CONNECTOR MAINTENANCE

Optical Business Unit

Connectors are designed to require minimum maintenance and provide reliable operation for many years. However, to ensure optimal operation and minimum insertion loss, it is important that fiber ends and optical ports be clean at all times. Proper cleaning also prevents the buildup of dirt, dust and other foreign substances–especially between connector pins.

This application note presents the proper maintenance procedures for connectors (FC, SC, ST and E-2000), fibers (singlemode and multimode) and other components such as bulkhead connectors, fiber-optic adapters (FOAs), detector ports and EUI connectors. This procedure ensures safe and effective inspection and cleaning techniques for long-lasting connectors.

Before any proper cleaning procedure can begin, it is important to make sure that the following standard cleaning equipment is on-hand:

- Cartridge cleaning tools
- Cotton swabs or lint-free wipes
- Specialized/specific alcohol and solvents used for “wet cleaning”
- Compressed air
- A fiber inspection probe (such as the FIP-400) to check for cleanliness and scratches

General Cleaning Instructions

The cleaning instructions below also contain some general safety precautions that must be observed during all cleaning phases.

1. Whenever alcohol or solvent is used to perform “wet cleaning”, make sure you have all the tools needed to prevent any evaporation and to ensure that the solvent will be completely removed from the connector afterwards. Evaporated (or absorbed) alcohol will leave a residue on the ferrule. This residue is extremely difficult to remove–usually, even more difficult to remove than the original contaminant–and will require a second “wet cleaning”. Some solvents do not contain alcohol and thus will not present this problem. Make sure to verify the content of the product you are using. Simply moisten a small section of a lint-free wipe or swab with a single drop of alcohol or solvent. Gently wipe the ferrule with this portion of the swab/wipe using a figure-8 motion. Then, immediately perform a similar wiping action using the dry portion of the swab/wipe to remove any residual liquid.

2. Never use the “wet cleaning” technique on multifiber, E-2000 or F-3000 connectors, as the guide pins and connector caps can trap some alcohol or solvent and cause recontamination of the connector.

3. When using compressed air, however, make sure that the product (air) is certified to be clean and exempt of any traces of water or oil. Before you begin, send the first spray in the air, as it can contain condensation or propellant, which can leave residue on the surface being cleaned. Always apply a very gentle spray of air at an angle, as the pressure may be strong enough todamage fragile devices such as detector windows. Compressed air is only good for dust, not grease, and care must be taken not to trap dust into small crevices on the surface being cleaned.

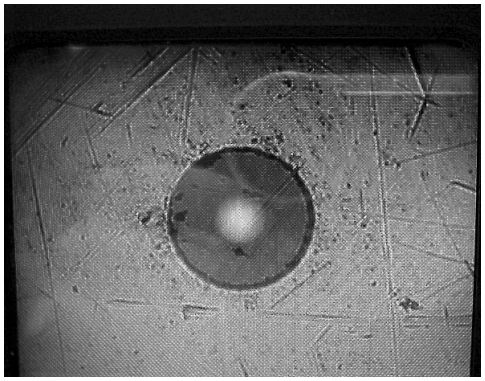

Figure 1: Scratched connectors must be rejected.

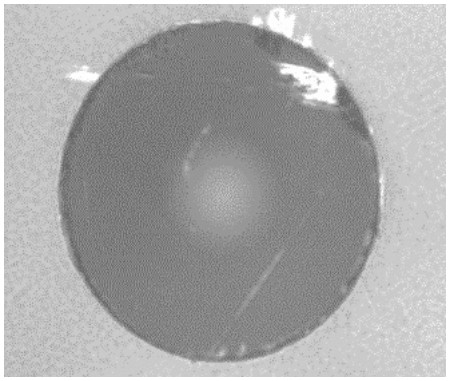

Figure 2: Worn connectors must be rejected.

To properly carry out connector maintenance, you must be familiar with the visual inspection procedure. It is imperative that there be no dirt on the connector core. Any connector that has a scratch across the core or a scratch that appears to affect the core/cladding transition region must be rejected. Any connector with more than one scratch or a deep scratch (visible to the human eye) must also be eliminated. In addition, any patchcord showing obvious signs of wear on the ferrule, cladding or core must be rejected (see Figures 1 and 2).

General Tips on Cleaning Connectors

Below are a few tips on how to keep your connectors in the best possible condition.

- When inserting a connector ferrule into a sleeve or adapter, ensure that the ferrule tip does not touch the outside of the mating sleeve or adapter. Otherwise, the fiber end will rub against an unsuitable surface, producing scratches and dirt deposits on the fiber. Please note that the ceramic or metal sleeves inside the adapter are tightly fitted. Carefully rotate the ferrule in the adapter in order to align it with the connector key. Do not force the ferrule into the adapter.
- Every time there is a disconnection or an undesirable contact, you must carry out the inspection and, if needed, the cleaning procedure. This helps ensure that patchcords remain in the best condition possible and, consequently, that transmission will not be affected or that measurement readings remain accurate. Still, this procedure does not replace careful handling of patchcords. The use of protective caps is also necessary, but does not guarantee the cleanliness or the quality of a patchcord. This procedure conforms to the GR-326 standard entitled Singlemode Optical Connectors and Jumper Assemblies.
- Cleaning connectors is difficult because the core diameter of a singlemode fiber is only about 9 µ m. This generally means that you will not be able to see scratches on its surface without special equipment. In order to be certain of the connection's surface condition and to be able to check it before and after cleaning, you need a fiber inspection probe such as the FIP-400. The use of a probe prevents the risk associated with damaging one's eyes since the image of the connector can be viewed on screen.

Warning: Never look into the end of an optical cable that is connected to an active light source!

Cleaning Fiber Ends

To adequately clean fiber ends, follow the steps below:

1. Make sure the fiber is not active.
2. Remove the protective caps.
3. Verify the cleanliness of the connector with your FIP (see Figure 3). The patchcord is clean when there is no debris touching the cladding or the core.
4. If the connector is not clean, gently wipe the fiber end with a cotton swab or lint-free wipe a second time (see Figure 4).
5. Verify the cleanliness of the connector with your FIP a second time. The patchcord is clean when there is no debris touching the cladding or the core.
6. If the connector is still not clean after two dry cleanings, perform a "wet cleaning" on the connector and then gently wipe the fiber end with a cotton swab or lint-free wipe.
7. Verify the cleanliness of the connector with your FIP a third time.

Figure 3: Verify connectors with your FIP-400.

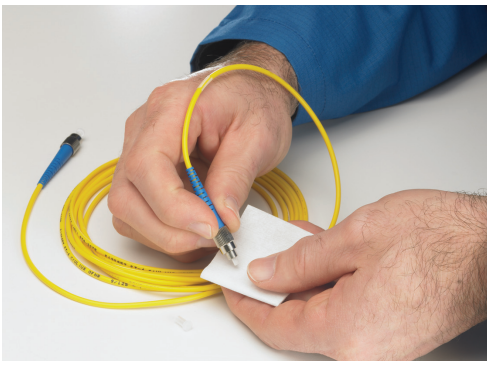

Figure 4: Cleaning fiber ends.

Cleaning Bulkhead Connectors

To clean bulkhead connectors, follow the steps below:

1. First inspect and, if needed, use a clean, dry swab to remove any debris that may be inside the sleeve (see Figures 5, 6 and 7).
2. Lightly press and turn the cleaning tip to clean the inside portion of the bulkhead adapter (see Figure 7).
3. When "wet cleaning" is required, make sure to use as little liquid as possible and rapidly dry the remaining alcohol or solvent with another dry tip.

Figure 5: Cleaning setup.

Figure 6: Cleaning tips.

Figure 7: Cleaning bulkhead connectors.

Cleaning Fiber-Optic Adapters

To clean fiber-optic adapters, follow the steps below:

1. Some fiber-optic adapters (FOAs) have an anti-reflection coating, which is very sensitive to abrasion and solvents. Therefore, the best cleaning method for these types of FOAs is "dry cleaning" (i.e., using compressed air).
2. To remove debris, take a clean, dry swab and wipe the FOA using a very gentle rotation movement, ensuring that you are not leaving any other debris (see Figure 8).
3. Remove any remaining lint on both the internal and external sides with a gentle spray of clean compressed air (see Figure 9).

Figure 8: Cleaning the FOA.

Figure 9: Using compressed air to end the procedure.

Cleaning Detector Ports

To ensure the maximum accuracy of power measurements, power meter detectors must be kept clean at all times. When not in use, the detector(s) should be covered with a protective cap. In addition, the optical source port and fiber end should be occasionally cleaned to minimize insertion loss.

The cleaning tips supplied with EXFO's test equipment are specially designed to clean the detector port(s) without having to disassemble the unit. You should clean detector ports only when it is absolutely necessary, as it is very difficult to remove any residue that may be trapped in a glass-housing interface.

To clean the detector port(s), follow the steps below:

1. Remove the protective cap from the detector.
2. If the detector is dusty, remove the dust using compressed air, applying low pressure and at a slight angle.
3. If you can still see some dust, carefully remove a clean, dry swab (1.25 mm may be appropriate for small surfaces) from the package without touching the cleaning end (tip) with your fingers.
4. Slowly and carefully insert the cleaning tip into the port until it reaches the detector's protective window (gently rotating the cleaning tip clockwise may help).
   Remember that, the detector window is very fragile and this step should be avoided if not really needed.
5. Using a gentle rotating movement, turn the clean tip one full turn to clean the detector. Ensure that you are not leaving any debris behind (see Figure 10a).
6. Gently withdraw the cleaning tip.
7. Using compressed air, blow on the detector to remove any remaining debris (see Figure 10b) or repeat steps 4 to 7.

Note: Always blow air at a 45° angle on the detector window and always clean fiber ends before connecting them to the power meter port.

Figure 10a: Cleaning the detector port(s) using cleaning tips.

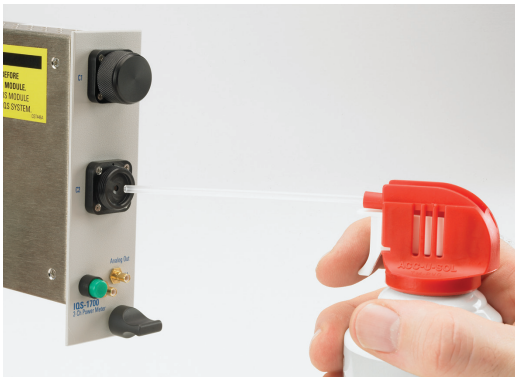

Figure 10b: Cleaning the detector port(s) using compressed air.

Cleaning EUI Connectors

To clean EUI connectors, follow the steps below:

1. First inspect and, if needed, use a clean, dry swab to remove any debris that may be inside.
2. For removable connector adapters that need to be turned and pulled out before inspection, make sure that any test jumper is disconnected, as it may damage both connectors. This applies to the EXFO Universal Interface (EUI).
3. Lightly press and turn the swab inside the EUI (see Figure 11).
4. When “wet cleaning” is required, make sure to use as little liquid as possible and rapidly dry the remaining alcohol or solvent with another dry swab (see Figures 12, 13 and 14).
5. Install the EUI connector back onto the instrument (see Figure 15).

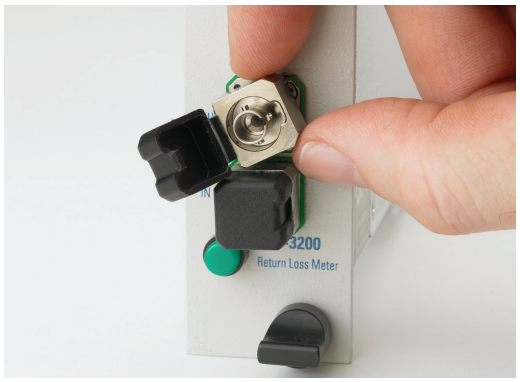

Figure 11: Removing the EUI.

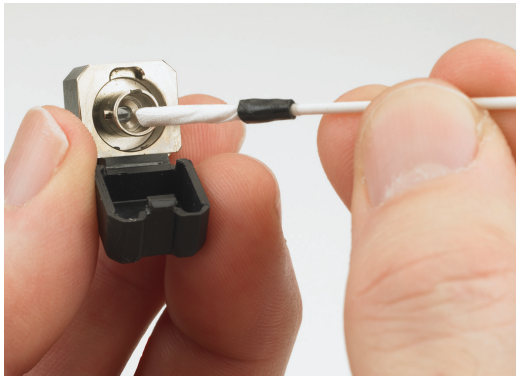

Figure 12: Cleaning the EUI.

Figure 13: Drying the EUI with compressed air.

Figure 14: Cleaning the ferrule in the connector port.

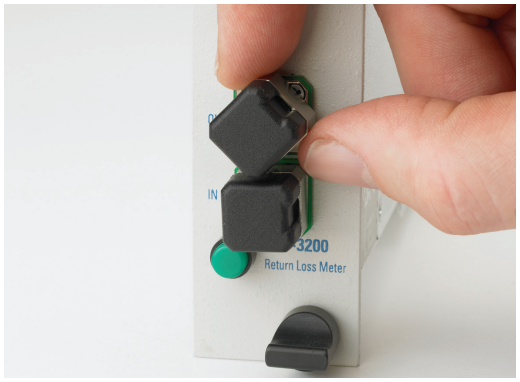

Figure 15: Putting the EUI connector back onto the instrument.

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