# Aerial Optical Fiber Interconnection Method for Connecting Fibers of Different Carriers

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**Abstract**

In response to demands to interconnect optical fibers owned by different carriers, we have developed a simple optical fiber interconnection method. Each carrier uses our cord converter to terminate a fiber in a standard connector. These connectors can then be connected together simply, without either carrier working on or handling fibers belonging to another carrier. We have also designed an aerial optical closure that can be mounted on a utility pole to accommodate several such connectors.

## 1. Background

Every year, the number of carriers offering optical fiber services increases. NTT's regional operating companies, NTT East and NTT West, already provide the B-FLET'S service. Although optical fiber is in the process of being supplied to some user premises, some route sections still have no optical fibers. On the other hand, some optical fibers that are already in place remain unused. Carriers with no optical fiber on certain routes have recently asked to lease these unused optical fibers (Fig. 1). In response to this demand, we have developed two products for interconnecting the optical fibers of different carriers.

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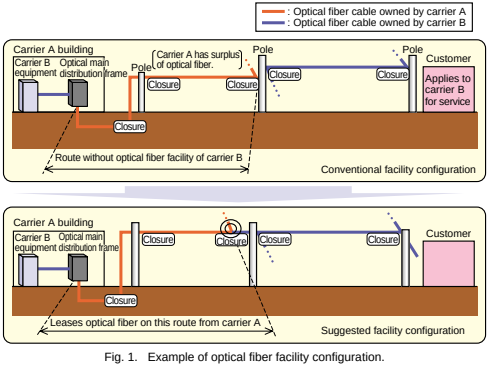


Fig. 1. Example of optical fiber facility configuration.

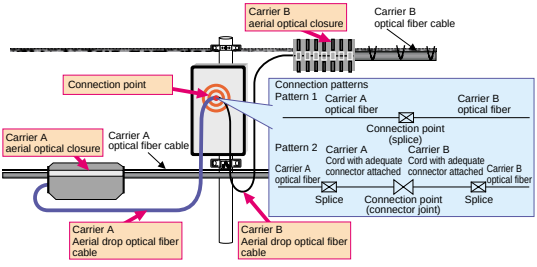


Fig. 2. Example of optical fiber cable connection configuration at a pole.

The conventional way to connect fibers of two different carriers is to connect together one aerial drop optical fiber belonging to each carrier (Fig. 2). There are two patterns of doing this: 1) one carrier splices together a single optical fiber belonging to each carrier or 2) each carrier splices a connector onto its own fiber and one of the carriers connects them. Both these methods have problems. In the first case, single optical fibers are exposed near the splicing point, which could lead to higher loss over the transmission route. Moreover, carriers have complained that their fibers have been damaged by another carrier working on them. In the second case, even though the inter-carrier splice is eliminated, the connectors are still left exposed. To solve these problems, we have developed i) a cord converter and ii) an aerial optical closure to accommodate SC connectors.

## 2. Design goals

In designing these products, we had the following goals.

1. It should be possible to lease optical fibers one by one.
2. The connector should be a standard one that any carrier can easily procure, attach, and detach. We chose to use the SC connector (Fig. 3).
3. The need to work on another carrier's facilities should be eliminated.
4. Interconnection should be done as close to a utility pole as possible.

## 3. Conventional method of attaching an SC connector

The usual way to attach an SC connector to a fiber cord is shown in Fig. 4. First, the SC connector is spliced onto the end of a short section of optical fiber

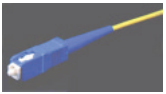

Fig. 3. SC connector.

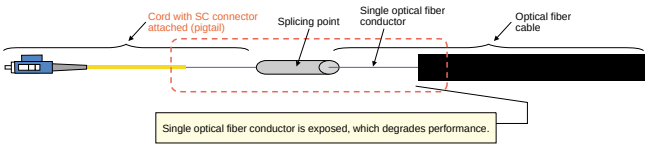


Fig. 4. Conventional connection method.

cord. Together, these are known as a pigtail. Then, the end of the fiber is bared and spliced to the end of a single optical fiber from the cable.

## 4. Optical fiber cord converter

In our method, shown in Fig. 5, the SC connector is attached to a fiber cord in a clean manufacturing environment. The other end of the cord can later be attached to an optical fiber cable by simple mechanical means. We developed two converters to handle either i) one or two single fibers or ii) a 4-fiber tape. Both types contain a filter (which can be optionally omitted) that cuts off the wavelength of a test light (1.55 or 1.65 μm), which allows easier maintenance and testing of optical facilities along with transmission and subscriber loop tests.

## 5. Aerial optical closure for accommodating SC connectors

Since NTT did not have a suitable closure, we developed an aerial optical closure to accommodate SC connectors (Figs. 6 and 7). Its structure was designed to connect and accommodate eight aerial drop optical fiber cables. To shorten the development period, we

Fig. 6. Aerial optical closure for accommodating SC connectors.

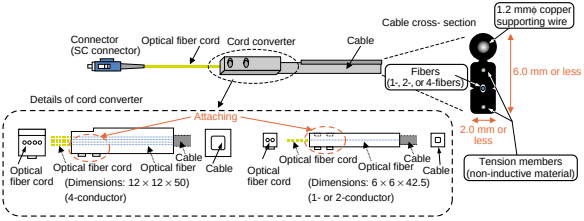


Fig. 5. SM aerial drop optical fiber cable with connector cord at one end.

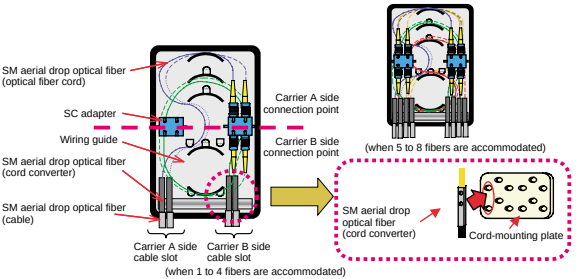


Fig. 7. Inside view of the closure.

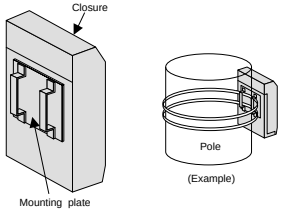


Fig. 8. Back of the closure.

Table 1. Specifications of the closure.

| | |
|---|---|
| Size | 210 [H] × 140 [W] × 45 [D] (mm) |
| Maximum capacity number of connections | 8 (16 fibers.) |
| Connectors | SC optical connector (conforming to JIS C 5973) |
| Applicable cable | 1-, 2-, or 4-fiber single mode aerial drop optical fiber cable with connectors at one end |
| Weight | About 1 kg |

employed existing closure parts used by NTT. The cord-mounting plate has mounting holes to match the pegs on the cord converter for easy installation. The SC adapter mates the female ends of two SC connectors. The closure accommodates four of these adapters. The closure carefully guides and holds the fibers so they are not bent or damaged. It has a mounting plate on the back (Fig. 8) to enable it to be attached to a pole. Table 1 lists the main specifications of this closure.

## 6. Future outlook

Technological innovation and competition have led to rapid progress in the telecommunications field. Movements towards innovation are particularly expected in the field of optical fiber facilities. We will contiave to work on the development of access line technology in order to achieve a network with the flexibility to satisfy future demands.


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