Tech Article

Recommended Best Practices for Cleaning Fiber Optic Connectors

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Sticklers™ Fiber Optic Splice & Connector Cleaner Cleaning Fluid is hermetically sealed to stay clean.

Here are some best practices for cleaning fiber optic connectors.
With the increase in network data rates, it is increasingly important to ensure that all fiber optic connectors are cleaned before mating. This means that both sides of a connector are 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. Cleaning and inspecting every connection every time is your best assurance of a reliable optical network.

Please note that it is important to differentiate between contamination on an end-face versus a defect embedded into the surface of the end-face. In some cleaning process specifications, it instructs installers to notice if a defect/contaminant moves on the surface of the end-face. If it moves, it's contamination. But in some cases a mark that appears as a contaminant may actually be a defect in the surface of the glass or ferrule. In these cases (non-movable defects), you 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.

Installers should note that dry wipes leave a static charge on the end-face of the connector which thereafter attracts particulate contamination. Therefore, it is recommended that you use a static-dissipative cleaning fluid with a dry wipe to eliminate this condition.

Techniques for Cleaning with Wipes or Cleaning Cassettes
As mentioned above, use a lint-free, non-debris generating wipe with a static dissipative cleaning fluid. Dampen a portion of the wipe with the fluid, place the connector end-face into the damp area of the wipe and draw the connector into the dry area of the wipe. A physical wipe of 2-5 cm is sufficient. This may be repeated in a different area of the wipe if desired, however 1 or 2 strokes is sufficient for most common contaminants.

Upon inspection, if the connector is still dirty after the first cleaning, repeat the process. Do not attempt more than three cleanings. Perhaps slightly more pressure on the connector to increase the mechanical action will enhance cleaning. If the connector is still not clean and the contamination has not moved, it is non-removable contamination. Depending on the location and size of the contamination (See Tables 1 and 2, below) the installer may have to reject the connector.

Dampen the cleaning stick or swab, but don't oversaturate.

Dry wiping causes static build-up.

Swabs or Port Cleaning Devices

Using purpose-built swabs or mechanical port cleaning devices provides excellent mechanical action and high absorbency of any contamination. However, since 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 cleaning fluid adds chemical action to the cleaning process and eliminates any residual static charge on the connector. Ensure that the cleaning end of the swab or the port cleaning device is lint-free, non-debris generating material.

Select a swab or port cleaning device made for the size connector you are cleaning. Do not touch or contaminate the cleaning end of the swab or the port cleaning device. Dampen the swab or port cleaning device with a static-dissipative cleaning fluid. 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 contaminates, whereas a wet sponge will only spread them around.) If you use a very fast-drying cleaning fluid, then follow-up the cleaning with a dry swab.

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 adapter — a turn back and forth rotation may help the swab end-face conform to the 8 degree angle. Thereby cleaning the entire surface of the connector end-face. If you used a very fast-drying cleaning fluid, then 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 by 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 is removed.

Upon inspection, if the connector is not clean after the first cleaning, repeat the process. If the connector is still not clean and contamination has not moved, it is a non-removable contamination. Depending on the location and size of the contamination (See Tables below) the installer should pass or reject use of the connector.

Notes about Cleaning Fluids

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

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Historically, 99% pure isopropyl alcohol (IPA) is used to clean. 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. This is a problem, especially 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 cleaning fluid that is compatible with the cleaning wipe, swab, or device. You do not want a cleaning fluid that dissolves the glue used in the wipe and leave additional contamination.

Other Notes

Do not clean connector end-faces with “canned air”.
Do not repackage cleaning wipes, swabs, cassettes, or port cleaning devices.
Do not repackage cleaning fluids as it leads to cross-contamination.
Use fast-drying cleaning fluids to clean (flush/rinse) inspection or test equipment adapter caps. These adapters are also sources of contamination in the optic network.

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

Zone	Description	Diameter	Allowed Defects	Allowed Scratches
A	Critical	0-25um	None any<2um	None
B	Cladding	24-120um	2-5um None> 5um	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 Any <2um	5 <3um None >3um
B	Cladding	24-120um	8 2-5um None > 5um	None >3um
C	Adhesive	120-130um	Any	Any
D	Contact	130-250um	None >10um	Any

Table 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.

About the Author:
Harvey Stone, retired Sticklers Product Manager, worked nearly 20 years as a fiber optic product manager, project manager and telecommunications network specialist. Harvey holds a BA in physics from Bridgewater State College and spent a portion of his career as a math and science teacher. For more information, visit www.microcare.com.