



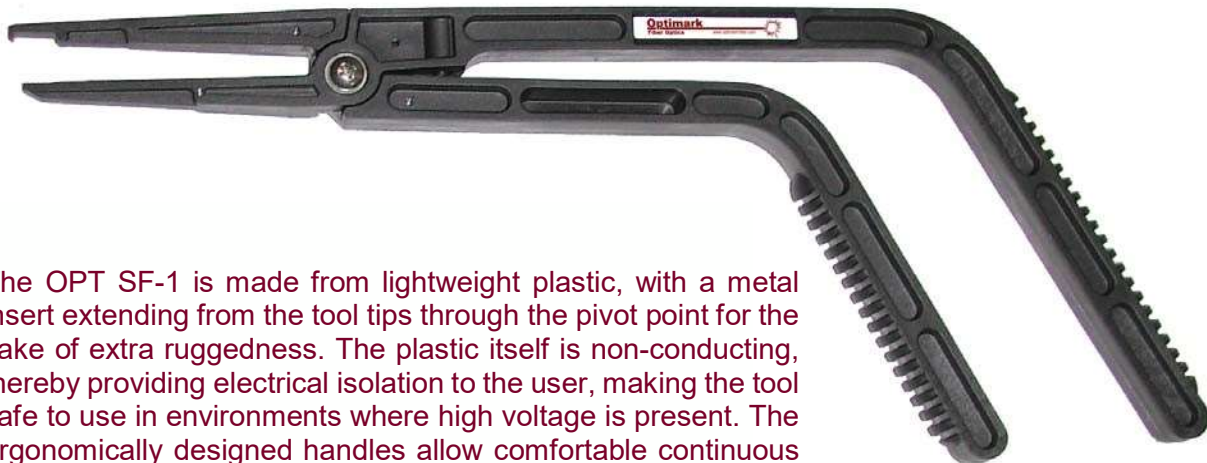
## **OPT SF-1**

### **Fiber Optic Connector Insertion/Extractor Tool**

**“SKINNY FINGERS”**

### **Operating Instructions**

The OPT SF-1 is designed to simplify the insertion and extraction of square– or rectangular- cross-section fiber optic connectors in densely-arrayed patch panels. Although the tool is a simple design, techniques for use on specific connectors need to be discussed, especially in the case of variants found in single types of connectors. This manual will discuss two of the most commonly-found connectors of this class of connectors; less commonly-found connectors will be discussed in addenda sheets.



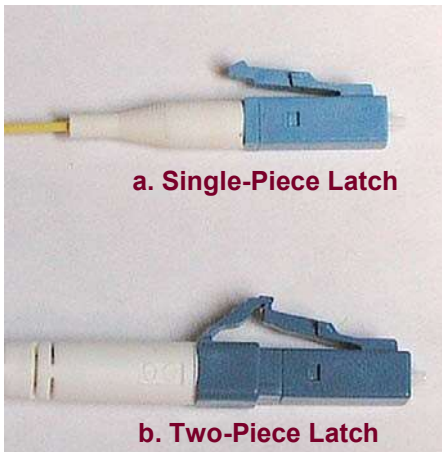
The OPT SF-1 is made from lightweight plastic, with a metal insert extending from the tool tips through the pivot point for the sake of extra ruggedness. The plastic itself is non-conducting, thereby providing electrical isolation to the user, making the tool safe to use in environments where high voltage is present. The ergonomically designed handles allow comfortable continuous usage, even for operators with small hands.

The tips are shaped to allow a firm grip on a wide variety of connectors, while simultaneously guarding against pinching of adjacent fibers or connector

# Usage With Specific Connector Types

## LC Connector

This small form-factor connector was originally developed by Lucent Technologies, and is one of the first fiber optic connectors to use a ferrule with a diameter of 1.25 mm. An obvious benefit of this type of connector is greater density of connectors in a fix-size space. Such a benefit unfortunately causes a major problem, namely difficulty of removing or inserting individual connectors within a densely-packed array. The OPT SF-1 was originally designed to address this problem with the LC connector.



**Figure 1: LC Connector Types**

Minor variations exist among LC connectors, although the only variation relevant to the OPT SF-1 is that of the latch used to secure the connector in the patch panel adapter. Figure 1a. shows a single-piece latch, while Figure 1b. Shows the more commonly-encountered two-piece latch. Either type of connector can be extracted in a similar fashion; only the insertion will vary somewhat depending upon the type of latch.

The only other variant which the user will commonly find is in the color of the connector body and patch panel adapter. A green connector color indicates that the connector ferrule has an *angled polish*. Similarly, a green patch panel adapter indicates that only this type of connector (commonly called an *APC Connector*) should be

used in the adapter. However, APC connectors do *not* require special handling when being inserted or extracted using the OPT SF-1. Non-APC connectors can be almost any color other than green, although the most commonly-used color is blue.

## LC Adapter

LC adapters exist as single units, dual units (as shown in Figure 2), or multiple-adapter configurations. The narrow cut-out at the top of each adapter shown in Figure 2 mates with the connector latch, thereby providing a secure grip on the connector when properly inserted. Normally the latch cut-out is located at the top of the adapter; however, one should *never* assume that this orientation will always be used. The operator should always visually inspect each installation before proceeding with maintenance.

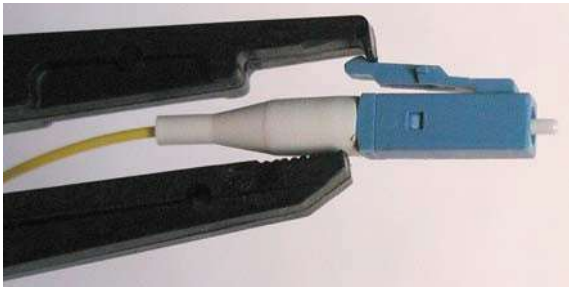
NOTE: It is common to find dual LC connectors wherever dual adapters are used. Dual LC connectors are merely two LC connectors physically ganged together with a bar joining the two individual latches. Use of the OPT SF-1 is virtually the same for dual LC connectors as it is for single LC connectors.



**Figure 2: Dual LC Adapters**

## Usage of the OPT SF-1 with Single-Piece Latch

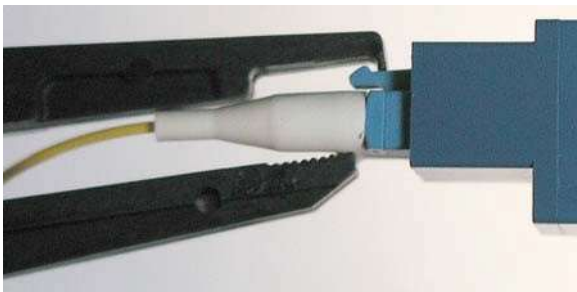
Figure 3 shows the proper way of gripping an LC connector with a single-piece latch, using the OPT SF-1. With the lower tip of the SF-1 resting on the connector boot, the upper tip should make contact just behind the small lip at the end of the latch. Gently squeezing the handles of the SF-1 will then compress the latch, as shown in Figure 4. Once the latch is compressed, the connector can be extracted from the adapter by pulling straight back; or it can be inserted into the adapter by pushing the connector as far forward as possible (see Figure 5). For insertion, one extra step is required: the latch is released, and the upper tip is then placed behind the latch so that the operator can give the connector a gentle shove to make the latch lock into the adapter (see Figure 6).



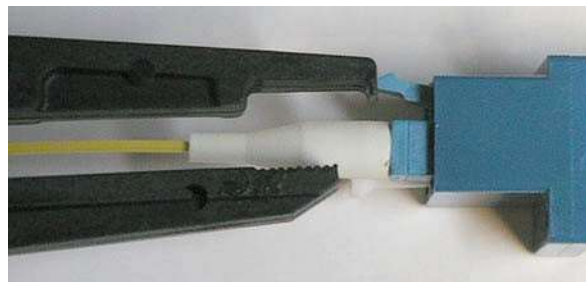
**Figure 3: Proper Grip Applied to Single-Piece Latch**



**Figure 4: Compressing the Single-Piece Latch for Insertion or Extraction**



**Figure 5: Insertion Into or Extraction from an LC Adapter**



**Figure 6: Giving the Connector an Extra Shove at the End of Insertion**

**NOTE:** Surgical precision is *not* required for using the OPT SF-1, despite the small dimensions of the connectors and their latches. The operator can easily “get the feel” for what the proper positions and grips are for effective and accurate usage.

## Usage of the OPT SF-1 with Dual-Piece Latch

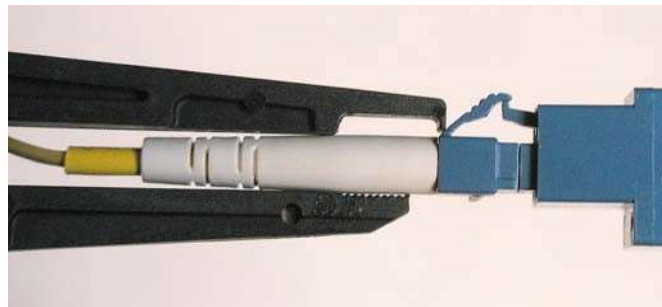
Figure 7 shows the proper way of gripping an LC connector with a dual-piece latch, using the OPT SF-1. With the lower tip of the SF-1 resting on the rear end of the connector, the upper tip should make contact with the rear section of the dual-piece latch. The lip on the upper tip of the SF-1 should hang down just beyond the forward end of the rear section of the dual-piece latch. Gently squeezing the handles of the SF-1 will then compress the latch, as shown in Figure 8. Once the latch is compressed, the connector can be extracted from the adapter by pulling straight back; or it can be inserted into the adapter by pushing the connector as far forward as possible. For insertion, one extra step is required: the latch is released, and the upper tip is then placed behind the rear section of the latch so that the operator can give the connector a gentle shove to make the latch lock into the adapter (see Figure 9).



**Figure 7: Proper Grip Applied to Dual-Piece Latch**



**Figure 8: Compressing the Dual-Piece Latch for Insertion or Extraction**

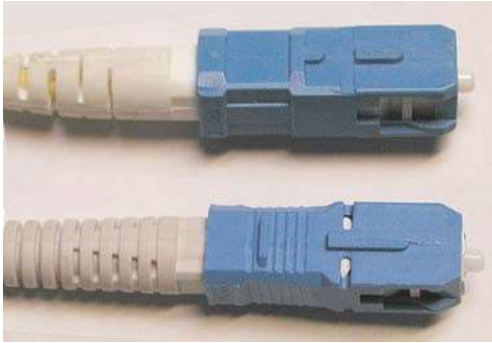


**Figure 6: Giving the Connector an Extra Shove at the End of Insertion**

**NOTE:** As in the case of the single-piece latch, surgical precision is *not* required for using the OPT SF-1 with the dual-piece latch, despite the small dimensions of the connectors and their latches. The operator can easily “get the feel” for what the proper positions and grips are for effective and accurate usage

## SC Connector

The SC connector was the first generally-accepted high-precision connectors having a plastic body. Like its high-precision predecessor, the FC connector, the SC connector uses a 2.5mm-diameter ferrule with either a PC or APC polish. Unlike the FC, which requires screwing into its adapter, the SC utilizes a push-to-insert/pull-to-extract linear motion, allowing quick changing while avoiding torque on the ferrule.



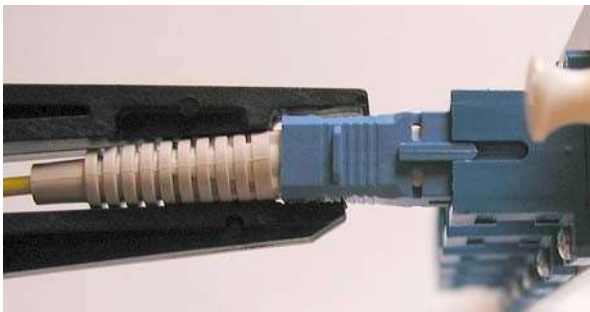
**Figure 11: Two Variants of the SC Connector Body**

The body of the SC connector exists in many subtle variations. Figure 11 shows two of the variants commonly found in installations. Other variations may be smooth on two opposite flat surfaces and rough on the other two. One thing which *all* SC connectors have in common is the key, which is a raised ridge running through the middle of one of the wider surfaces not far from the ferrule. This key fits into a corresponding slot in the SC bulkhead adapter, thereby providing a determinate orientation of the connector. This is particularly important in the case of angle-polished connectors (APC), where exact orientation is mandatory for operation. (**NOTE:** APC connector

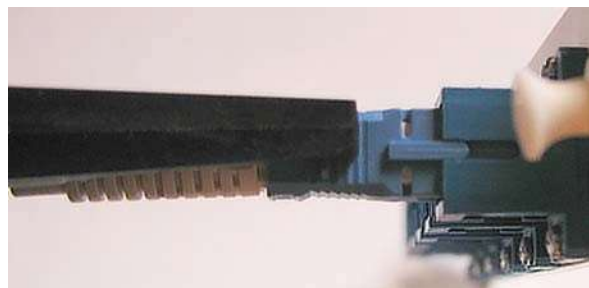
bodies and adapters are indicated by a green color. Otherwise, APC connector bodies and adapters have no physical differences from their PC counterparts. PC connectors and adapters are normally blue in color, but can have virtually any color other than green.)

### Usage of the OPT SF-1 with SC Connectors

The proper way to grip a particular variant of the SC connector body needs to be determined empirically, that is, by trial-and-error. As for orientation of the connector, the one constant is that the pin and corresponding slot in the adapter will be on one of the sides. In common usage, the adapter slot will *never* be on the top or bottom. Figures 12 and 13 show how to grip the connector body on the top/bottom surfaces and the side surfaces, respectively. The general rule of thumb is: whichever works better is the correct way!



**Figure 12: Gripping the SC Connector on the Top and Bottom**



**Figure 13: Gripping the SC Connector on the Sides**

One variety of SC connector encountered at some telecom facilities is smooth on the top and bottom surfaces and rough on the side surfaces. The ridged surface of the lower tip of the OPT SF-1 is perfectly matched to this rough side surface. Therefore, the correct way to use the OPT SF-1 at most Verizon facilities is the sideways method shown in Figure 13.

For insertion of connectors, visual inspection of the patch panel will be necessary to determine the orientation of the adapter slot. Otherwise, insertion and extraction of connectors is virtually the same: grip the connector, and either push until the connector clicks into the adapter (insertion) or pull to remove the connector from the adapter (extraction).

## SUMMARY

Wherever fat fingers fail, “Skinny Fingers” succeed!



**Figure 14: “Skinny Fingers” Gripping a Densely-arrayed LC Connector**