Magnifier) such as Neutrik Fiber Scope w/Adapter, PRG P/N 2.530-104991

opticalCON QUAD Dry Cleaning Process (w/ Service Tool):

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove dust cap from connector.
- Step 3. Mount the Neutrik Service Tool onto the front shell, as seen in **Figure 2-1**.
- Step 4. Remove the IBC Click Cleaner cap.
- Step 5. Seat the IBC Click Cleaner over a ferrule hole (**Figure 2-2**)
- Step 6. Push down the IBC outer shell to start cleaning fiber. A "click" sound indicates the end of the cleaning process.
- Step 7. Turn the click cleaner 90° and repeat Step 6. Typically you will click twice per ferrule hole.
- Step 8. Continue cleaning remaining ferrules.
- Step 9. Close the IBC Click Cleaner cap cover.
- Step 10. OPTIONAL: Inspect fiber ferrules with fiberscope. (**Figure 2-3**, image examples below in **Figure 2-4**)
- Step 11. If needed, use compressed air to blow out contaminants from front shell.
Note: **NEVER** blow fiber ferrules with compressed air.
- Step 12. Remove Neutrik Service Tool from connector.
- Step 13. Reinstall dust cap to connector head.

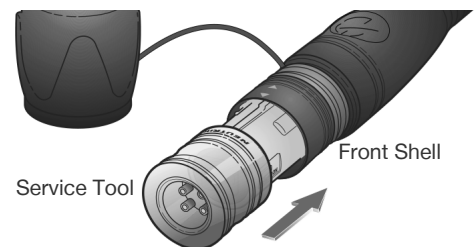


Figure 2-1: QUAD Service Tool Installation



Figure 2-2: QUAD Service Tool Cleaning

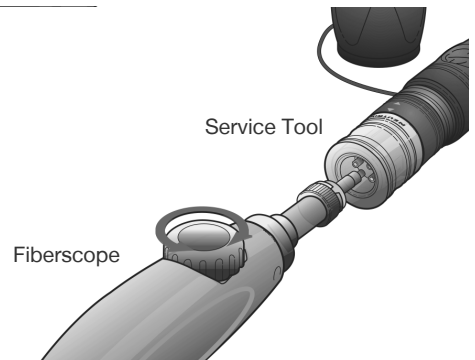


Figure 2-3: QUAD Service Tool Inspection

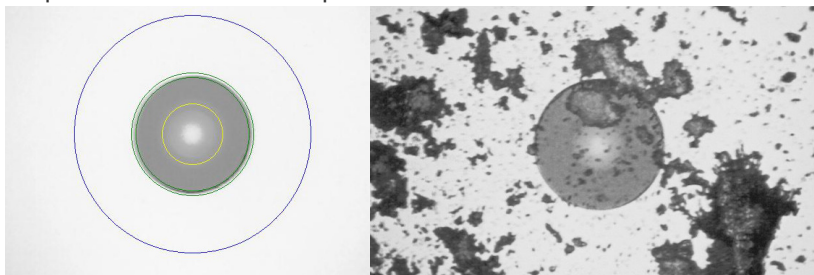


Figure 2-4: Clean (left) and dirty (right) fiberscope images

opticalCON QUAD Dry Cleaning Process (w/o Service Tool):

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Pull up on silver retaining ring. (**Figure 2-5**). Note: The ring may be damaged or bent if not pulling up from boot. A jewelers flat head can be used to pry up. If front shell cannot be repaired, it should be replaced.



Figure 2-5: opticalCON QUAD Retaining Ring

- Step 3. Spin the rear boot from the front shell. When released, slowly separate pieces. Note: Exposed fiber ferrules are high susceptible to damage. (**Figure 2-6**)
- Step 4. Open IBC guide cap cover.
- Step 5. Insert guide cap onto fiber end (ferrule) while observing cautions as shown in **Figure 2-7**.
- Step 6. Push down the IBC outer shell to start cleaning fiber. A "click" sound indicates the end of the cleaning process.
- Step 7. Turn the click cleaner 90° and repeat the click clean.
- Step 8. Continue cleaning remaining ferrules.

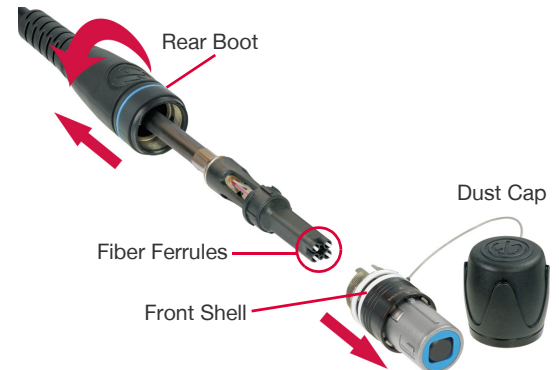


Figure 2-6: opticalCON QUAD Components

- Step 9. Close IBC guide cap cover.
- Step 10. OPTIONAL: Inspect fiber ferrules with fiberscope.
- Step 11. If needed, use compressed air to blow out contaminants from front shell.
Note: NEVER blow fiber ferrules with compressed air.

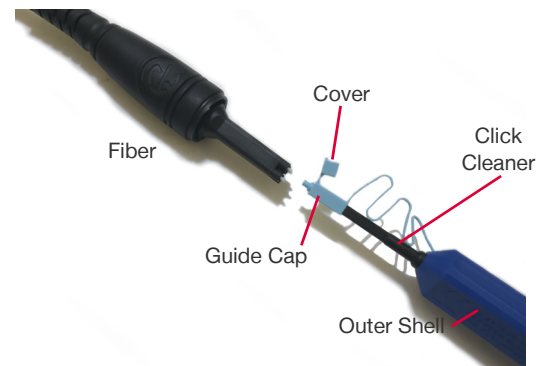


Figure 2-7: opticalCON QUAD Click Cleaner

- Step 12. Re-assemble opticalCON connector. (**Figure 2-8**)

When replacing the front shell, ratchet the rear boot until it clicks about five (5) times. Over tightening can damage the cap, making it difficult to disassemble during a future cleaning. If more clicks are required to tighten, the shell may be damaged. Ensure silver retaining ring is properly aligned.

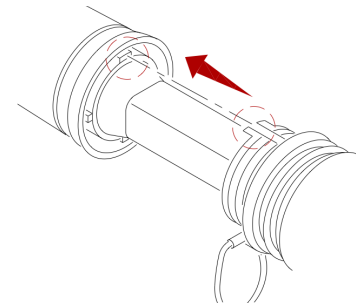


Figure 2-8: opticalCON QUAD Reassembly

- Step 13. Spin the retaining ring to protect the steel cap from damage (**Figure 2-9**).



Figure 2-9:
opticalCON QUAD Twisted Cap Cord

Dry Cleaning: opticalCON DUO Cable

The opticalCON QUAD Fiber requires appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged. It is highly recommended to utilize the Neutrik Fiber Service Tool to perform cleaning.



WARNING! Disconnect fiber or power down source. Invisible laser radiation can be harmful if viewed directly.

Tools and Supplies:

IBC Click Cleaner, PRG P/N 2.575-1006F1, Mfg. P/N 9393

Suggested: Neutrik Fiber Duo Service Tool, PRG P/N 2.530-104995, Neutrik P/N: FOCD-STQ

Optional: Fiberscope (Video Scope or Magnifier) such as Neutrik Fiber Scope w/Adapter, PRG P/N 2.530-104991

opticalCON DUO Dry Cleaning Process (w/ Service Tool):

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove dust cap from connector.
- Step 3. Mount the Neutrik Service Tool onto front shell. **(Figure 2-10)**
- Step 4. Remove the IBC guide cap.
- Step 5. Seat IBC cleaner over a ferrule hole. **(Figure 2-11)**
- Step 6. Push down the IBC outer shell to start cleaning fiber. A "click" sound indicates the end of the cleaning process.
- Step 7. Turn click cleaner 90° and repeat click clean, Step 6.
- Step 8. Continue cleaning remaining ferrules.
- Step 9. Close IBC guide cap cover.
- Step 10. Optional: Inspect fiber ferrules with fiberscope. **(Figure 2-12)**
- Step 11. If needed, use compressed air to blow out contaminants from front cap.

Note: **NEVER** blow fiber ferrules with compressed air.

- Step 12. Remove Service Tool from connector.
- Step 13. Reinstall dust cap to connector head.

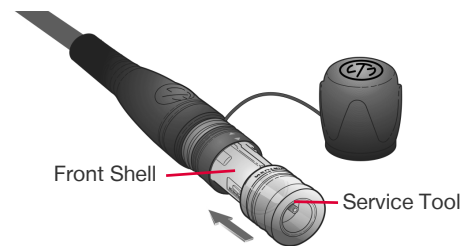


Figure 2-10: DUO Service Tool Installation

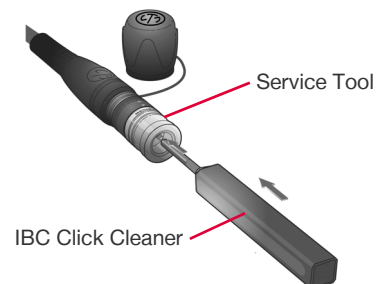


Figure 2-11: DUO Service Tool Cleaning

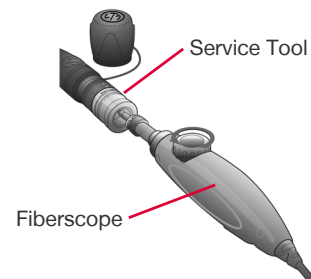


Figure 2-12: DUO Service Tool Inspection

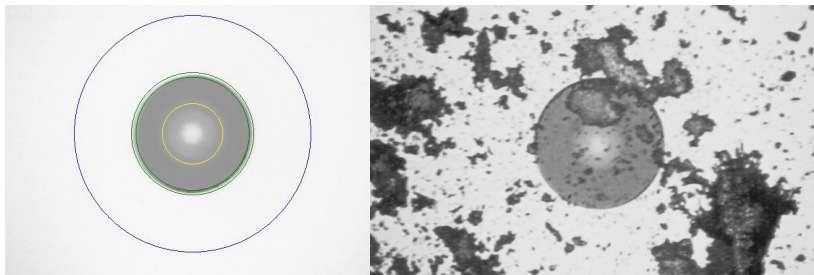


Figure 2-13: Clean (left) and dirty (right) fiberscope images

opticalCON DUO Dry Cleaning Process (w/o Service Tool):

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Pull up on silver retaining ring. (**Figure 2-14**). Note: The ring may be damaged or bent if not pulling up from boot. A jewelers flat head can be used to pry up. If front shell cannot be repaired, it should be replaced.
- Step 3. Spin the rear boot from the front shell.
When released, slowly separate pieces.
Note: Exposed fiber ferrules are high susceptible to damage. (**Figure 2-15**)
- Step 4. Open IBC guide cap cover.
- Step 5. Insert guide cap onto fiber end (ferrule) while observing cautions as shown in (**Figure 2-16**).
- Step 6. Push down the IBC outer shell to start cleaning fiber. A "click" sound indicates the end of the cleaning process.
- Step 7. Rotate click cleaner 90° and repeat click clean, Step 6.
- Step 8. Continue cleaning remaining ferrules.



Retaining Ring
Figure 2-14: opticalCON DUO Retaining Ring

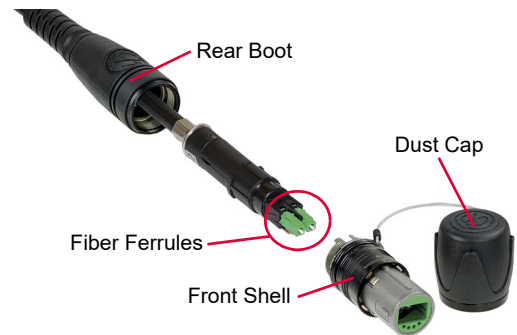


Figure 2-15: opticalCON DUO Components

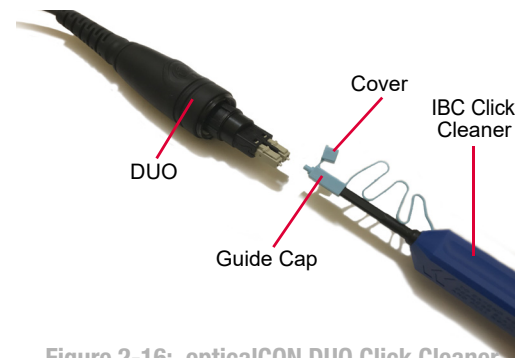


Figure 2-16: opticalCON DUO Click Cleaner

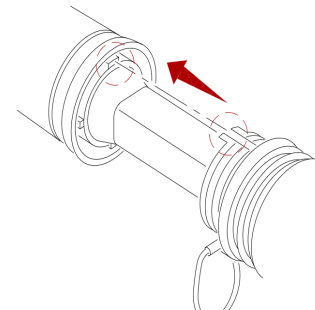




Figure 2-17: opticalCON DUO Click Cleaner



Figure 2-18:
opticalCON DUO Twisted Cap Cord

-
-  CAUTION: Be careful not to slant the IBC guide cap while inserting LC fiber ferrule.
-
-  CAUTION: Do not overly exert force during insertion as this may cause damage to both the LC ferrule and IBC guide cap.
-

- Step 9. Close IBC guide cap cover.
- Step 10. Optional: Inspect fiber ferrules with fiberscope.
- Step 11. If needed, use compressed air to blow out contaminants from front shell.
Note: NEVER blow fiber ferrules with compressed air.

- Step 12. Re-assemble opticalCON connector. (**Figure 2-17**)
When replacing the front shell, ratchet the rear boot until it clicks about four (4) times. Over tightening can damage the cap, making it difficult to disassemble during a future cleaning. If more clicks are required to tighten, the shell may be damaged.
Ensure silver retaining ring is properly aligned.
- Step 13. Spin the retaining ring to protect the steel cap from damage. (**Figure 2-18**)

Dry Cleaning: opticalCON QUAD and DUO Coupler

The opticalCON QUAD and DUO coupler requires appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage. Cleaning is required even when both ends of coupler are always connected to a cable. It is highly recommended to wrap the connections with PVC tape to reduce contaminants inside coupler.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.

Tools and Supplies:

IBC Click Cleaner, PRG P/N 2.575-1006F1, Mfg. P/N IBC-LC

Optional: Fiberscope (Video Scope or Magnifier) such as the Lightriel DI-1000 videoscope w/ "PT2-LC/PC/M" tip.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly.

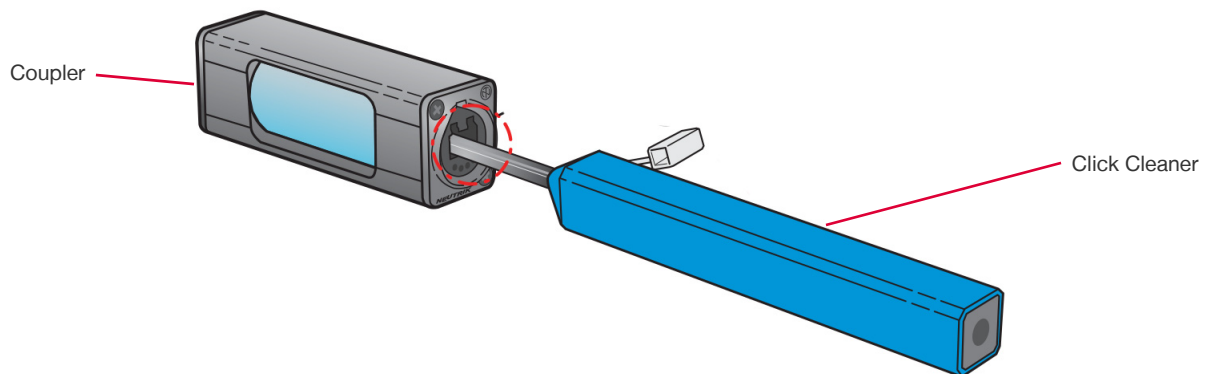


Figure 2-19: opticalCON Coupler Click Cleaning

opticalCON QUAD and DUO Coupler Dry Cleaning Process:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove dust caps from coupler chassis. Ensure screws are tightly installed, cap cord is undamaged, cap is present, and door mechanism functions properly. See "QUAD/DUO Couplers" on page 56.
- Step 3. Remove the IBC guide cap.
- Step 4. Using your finger, press down on the chassis spring mechanism to open shutter door.
- Step 5. Carefully align the IBC stick on a fiber ferrule hole. (Figure 2-19)
- Step 6. Firmly click down on the IBC cleaner until an audible "click" is heard.
- Step 7. Repeat this process for remaining ferrules. Typically you will perform two (2) clicks per ferrule hole.
- Step 8. Optional: Perform Coupler Inspection
- Step 9. Replace dust caps.

Dry Cleaning: opticalCON QUAD and DUO Chassis

The fiber chassis found on devices such as VIA12 switches, GC Truss Box, GC Controller, Fiber Breakouts, Panel Mounts, require appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage. The same level of maintenance and care should be taken with chassis as with fiber cable.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.

Tools and Supplies:

IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393
Compressed Air Can

opticalCON QUAD/DUO Chassis Dry Cleaning Process:

- Step 1. Turn off source so fiber lines are inactive.
- Step 2. Remove dust caps from coupler chassis.
Ensure screws are tightly installed, cap cord is undamaged, cap is present, and door mechanism functions properly.
- Step 3. Remove the IBC guide cap.
- Step 4. Using your finger, press down on the chassis spring mechanism to open shutter door.
- Step 5. Carefully align the IBC stick on a fiber ferrule hole. **(Figure 2-20)**
- Step 6. Firmly click down on the IBC cleaner until an audible "click" is heard.
- Step 7. Repeat this process for remaining ferrules.
- Step 8. Replace dust caps.

opticalCON QUAD/DUO Chassis Dry Cleaning Process Without Fiber:

- Step 1. Remove fiber from Chassis.
- Step 2. Remove dust caps from coupler chassis. Ensure screws are tightly installed, cap cord is undamaged, cap is present (if applicable), and door mechanism functions properly.
- Step 3. Using your finger, press down on the chassis spring mechanism to open shutter door. **(Figure 2-20)**
- Step 4. Using canned air, blow out entire chassis and ferrule "tunnels".
- Step 5. Inspect tunnels for damage.
- Step 6. Replace dust caps.
- Step 7. Re-install fiber. Install rubber duplex seal if no fiber.

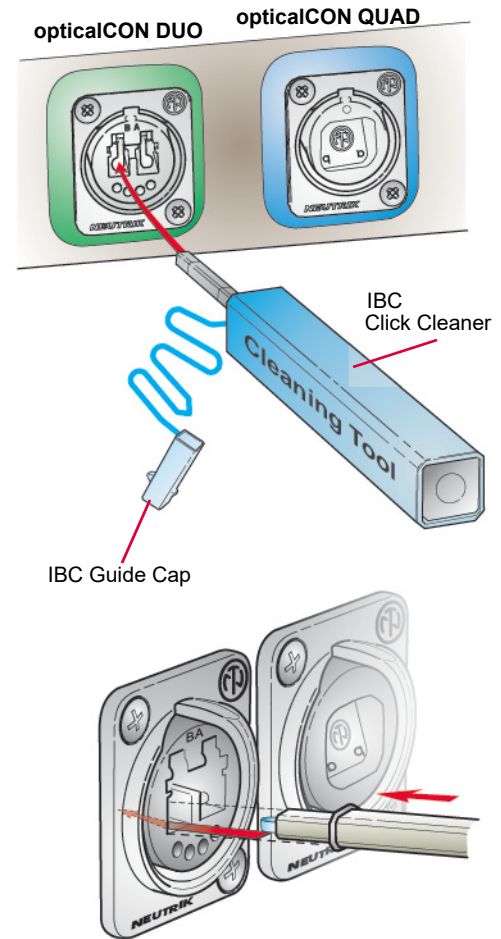


Figure 2-20:
opticalCON Chassis Click Cleaning

FIELD SERVICE: WET/DRY CLEANING PROCESSES

Note: In the field, the Wet Dry Process should only be used as a last resort. The harsh environments and time constraints of typical production environments make Wet/Dry cleaning a risky situation where the fiber has a higher chance of damage.

Wet/Dry Cleaning: opticalCON QUAD/DUO Cable

The opticalCON QUAD/DUO Fiber requires appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.

Tools and Supplies:

- Chemtronics Compact Fiber Optic Cleaning Kit, PRG P/N 2.575-1006F4, Mfg P/N CCK-1
(lint free wipes may also be used)
- IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393
- Optional: Fiberscope (Video Scope or Magnifier) such as Neutrik Fiber Scope w/Adapter

opticalCON QUAD/DUO Wet Dry Cleaning Process

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Pull up on silver retaining ring. **(Figure 2-14)**
Note: The ring may be damaged or bent if not pulling up from boot. A jewelers flat head can be used to pry up. If front shell cannot be repaired, it should be replaced.
- Step 3. Spin the rear boot from the front shell. When released, slowly separate pieces. Note: Exposed fiber ferrules are high susceptible to damage. **(Figure 2-15)**
- Step 4. Lightly spray a nickel size of Fiber Optic Cleaner onto the top of a clean sheet on the QbE box. **(Figure 2-21)**
- Step 5. With light downward force, hold all fiber ferrules onto wet portion of sheet.
- Step 6. Carefully drag down fiber ferrules to the dry portion of sheet. **(Figure 2-22)**
- Step 7. Repeat this process two (2) times.
Note: Remember all chemical residue must be removed, so its better to be dry than wet! Scratching of the fiber ferrule can be caused by too much downward force onto cleaning surface.
- Step 8. Using fiberscope, inspect each fiber ferrule for any remaining contaminants.
- Step 9. If contaminants remain, repeat Wet Dry Cleaning Process or perform Dry Cleaning Process until all ferrules are uncontaminated.
- Step 10. If needed, use compressed air to blow out contaminants from front shell.



Figure 2-21: QbE Box w/Cleaner Fluid

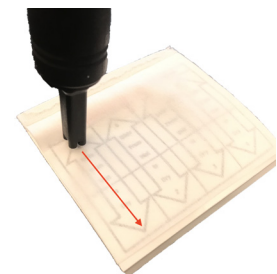


Figure 2-22: Fiber QbE Cleaning Action

Step 11. Re-assemble opticalCON connector. (**Figure 2-23**)

When replacing the front shell to boot, ensure guides are properly aligned. Spin the rear boot until it clicks about five (5) times. Turning it further will make it harder to disassemble during a future cleaning. If more clicks are required, the connector may be damaged. Ensure silver retaining ring is properly aligned.

Step 12. Spin the retaining ring to protect the steel cap from damage. (**Figure 2-24**)

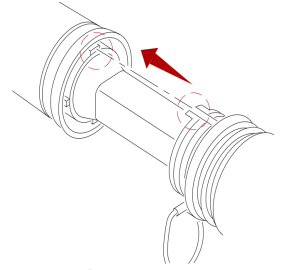


Figure 2-23:
opticalCON QUAD Reassembly



Figure 2-24:
opticalCON Twisted Cap Cord

Wet/Dry Cleaning: opticalCON QUAD/DUO Coupler

The opticalCON QUAD and DUO coupler requires appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage. Cleaning is required even when both ends of coupler are always connected to a cable. During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.

Wet/Dry cleaning is NOT recommended to be performed in the field. Ensure continuity exists in fiber lines before opening coupler for cleaning.

Tools and Supplies:

Chemtronics Compact Fiber Optic Cleaning Kit, PRG P/N 2.575-1006F4, Mfg P/N CCK-1

(Lint free wipes may also be used with Fiber-Wash MX Cleaner)

IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393

Flat Blade Jewelers Driver (fastener type may vary)

Fiberscope such as the Lightrel DI-1000 videoscope with "PT2-LC/PC/M" aka "u25" tip.

If needed: opticalCON Coupler Gasket, Neutrik P/N SCO-.

opticalCON QUAD/DUO Coupler Wet Dry Cleaning Process

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove all screws and caps. **(Figure 2-25).**
- Step 3. Separate top and bottom enclosure pieces. **(Figure 2-26).**
- Step 4. Carefully slide cylindrical protector over one chassis, exposing the LC connectors from the other chassis. **(Figure 2-27).**

Note: The chassis features a rear gasket seal which can easily get damaged if too much pressure is applied when shifting the protector. The guides are lubricated to prevent damage, but special care should be taken at this step. Gaskets should be replaced if damaged or not able to re-install. DO NOT remove gasket without replacing!

- Step 5. Remove all LC ferrules from chassis rear.
Take note of orientation of the chassis during removal. It must be re-installed in the original orientation to maintain polarity.
- Step 6. Clean LC ferrules (See [Wet/Dry Cleaning: opticalCON QUAD/DUO Cable](#))
- Step 7. Using fiberscope, inspect each fiber ferrule for any remaining contaminants.
- Step 8. If contaminants remain, repeat Wet Dry Cleaning Process or perform Dry Cleaning Process until all ferrules are uncontaminated.
- Step 9. Carefully re-install LC fiber into chassis, ensuring proper orientation. (AB should be on the top of both sides of coupler).
- Step 10. Repeat process for other chassis end.
- Step 11. Slide cylindrical protector to original centered position.
- Step 12. Re-install top and bottom enclosure pieces. The protector will sit snug between pieces.

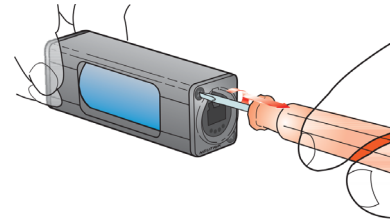


Figure 2-25: opticalCON Coupler Unscrew

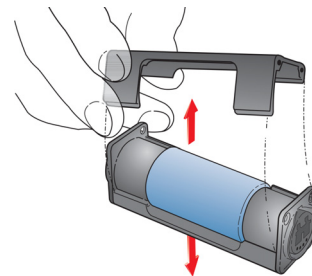


Figure 2-26: opticalCON Coupler Disassemble

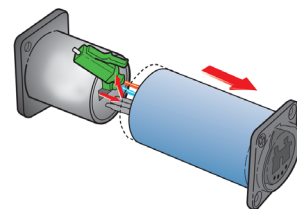


Figure 2-27: opticalCON Coupler Slide



Wet/Dry Cleaning: opticalCON QUAD and DUO Chassis

The fiber chassis found on devices such as VIA12 switches, GC Truss Box, GC Controller, Fiber Breakouts, Panel Mounts, require appropriate maintenance to ensure consistent, reliable operation. Frequency of cleaning varies on type of show, environment, and usage. The same level of maintenance and care should be taken with chassis as with fiber cable.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.

Tools and Supplies:

IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393

Compressed Air Can

If needed, Neutrik Duplex Rubber Seal, Neutrik P/N NOR-0

opticalCON QUAD/DUO Chassis Wet/Dry Cleaning Process With Fiber Installed:

- Step 1. Turn off source so fiber lines are inactive.
- Step 2. Remove dust caps from coupler chassis.
Ensure screws are tightly installed, cap cord is undamaged, cap is present, and door mechanism functions properly.
- Step 3. Disassemble equipment/rack to access rear side of chassis.
- Step 4. Disconnect all LC fibers from chassis. Ensure to take notice of each fiber channel to properly re-install.
Note: Exposed fiber ferrules are highly susceptible to damage/scratches.
- Step 5. If needed, use canned air to blow out contaminants from chassis interior, cap, and fiber tunnels.
- Step 6. Replace chassis dust cap.
- Step 7. Perform the "Wet/Dry Cleaning Process" on a fiber ferrule.
- Step 8. Optional: Inspect fiber using "LC Inspection Process".
Note: Visual inspection is required to guarantee fiber is suitably clean.
- Step 9. Re-install ferrule to chassis. Ensure ferrule is in same channel prior to removal.
- Step 10. Repeat cleaning, inspection, and installation with remaining ferrules.
- Step 11. Ensure all LC connectors are properly seated in chassis. There should be no deviance in insertion depth.
- Step 12. Reassemble equipment/rack.

opticalCON QUAD/DUO Chassis Dry Cleaning Process Without Fiber:

- Step 13. Remove fiber from Chassis.
- Step 14. Remove dust caps from coupler chassis. Ensure screws are tightly installed, cap cord is undamaged, cap is present (if applicable), and door mechanism functions properly.
- Step 15. Using your finger, press down on the chassis spring mechanism to open shutter door.
- Step 16. Using canned air, blow out entire chassis and ferrule "tunnels".
- Step 17. If needed, rinse the chassis with running water to remove deep sediment.
- Step 18. Inspect tunnels for damage.
- Step 19. Replace dust caps.
- Step 20. Re-install fiber. Install rubber duplex seal if no fiber.



3.

FIELD SERVICE: FIBER OPTIC TESTING & INSPECTION

This chapter introduces the testing of PRG fiber optic cables and components in the field.

- + INTRODUCTION
- + FIELD SERVICE: VISUAL FIBER TEST
- + FIELD SERVICE: VISUAL FIBER INSPECTION



INTRODUCTION

About Fiber Optic Field Service

This chapter provides field testing and inspection information for Neutrirk QUAD and DUO fiber optic components.

About QUAD and DUO Show Prep

All fiber optic components should be cleaned, inspected, and tested by shop technicians prior to delivery onsite or in prep. Show technicians and prep technicians should handle all fiber optic cable with care, especially when creating looms and while installing cable into a rig. The following sections will explain the tasks and the equipment required to perform additional cleaning and testing.

About QUAD and DUO Show Maintenance

It is critical to have the tools and understanding of how to maintain your fiber optic cables over the course of a show or tour. Required cleaning can range from every few shows to never. Frequency is dependent on various aspects including atmospheric, pyrotechnics, usage of couplers, frequency of connections, venue type, etc. Most productions will clean around 10-20 connections, but technicians should get a better sense for their production and monitor when fiber optic transmission errors begin to occur to know how often to clean.

Your PRG representative or fibersupport@prg.com can help crews setup a plan for fiber optic maintenance.

Prior to Any Maintenance

- + Ensure that you have a clean workstation. This is paramount to success, especially under show conditions.
- + Wash your hands prior to cleaning or disassembling fiber components. Unless it's required for cleaning chemicals used, it is not recommended to use disposable gloves.
- + Keep tools and measuring devices clean at all times. Use compressed air on simple devices such as service tools or inspection tips. Testing tools should be cleaned and maintained by the manufacturers specification. If no specification is available, the technician should assume best practices in cleaning the fiber components.
- + Use caution when working with exposed fibers. Scratching or forcing tools against the fiber can cause damage.

FIELD SERVICE: VISUAL FIBER TEST

Visual (Continuity) Test

Fiber Optics utilize light pulses to transport data from a transmitter to a receiver. The easiest method to ensure continuity of a fiber optic cable is a "flashlight" test. Any potential light loss (called "attenuation") cannot be perceived by the human eye. This procedure does not guarantee the proper operation of the fiber cable but it provides a simple first step when troubleshooting cable issues.

Many consumer fiber illumination devices exist in the marketplace. Lasers are commonly employed as a light source in testing, but for the safety of all involved, lasers should be avoided for the visual test. Most high-powered LED flashlights/torches are powerful enough to test on any length of cable.

During the fiber inspection process, special care must be taken to ensure vulnerable components do not get damaged.

Tools:

- High powered LED flashlight
- Optional: Neutrik Service Tool or Campex Shutter Restraint

Visual Continuity Testing Process (for QUAD and DUO)

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Install service tool/shutter restraint to the connector. If no tool, disassemble the connector. **(Figure 3-2)**
- Step 3. Install service tool/shutter restraint to the opposite connector. **(Figure 3-1)**
If no tool, disassemble the connector.
- Step 4. Shine light source over one end of the fiber ferrules. If continuity exists, light will appear in ferrules on the other end of the cable. **(Figure 3-3)**
- Step 5. Shine light source over each ferrule to ensure proper polarity/fiber channels.
- Step 6. If light does not appear, ensure that light source is bright enough and properly aimed into ferrule.
- Step 7. If light does not appear after Steps 1-7, continuity does not exist and the cable should be taken out of service for repair or replacement.



Figure 3-1: Cable with service tools installed



Figure 3-2: Test with connectors disassembled

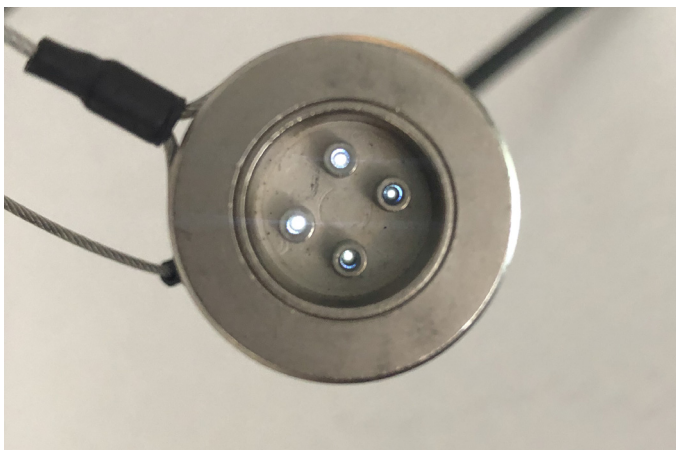


Figure 3-3: Illuminated fiber ferrules

FIELD SERVICE: VISUAL FIBER INSPECTION

Active/Video Scope Inspection

Fiber optic connections must remain clean to allow for the maximum amount of light (data) to pass from transmitter to receiver. After cleaning any fiber optic cable, the surface of the fiber ferrule must be inspected by a microscope. This ensures that all contaminants have been removed, cleaning chemicals have been removed, and provides surface-level detail of the fiber to make sure that no scratches or cracks exist.

During the fiber inspection process, special care must be taken to ensure that vulnerable components do not get damaged.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly. NEVER inspect a fiber ferrule that is still connected to a light source!

Tools:

Fiberscope (Video Scope or Magnifier) such as Lightrel DI-1000 videoscope with "PT2-LC/PC/M" aka "u25" tip.

Active Inspection Process

- Step 1. Disconnect both ends of fiber optic cable.
- Step 2. Remove any caps or barrel heads to expose LC ferrules. Remember to use caution as exposed ferrules are easily susceptible to damage.
- Step 3. Carefully slide the tip of the fiberscope onto fiber ferrule.
- Step 4. Adjust focus knob to clearly view ferrule surface. The ferrule should be free of any dirt, debris, or oil.
- Step 5. Continue the cleaning process until fiber ferrule is acceptably clean. If after several cleanings you are unable to get the fiber acceptably clean and free of debris, take the fiber out of service and send to Repair.

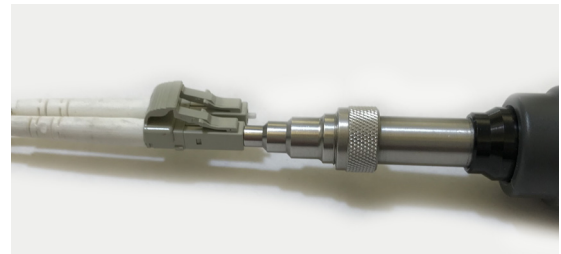


Figure 3-4: Inspecting LC ferrules

See **Figure 3-5** below for examples of a clean and dirty inspection.

- Step 6. Re-cap the fiberscope tip.

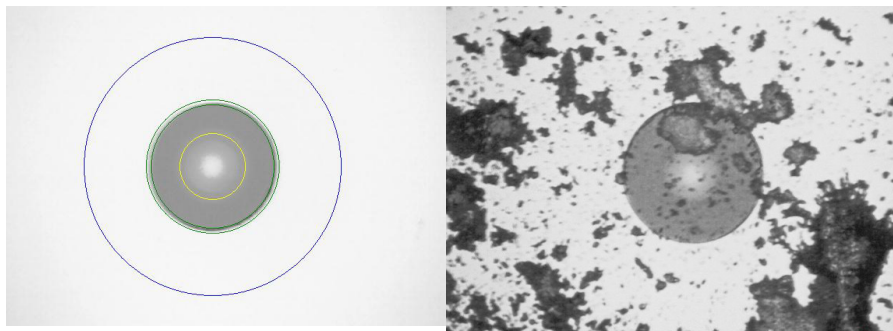


Figure 3-5: Clean (left) and dirty (right) fiberscope images

Note: If any inspection images are unclear or questionable, please email fibersupport@prg.com for further support.



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PRG FIBER OPTIC SYSTEMS GUIDE

SHOP SERVICE

- + SHOP SERVICE: FIBER OPTIC CLEANING
- + SHOP SERVICE: FIBER OPTIC INSPECTION & TESTING
- + APPENDIX A: FIBER INSPECTION VISUAL GUIDE



4.

SHOP SERVICE: FIBER OPTIC CLEANING

This chapter introduces the testing and prep of PRG fiber optic cables and components in the shop.

- + INTRODUCTION
- + SHOP SERVICE CLEANING KITS
- + PHYSICAL INSPECTION
- + WET/DRY CLEANING
- + DRY CLEANING

INTRODUCTION

About Fiber Optic Shop Service

This chapter provides Shop Service level testing and inspection information for Neutrik QUAD and DUO fiber optic components.

About QUAD and DUO Shop Prep

All fiber optic components must be cleaned, inspected, and tested in order to be classified as "Rental Ready." The following sections will explain the steps to perform these tasks and the equipment required.

Combined Procedures for "Rental Ready" Fiber Optic Cable and Components

For QUAD/DUO Cable:

- + Physical Inspection
- + Fiber Cleaning
- + Fiber Inspection
- + Cable Tested
- + Pack Up



For QUAD/DUO Couplers:

- + Physical Inspection
- + Coupler Cleaning
- + Coupler Inspection
- + Coupler Tested
- + Pack Up



For any gear with a QUAD/DUO Chassis (Connection):

- + Physical Inspection
- + Chassis Cleaning
- + Chassis Inspection



Prior to ANY Maintenance

- + Ensure that you have a clean workstation. This is paramount to successfully prepared fiber optic equipment.
- + Wash your hands prior to cleaning or handling of fiber optic cable, couplers, and equipment. Unless required for cleaning chemicals used, it is not recommended to wear disposable gloves.
- + Keep tools and measuring devices clean at all times. Use compressed air on simple devices such as service tools or inspection tips. Testing tools should be cleaned and maintained by the manufacturers specification. If no specification is available, the technician should assume best practices in cleaning the fiber components.
- + Use caution when working with exposed fibers. Scratching or forcing tools against the fiber can result in damage to the fiber.

SHOP SERVICE CLEANING KITS

The SHOP SERVICE level cleaning and inspection tools are recommended for PRG fiber optic operations. Due to the specialized nature and care needed for fiber optic systems, we recommend the following equipment for SHOP SERVICE level work:

SHOP SERVICE Cleaning and Inspection Kit

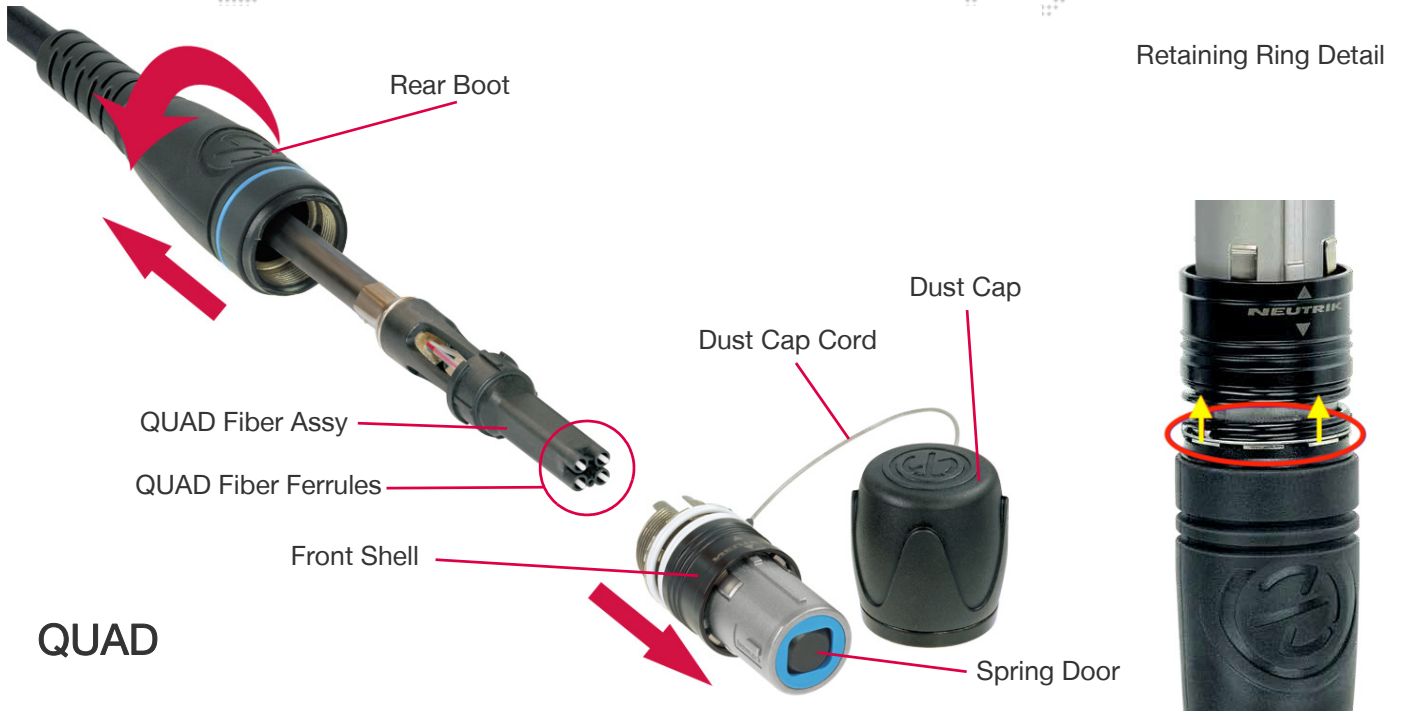
CLEANING OPERATIONS			
<i>Product</i>	<i>Link</i>	<i>Model #</i>	<i>PRG Ecode</i>
IBC One-Click Fiber Cleaner for LC	Click Here	9393	2.575-1006F1
IBC One-Click Fiber Cleaner for ST/SC	Click Here	9392	
IBC One-Click Fiber Cleaner for LC Dual	Click Here	IBC-LC2	2.575-1006F2
QbE Fiber Optic Cleaning Wipes, 200-ct Box	Click Here	QbE	
Chemtronics ES810 Electro-Wash PX Fiber Optic Cleaner, 5oz	Click Here	ES810	
Neutrik FOCD-STD opticalCON DUO Fiber Cleaning Tool	Click Here	FOCD-STD	E900F-
Neutrik FOCD-STQ opticalCON QUAD Fiber Optic Cleaning Tool	Click Here	FOCD-STQ	E900G-
FERRULE INSPECTION			
Lightel Fiber Optic Connector Inspector and Broadcaster Tip Set	Click Here	CI-1100-A2-TV	
Lightel PT2-LC/PC/F-S Short Extended Tip for LC PC Type Female Connectors	Click Here	PT2-LC/PC/F-S	
SPARE PARTS			
Neutrik SCNO4MX-A Front Housing Protection Cover for Multimode opticalCON QUAD	Click Here	SCNO4MX-A	2.530-10369P37
Neutrik SCNO-FDW-A Protection Cover for D-Series opticalCON Receptacles	Click Here	SCNO-DFDW-A	52.6106.0001.0
Neutrik NO4FDW-A opticalCON QUAD Chassis Connector	Click Here	NO4FDW-A	2.530-104951

Image of SHOP SERVICE kit insert here

PHYSICAL INSPECTION

QUAD/DUO Connector Detail

The opticalCON QUAD and DUO cable connectors are assembled and disassembled as follows:



Retaining Ring Detail



QUAD/DUO Cable

QUAD and DUO cable should be visually inspected for abrasions or signs of harsh bends.

- Step 1. Remove all tape from cable, other than PRG labels.
- Step 2. Inspect cable jacket to ensure that the jacket is not cut in any depth.
- Step 3. Ensure that the PRG BARCODE is present, and neatly attached to cable. (Figure 4-1)
- Step 4. Ensure that the LENGTH label is present and neatly attached to cable. (Figure 4-1)



Figure 4-1: PRG Barcode, Length Label, and PRG Logo label

QUAD/DUO Connectors

To make a solid, reliable connection, it is imperative that the QUAD and DUO connectors are in good physical shape.

- Step 1. Ensure that the Dust Cap is present and in good physical shape. (Figure 4-2)
- Step 2. Ensure that the Cap Cord is present and in good physical shape. (Figure 4-2)
- Step 3. Inspect for signs of corrosion; replace any corroded components found during inspection.
- Step 4. Ensure that the retaining ring is properly seated in both retaining ring channels. (Figure 4-2)
- Step 5. Check that the connector's "fiber door" springs are functioning. The door should be in the closed position, open when pushed, and then spring back to the fully closed position. (Figure 4-3)



Figure 4-2: Connector with Good Cap



Figure 4-3: QUAD connector door partially opened



DUO w/ Dust Cap



QUAD w/ Dust Cap

Figure 4-4: DUO and QUAD Fiber Connectors

QUAD/DUO Couplers

To improve the fiber connection in the coupler, follow these steps when performing coupler inspection:

- Step 1. Ensure that the chassis cover is present and in good physical shape.
- Step 2. Ensure that the chassis cover cord is present and in good physical shape. **(Figure 4-8)**
- Step 3. Ensure that the chassis cover cord is in the correct position. **(See Figure 4-9 on next page)**
- Step 4. Make sure that the washer is **NOT** present on the cover cord screw; The washer **will** result in a poor cable connection. **(Figure 4-5)**
- Step 5. Make sure that all hardware is present and secure. If not, tighten or replace hardware. **(Figure 4-6)**
- Step 6. Ensure that the coupler's "fiber door" springs are functioning; the door should normally be in the closed position, open when pushed, and spring back fully closed.
- Step 7. Make sure that the PRG barcode is present and secure. If not, replace the barcode.



Figure 4-5: Coupler with Washer present

Loose retaining screws



Figure 4-6: Coupler with loose hardware



Figure 4-7: Coupler with good hardware



Figure 4-8: Coupler with destroyed cap cord

QUAD/DUO Chassis

To improve the connection of fiber into the chassis, the following steps should be completed when inspecting the QUAD and DUO chassis:

- Step 1. Make sure the chassis cover is present and in good physical shape.
- Step 2. Ensure that the chassis cover cord is present and in good physical shape. (Figure 4-10)
- Step 3. Ensure the chassis cover cord is in the proper installation orientation. (Figure 4-9)
- Step 4. Make sure that the washer is NOT present on the cover cord screw; The washer WILL result in a poor cable connection. (See Figure 4-5 on Page 56).
- Step 5. Make sure all hardware is present and secure. If not, tighten or replace.
- Step 6. Check that the connector's "fiber door" springs are functioning. The door should be in the closed position, open when pushed, and then spring back to the fully closed position.

Note Cap Cord swing direction

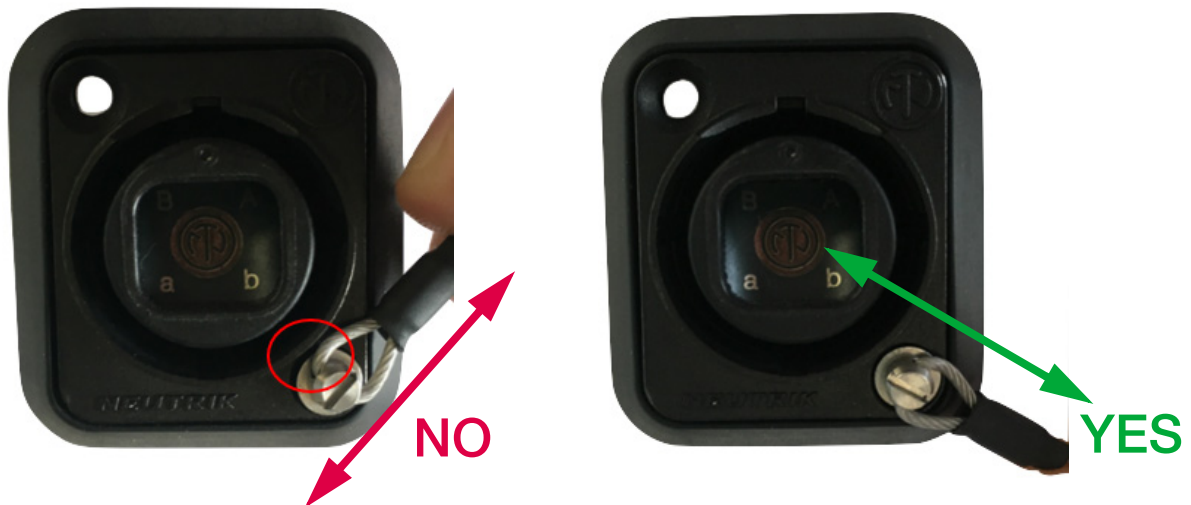


Figure 4-9: Correct and Incorrect Chassis Cap Cord Orientation



Figure 4-10: Chassis mount with good cap cords

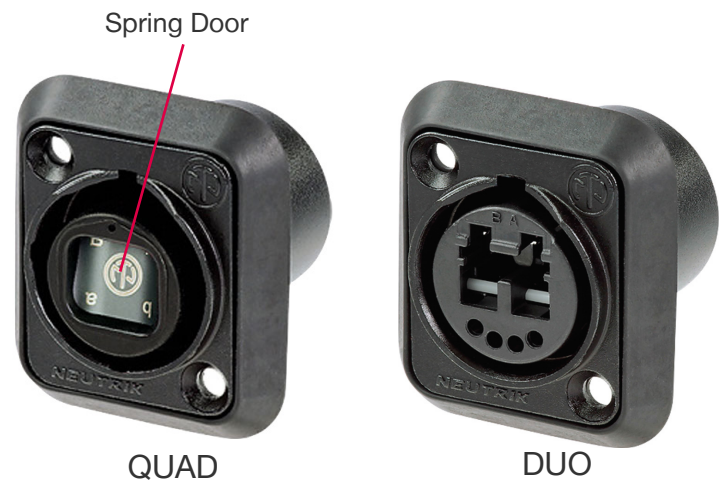


Figure 4-11: QUAD and DUO Chassis Mounts

WET/DRY CLEANING

opticalCON QUAD/DUO Cable

The opticalCON QUAD/DUO fiber requires appropriate maintenance to ensure consistent, reliable operation. Cleaning must occur if cable is dirty upon inspection.



CAUTION: During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Cable Inspection Process, QUAD/DUO Cable Dry Cleaning Process

Tools:

Chemtronics ES810 Electro-Wash PX Fiber Optic Cleaner Aerosol, PRG P/N none, Mfg P/N ES810
QbE Fiber Optic Cleaning Wipes 200 Wipe Box, PRG P/N none, Mfg P/N QBE

Parts:

Replacement Front Housing Protection Cover for MM opticalCON QUAD, PRG P/N
Note: The same style of LC cable MUST be used.

To perform Wet/Dry Cleaning on QUAD/DUO Fiber:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Pull up on silver retaining ring. If ring is difficult to pull up from boot, ensure the retaining ring is properly seated on front connector channels.
(See "QUAD/DUO Connector Detail" on page 54)
- Step 3. Spin the rear boot from the front shell. When released, slowly separate pieces. Extra care should be exercised with exposed fiber connectors to prevent physical damage.
- Step 4. Lightly spray a nickel-sized amount of Fiber Optic Cleaner onto the top of a clean sheet on the QbE box.
(**Figure 4-12**)
- Step 5. With light downward force, hold all fiber connectors onto wet portion of sheet. Carefully drag down fiber connectors to the dry portion of the sheet. (**Figure 4-13**)
- Step 6. Repeat Steps 4 through 6 a total of two (2) times.
REMEMBER: All chemical residue must be removed, so it's better to be dry than wet!

Be cautious not to press down too hard when cleaning, as scratching of the fiber can occur from too much downward pressure.

- Step 7. Inspect the fiber surfaces by using the QUAD/DUO Inspection w/o Service Tool Process.
- Step 8. If contaminants remain, repeat Steps 4 through 6, OR perform the Dry Cleaning Process until uncontaminated.



Figure 4-12: Applying cleaner to the QbE Box



Figure 4-13: Cleaning fiber ferrules on QbE Box

- Step 9. If needed, use compressed air to blow out any contaminants from the front shell. **REMEMBER: NEVER USE COMPRESSED AIR DIRECTLY ON FIBER SURFACE!**
- Step 10. Reassemble the opticalCON connector. **(Figure 4-14)**
- Step 11. Carefully reinstall the front shell by sliding over properly aligned channels.
- Step 12. Screw the rear boot to the front shell. The retaining ring should click 4-5 times. **DO NOT OVERTIGHTEN!** Overtightening can cause damage to the connector.

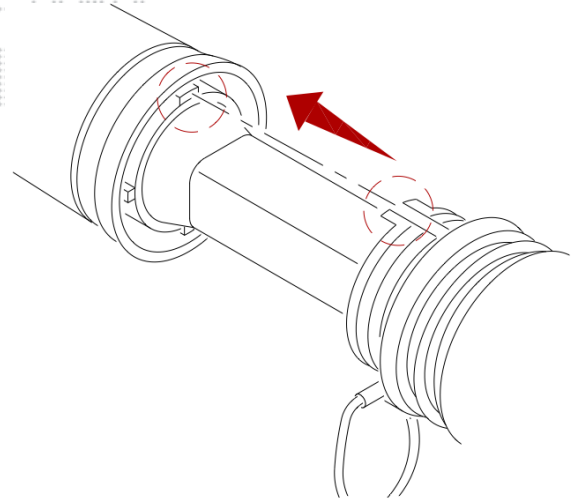


Figure 4-14: opticalCON connector reassembly

- Step 13. Spin the retaining ring to protect the cap cord from damage. **(Figure 4-15)**



Figure 4-15: Cap cord spun for protection

opticalCON QUAD/DUO Coupler

The opticalCON QUAD/DUO Fiber Coupler requires appropriate maintenance to ensure consistent, reliable operation.

Note: For both SHOP and FIELD SERVICE, it is highly suggested to **ONLY** use the Dry Cleaning Process with QUAD and DUO Couplers. Wet/Dry Cleaning should be used as a LAST RESORT if the Dry Cleaning Process does not adequately clean the fiber.



CAUTION: During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Coupler Inspection Process, QUAD/DUO Chassis Dry Cleaning Process

Tools:

Chemtronics ES810 Electro-Wash PX Fiber Optic Cleaner Aerosol, PRG P/N none, Mfg P/N ES810
QbE Fiber Optic Cleaning Wipes 200 Wipe Box, PRG P/N none, Mfg P/N QBE
IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393
Flat Blade Jewelers Driver (fastener type may vary)

Parts (if needed):

Replacement Neutrik Coupler LC MM Jumper, PRG P/N none, Mfg P/N ?
Note: DO NOT replace with any other type of jump.
Replacement Chassis Gasket, PRG P/N none, Mfg P/N ?
Lubricant, PRG P/N none, Mfg P/N ?

To perform Wet/Dry Cleaning on a QUAD/DUO Coupler:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove all caps and screws. **(Figure 4-16)**
- Step 3. Separate top and bottom enclosure pieces. **(Figure 4-17)**

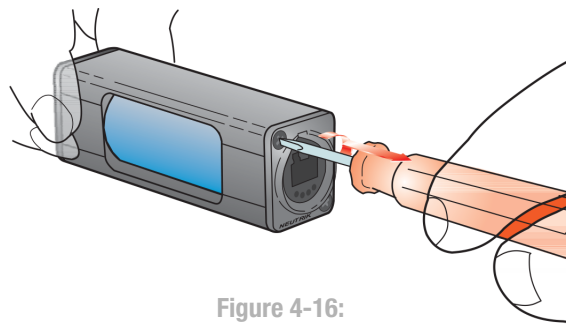


Figure 4-16:
Removing screws and caps from coupler

- Step 4. Carefully slide the cylindrical protector over one chassis, exposing the LC connectors from the other chassis, **(See Figure 4-18 on next page)**

Note:

The chassis features a rear gasket seal which can easily get damaged if too much pressure is applied when shifting the protector. The guides are lubricated to prevent damage, but special care should be taken at this step. Gaskets should be replaced if damaged, or if you're not able to reinstall. **DO NOT** remove the gasket without replacing it!

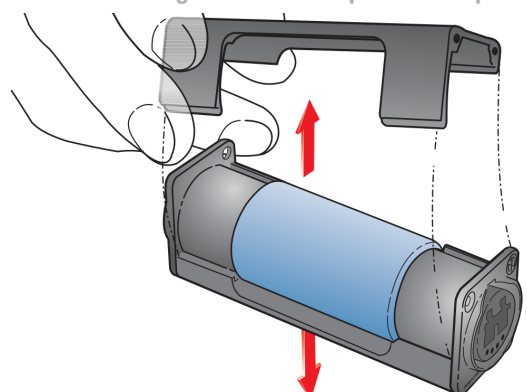


Figure 4-17: Removing top from coupler

Step 5. Remove all LC connectors from the chassis rear. Take note of the orientation of the chassis during removal. It must be reinstalled in the original orientation to maintain polarity.

Step 6. Clean one of the LC fibers by performing the QUAD/DUO Wet/Dry Cleaning Process.

Step 7. Inspect the fiber surface using the QUAD/DUO Chassis Inspection Process.

Step 8. If contaminants remain, repeat the Wet/Dry Cleaning Process or perform the Dry Cleaning Process until decontaminated. If the cleaning is unsuccessful or fiber is cracked, the LC jumper should be replaced.

Step 9. Carefully reinstall the LC fiber jumper into the chassis, ensuring proper orientation. (AB should be on the top of both sides of the coupler.)

Step 10. Repeat Steps 6 through 8 for the remaining LC fibers.

Step 11. Slide the cylindrical protector onto the opposite chassis to expose LC fibers on opposite chassis.

Step 12. Repeat Steps 6 through 8 on the exposed chassis.

Step 13. Once the process has been completed for both chassis on the coupler, slide the cylindrical protector to the original centered position.

Step 14. Reinstall the top and bottom enclosure pieces. The protector will sit snug between both pieces.

Step 15. Reinstall all hardware. Chassis cover screws should be on the bottom of both sides of the coupler.

Step 16. To ensure no contaminants were introduced during reassembly, perform the QUAD/DUO Chassis Inspection Process. Clean as necessary.

Step 17. Once the coupler fibers are verified visually as clean, re-cap the chassis.

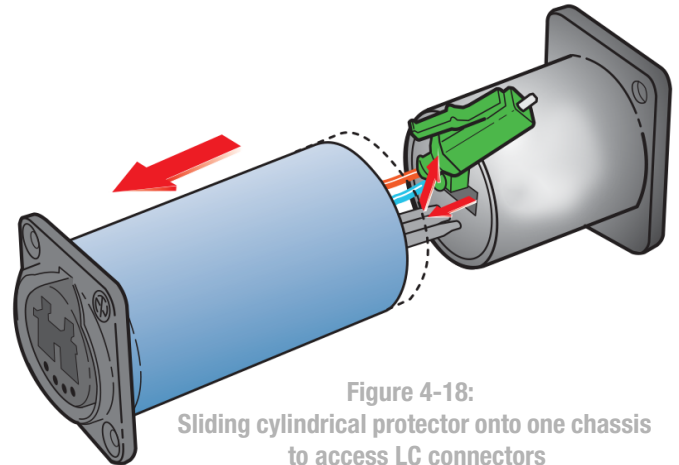


Figure 4-18:
Sliding cylindrical protector onto one chassis
to access LC connectors

opticalCON QUAD and DUO Chassis with Fiber Installed

The fiber chassis found on devices such as VIA12 switches, GC Truss Boxes, GC Controllers, Fiber Breakouts, Panel Mounts, *et al*, require appropriate maintenance to ensure consistent, reliable operation. Cleaning should occur if chassis is dirty upon inspection in order to make the equipment "Rental Ready." The same level of maintenance and care should be taken with chassis as with fiber cable.

Note: For both SHOP and FIELD SERVICE, it is highly suggested to ONLY use the Dry Cleaning Process with a QUAD/DUO Chassis. Wet/Dry Cleaning should be used as a LAST RESORT if the Dry Cleaning Process does not adequately clean the fiber.



CAUTION: During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Cable Inspection Process, QUAD/DUO Chassis Inspection Process

Tools:

Chemtronics ES810 Electro-Wash PX Fiber Optic Cleaner Aerosol, PRG P/N none, Mfg P/N ES810
QbE Fiber Optic Cleaning Wipes 200 Wipe Box, PRG P/N none, Mfg P/N QBE
IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393

Parts:

Replacement LC Jumper (type varies)
Note: The same style of LC cable MUST be used.
Replacement Chassis, PRG P/N 2.530-104951, Mfg P/N NO4FDW-A

To perform Wet/Dry Cleaning on a QUAD/DUO Chassis with Fiber Installed:

- Step 1. Turn off source.
- Step 2. Remove the dust caps from coupler chassis. Ensure screws are tightly installed, cap is present, cap cord is undamaged, and door mechanisms function properly.
- Step 3. Disassemble equipment/rack to access rear side of chassis.
- Step 4. Disconnect all LC connectors from chassis. Make sure to take notice of each fiber channel to properly reinstall. Extra care should be used with exposed fiber to prevent physical damage.
- Step 5. If needed, use canned air to blow out contaminants from chassis interior, dust cap, and fiber alignment sleeves. DO NOT blow compressed air or canned air on exposed fiber ferrules!
- Step 6. Replace chassis dust cap.
- Step 7. Clean fiber surfaces by performing the QUAD/DUO Wet/Dry Cleaning Process on each LC fiber connection.
- Step 8. Inspect fiber surface by performing the QUAD/DUO Cable Inspection Process.
- Step 9. Reinstall LC fiber to chassis. Make sure the fiber is in the same channel prior to removal.
- Step 10. Repeat cleaning and installation with remaining fibers.
- Step 11. Make sure all LC connectors are properly seated in chassis.
There should be no deviation in the insertion depth.
- Step 12. Reassemble the equipment/rack.
- Step 13. To ensure contaminants were not introduced during reassembly, inspect the fiber surfaces by performing the QUAD/DUO Chassis Inspection Process. Clean as necessary.
- Step 14. Once the coupler fiber is visually verified as clean, re-cap the chassis (if applicable).

opticalCON QUAD and DUO Chassis without Fiber Installed

QUAD and DUO Chassis Panel Mounts require appropriate maintenance to ensure consistent, reliable operation. Cleaning must occur if chassis is dirty upon inspection. The same level of maintenance and care should be taken with the chassis as with fiber cable.

Note: For both SHOP and FIELD SERVICE, it is highly suggested to ONLY use the Dry Cleaning Process with a QUAD/DUO Chassis. Wet/Dry Cleaning should be used as a LAST RESORT if the Dry Cleaning Process does not adequately clean the fiber.

Tools:

- Can of Compressed Air
- Running water (optional)

To perform Wet/Dry Cleaning on a QUAD/DUO Chassis without Fiber Installed:

- Step 1. Remove dust caps from coupler chassis. Ensure screws are tightly installed, cap cord is undamaged, cap is present (if applicable), and door mechanism functions properly.
- Step 2. Using your finger, press down on the chassis spring mechanism to open shutter door.
- Step 3. Using canned air, blow out entire chassis and LC alignment sleeves.
- Step 4. If needed, rinse the chassis with running water to remove deep sediment.
- Step 5. Visually inspect connections for damage.
- Step 6. Replace dust caps.
- Step 7. Install rubber duplex seal to rear connections OR place in clean enclosure.
(Figure 4-19 and Figure 4-20)



Figure 4-19: Installing rubber duplex seal



Figure 4-20: Rubber Duplex seal for Chassis

DRY CLEANING

opticalCON QUAD/DUO Cable with Service Tool

The opticalCON QUAD Fiber requires appropriate maintenance to ensure consistent, reliable operation. Cleaning must occur if chassis is dirty upon inspection.

During the fiber cleaning process, special care must be taken to ensure vulnerable components do not get damaged. It is highly recommended to utilize the Neutrik Fiber Service Tool to perform dry cleaning.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Cable Inspection Process without Service Tool

Tools:

- IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393
- Neutrik Fiber Quad Service Tool, PRG P/N 2.530-104996, Neutrik P/N FOCD-STQ
- Neutrik Fiber DUO Service Tool, PRG P/N 2.530-104995, Neutrik P/N FOCD-STD

To perform Dry Cleaning on a QUAD/DUO Cable Using the Neutrik Service Tool:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove the Dust Cap from the connector.
- Step 3. Mount the Neutrik Service Tool onto the Front Shell. **(Figure 4-21)**
- Step 4. Remove the Guide Cap from the IBC Click Cleaner.
- Step 5. Seat the IBC Cleaner over an LC connection.
- Step 6. Push down the IBC outer shell until you hear an audible "click." The "click" sound indicates the end of the cleaning process. **(Figure 4-22)**
- Step 7. Repeat Step 6 one more time, for a total of two times per fiber ferrule.
- Step 8. Clean the remaining fiber ferrules following Steps 6-7.
- Step 9. Replace the IBC Click Cleaner guide cap cover.
- Step 10. Inspect the fiber surfaces by performing the QUAD/DUO Cable Inspection process with Service Tool.
- Step 11. If needed, use compressed air to blow out any contaminants from the Dust Cap. **DO NOT** blow compressed air of any kind onto the fiber connectors!
- Step 12. Remove the Service Tool from the connector.
- Step 13. Reinstall the Dust Cap to connector head.
- Step 14. Spin the retaining ring to protect the Cap Cord from damage. **(Figure 4-23)**

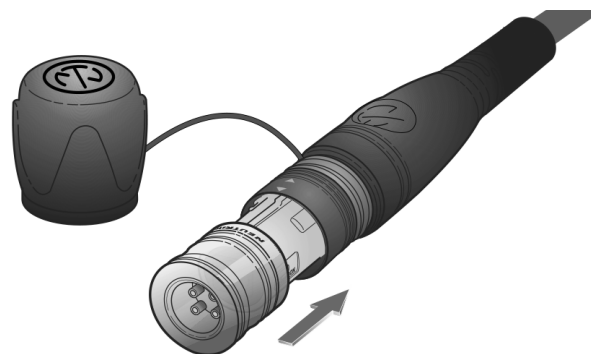


Figure 4-21: Installing the Neutrik Service Tool

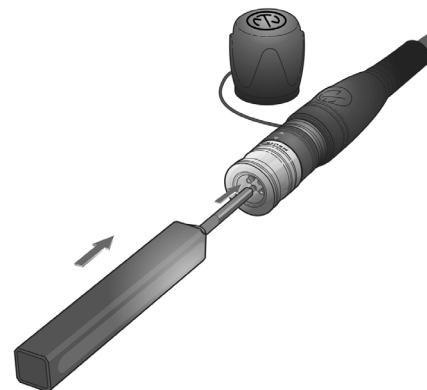


Figure 4-22: Click cleaning with the Service Tool

Figure 4-24:
Neutrik QUAD (Left) and DUO
(Right) Service Tools



Figure 4-23: Proper Dust Cap cord orientation

opticalCON QUAD/DUO Cable without Service Tool

The opticalCON QUAD and DUO Fiber cables require appropriate maintenance to ensure consistent, reliable operation. Cleaning must occur if chassis is dirty upon inspection. It is highly recommended to utilize the Neutrik Fiber Service Tool to perform dry cleaning.



CAUTION: Special care must be taken to ensure fiber components do not get damaged. during cleaning.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Cable Inspection Process without Service Tool

Tools:

IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393

To perform Dry Cleaning on QUAD/DUO Cable without using the Neutrik Service Tool:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Pull up on the silver retaining ring, spin the rear boot from the front shell, and slowly disassemble the connector. See "[QUAD/DUO Connector Detail](#)" on page 54 for detail on connector disassembly/reassembly.
- Step 3. Open the IBC Click Cleaner guide cap cover.
- Step 4. Insert the guide cap onto LC fiber ferrule end.
- Step 5. Push down the IBC outer shell until you hear an audible "click." The "click" sound indicates the end of the cleaning process.
- Step 6. Repeat Step 5 one more time, for a total of two times per fiber ferrule.
- Step 7. Clean the remaining fiber ferrules, following Steps 4-6.
- Step 8. Replace the IBC Click Cleaner guide cap cover.
- Step 9. Inspect the fiber surfaces by performing the QUAD/DUO Cable Inspection process without Service Tool.
- Step 10. If needed, use compressed air to blow out any contaminants from the Dust Cap.
DO NOT blow compressed air of any kind onto the fiber connectors!
- Step 11. Reassemble the opticalCON connector. See "[QUAD/DUO Connector Detail](#)" on page 54 for detail on connector disassembly/reassembly.

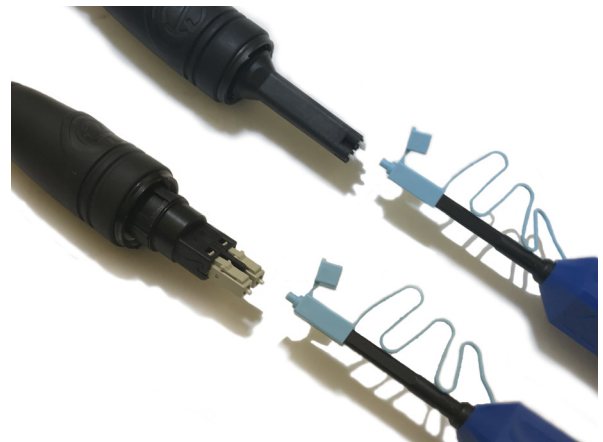


Figure 4-25: DUO (left) and QUAD (right) click clean detail without Service Tool

Note: When screwing rear boot onto front shell, the retaining ring should click 4-5 times. DON'T OVERTIGHTEN! Over-tightening can cause damage to the connector!

- Step 12. Spin the retaining ring to protect the cap cord from damage. (Figure 4-26)



Figure 4-26: Proper Dust Cap Cord orientation

opticalCON QUAD and DUO Coupler

The opticalCON QUAD and DUO couplers require appropriate maintenance to ensure consistent, reliable operation. Cleaning must occur if coupler is dirty upon inspection. It is highly suggested to ONLY use the Dry Cleaning Process with QUAD and DUO couplers.

Note: For both SHOP and FIELD SERVICE, it is highly suggested to ONLY use the Dry Cleaning Process with a QUAD/DUO Coupler. Wet/Dry Cleaning should be used as a LAST RESORT if the Dry Cleaning Process does not adequately clean the fiber.



CAUTION: Special care must be taken to ensure fiber components do not get damaged. during cleaning.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Tools:

- IBC Click Cleaner, PRG P/N 2.575-1006F1, Mfg. P/N 9393
- Fiberscope (Video Scope) such as the Lightrel DI-1000 videoscope w/ "PT2-LC/PC/M" tip.

To perform Dry Cleaning on QUAD and DUO couplers:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove dust caps from coupler chassis. Ensure screws are tightly installed, the cap cord is undamaged, the dust cap is present, and the spring door mechanism functions properly. For detail on physical inspection, see "**QUAD/DUO Couplers**" on page 56.
- Step 3. Remove the IBC Click Cleaner guide cap.
- Step 4. Using your finger, press down on the chassis spring mechanism to open the spring door on the coupler.
- Step 5. Carefully align the IBC Click Cleaner onto an LC connection. (**Figure 4-27**)
- Step 6. Push down the IBC outer shell until you hear an audible "click." The "click" sound indicates the end of the cleaning process.
- Step 7. Repeat Step 6 one more time, for a total of two times per fiber ferrule.
- Step 8. Clean the remaining fiber ferrules, following Steps 4-6.
- Step 9. Replace the IBC Click Cleaner guide cap cover.
- Step 10. Inspect fiber surfaces by performing the QUAD/DUO Coupler Inspection Process.
- Step 11. Once fibers are visually verified clean, replace chassis caps.

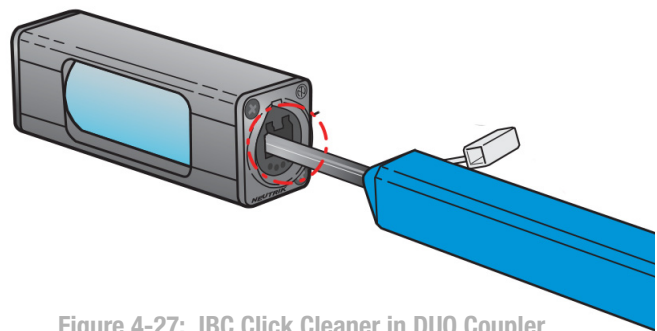


Figure 4-27: IBC Click Cleaner in DUO Coupler

opticalCON QUAD/DUO Chassis with Fiber Installed

The fiber chassis found on devices such as VIA12 switches, GC Truss Boxes, GC Controllers, Fiber Breakouts, Panel Mounts, *et al*, require appropriate maintenance to ensure consistent, reliable operation. Cleaning should occur if chassis is dirty upon inspection in order to make the equipment "Rental Ready." The same level of maintenance and care should be taken with chassis as with fiber cable.

Note: For both SHOP and FIELD SERVICE, it is highly suggested to ONLY use the Dry Cleaning Process with a QUAD/DUO Chassis. Wet/Dry Cleaning should be used as a LAST RESORT if the Dry Cleaning Process does not adequately clean the fiber.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Chassis Inspection Process

Tools:

IBC Click Cleaner LC, PRG P/N 2.575-1006F1, Mfg. P/N 9393
Can of Compressed Air

To perform Dry Cleaning on QUAD/DUO Chassis with Fiber Installed:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove dust caps from chassis. Make sure screws are tightly installed, cap cord is undamaged, dust cap is present, and spring door mechanism functions properly.
- Step 3. Remove the IBC Click Cleaner Guide Cap.
- Step 4. Using your finger, press down on the chassis spring mechanism to open flip door.
- Step 5. Carefully align the IBC Click Cleaner guide onto an LC connection. (**Figure 4-28**)
- Step 6. Push down the IBC outer shell until you hear an audible "click." The "click" sound indicates the end of the cleaning process.
- Step 7. Repeat Step 6 one more time, for a total of two times per fiber ferrule.
- Step 8. Clean the remaining fiber ferrules, following Steps 5-6.
- Step 9. Replace the IBC Click Cleaner guide cap cover.
- Step 10. Inspect fiber surfaces by performing the QUAD/DUO Chassis Inspection Process.
- Step 11. Once the fibers are visually verified as clean, replace the dust caps.

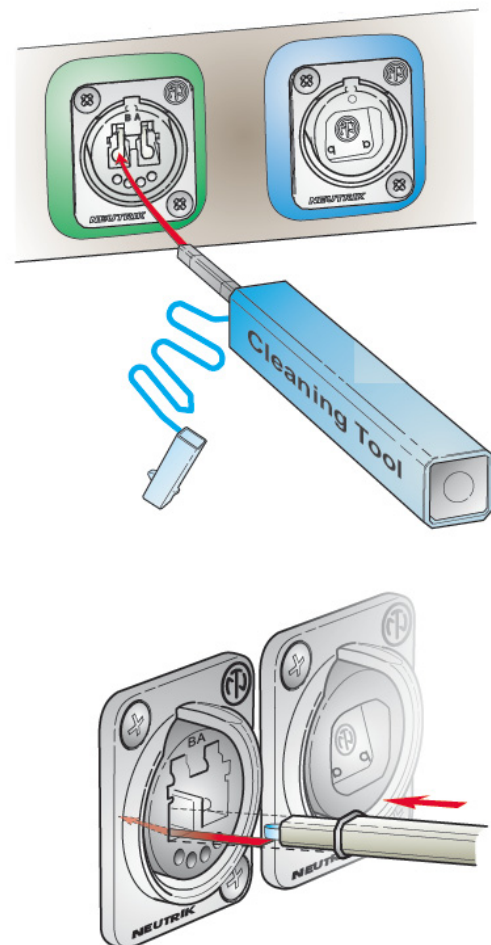


Figure 4-28:
Cleaning QUAD/DUO Chassis with IBC Click Cleaner

opticalCON QUAD/DUO Chassis without Fiber Installed

QUAD and DUO Chassis Panel Mounts require appropriate maintenance to ensure consistent, reliable operation. Cleaning must occur if chassis is dirty upon inspection. The same level of maintenance and care should be taken with chassis as is with fiber cable.

Note: For both SHOP and FIELD SERVICE, it is highly suggested to ONLY use the Dry Cleaning Process with a QUAD/DUO Chassis. Wet/Dry Cleaning should be used as a LAST RESORT if the Dry Cleaning Process does not adequately clean the fiber.



CAUTION: Special care must be taken to ensure fiber components do not get damaged. during cleaning.

Tools:

Can of Compressed Air

To perform Dry Cleaning on QUAD/DUO Chassis without Fiber Installed:

- Step 1. Remove LC connectors from chassis.
- Step 2. Remove dust caps from chassis. Make sure screws are tightly installed, cap cord is undamaged, dust cap is present (if applicable), and spring door mechanism functions properly.
- Step 3. Using your finger, press down on the chassis spring mechanism to open spring door.
- Step 4. Using the canned air, blow out the entire chassis and LC alignment sleeve.
- Step 5. Inspect the alignment sleeve for damage and debris.
- Step 6. Replace dust caps.
- Step 7. Reinstall fiber, or install rubber duplex seal if no fiber is installed.
(**Figure 4-29** and **Figure 4-30**)



Figure 4-29: Installing rubber duplex seal



Figure 4-30: Rubber duplex seal for chassis



5.

SHOP SERVICE: FIBER OPTIC INSPECTION & TESTING

This chapter introduces the Shop level inspection and testing of PRG fiber optic equipment.

- + INTRODUCTION
- + VISUAL FIBER INSPECTION
- + TESTING



INTRODUCTION

About Fiber Optic Shop Service Inspection and Testing

This chapter provides Shop Service level testing and inspection procedures for Neutrik QUAD/DUO fiber optics.

Fiber optic connections must remain clean to allow for the maximum amount of light (data) to pass from transmitter to receiver. After cleaning any fiber optic cable or equipment, the fiber surface must be inspected with a microscope. This ensures that all contaminants have been removed, all cleaning chemicals have been eliminated, and it verifies that no scratches or cracks exist in the fiber surface.

Prior to ANY Maintenance

- + Ensure that you have a clean workstation. This is paramount to successfully prepared fiber optic equipment.
- + Wash your hands prior to cleaning or handling of fiber optic cable, couplers, and equipment. Unless required for cleaning chemicals used, it is not recommended to wear disposable gloves.
- + Keep tools and measuring devices clean at all times. Use compressed air on simple devices such as service tools or inspection tips. Testing tools should be cleaned and maintained by the manufacturers specification. If no specification is available, the technician should assume best practices in cleaning the fiber components.
- + Use caution when working with exposed fibers. Scratching or forcing tools against the fiber can result in damage to the fiber.

VISUAL FIBER INSPECTION

QUAD/DUO Cable with Service Tool

Note: It is highly recommended to utilize a Neutrik Service Tool to perform the most efficient inspection. If you do not have access to the Neutrik Service Tool, observe extra care when assembling and disassembling the fiber connectors, couplers, and chassis for inspection.



CAUTION: Special care must be taken to ensure fiber components do not get damaged. during cleaning.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Dry Cleaning Process, Fiber Inspection Visual Guide (Appendix A)

Tools:

Fiberscope, such as Lightrel DI-1000 videoscope with “PT2-LC/PC/F-S” elongated Female LC tip.
Fiber Quad Service Tool, PRG P/N 2.530-104996, Neutrik P/N: FOCD-STQ
Fiber Duo Service Tool, PRG P/N 2.530-10499?, Neutrik P/N: FOCD-STD

To perform Visual Fiber Inspection of QUAD/DUO Cable with Service Tool:

- Step 1. Disconnect both ends of the fiber optic cable.
- Step 2. Remove dust cap from fiber connector
- Step 3. Install Neutrik Service Tool onto connector end.
- Step 4. Slide the inspector tip over an LC connector head.
- Step 5. Adjust the focus knob to get a clear view of the fiber surface.
If you're finding difficulty getting the fiber into view, carefully adjust the angle of the inspector tip against the service tool.
- Step 6. Visually verify that the fiber surface is free of any dirt, debris, oil, or cracks.
(Refer to Appendix A, Fiber Inspection Visual Guide)
- Step 7. Moving in a clockwise direction, continue the inspection process on all other fiber connections.
- Step 8. Remove the Service Tool when finished inspecting.
- Step 9. Reinstall the Dust Cap onto the connector.
- Step 10. Spin the retaining ring to protect the cap cord from damage.

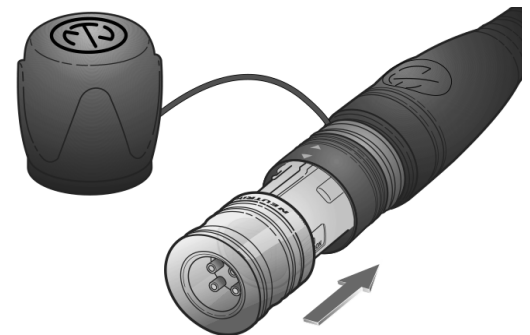


Figure 5-1: Installing Neutrik Service Tool

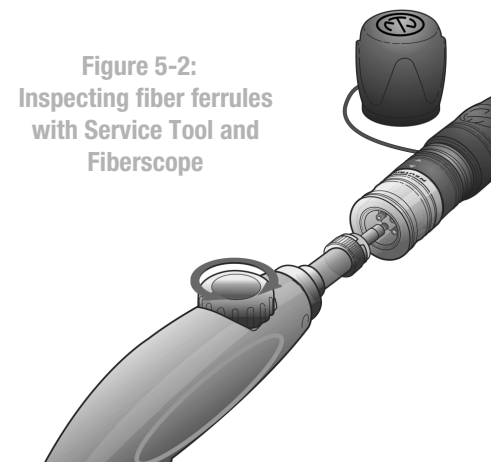


Figure 5-2:
Inspecting fiber ferrules
with Service Tool and
Fiberscope

Note: If any inspection images are unclear or questionable, email a scan or screenshot to fibersupport@prg.com

Figure 5-3:
Proper dust cap cord orientation



QUAD/DUO Cable without Service Tool

Note: It is highly recommended to utilize a Neutrik Service Tool to perform the most efficient inspection. If you do not have access to the Neutrik Service Tool, observe extra care when assembling and disassembling the fiber connectors, couplers, and chassis for inspection.



CAUTION: Special care must be taken to ensure fiber components do not get damaged during cleaning.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Wet/Dry Cleaning Process, Fiber Inspection Visual Guide (Appendix A)

Tools:

Fiberscope (Video Scope or Magnifier) such as Lightrel DI-1000 videoscope with “PT2-LC/PC/M” aka “u25” tip.

To perform Visual Inspection of QUAD/DUO Cable without Service Tool:

- Step 1. Disconnect both ends of fiber optic cable.
- Step 2. Pull up on the silver retaining ring, spin the rear boot from the front shell, and slowly disassemble the connector. See "**QUAD/DUO Cable with Service Tool**" on page 71 for detail on connector disassembly/reassembly.
- Step 3. Carefully slide the tip of fiberscope onto LC fiber.
(**Figure 5-4** and **Figure 5-6**)
- Step 4. Adjust the focus knob to clearly view the fiber surface.
- Step 5. Visually verify that the fiber surface is free of any dirt, debris, oil, or cracks. (Refer to "**Fiber Surface Examples**" on page 81)
- Step 6. If needed, perform the QUAD/DUO Wet/Dry Cleaning Process.
- Step 7. Continue inspection on all other LC fibers.
- Step 8. Reassemble the opticalCON connector. See "**QUAD/DUO Cable with Service Tool**" on page 71 for detail on connector disassembly/reassembly.

Note: When screwing rear boot onto front shell, the retaining ring should click 4-5 times. **DON'T OVERTIGHTEN!** Over-tightening can cause damage to the connector!

- Step 9. Spin the retaining ring to protect the cap cord from damage.
(**Figure 5-5**)



Figure 5-4:
Installing the fiberscope
onto QUAD LC fiber

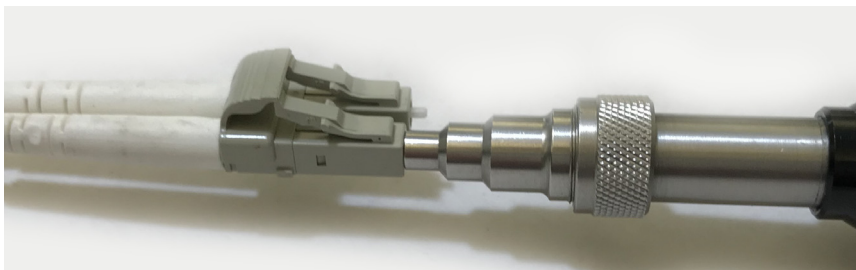


Figure 5-6: Installing the fiberscope on DUO LC fiber



Figure 5-5: Proper dust cap cord orientation

Note: If any inspection images are unclear or questionable, email a scan or screenshot to fibersupport@prg.com

QUAD/DUO Chassis and Couplers

Note: It is highly recommended to utilize a Neutrik Service Tool to perform the most efficient inspection. If you do not have access to the Neutrik Service Tool, observe extra care when assembling and disassembling the fiber connectors, couplers, and chassis for inspection.



CAUTION: Special care must be taken to ensure fiber components do not get damaged during cleaning.



WARNING! Invisible laser or LED radiation can be harmful if viewed directly!

Associated Procedures: QUAD/DUO Wet/Dry Cleaning Process, Fiber Inspection Visual Guide (Appendix A)

Tools:

Fiberscope (Video Scope or Magnifier) such as Lightrel DI-1000 with “PT2-LC/PC/F-S” short extended tip.

To perform Visual Inspection on QUAD/DUO Chassis and Couplers:

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Remove dust caps from chassis. Make sure screws are tightly installed, cap cord is undamaged, dust cap is present, and spring door mechanism functions properly.
- Step 3. Using your finger, press down on the chassis spring mechanism to open flip door.
- Step 4. Carefully slide the tip of the fiberscope onto LC connection inside chassis fiber.
(**Figure 5-7** and **Figure 5-8**)
- Step 5. Adjust focus knob to clearly view fiber surface.
- Step 6. Visually verify that the fiber surface is free of any dirt, debris, oil, or cracks.
(Refer to Appendix A, Fiber Inspection Visual Guide)
- Step 7. If needed, perform the QUAD/DUO Chassis Dry Cleaning Process.
- Step 8. Continue the inspection process on all other LC fiber connections.
- Step 9. Once visually verified as clean, recap chassis.



Figure 5-7: DUO Coupler LC inspection

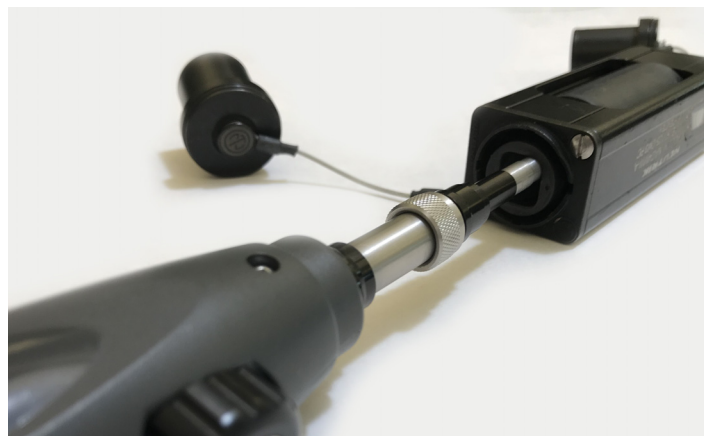


Figure 5-8: QUAD Coupler LC inspection

Note: If any inspection are unclear or questionable, email a scan or screenshot to fibersupport@prg.com

TESTING

FiberCheck 800 QUAD/DUO Testing

The FiberCheck 880 is a simple go/no-go bench testing device that qualifies opticalCON QUAD fiber optics for acceptable insert loss. While the testing process is simple, continuous maintenance and upkeep of the device is required.

Important FiberCheck 800 Notes

- + All cables MUST be cleaned and inspected prior to testing. This is to prevent damage and invalid readings with the FiberCheck. DO NOT attempt to test cables that have not been cleaned AND inspected.
- + To confirm valid test results, the Fiber Check fiber connections must remain clean. It is recommended to click clean and inspect the machine after approximately every ten (10) cable tests.
- + If an inspection does not pass initially, it should be first assumed the tester has a dirty connection and should be cleaned/inspected prior to failing cable.
- + Cables should be tested in BOTH directions.
- + Ensure connections are well-mated.
- + Tester is ONLY for Multi-Mode fiber types.
- + If inspection of the fiber surface within the Fiber Check 800 fails, the LC/ST should be replaced.

To test QUAD and DUO cable using FiberCheck 800:

- Step 1. Verify the FiberCheck 800 is clean by using the Chassis Cleaning and Inspection Shop Procedure; (See "opticalCON QUAD and DUO Chassis with Fiber Installed" on page 62) (Figure 5-9)
- Step 2. Verify that the cable to be tested is clean by using the Shop Fiber Cleaning and Inspection procedures; (See "SHOP SERVICE: FIBER OPTIC INSPECTION & TESTING" chapter on page 69)
- Step 3. Remove the Dust Cap from the QUAD/DUO cable front connector.
- Step 4. Connect QUAD/DUO cable connector into **RECEIVE** port. (Figure 5-10)
- Step 5. Connect opposite QUAD/DUO cable connector into **TRANSMIT** port. (Figure 5-11)
- Step 6. Observe the dBm Power meter reading; view table in FIGURE XXX for acceptable readings. (Figure 5-13)
- Step 7. If **PASS**, skip to Step 10. If cable does NOT pass, re-inspect the fiber and FiberCheck to confirm that both are free of contaminants.
- Step 8. Re-test fiber after FiberCheck and cable are verified free of contaminants.
- Step 9. If fiber still fails after verification that equipment and cable are contaminant free, the cable must be placed into Repair and sent for service.

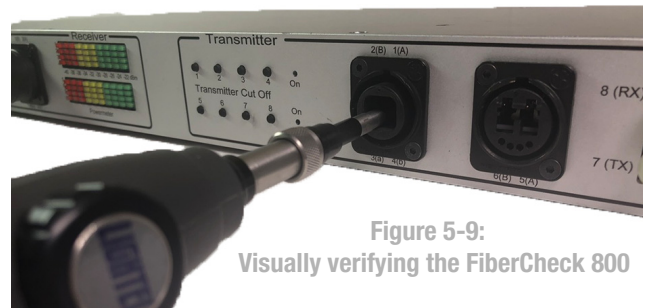


Figure 5-9:
Visually verifying the FiberCheck 800



Figure 5-10:
Connector in
RECEIVE port

- Step 10. Disconnect connector from **TRANSMIT** port and disconnect connector from **RECEIVE** port. Swap connectors: connector from **TRANSMIT** will go into **RECEIVE** and vice-versa.
- Step 11. If **PASS**, cable should be properly coiled, and is ready for deployment. If **FAIL**, see Step 7.



Figure 5-11:
Connector in TRANSMIT port

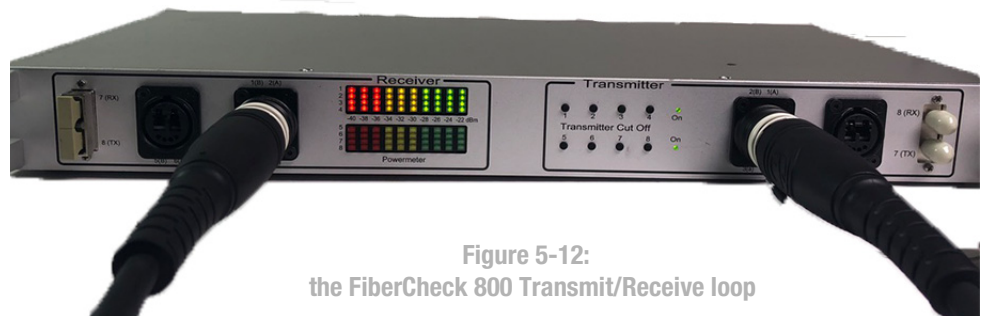
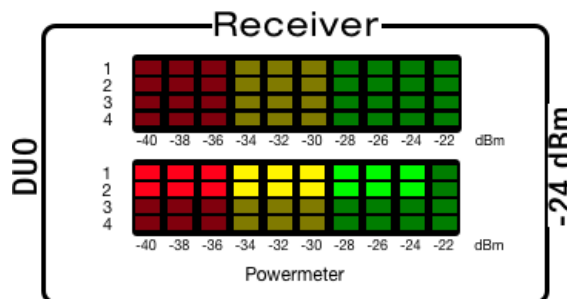
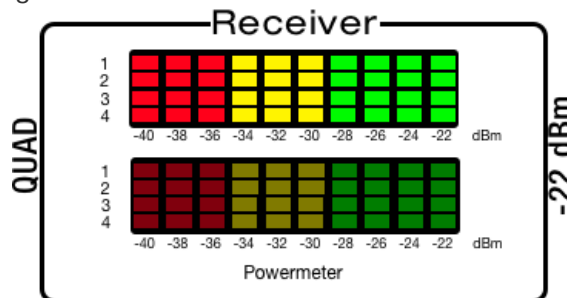


Figure 5-12:
the FiberCheck 800 Transmit/Receive loop

Interpreting Tester Results

QUAD and DUO cable both have unique acceptable dBm limits, and attention must be paid to which cable type you're testing. opticalCON QUAD, MM cable has an acceptable dBm of -22 on the FiberCheck, and opticalCON DUO, MM cable has an acceptable reading of -24.

QUAD MM
Acceptable dBm:
-22 dBm



DUO MM
Acceptable dBm:
-24 dBm

Figure 5-13: FiberCheck QUAD and DUO Acceptable dBm Readings

Visual (Continuity) Test

Fiber Optics utilize light pulses to transport data from a transmitter to a receiver. The easiest method to ensure continuity of a fiber optic cable is a "flashlight" test. Any potential light loss (called "attenuation") cannot be perceived by the human eye. This procedure does not guarantee the proper operation of the fiber cable but it provides a simple first step when troubleshooting cable issues.

Many consumer fiber illumination devices exist in the marketplace. Lasers are commonly employed as a light source in testing, but for the safety of all involved, lasers should not be used for the visual test. Most high-powered LED flashlights/torches are powerful enough to test on any length of cable.

During the fiber inspection process, special care must be taken to ensure vulnerable components do not get damaged.

Tools:

- High powered LED flashlight
- Optional: Neutrik Service Tool or Campex Shutter Restraint

Visual Continuity Testing Process (for QUAD and DUO)

- Step 1. Turn off source or disconnect both ends of the cable.
- Step 2. Install service tool/shutter restraint to the connector. If no tool, disassemble the connector. **(Figure 5-15)**
- Step 3. Install service tool/shutter restraint to the opposite connector. If no tool, disassemble the connector. **(Figure 5-14)**
- Step 4. Shine light source over one end of the fiber ferrules. If continuity exists, light will appear in ferrules on the other end of the cable. **(Figure 3-3)**
- Step 5. Shine light source over each ferrule to ensure proper polarity/fiber channels.
- Step 6. If light does not appear, ensure that light source is bright enough and properly aimed into ferrule.
- Step 7. If light does not appear after Steps 1-7, continuity does not exist and the cable should be taken out of service for repair or replacement.



Figure 5-14: Cable with service tools installed

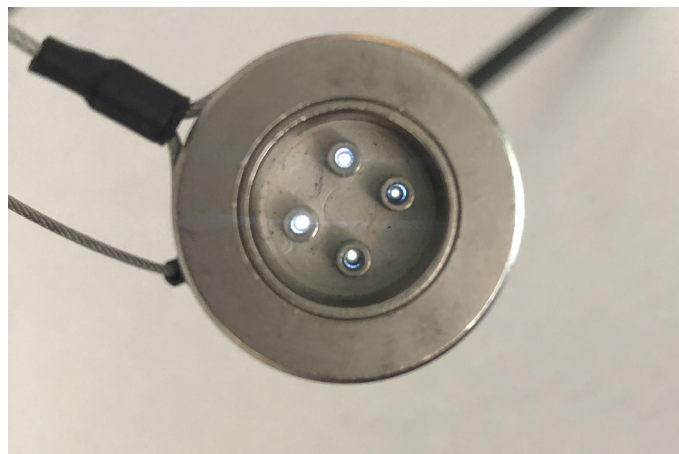


Figure 5-16: Illuminated fiber ferrules



Figure 5-15: Cable with connectors disassembled



Between Equipment



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6.

APPENDIX A: FIBER INSPECTION VISUAL GUIDE

This chapter introduces the Shop level inspection and testing of PRG fiber optic equipment.

- + FIBER SURFACE EXPLANATION
- + FIBER SURFACE EXAMPLES

FIBER SURFACE EXPLANATION

The diagram below describes the IEC 61300-3-35 standard which specifies pass/fail requirements for connector end face quality. The detailed analysis for this standard is performed using advanced scanning software such as the ConnectorView software from Lightel.

Without the software, human inspectors should review the different zones as shown below in **Figure 6-1** and ensure no contamination is found in Zones A-D. While contamination found outside of Zone D will not have adverse effect on the connection, it is good practice to remove all visible contamination.

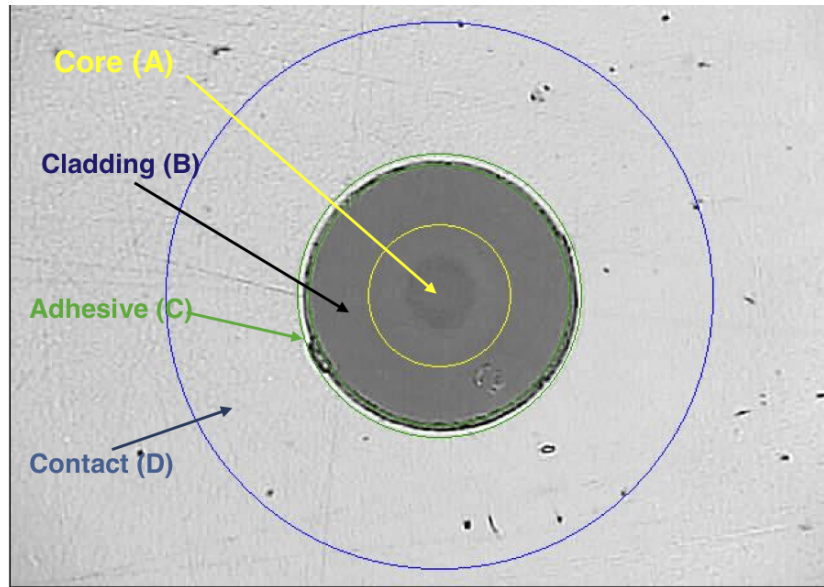
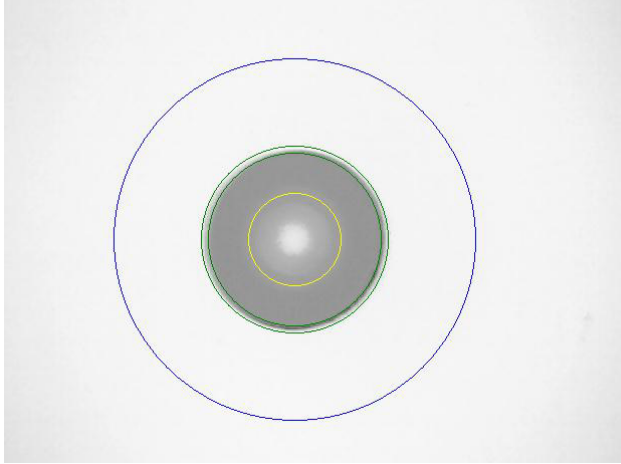
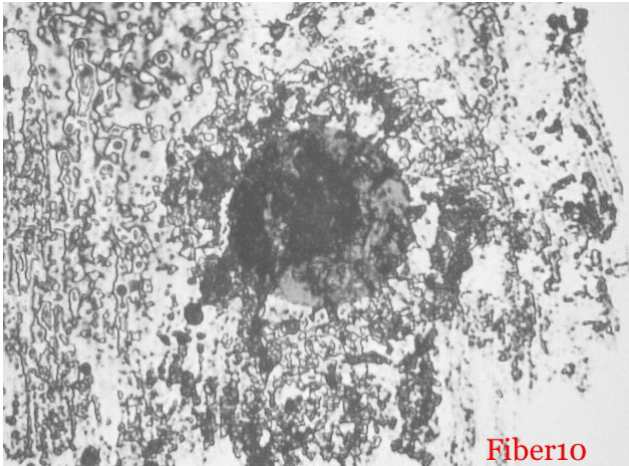


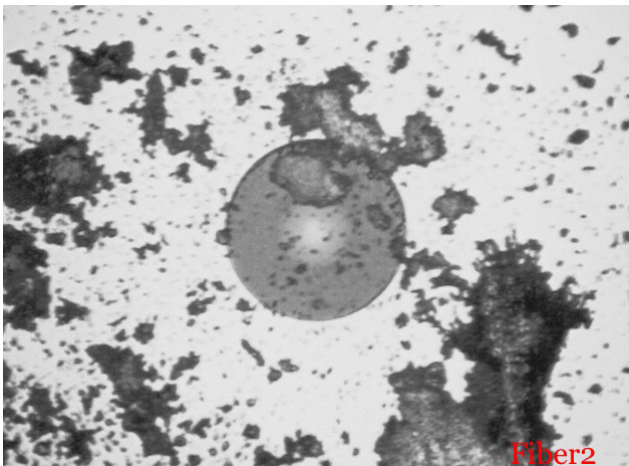
Figure 6-1: Fiber Surface Zones Detailed

IEC 61300-3-35 Surface Standard for Pass/Fail of Fiber Optic Surfaces		
Zone Name	Scratches	Defects
A: Core	None > 3µm No limit ≤ 3µm	4 ≤ 5µm None > 5µm
B: Cladding	No limit ≤ 5µm None > 5µm	Any < 2µm 5 from 2 to 5µm None > 5µm
C: Adhesive	No limit	No Limit
D: Contact	No limit	None ≥ 10µm

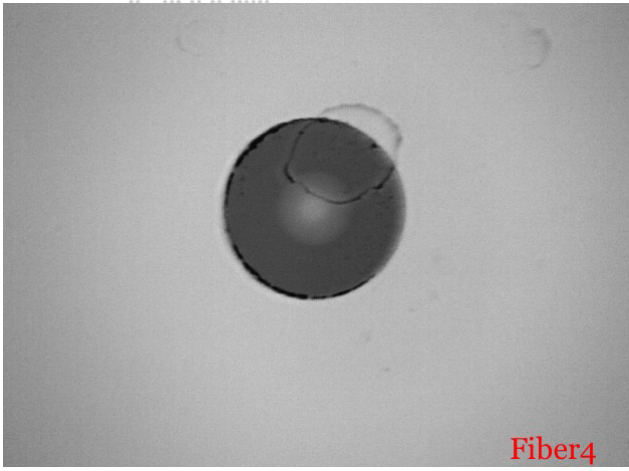
FIBER SURFACE EXAMPLES

Perfect Fiber Inspection		
Description	No cracking or contamination on fiber surface or cladding surrounding fiber.	
Result	Good results	
Notes	Rings are shown in the ConnectorView software	

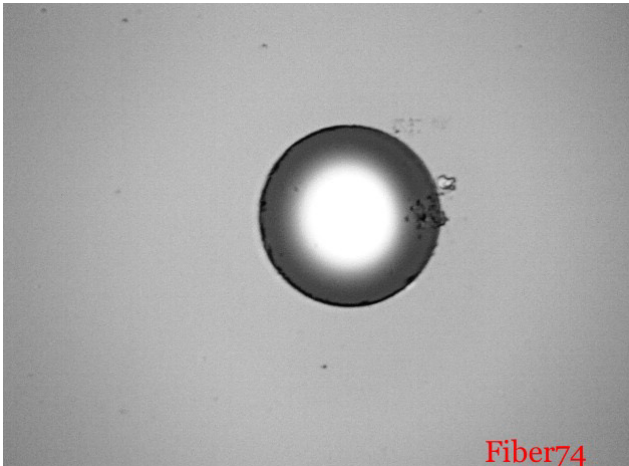
Inspection Showing Oily Residue		
Description	Oil contamination on fiber surface during inspection.	
Result	Cleaning process should remove contamination.	
Notes	Inspect this fiber again after cleaning to ensure a clean surface.	

Inspection Showing Dirt Contamination		
Description	Dirt contamination on fiber surface during inspection.	
Result	Cleaning process should remove contamination.	
Notes	Inspect this fiber again after cleaning to ensure a clean surface.	

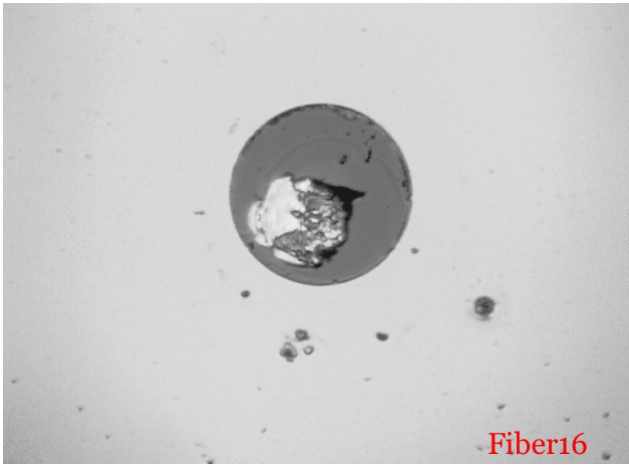
Inspection Showing Residuals

Description	Residuals on fiber surface during inspection.	 <p style="color: red; font-weight: bold;">Fiber4</p>
Result	Perform Wet/Dry Cleaning. If you're unable to remove this residue, this fiber should be returned for service.	
Notes	Inspect this fiber again after cleaning to ensure a clean surface.	

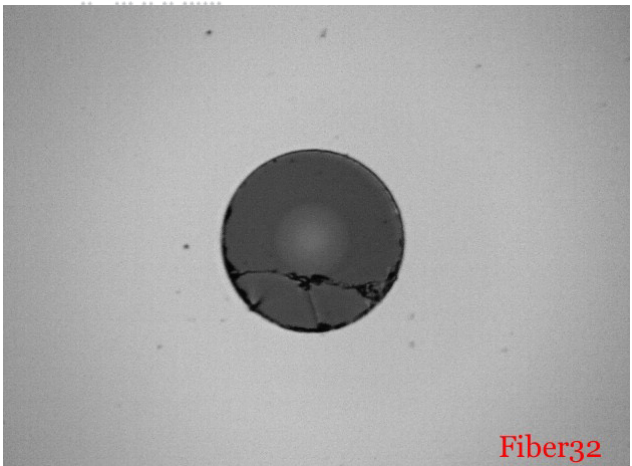
Inspection Showing Overexposed Core

Description	Large exposure of illuminated fiber core -- this fiber inspection is of a powered up and connected light source.	 <p style="color: red; font-weight: bold;">Fiber74</p>
Result	Fiber should be powered down or disconnected for a more detailed inspection.	
Notes	Viewing active fiber should ONLY be done with a videoscope -- never look at an active fiber with a microscope!	

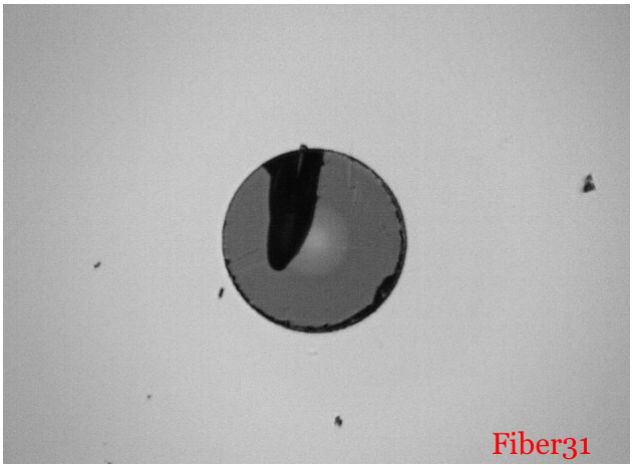
Inspection Showing A Crater

Description	Large crater on fiber during inspection.	 <p style="color: red; font-weight: bold;">Fiber16</p>
Result	Potentially a crack or soil residual. If cleaning does not remove contaminant, cable should be returned for re-polishing.	
Notes	Inspect this fiber again after cleaning to ensure a clean surface.	

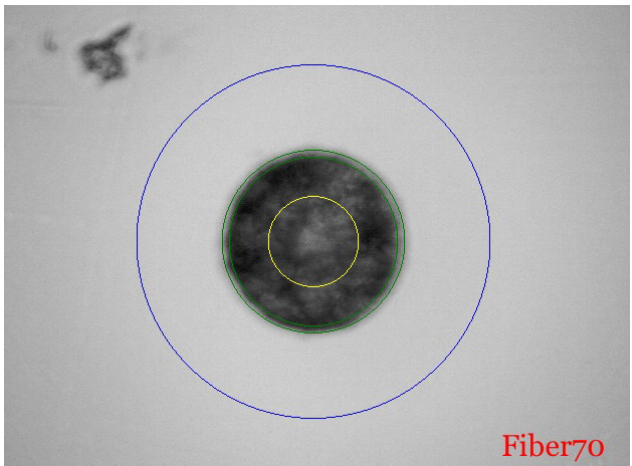
Inspection Showing Visible Cracks

Description	Visible cracks on cladding, but not core during inspection.	 <p style="text-align: right; color: #e91e63; font-weight: bold;">Fiber32</p>
Result	This fiber has failed inspection. It should be returned for re-polishing.	
Notes		

Inspection Showing Glue Residuals

Description	Black obstruction on cladding during inspection.	 <p style="text-align: right; color: #e91e63; font-weight: bold;">Fiber31</p>
Result	This fiber has failed inspection. It should be returned for re-polishing.	
Notes	Residuals have a high risk of contaminating connected fiber.	

Inspection Showing Incomplete Polishing

Description	Cloudy cladding/core upon inspection.	 <p style="text-align: right; color: #e91e63; font-weight: bold;">Fiber70</p>
Result	This fiber has failed inspection. It should be returned for service.	
Notes	Do not attempt to self-polish.	



Notes



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