To all Optical Connector Installers and Workers,

The 2nd generation series of popular optical connector related materials

The Impact of Optical Connector End Face Contamination and How to Prevent It

--Why do I need to clean and inspect the end face now?--

※Photo of JDSU Fiber Inspection & Test System product.
NTT Advanced Technology Corporation is an official supplier of the JDSU Fiber Inspection & Test System.

NTT Advanced Technology Corporation
Advanced Products Business Headquarters Optical Products Business Unit

October 17, 2013
Ver.1.3

About this Pamphlet

The material in this pamphlet presents beneficial information for our customers who are using optical connector products. We welcome your thoughts, impressions and any questions you may have after reading over this material.

- **It is our hope that this pamphlet is a helpful tool in understanding the importance of optical connector cleaning and end face inspection.**
- **It would be greatly appreciated if you would send copies of this pamphlet to any related people and companies as you feel necessary.**

Performing optical connector cleaning and end face inspections will bring you reliable optical connections and radically reduce the occurrence of start-up troubles.

The result is

cost reductions,

and elimination of unnecessary extra work.

Caution

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1. THE BASICS OF FIBER OPTICS

1.1. The Structure of Optical Fiber

The commonly used optical fibers are single mode fiber and multimode fiber.

In single mode fiber, the core through which the ray of light passes has a diameter of 10um. The core of multimode fiber is either 50um, or 62.5um in diameter. In either case, the external diameter is 125um.

The core goes through the very center of the optical fiber and is very narrow. Both kinds of optical fiber are wrapped in a cladding which has a slightly different refractive index than the core.

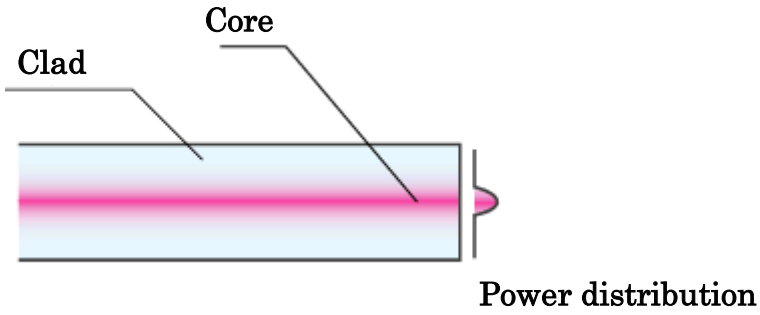


Fig. 1 The structure of Optical Fiber

1.2. The Optical Connector

Extremely fine optical fiber cannot be simply connected just as it is. That is why the "Optical Connector" is necessary.

In laying out optical fiber, the optical connector is necessary. Because the optical connector is the part which connects extremely fine optical fiber, it has to be both small and inexpensive. However, if just anyone tries to design and manufacture optical connectors on their own, incompatibility issues arise and it becomes impossible to construct a smoothly operating optical network. For this reason, having "standardized" optical connectors is a prime necessity.

Figure 2 shows the "SC Optical Connector" developed by NTT. This optical connector is standardized to meet many international standardization organizations such as JIS, IEC, IEEE, TIA/EIA, etc., and is used all around the world.

Recognizing that optical connectors would certainly come into use for personal

computers and domestic wiring, NTT developed the even smaller “MU Optical Connector” for connecting optical devices and high density arrays aimed at high end and mid-end devices.

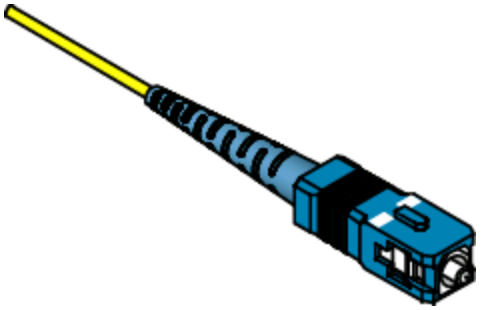


Figure 2 The SU Optical Connector developed by NTT

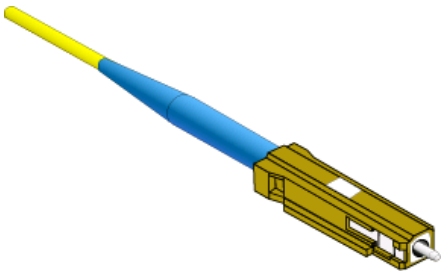


Figure 3 The MU Optical Connector also developed by NTT

Because optical fiber was weak against bending, great care was always necessary in handling it. However recently, high performance optical fiber using fiber that is strong even in bending has come on the scene and we can expect an increasing spread of in-home optical fiber use.

1.3. Optical Transmission

So how is it that a ray of light can be sent through such a fine glass filament?
You have seen the phenomenon of the surrounding scenery clearly reflected on the surface of calm water. The air and the surface of the water are interacting to create a reflection of light and optical transmission works on the same principle as when scenery is mirrored in water.

As was written earlier, there are two layers in the structure of optical fiber, the “core” and the “clad” each with a slightly different refractive index. When light enters the core, the light **“reflects”** along the interfacing surfaces of the core and the clad. The ongoing reflection of the light causes it to proceed along the core in

the center of the fiber.

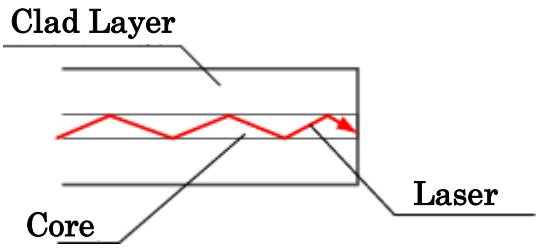


Figure 4 Light Reflection Interface in the Core and Clad Layer

1.4. Joining Optical Fibers

Since optical fiber cannot be made with an infinite length, optical fiber connection points are needed in order to allow the light to travel through the optical fiber and a perfect match between coupling lines is necessary. Light can only be transmitted after a perfect join between fiber and fiber is made.

Figure 5 Transmission from optical fiber to optical fiber

But how do you perfectly join optical fiber that has a diameter of only 1/10th of 1mm?

Do you think you could make a perfect match joining 1/1000mm optical fiber by hand? It's too much to ask of even the most skilful person. Especially since you must not allow the axis to shift as shown in figure 6, or to allow shifting to make an angle at the connection as in figure 7!

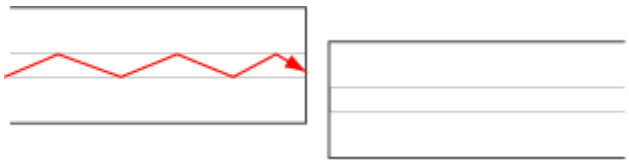


Figure 6 When the axis is shifted, the light is not transmitted

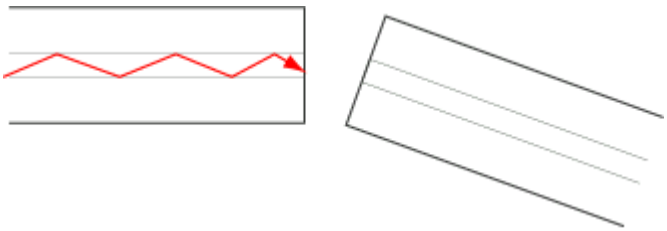


Figure 7 Even when connected, if the angle is shifted no light is transmitted.

1.5. The Optical Fiber Connection

Inside the optical connector plug (SC or MU type) there is a cylindrically shaped part made from zirconium ceramics with a diameter of 2.5mm (for SC type) and 1.25 mm (MU type), known as the "ferrule" (see figure 8). The ferrule is produced with ultrafine precision, with optical fiber of 0.125mm diameter bond anchored at its core, with its end face polished to a mirror surface finish. The light signal passes through the very center (core: diameter approximately 0.01mm). The optical connector adapter is matched to the optical connector plug and fixed in place at a spliced part called the "split sleeve" to maintain its position and prevent bending at the joint. This allows the light to pass through.

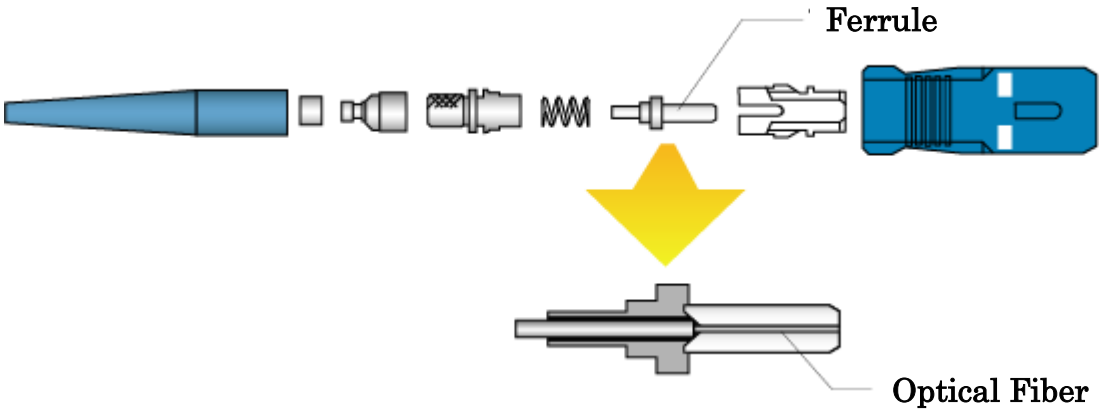


Figure 8 Structure of the Optical Connector with magnified view of the Ferrule

The adaptor can connect the ferrule with no shifting or improper angle.

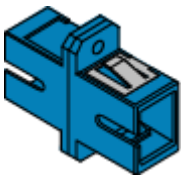


Figure 9 SC type Adaptor

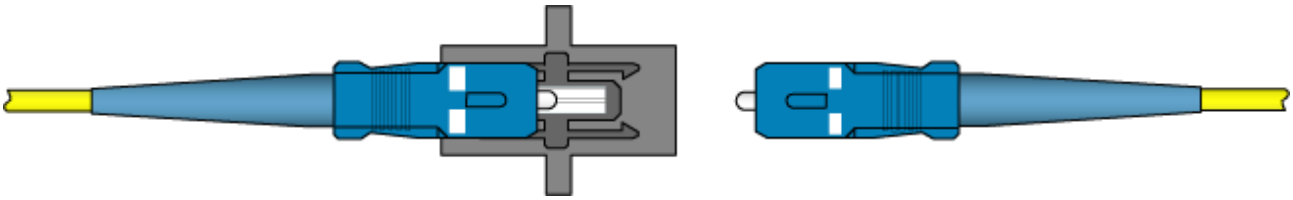


Figure 10 SC type Optical Connector being connected to an adaptor

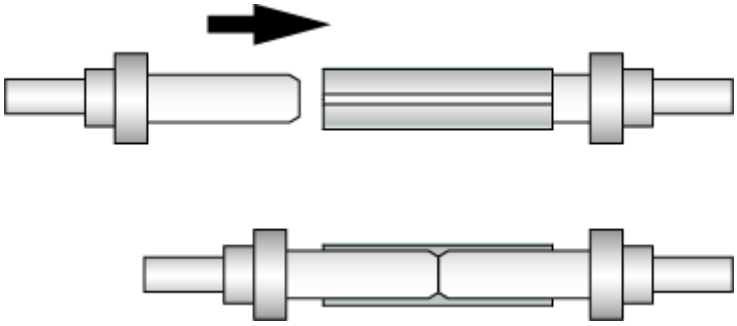
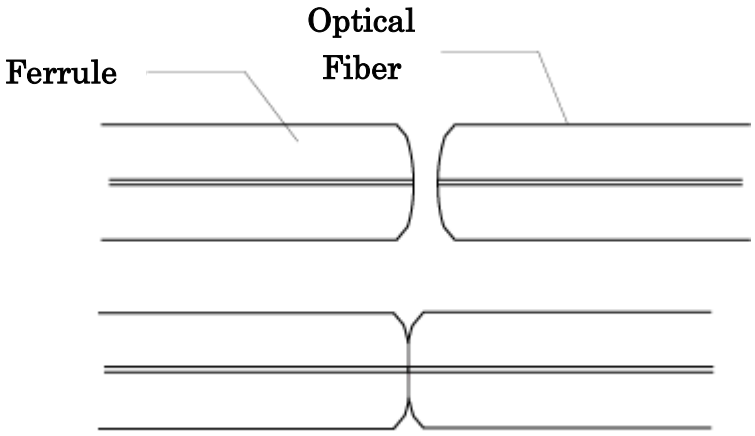


Figure 11 The ferrule being inserted into the split sleeve (above)
The ferrule are connected to each other inside the split sleeve (below)

Optical Fibers are joined through the contact of being pressed together.
When the ferrules of an optical connector are connected in an adaptor, both sides are pushed together by an embedded spring. In this way the end faces of the ferrule are slightly crushed and the pair of optical fibers is physically connected. This is called the "Physical Connection" (PC Connection).

The Basics of Fiber Optics



Ferrule end faces are slightly crushed together

Figure 12 Connected Optical Fibers

1.6. Types of Optical Connectors

The use of optical connectors in general has spread widely and you can find a great many varieties as well. These connectors can be divided into the 2 main

types of simplex (or single) fiber connectors and multi-fiber connectors.

・Simplex fiber connectors

Generally, the SC and FC connector types, using φ2.5mm ferrule and the MU and LC connector types using φ1.25mm ferrule, have become widely used simplex connectors. At a very low price, these have become indispensible parts for optical network communication.

・Multi-fiber connectors

Generally, the MT connector and MPO connector, etc. are available, with 4, 8, 12, 24, 48, 72, etc. fiber core varieties. Multi-core connectors are the best optical connectors for high density packaged systems as they are able to connect a number of optical fiber lines at the same time.

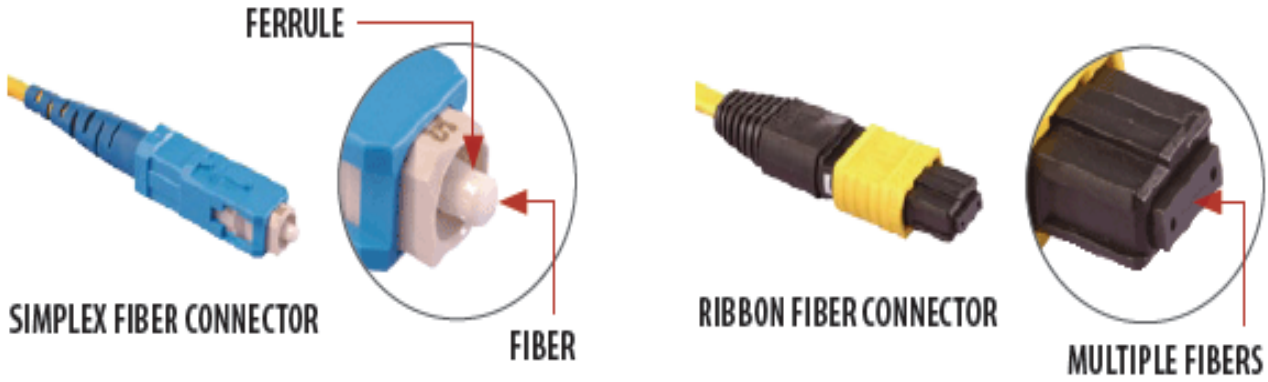


Figure 13 Simplex and multi-core connectors

2. OPTICAL CONNECTOR CONTAMINATION

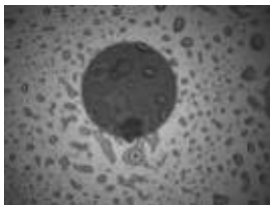
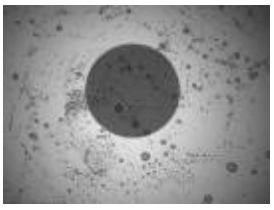
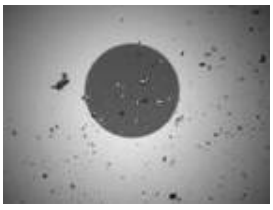
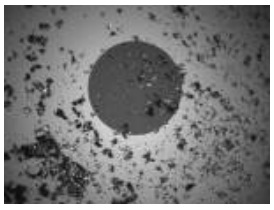
2.1. Troubles Caused by Optical Connector End Face Contamination

Since the above explanations help us to understand the design and method of connecting optical connectors, we can now move on to the main issue at hand. What happens if the optical connector end face becomes contaminated? Generally speaking, problem occurrences can be divided into two main symptoms.

Trouble #1: Light is transmitted poorly or not at all.
Trouble #2: Light is reflected back at the connection point, returning to the point of transmission and causing equipment breakdown.

Table 1 shows what optical end face contamination looks like. The circle in the centre of the photo is the optical fiber.

Table 1: Examples of contaminants adhering to end face

Skin Oil	Hand Lotion	Fiber Residue	Dirt and Dust
			

Optical connector end face must have no contaminations from the start.

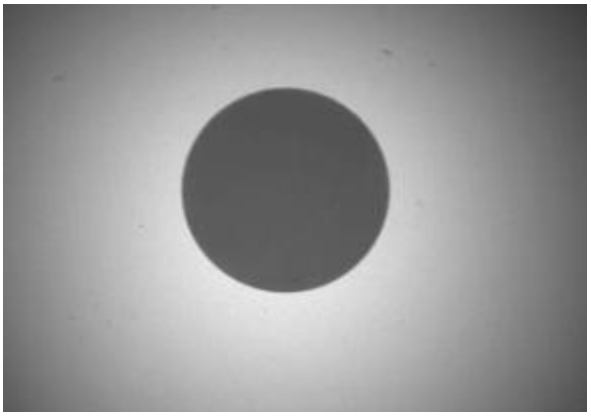


Figure 14 Clean Optical Connector End Face

What sort of things happen when optical fiber end face is dirty?
What actually happens to the light when the optical connector end face is dirty?
In the first case, when contaminants are on the optical fiber end face, the light ray may not be able to travel through the line.

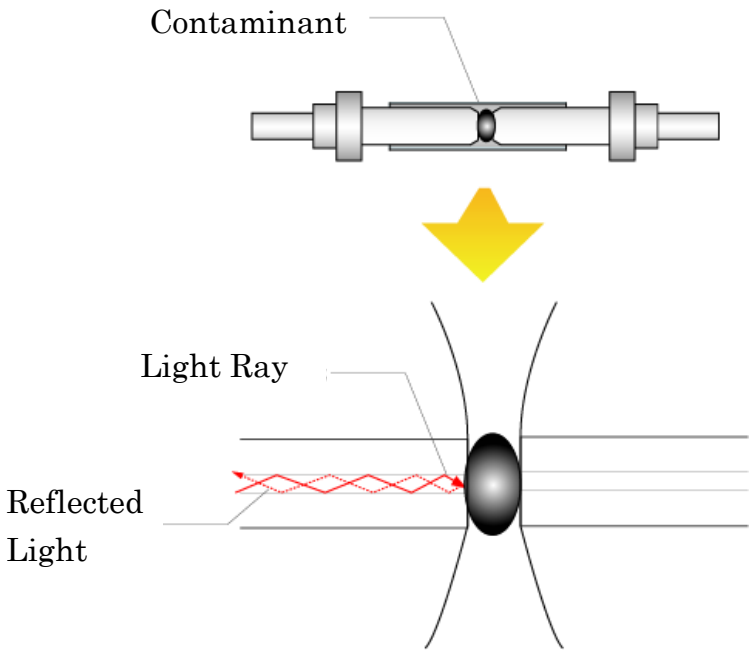


Figure 15 Light ray prevented from passing through due to contaminants on the end face, resulting in the occurrence of light reflection

In the second case, contaminants on the side of the ferrule cause **the connection of** the two ferrules to bend with the result that the light ray cannot travel through the connection well.

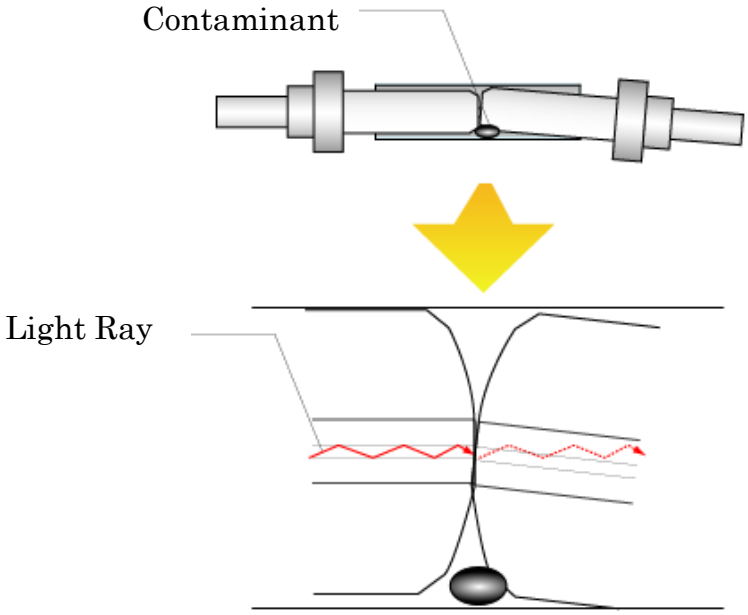


Figure 16 Contaminants at the side of the ferrule prevent the light from properly passing through

Consequently, **the optical connector must always be clean!**

2.2. Optical Connector End Face Contamination

Optical connectors can become contaminated from a variety of causes. Generally, 2-15 um sized contaminant will have an impact on signal transmission and cause damage to the optical connector end face. The cause of a large amount of the trouble on the work site is due to optical connector contamination.

When contaminants adhere near to the core, they will cause large increases in signal interruption and in the amount of loss and return loss. Also, these kinds of contaminants can cause chipping and scoring in the connector end face under the pressure of the physical connection. Large contaminants can result in gaps in the physical connection, resulting in the occurrence of loss. These kinds of contaminants can actually spread and be moved around by the physical connection.

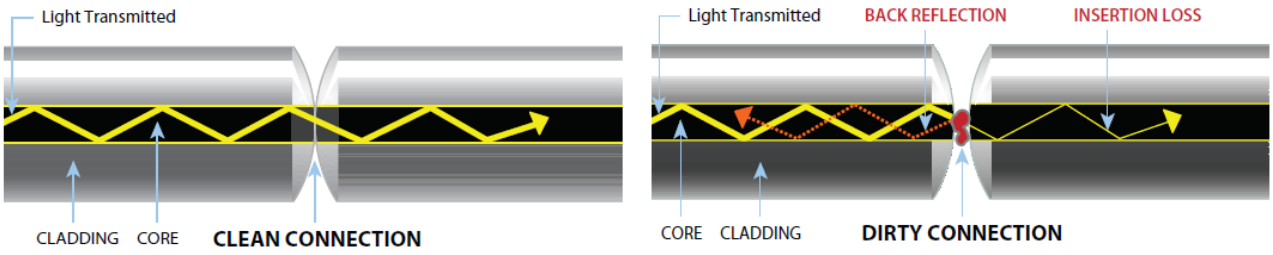


Figure17 Normal and Contaminated Connections of Optical Connectors

Damage to optical connectors occurs when there is improper usage at polishing and cleaning times. If damage occurs to the core, various serious problems such as great increases in the amount of return loss can occur. Once the end face is damaged, it cannot become clean again by simple cleaning. In that kind of situation, time consuming labor such as re-polishing or replacing cable becomes necessary

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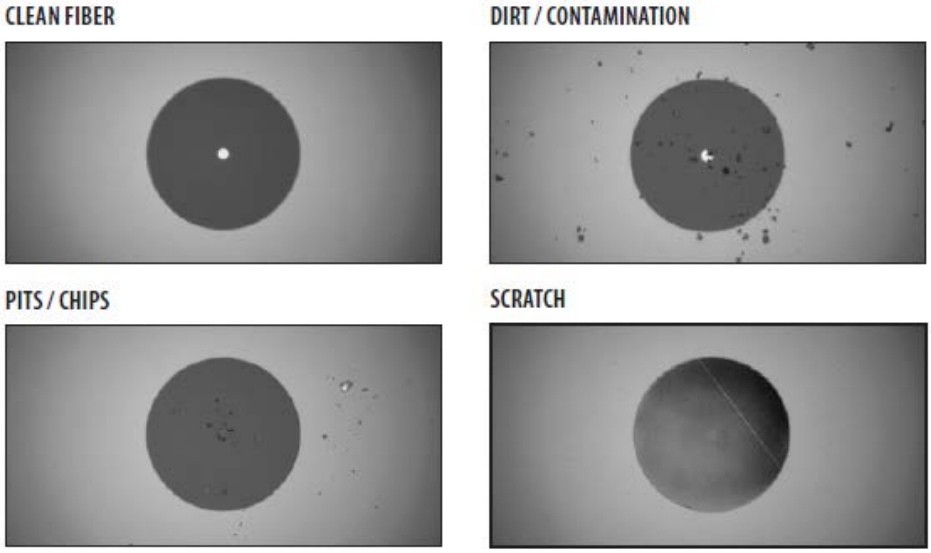


Figure 18 Normal Optical Connector End Face and End Faces in Bad Condition

2.3. Contamination Occurring During Connection of Optical Connectors

Before making a connection are you making sure that the end faces have been properly inspected and confirmed to be clean? Let's explain the phenomena that occur when cleaning and inspection of optical connectors is not done.

Contaminants adhering to one of the optical connectors at the time of connection cause the other optical connector to also become contaminated during connection. Even if the contamination is not initially close to the core repeated connections can move it near to the core, resulting in an increase of reflection and loss. Figure 19 shows how contamination on the end face is affected by repeated connections which can spread and move the contaminants on the end face.

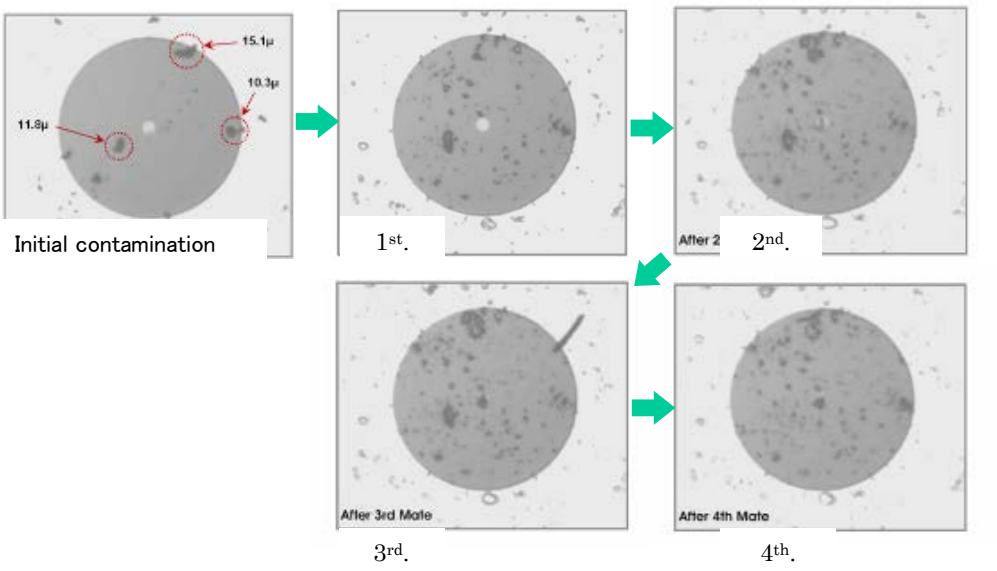


Figure 19 Changes caused by repeated connection of dirty optical connector

When an unclean optical connector is connected, the contaminant is forced into the ferrule and may become a permanent adhesion. In that kind of situation the adhesion cannot be removed even if you use an optical connector cleaner and the optical connector itself may be damaged. In order to avoid this kind of situation, it is vitally important to inspect the optical connector end face and clean it where necessary before making a connection.

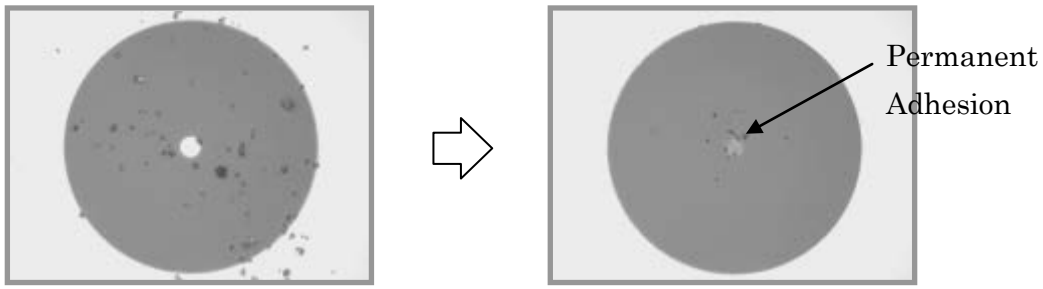


Figure 20 Changes to the end face when connected in a contaminated condition

2.4. In Cases Where High Power Lasers Are Used

With the introduction of high speed optical transmission and multiple-wavelength transmission (WDM), the use of 100mW or greater high power lasers will greatly increase. When high power lasers are used, the troubles related to contamination become even more serious.

When residue and dust are adhering to the optical connector end face that dust, etc. will produce heat, which can not only melt the optical fiber and cause reflected wave damage to the optical fiber, it can also destroy devices and equipment and even cause major damage to an entire transmission system.

Without fail make sure the optical connector end face is wiped clean!

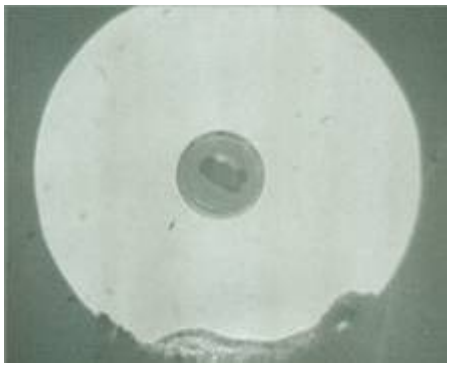


Figure 21 Core damage caused by high power laser hitting end face contaminants

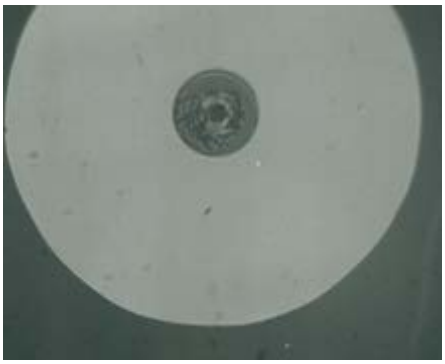


Figure 22 Dents from burning in the core area due to high power laser hitting end face contaminants

Figure23 shows how end face contamination causes heat to develop when a high power laser beam enters the fiber and the necessary constant temperature is exceeded causing a flare up to occur and spread in the optical fiber resulting in serious damage to the fiber core. This phenomenon is called the “Fiber Fuse Effect” and the result is that the fiber can no longer be used for transmission.

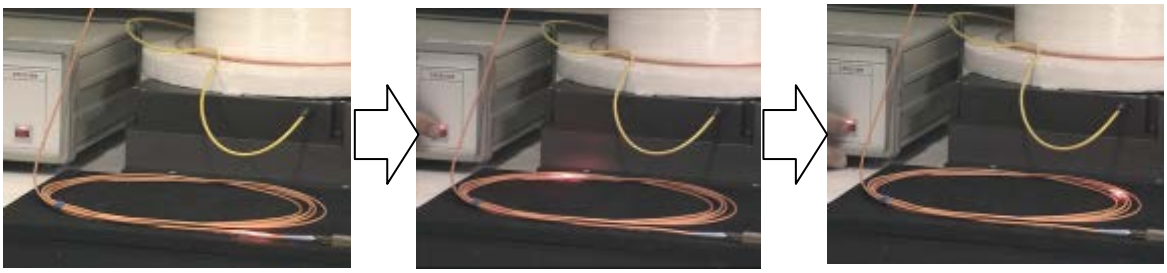


Figure 23 Fiber Fuse Effect

3. CLEANING OPTICAL CONNECTORS

While optical connectors have opened the door to super high speed transmission, end face contamination ruins the capability of sending your valuable data. For reliable data transmission, **optical connector end faces must be kept in a clean condition.**

3.1. Optical Connectors Require Cleaning

Even a slight contamination that cannot be seen with the naked eye and small amounts of residue on the optical connector end face can result in signal transmission loss. Also, contaminants can cause gaps between connectors which can hinder signal transmission. Therefore, it is necessary to clean the optical connector end faces before making any connection.

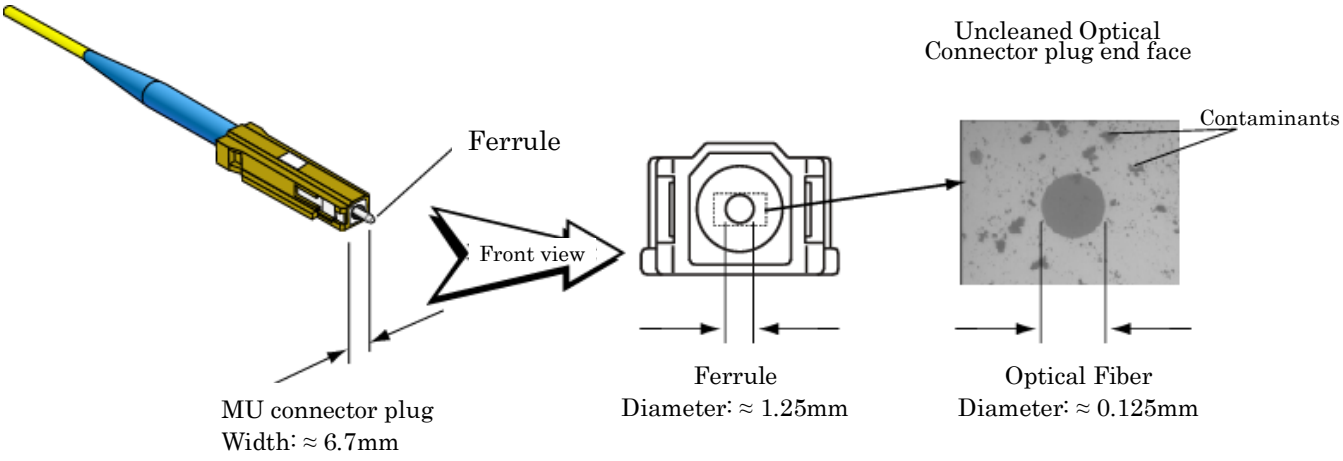


Figure 24 MU type optical connector

3.1.1. What are Optical Connector Cleaners?

Optical connector cleaners make use of end face cleaning cloth specifically developed for optical connectors. Optical connector end face can easily be scratched by polishing and cleaning so these operations must be done with care. NTT-AT's optical connector cleaners use microfiber cleaning cloth which is soft and will not easily scratch yet effectively absorbs dust and residue. These products incorporate the experience we have gained from many years of handling optical related products.

From skin oil residue to dust, there are many kinds of contaminations. NTT-AT provides a wide variety of optical connector cleaners for many applications.

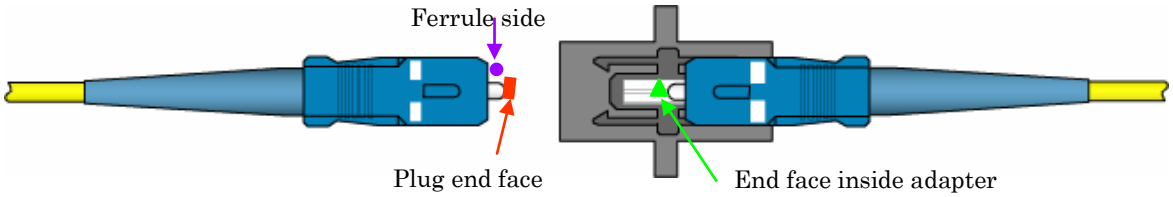


Figure 25 Cleaning spots in the optical connector

Optical Connector Plug end face

CLETOP
- Replaceable reel
- Simple lever action

OPTIPOP R
- Replaceable reel
- Right or left handed

CLETOP-S
- Replaceable cartridge
- Right or left handed

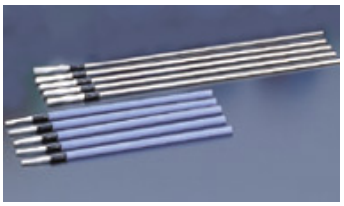
NEOCLEAN-R
- Compact, light and disposable.

Optical Connector Plug end face / In-adapter Ferrule

NEOCLEAN-E
- Both plugs and adaptors
- Replaceable cartridge

NEOCLEAN-EZ
- Both plugs and adaptors
- Compact body

In-adapter Ferrule/Sleeve Cleaner



CLETOP Stick
- Disposable

NEOCLEAN-S
- Adjustable length
- Disposable

Optical Connector Side Face Cleaner

OPTIPOP P
- Disposable

Figure 26 Optical Connector Cleaner Product Line-up

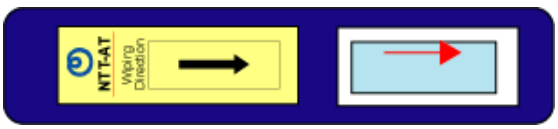
3.2. Optical Connector Cleaning Methods

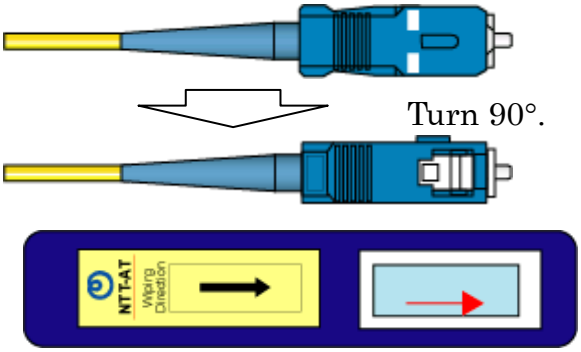
▪ Cleaning End Face of Optical Connector Plugs

Use a cassette type cleaner to clean optical connector plug end face.

Figure 27 Cassette type optical connector cleaners

* This explanation will use the OPTIPOP R as an example.

① Pushing the lever opens up the shutter.	
② The cleaning cloth simultaneously appears in the cleaning window.	The lever has the feel of a pulling a bicycle break handle, please grasp it lightly and carefully.
③ Push the plug vertically into the cleaning surface.	 Apply just enough pushing pressure to feel the spring inside the connector.
④ Pushing the plug against the cleaning surface, slide the plug one time along the cleaning window from one end to the other.	 Slide along the direction indicated by the → on the cleaner body.

⑤ Turn the plug 90°. Using a different cleaning location than in step ④, using the same procedure, while pushing slide once along the cleaning window.	
⑥ Release the lever.	

Do not reuse the same cloth area for cleaning again.

NTT-AT cassette type cleaners will provide about 400 cleaning operations.

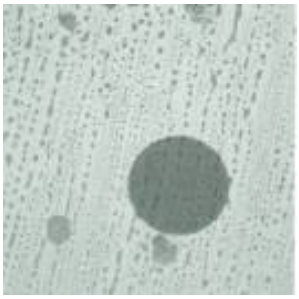
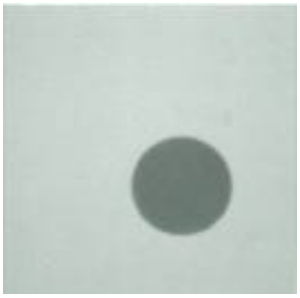
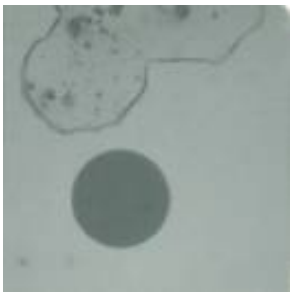
Contaminant	Before Cleaning	After Cleaning
Skin Oils		
Ethanol + Impurities		

Figure 28 Optical Connector Plug before and after cleaning with NTT-AT Optical Connector Cleaners

Please use the following website to watch videos demonstrating the use of our optical connector cleaners.

◇Optical Connector Cleaner Series Product Introduction Site

How To Clean Optical Connectors! <Video Now Available>

[Sorry, currently the subtitles are in Japanese only but the video is still helpful.]

http://www.ntt-at.com/product/neoclean/

・ Cleaning Inside Optical Connector Adaptors (NEOCLEAN-E)

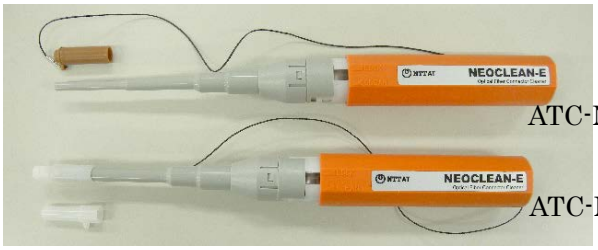
Use the pen-shaped optical connector cleaner NEOCLEAN-E to clean inside optical connector adaptors. NEOCLEAN-E comes in 2 types, for 2.5mm use and for 1.25 mm use, and for common optical connectors it is able to clean both the adaptor and the plug equally well.

Optical Connector Adaptor/Plug Compatibility

NEOCLEAN-E ATC-NE-E1 MU, LC: Connector Plug / Adaptor

NEOCLEAN-E ATC-NE-E2 SC, FC: Connector Plug / Adaptor

FA, FAS: Plug / Socket

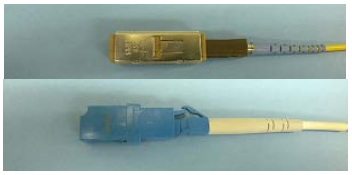
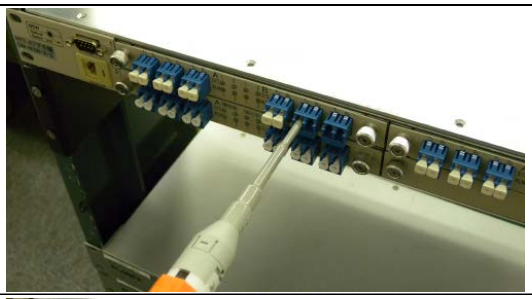


ATC-NE-E1（MU/LC）

ATC-NE-E2（SC/FC/FAS）

Figure 29 Optical Connector Cleaner NEOCLEAN-E

This explanation will use the Optical Connector Adaptor as an example.

① Confirm the type of optical connector adaptor you want to clean. (Confirm using the label on the main body)	MU or LC adaptor: ATC-NE-E1 SC or FC adaptor: ATC-NE-E2 
② Remove the cap from the NEOCLEAN-E.	For MU or LC adaptor  
③ Insert the tip of the NEOCLEAN-E into the adaptor.	
④ Push the slider in until it contacts the part inside the adaptor.	
⑤ Remove from adaptor.	

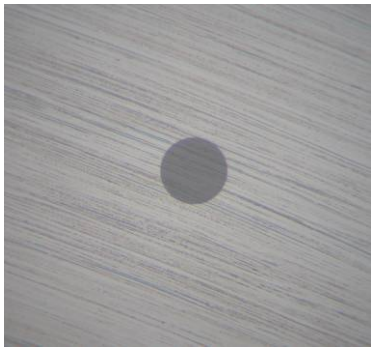
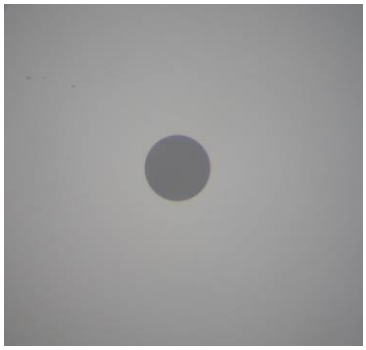
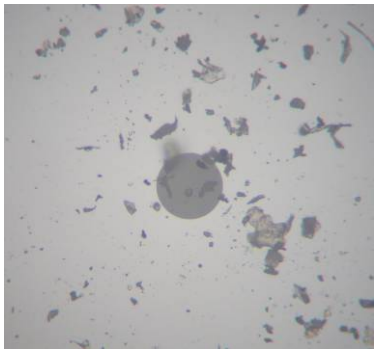
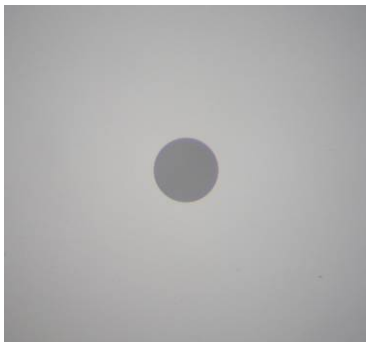
Contaminant	Before Cleaning	After Cleaning
Skin Oils		
Dust		

Figure 30 Before and After Cleaning Inside of the Optical Connector Adaptor Using an Optical Connector Cleaner

One pen-type NEOCLEAN-E Optical Connector Cleaner provides ≈ 750 cleanings.
Replaceable Cartridges reduce your running costs even more.
Using one main body with 3 replacement cartridges will reduce costs 21.4%.

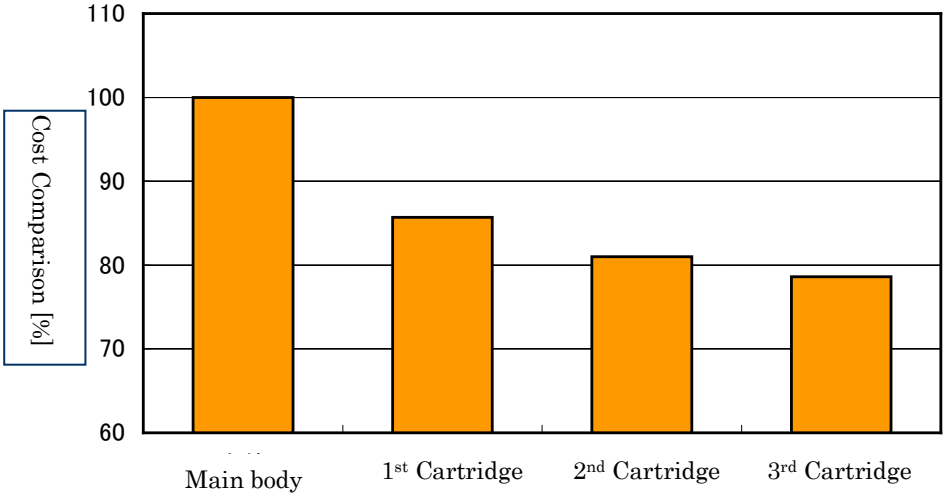
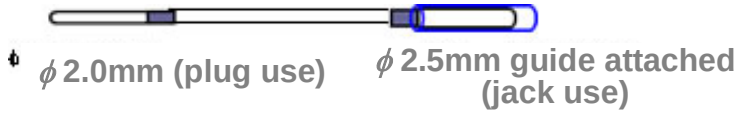
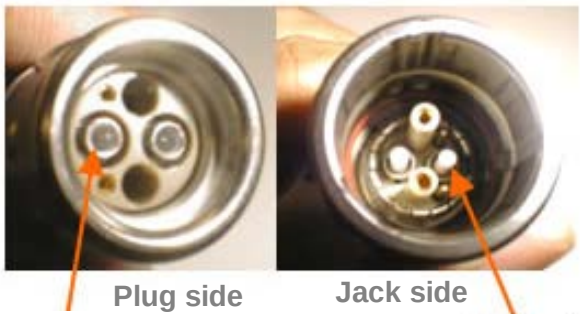


Figure 31 Cost Reductions Through Using NEOCLEAN-E Replacement Cartridges

Cleaning for High-Definition Cameras (CLETOP φ2.0-2.5)

Use a cleaning stick for cleaning optical ferrule end face and inside the sleeves of high-definition camera use connectors.

Figure 32 Optical Connector Cleaner CLETOP Stick 2.0-2.5 mm

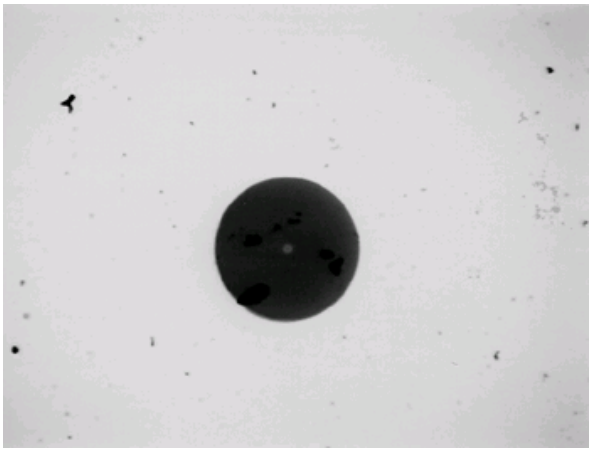
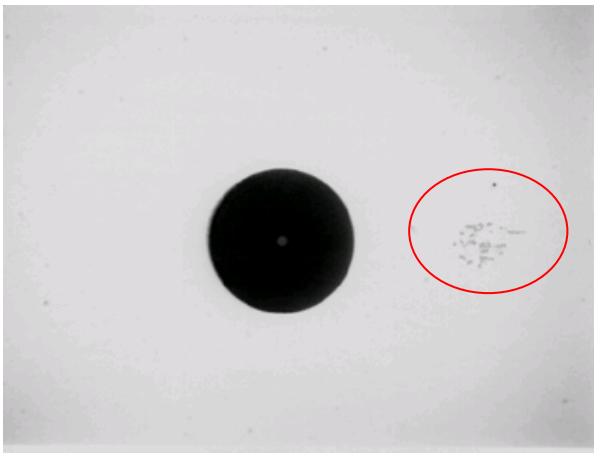
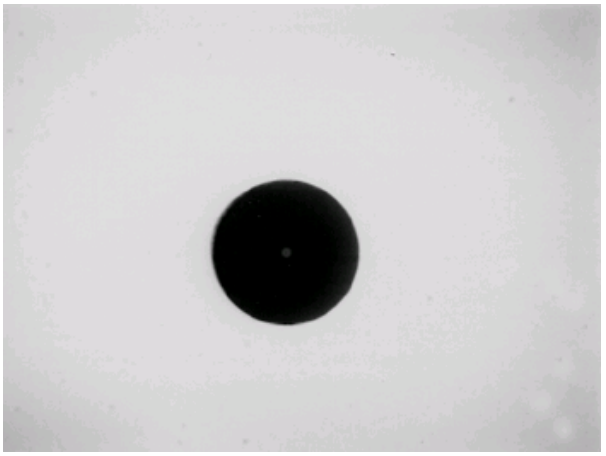
① Match the stick shaped optical connector cleaner axially to the plug or jack.	
② Insert the stick into the sleeve hole. For cleaning the ferrule side, insert the side of the stick with the guide attachment.	 Avoid using a cleaning tool that has mistakenly been inserted in a hole that is not the sleeve hole.
③ While pushing the stick into the connector with a consistent amount of pressure, rotate it 3 to 5 times.	 Clean the plug using the φ2.0mm side and the jack using the φ2.5mm guide attachment.
④ Dispose of the used stick.	

Cleaner usages: use 1 stick for cleaning 1 plug terminal only.

3.3. Examples of Cleaning Failures

For example, if the pushing pressure against the cleaning surface is too weak when cleaning an optical connector, then a residue from the wiping action will be left behind.

Table 2 Cases of Failure in Cleaning (from actual cleaning situations)

	Optical Connector Plug End Face
Contaminated optical connector plug end face.	
When hardly applying any pressure during cleaning of the optical connector plug end face… • Some residue is left behind.	
Please ensure that enough pressure is applied on the cleaning material to feel the spring inside the optical connector plug when performing the cleaning operation.	

3.4. What Happens When the Same Cleaning Surface is Reused?

As the cleaning fiber used by NTT-AT in its optical connector cleaners is an exceedingly high performance material, oil contaminants, etc. will in fact be wiped clean even if the same surface is used several times. However, no matter how high performance the cleaning fibers are, some cloth fibers and fine dust may not be wiped off.

The photo below shows a ferrule end face which has been pressed against a carpet and cleaned using the same cleaning surface of the cleaning fiber. Even though the surface was completely cleaned by the second wiping, when wiping it the third time some dust was left behind.

To maintain important optical connectors in good condition, please do not reuse the same fiber surface for repeated cleaning!

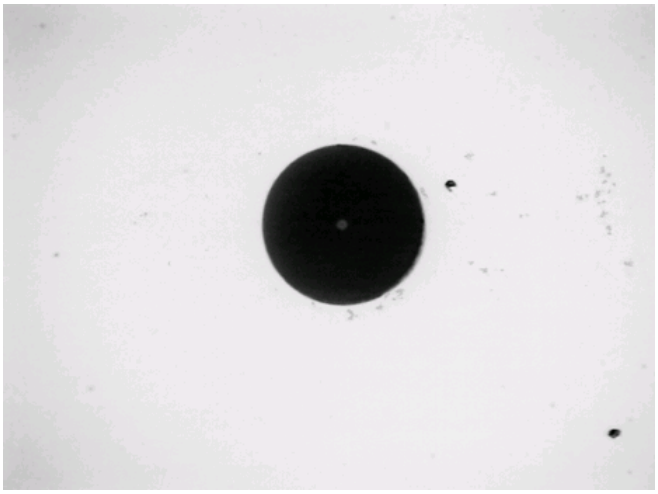


Figure 33 End face cleaned using the same cleaning surface

4. INSPECTING OPTICAL CONNECTORS

4.1. Before Using Optical Connectors

The number one cause of network trouble is contaminated connector end face. Trouble can be prevented beforehand by confirmation inspection of all optical connector end faces before connections are made.

The most effective method to confirm whether an optical connector is clean or not is to observe the end face. The area through which the light travels in an optical connector is extremely small so specially designed optical connector end face inspection tools are needed for this observation.

The process of end face inspection is to observe the optical connector end face, clean it if it is contaminated, and connect it if it is clean. Through following this process flow, you can reduce contamination caused troubles to a minimum.

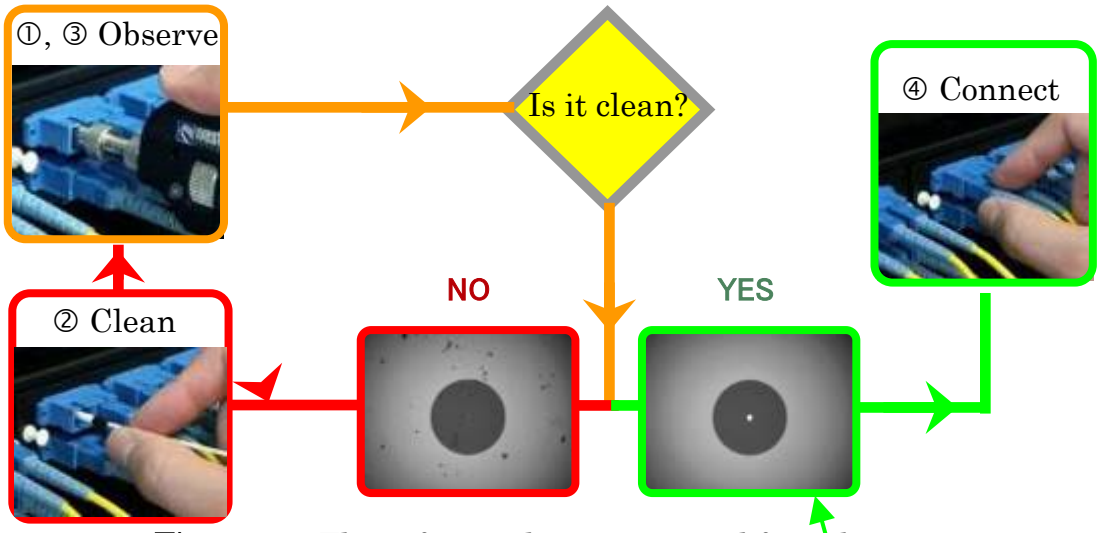


Figure 34 Flow of optical connector end face observation

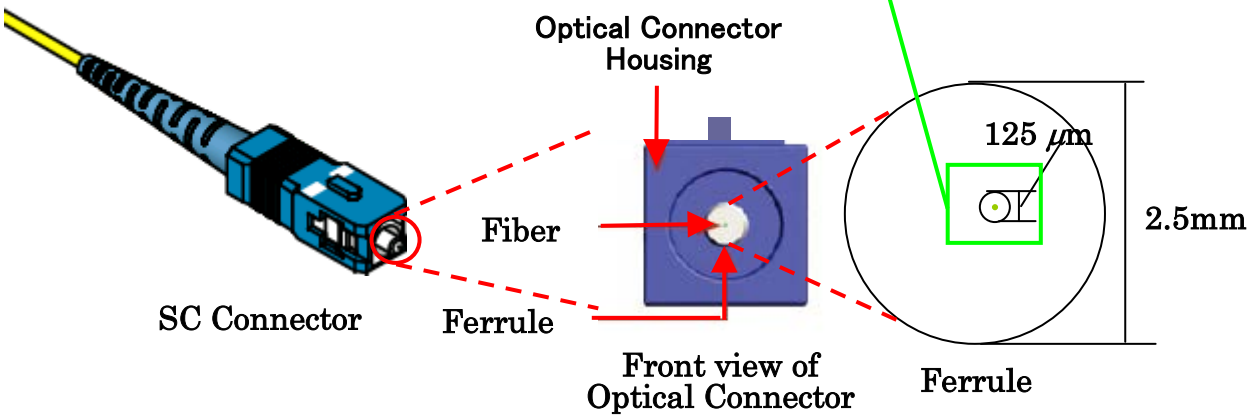


Figure 35 Optical connector end face observation points

4.2. Inspecting Optical Connectors

In general, the device used to pinpoint locations of loss and reflection occurrences in optical connectors is the OTDR (Optical Time-Domain Reflectometer). The OTDR is used at the construction site, etc. to confirm whether there are any abnormalities in connection points and cables. The light output from the measurement equipment's port is reflected or dispersed by any abnormalities in the optical cables or connection points. Any loss and reflection occurrences are measured as a function of time and the results are displayed in the form of what are known as traces. Figure 11 shows the OTDR measurement results of a cable where a connector with a normal end face has been connected to one which has contaminant adhering near to the core.

As you can read from Figure 11, the reflection at points ① and ② is not large, but the reflection at the connection point ③ has become much larger. In this way, even a small amount of contamination on the end face can deteriorate the transmission level and cause a breakdown in the network.

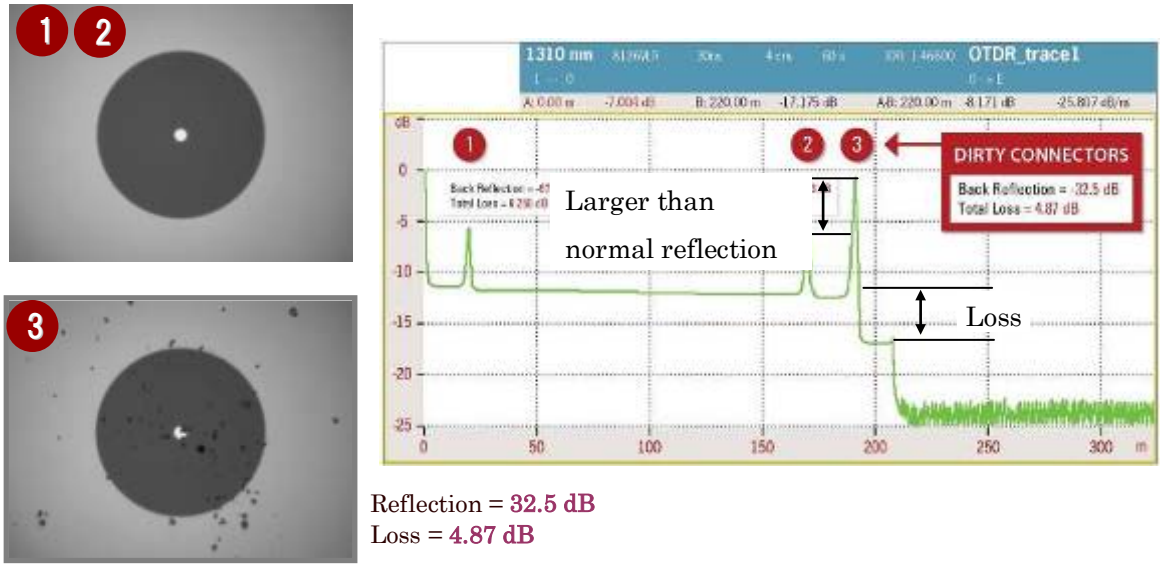


Figure 36 Reflection results from connecting a normal optical connector end face and a contaminated end face

4.3. Optical Connector End Face Inspection Equipment

In general, there are 2 main methods for inspecting optical connector end faces. The first method is to look directly into the optical fiber connector with a fiberscope. This method is inexpensive and simple, however, when used for

inspecting lines that are actually in use **the user is in fact looking directly into the transmission light beam, which is extremely dangerous!!!** It is very important to take special care to never look directly into the transmission light beam.

The second method is to optically receive an image of the end face using a CCD and display the signal onto a monitor. A monitor display device is needed; however, this method avoids the danger of direct eye contact with the light beam and so provides the value of a high level of safety.

For inspecting connector end faces where there is an active output light beam such as with in-use lines, using an optical connector end face monitor or similar device which allows you to use the monitor to visually confirm the condition of the end face is very important.

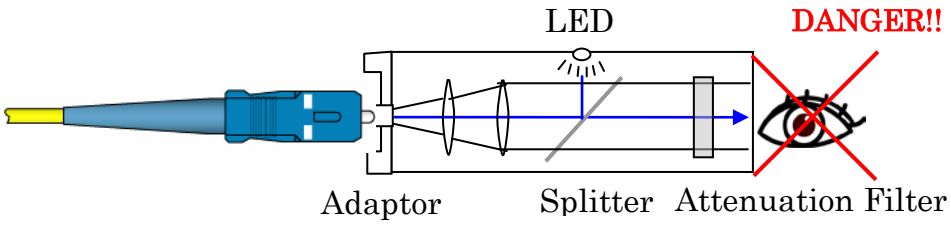


Figure 37 Sketch of a fiber scope inspection method

Figure 38 Fiberscope product example (FM-C200)

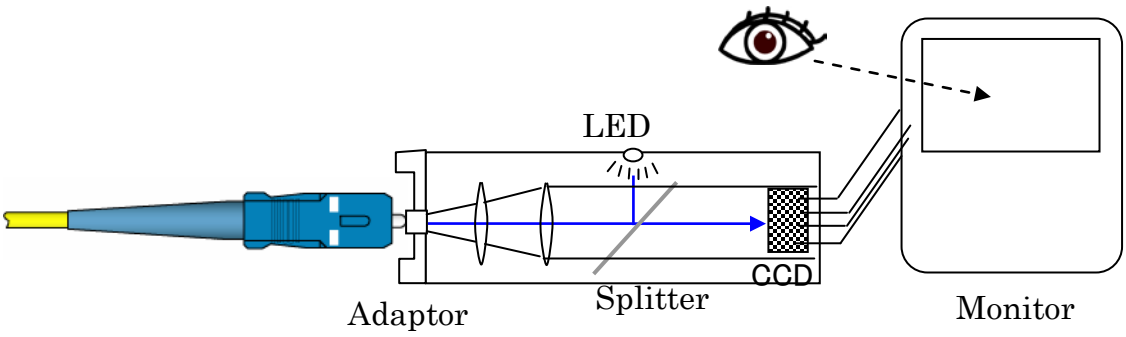


Figure 39 Sketch of an optical connector end face monitor

Figure 40 Optical connector end face monitor product examples
(Left: FBP-HD3-PA; Right: FBP-SC01)

4.4. Optical Connector End Face Quality Standards

In the manufacturing of optical connectors up until now, optical connectors were always inspected and shipped according to the individual standards set by each maker. However, those inspection standards were very strict and the fact that there was so much difference in the inspection standards of each company was a large stumbling block to efforts at cost reduction. For this reason there has been a movement in recent years to have a set of internationally prescribed optical connector end face standard criteria.

4.5. Methods for Cleaning and Observing Optical Connector End Face

① Optical Connector Plug Cleaning

Use a cleaner to clean the optical connector plug end face.

② Optical Connector Plug Inspection

Insert the optical connector plug you want to inspect and adjust the focus on the patch cord module. The green indicator light will turn on at this time.

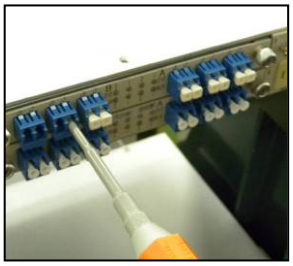
③ Switch the Optical Connector Plug/Adaptor Mode

Push the Patch Cord Module / Probe toggle button.

The red indicator light on the probe side will turn on at this time.

④ Optical Connector Adaptor Cleaning

Insert the optical connector cleaner to clean inside the optical connector adaptor.



⑤ Optical Connector Adaptor Inspection

Remove the optical connector plug from the optical connector adaptor you want to inspect.

Insert the probe deep all the way and adjust the focus.

⑥ Optical Connector Plug Connection

If both the optical connector plug and adaptor are clean, connect the plug into the adaptor.

Figure 41-1 ~ 41-6

5. OPTICAL CONNECTOR END FACE INSPECTION TOOLS

5.1. Optical Connector End Face Inspection Tools

Tools are available for a wide variety of applications and locations that are specifically designed for inspecting optical connector end face. Among these are products with special features such as automatic evaluation capability equipped products which can determine the actual contamination and damage condition of end face, and products which in addition to end face inspection capability, include functions such as a power meter making them perfectly suited for on-site installation work. When used along with optical connector cleaners, these end face inspection tools provide you with reliable optical connector cleaning that you can count on while also helping you to economize on materials.

NTT-AT is an authorized distributor for JDSU products (Optical Connector End Face Inspection tools) in Japan. These JDSU products may be purchased from one of the authorized distributors in respective countries outside of Japan.

Figure 42-1 Optical Connector End Face Inspection Tools Product Line-up

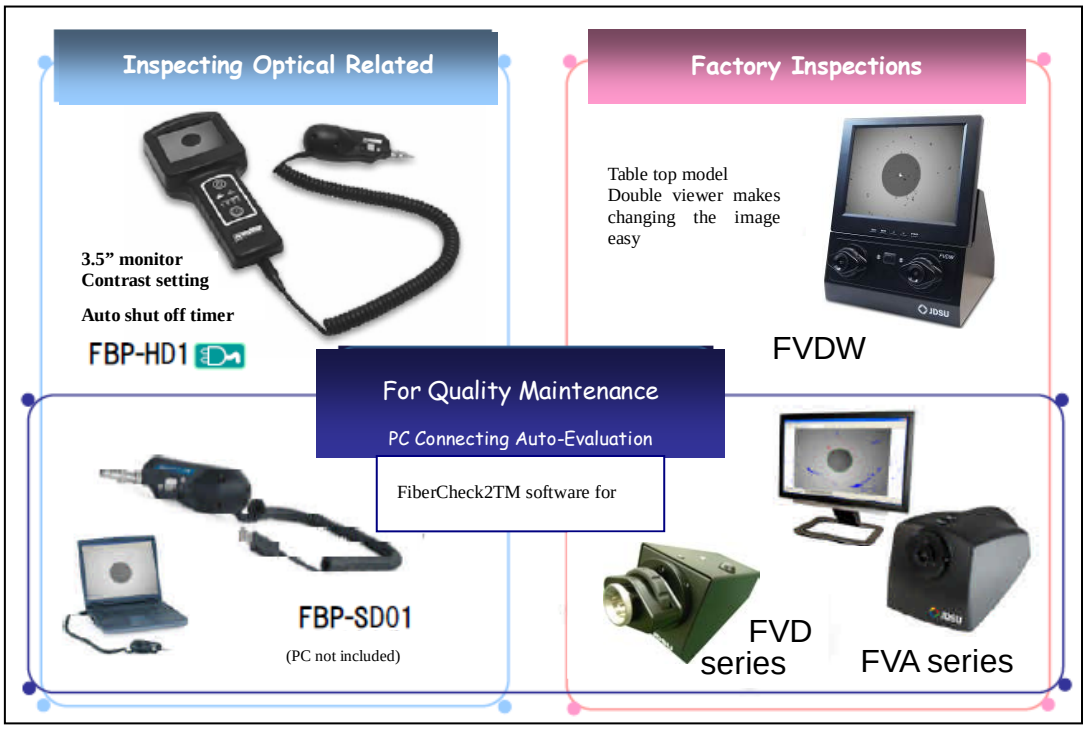


Figure 42-2 Optical Connector End Face Inspection Tools Product Line-up

5.1.1. Module CCD (FBP-HD3-PA, FIT-S105)

The FBP-HD3-PA, FIT-S105 is a module CCD type tool that allows you to switch back and forth between optical connector plug side and adaptor side observation during inspection. This allows you to greatly reduce the troublesome work of changing chips for different work that was necessary in previous products, and the single CCD type tool lets you to do inspections in a much shorter time.

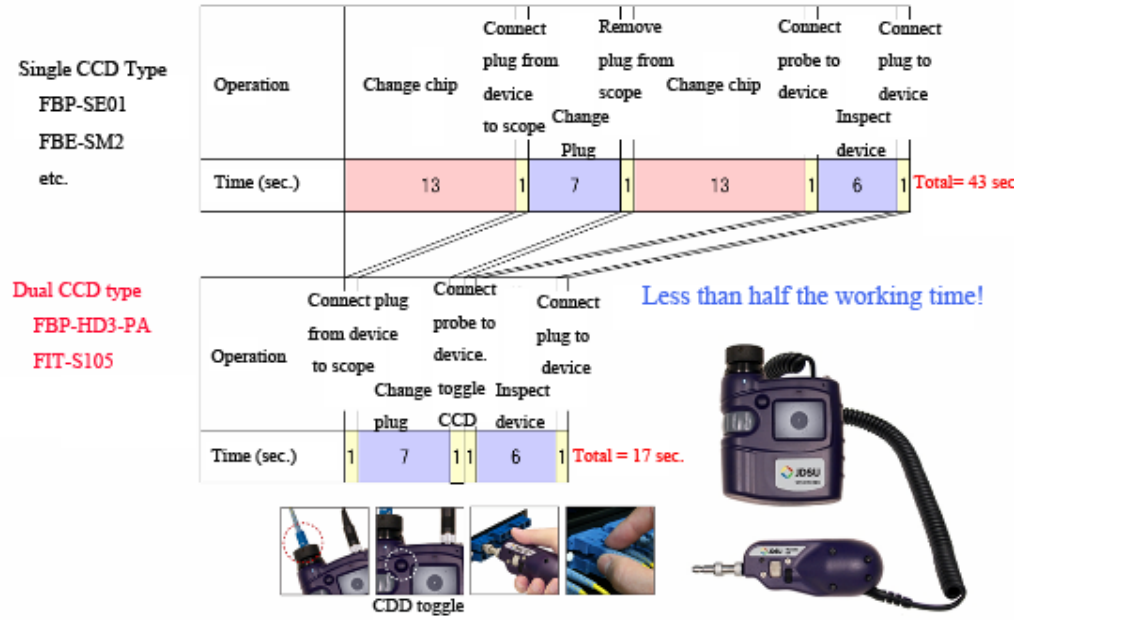


Figure 43 Comparison of inspections times using a dual or single CCD.

5.1.2. Automatic Analysis Function (FBP-SD01, FVD series, FVA series)

With the capability to connect directly to a computer through a USB port, the FBP-SD01 and FVD series, and the new FVA series use the specially designed FiberChek2 software. In addition to graphic image saving capability, this software comes equipped with the capability to automatically analyze the condition of optical connector end face.

This function enables the following capabilities:

- Distinguishes between running scratches, pitting/chipping and debris on the optical connector end face and makes a pass/fail decision.
- Image capture capability – easily saves the image with a push of one button.
- Makes a report

  Display evaluation results with a single click.

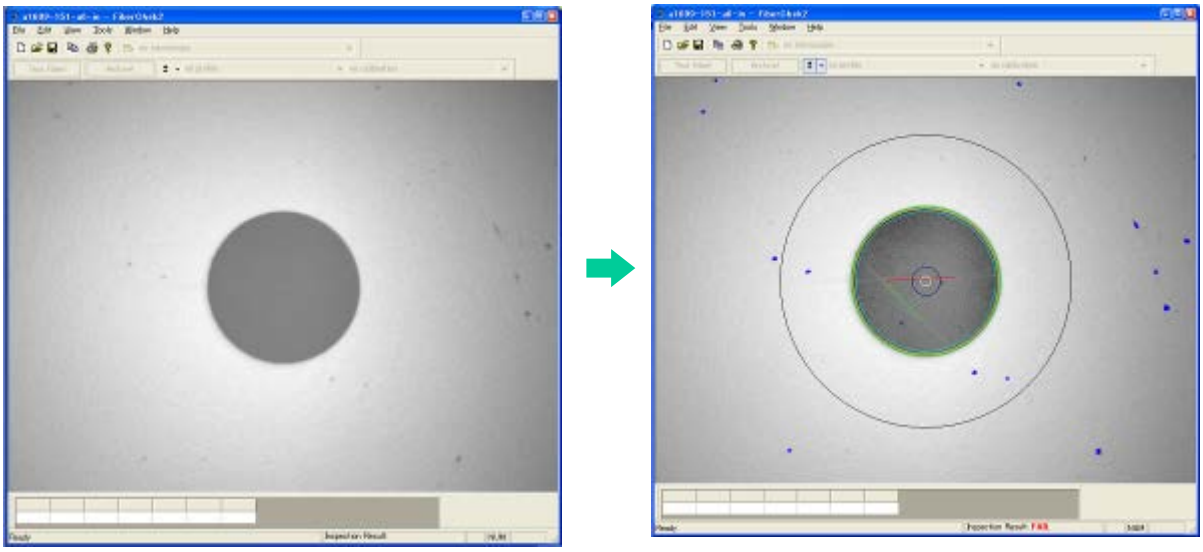


Figure 44 Post evaluation results of an optical connector end face (Left: before evaluation, Right: after evaluation)

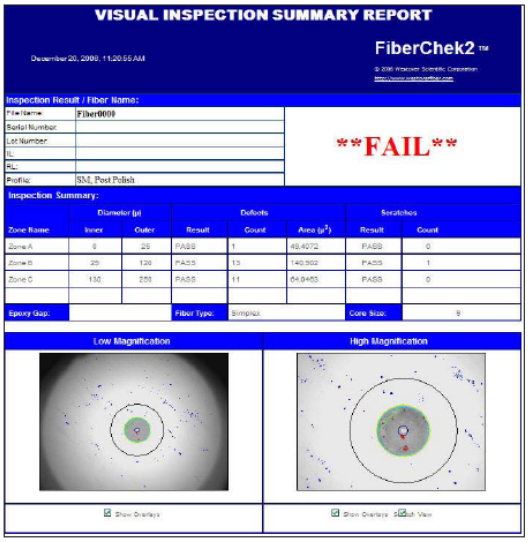


Figure 45 Optical connector end face inspection results report

7. Help and Support for Optical Connector Inspection & Cleaning

Thank you so much for taking time to read through this manual.
Do you have any problems related to optical connector technology, handling, performance evaluation and/or cleaning?
Please don't hesitate to consult with us no matter how small your problem may seem.

We also offer free consulting seminars, etc. So please feel free to contact us.

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