



**Fiber Optic Technical Notes**

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## Fiber Optic Connector Cleaning – Suggested Practices

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### Introduction

With the increase in network data rates, it has become increasingly important to assure that all fiber optic connectors are cleaned before mating. This means that both sides of a connector should be inspected and cleaned before making the connection. This applies to test equipment and test jumpers as well as network components. New connectors must be inspected and cleaned as well. Clean and inspect every connection every time is your best assurance of a reliable optical network.

Please note that it is important to remove all contaminants, and to differentiate between contamination on an end-face versus a defect embedded into the surface of the end-face. In some cleaning process specifications, users are instructed to notice if a defect/contaminant has moved on the surface of the end-face. If it's moved, it's contamination. But in some cases a mark that appears to be a contaminant may actually be a defect in the surface of the glass or ferrule. In these cases (non-movable defects), we do not have to worry about a potential migration of the contamination toward the core area causing system failure in the future.

### Use of Wipes and/or Cleaning Cassettes

Fabric and/or composite material wipes provide combined mechanical action and absorbency to remove contamination. Wipes should be used with a resilient pad in order to avoid potential scratching of the connector end-face. This is appropriate for cleaning connectors with exposed ferrules or termini but cannot be used to clean connector end-faces within alignment sleeves. The wipe should be constructed of material that is lint free and non-debris producing during the cleaning process.

Users should note that dry wipes have been shown to leave a static charge on the end-face of the connector which can thereafter attract particulate contamination. Therefore it is recommended that a static-dissipative solvent be used with a dry wipe to eliminate this condition.

### Techniques for Cleaning with Wipes or Cleaning Cassettes

As mentioned above, it is recommended to use a lint-free, non-debris generating wipe with a static dissipative solvent. The user should dampen a portion of the wipe with the solvent, place the connector end-face into the damp area of the wipe and draw the connector into the dry area of the wipe. A

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physical wipe of 2 – 5 cm should be sufficient. This may be repeated in a different area of the wipe if desired, however 1 or 2 strokes should be sufficient for most common contaminants.

Upon inspection, if the connector is not clean after the first cleaning, it is acceptable to repeat the process. More than two or three attempts is not recommended. Perhaps slightly more pressure on the connector to increase the mechanical action and perhaps making several strokes from the damp to dry sections of the cleaning material will enhance cleaning.

If the connector is still not clean and contamination has not moved, it should be considered non-removable contamination and depending on the location and size of the contamination (See Tables 1 and 2, below) the user may have to reject the connector.

### **Swabs or Port Cleaning Devices**

The use of purpose-built swabs or mechanical port cleaning devices provides excellent mechanical action and high absorbency of any contamination. However since the a port is very confined and the mechanical motion is limited, it is recommended that the “wet/dry” cleaning process be utilized for cleaning connector end-faces within alignment sleeves. A static-dissipative solvent will add chemical action to the cleaning process and eliminate any residual static charge on the connector. The cleaning end of the swab or the port cleaning device should be lint-free, non-debris generating material.

Select a swab or port cleaning device that is manufactured for the size connector you are cleaning. Do not touch or contaminate the cleaning end of the swab or the port cleaning device. It is recommended that the user dampen the swab or port cleaning device with a static-dissipative solvent. The swab or port cleaning device should be damp but not wet. (The process is analogous to wiping a smooth surface with a sponge. A damp sponge will pick up contaminants, whereas a wet sponge will only spread them around.) If a very fast-drying solvent is used, then a follow-up cleaning with a dry swab or an additional activation of the port cleaning device may not be necessary.

### **When Using Swabs**

Place the dampened cleaning end of the swab into the port and rotate the swab while applying some pressure to the connector end-face. Usually pushing so that the compression spring in the connector is slightly activated is ideal for 2.5mm connectors. Rotating the swab 6 – 12 times is sufficient. The swab should only be used once and then disposed.

When cleaning angled polished connectors – APC connectors are typically color coded with a green connector housing or bulkhead adaptor – then merely a ¼ turn back and forth rotation may help the swab end-face conform to the 8 degree angle and thereby clean the entire surface of the connector end-face. If a very fast-drying solvent was used, you are now ready to inspect. If not, repeat the above process with a dry swab.

### **When Using Port Cleaning Devices**

Insert the solvent-dampened device into the alignment sleeve and activate the cleaner to perform the mechanical clean either by pushing the device or by pressing on a button on the device. To accomplish the dry portion of the cleaning process, an additional activation of the device assures that any excess solvent has been removed.

Upon inspection, if the connector is not clean after the first cleaning, the process can be repeated.

If the connector is still not clean and contamination has not moved it should be considered non-removable contamination and depending on the location and size of the contamination (See table below) the user should pass or reject use of the connector.

### **Notes about Solvents**

The solvents used to clean fiber optics should be fast-drying, static-dissipative and residue-free. Many solvents are flammable and/or considered hazardous materials, increasing cost of shipment and storage of the solvent. However, there are solvents available that are non-flammable, non-hazardous and packaged so that shipping requires no additional fees or paperwork.

Historically, 99% pure isopropyl alcohol (IPA) has been used as a solvent. However, IPA is easily contaminated. IPA is hygroscopic and absorbs moisture from the atmosphere including any contaminants present, potentially leaving a haze on the connector end-face which can be a problem with higher power laser networks. In addition, IPA is flammable and a hazardous material. Typically IPA must be repackaged for use and is therefore very subject to contamination.

Also, it is important to select a solvent that is compatible with the cleaning wipe, swab, or device. You do not want a solvent that will dissolve the glue used in the wipe and leave additional contamination.

### **Other Notes**

Cleaning connector end-faces with “canned air” is not recommended.

Do not repackage cleaning wipes, swabs, cassettes, or port cleaning devices. Do not repackage solvents as it will lead to cross-contamination.

Fast-drying solvents can be used to clean (flush/rinse) adaptor caps used on inspection or test equipment. These adaptors can also be sources of contamination in the optic network.

For more details, visit [www.SticklersCleaners.com](http://www.SticklersCleaners.com) and search for “wet-dry”, “hygroscopic”, “canned air”, “lint-free wipe” and related terms.

**Table 1: Single Mode Connector Acceptance Criteria**

Zone	Description	Diameter	Allowed Defects	Allowed Scratches
A	Critical	0-25um	None	None
B	Cladding	24-120um	any <2 um 5 2-5um None > 5 um	None >3um
C	Adhesive	120-130um	Any	Any
D	Contact	130-250um	None >10um	Any

**Table 2: Multi-Mode Connector Acceptance Criteria**

Zone	Description	Diameter	Allowed Defects	Allowed Scratches
A	Critical	0-66um	5 <5um None >5um	5 <3um None >3um
B	Cladding	24-120um	Any <2 um 8 2-5um None > 5 um	None >3um
C	Adhesive	120-130um	Any	Any
D	Contact	130-250um	None >10um	Any

*Notes:*

*Zones are concentric circles about the center of the fiber in the connector end-face.*

*Defects may include non-removable contaminants.*

*Size of Defects is defined as its widest dimension.*

*Size of a scratch is defined as its width, not its length*