



A Furukawa Company

Your Optical Fiber Solutions Partner™

EZ-Bend® InvisiLight™ Solution

Installation Instructions

Revision 3.0

EZ-Bend[®] InvisiLight[™] Solution

Installation Instructions

Contents

- 1.0 System Overview
- 2.0 Tools and Components
- 3.0 Adhesive System Overview
- 4.0 Installation Procedure
- 5.0 Testing and Final Assembly
- 6.0 Troubleshooting and Repair

1.0 System Overview

The OFS EZ-Bend® InvisiLight™ solution enables nearly invisible, fast, plug and play fiber placement into living units to connect FTTH services to subscribers.

The InvisiLight solution consists of a 0.9 mm buffered EZ-Bend fiber “micro-drop” with factory mounted OFS SC-APC connectors on both ends. The tiny micro-drop and clear adhesive mounting system provides a nearly invisible, fast, and easy means of routing fiber inside a living unit to the Wall module near the ONT, from which a short EZ-Bend 3 mm jumper (sold separately) is used to make the final connection to the ONT. The InvisiLight solution is installed in the grooves between ceilings and walls, baseboards and walls, and vertical corners between walls, since they are easily accessed and naturally protected pathways to route the micro-drop. The connectorized Micro-drop assembly is available on small diameter spools in lengths of 20, 30, 40 meters (66, 99, and 132 feet) to reach into nearly any living unit. For very large residences, two EZ-Bend InvisiLight micro-drops may be placed and connected through a wall mount module to enable routing lengths of up to 244 feet.

WE RECOMMEND THAT INSTALLERS USE SAFETY GLASSES OR GOGGLES WHEN HANDLING OPTICAL FIBERS. IN ADDITION, GLOVES OR FINGER COVERS SHOULD BE USED WHEN HANDLING ANY CHEMICALS OR ADHESIVES. PRIOR TO USING ANY POWER EQUIPMENT IN CONNECTION WITH THE INSTALLATION OF THE INVISILIGHT SOLUTION, INSTALLERS SHOULD BECOME FAMILIAR WITH SUCH EQUIPMENT MANUFACTURER’S INSTRUCTIONS AND FOLLOW THOSE INSTRUCTIONS AS THEY ARE PERFORMING THE INSTALLATION.

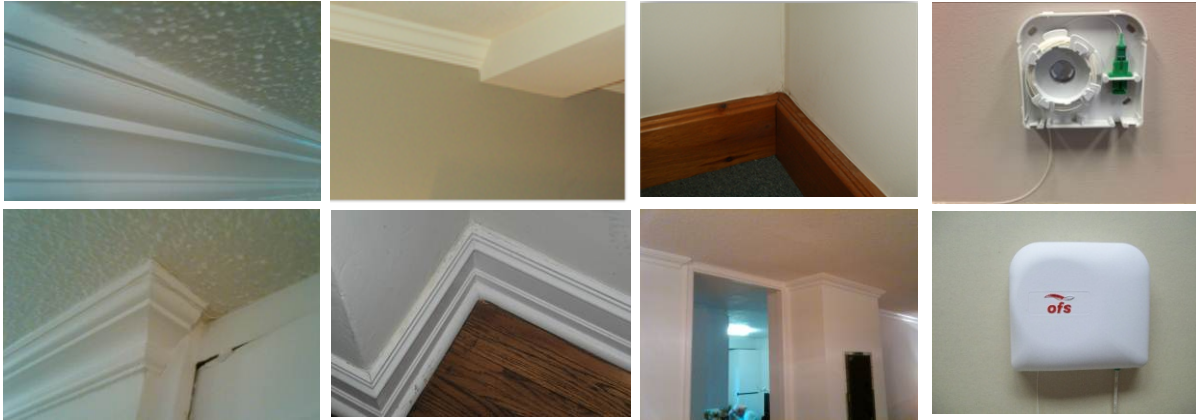
INSTALLERS SHOULD USE EXTREME CAUTION WHEN DRILLING INTO INTERIOR WALLS TO INSTALL INVISILIGHT FIBER. SERVICES SUCH AS ELECTRICITY, WATER, AND GAS, MAY BE CONCEALED WITHIN A WALL. INSTALLERS SHOULD IDENTIFY AND LOCATE THESE SERVICES PRIOR TO COMMENCING ANY DRILLING. FOR EXAMPLE, AREAS DIRECTLY ABOVE ELECTRICAL OUTLETS AND SWITCHES SHOULD BE AVOIDED AS WELL AS WALLS NEAR ANY PLUMBING FIXTURES OR OPPOSING WALLS THAT SUPPORT PLUMBING FIXTURES.

A typical installation proceeds as follows.

- 1) The desired location for the wall mount module near the subscribers requested ONT location is identified and the wall mount module is secured in place.
- 2) The desired pathway between the fiber entry point and wall module location is identified, holes are drilled through walls where needed, the pathway is wiped with a clean cloth, and bend limiters are pressed on to the corners in the pathway.
- 3) The micro-drop connector is plugged into the fiber entry module, the micro-drop is unspooled and loosely placed along the pathway, and spool is placed near the wall module.
- 4) A very thin line of engineered adhesive is extruded along the routing path in ~1 - 2 meter lengths and the Micro-drop is pressed in to the adhesive. This process is repeated until the installer reaches the Wall module.

- 5) The connector is plugged into the module's adapter, and a short EZ-Bend jumper is plugged between the wall module and ONT to complete the installation. The micro-drop adheres to most surfaces including painted or unpainted wood, most masonry, and brick.

Examples of Installed EZ-Bend InvisiLight Solution



2.0 Tools and Components

2.1 Installation Tool and adhesive tube (sold separately)



**Dispensing
Tool**



Adhesive tube, nozzles



Loaded with Adhesive Tube

2.2 Components



**EZ-Bend micro-drop spool assembly
with factory installed SC-A connectors.**



**Inside and outside
bend limiters**



**Inside bend limiter
fiber insertion tool**



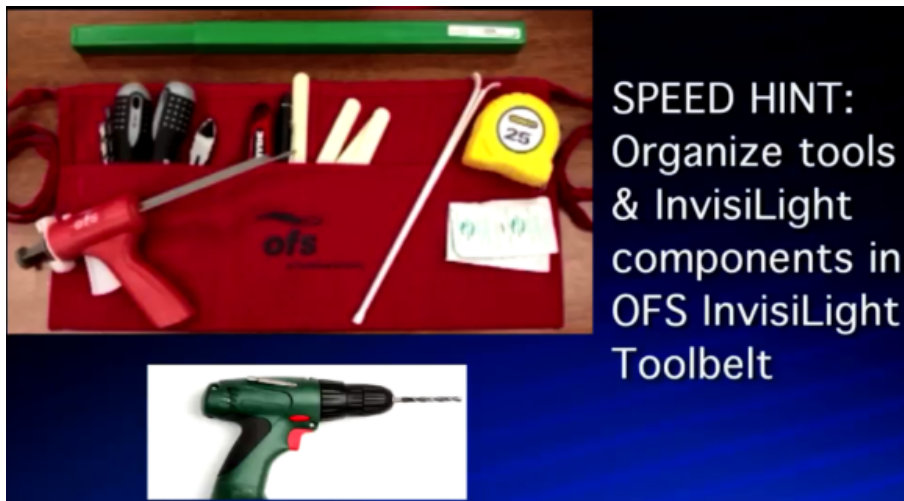
Through wall tool



Through hole eyelet
and cap



Wall module with factory installed SC-APC adapter



3.0 Adhesive System Overview

- 3.1 The InvisiLight adhesive is a water-based indoor adhesive that is tested to be fully compatible with the InvisiLight micro-drop. It provides a water-resistant bond without chemical smells, is acid-free, dries clear, and cleans up immediately with soap and water. An MSDS of the adhesive is available from OFS upon request.
- 3.2 Recommended installation surfaces:
 - 3.2.1 Most common construction materials including brick, wood, dry-wall, plaster, wall paper, fabrics and painted surfaces
- 3.3 Not recommended for use on or with:
 - 3.3.1 Metals that will corrode. Mirrors. Natural Marble (could stain) Polyethylene, polypropylene, Nylon™ or Teflon™
- 3.4 Installation conditions
 - 3.4.1 Store adhesive tubes above freezing
 - 3.4.2 Surfaces should be clean and dry
 - 3.4.3 Application temperature >10°C (50°F)
 - 3.4.4 Set Time and repositioning: 10 minutes.
 - 3.4.5 Dry time: 1 to 24 hours (depending on thickness)

3.4.6 Dries clear within 1 – 3 hours depending on thickness.

3.4.7 Non-flammable, flexible solid, water resistant

3.5 Safety precautions

3.5.1 Wear gloves and goggles or safety glasses with side shields while applying the adhesive.

4.0 Installation Procedure

4.1 Survey Residence and Determine Placement Strategy

4.1.1 Identify location of Fiber Entry Point

4.1.2 Determine desired location of Desktop ONT.

4.2 Wall Mount Module Mounting

4.2.1 Identify a space on a wall within 10 feet (3m) of the desired desktop ONT location. Note: Within 10 feet (3m) is recommended since 3m is a common jumper length, but a longer length could be used if needed.

4.2.2 Secure the Wall module to the living unit wall with screws or double sided tape. Do not yet snap on Wall Mount Module cover. Unless the wall material is very weak, the module is light enough (<1 lb.) that it does not need to be directly screwed into a wall stud.



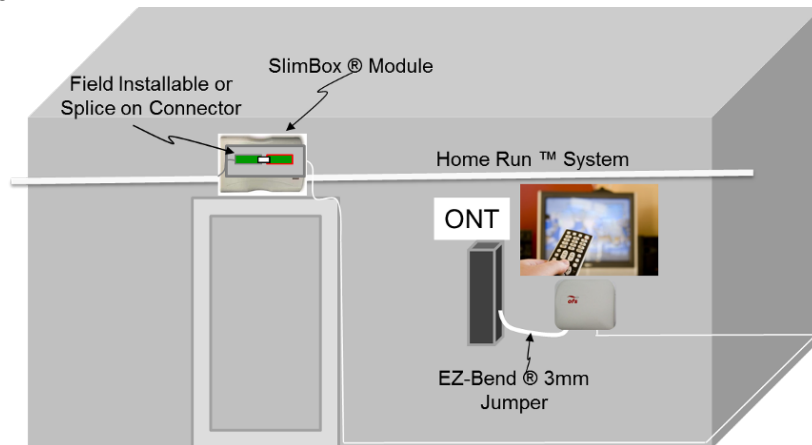
Wall module (with cover removed)

4.3 Identify, Prepare, and Measure the Desired Fiber Pathway

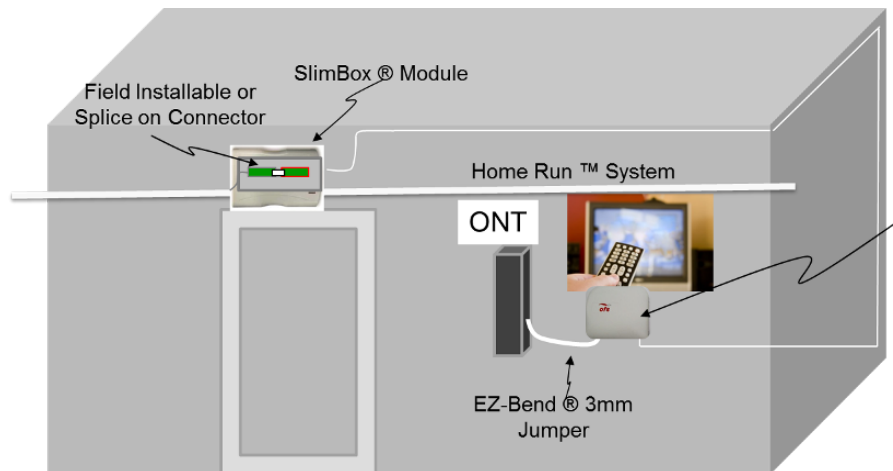
4.3.1 Identify fiber installation path between the fiber entry point and the Wall module location. The pathway selected may be in the groves between ceilings and walls, ceilings and crown molding, walls and crown molding, walls and door or window molding, and between baseboards and walls. The pathway may also be in the vertical groove at the intersection of 2 walls. Any combination of the above routing paths is acceptable. (See Section 1.0 for some examples). Routing the fiber adjacent to the ceiling or crown molding may reduce the need to move furniture but does require the use of a ladder in most cases. Routing the fiber along baseboards may require furniture or other objects to be

moved, but does not require a ladder. The micro-drop may be routed through interior walls enabling faster installation and shorter path lengths.

Baseboard Installation



“Crown Molding” Installation



- 4.3.2 Create interior wall holes as needed along the selected path using a 3/8” inch (9.5 mm) drill bit. **CAUTION:** Prior to drilling check to be sure there are no electrical wires, pipes, or any other obstacles that may be in the path of the drill. If such obstacles are present move the hole location to where no obstacles exist, or route the fiber around the wall. Clean up debris resulting from the drilling process.



- 4.3.3 Prepare the pathway by wiping it down with a clean soft cloth to remove heavy dust and any remaining debris from drilling. If grease or oil is discovered in the pathway, seek a new pathway avoiding the grease or oil (and adjust the pathway measurement as needed), or get permission from the subscriber to clean the grease/oil using a company approved solvent. As the pathway is wiped, install bend limiters on **all** outside and inside corners, as shown below. The inside bend limiter insertion/ installation tool may be used to press on the inside bend limiters in tight corners. The EZ-Bend fiber's superior bending performance allows for up to 25 outside corners and 25 inside corners to be in the pathway.



- 4.3.4 Measure approximate length of the selected pathway from the fiber entry point to the Wall module and record the measurement.
- 4.3.5 Select a spool of at least 3 meters (10 feet) longer in length than the measured pathway length. The table below recommends the spool length based on the measured pathway. This approach will allow for slack to account for measurement inaccuracy and connector replacement if needed, and changes in wall module location.

Measured Fiber Pathway Length	Spool Length for Installation
up to 17 meters (56 feet)	20 meters (66 feet)
up to 27 meters (89 feet)	30 meters (99 feet)
up to 37 meters (122 feet)	40 meters (132 feet)
37 – 54 meters (122 – 178 feet)	Concatenate* 40 + 20 or 30 + 30 spools
54 – 64 meters (178 - 211 feet)	Concatenate* 40 + 30 meter spools
64 – 74 meters (211 – 244 feet)	Concatenate* 40 + 40 meter spools

- Two spools may be concatenated (connected together) through a Wall module to achieve a reach of up to 74 meters (244 feet)

4.4 Micro-drop Initial Loose Placement Along the Route (Attaching the micro-drop is described in a later section.)

- 4.4.1 Place the spool on to the wall module flange and verify that it spins freely. Carefully remove the tape holding the outside end connector to the spool, and unspool the fiber connector along the selected route.



- 4.4.2 Use tool as show below to push connector through any interior wall holes until connector is at the entry location. For each wall hole, seat the connector in the tool, push through the wall, and rotate the tool ½ turn to release the connector. Remove the tool from the wall.



- 4.4.3 If there are sections along the route where there is concern the loose micro-drop might be damaged use painters tape to secure the micro-drop to the walls as needed.

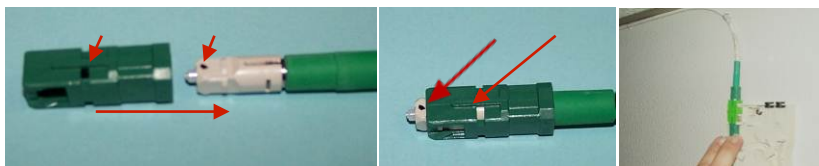


4.5 Entry Module Connection

- 4.5.1 Drill a 3/8" hole in the center of the fiber entry module to the inside of the unit. If there is no fiber entry module in place, place the company specified fiber entry module (OFS SlimBox™ Module for example) over the hole drilled to the inside of the living unit. Using the through wall tool, push the connector through the 3/8" hole (9.5 mm) in the wall from inside the living unit out into the hallway or exterior and into the module. Feed through about 1 meter (3 feet) of fiber which will be stored in the box and possibly used to enable a future connector replacement if needed.



- 4.5.2 Slide on and snap on the connector grip (supplied with the spool assembly), then plug in the connector to the adapter inside the fiber entry module to mate it with the hallway connector. **The grip key must be aligned with the mark on the connector to make sure that the ferrule end face angle is in the correct position as shown below.** An audible click will be heard when the grip has been fully seated. Remove dust cover and plug connector into the adapter to mate the InvisiLight connector to the fiber entry module connector.



- 4.5.3 Apply two ~2 mm dots of adhesive under flange of eyelet where shown. Slide micro-drop into eyelet slot, push eyelet into hole and seat flange on to wall such that adhesive tack holds the eyelet to the wall. Align cap slot with micro-drop and carefully press cap onto eyelet. **CAUTION: Failure to align fiber with cap slot will cause fiber to break as the cap is pressed-on.**



4.6 Micro-drop Attachment

- 4.6.1 Work from the fiber entry module toward the wall module near the ONT by applying very small 1 mm line of engineered adhesive (about the same diameter as the micro-drop) in ~1 - 2 meter lengths. Pull an index finger or the end of a Popsicle stick along the path over the micro-drop while gently pressing it in to the adhesive. Latex gloves or a finger cot may be worn to avoid skin contact with the adhesive if desired. When reaching an interior wall hole, pull through slack and install the eyelet/cap per 4.5.3. Repeat this process until the Wall module is reached.

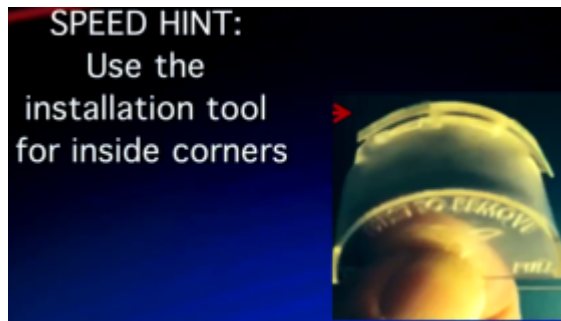


4.6

installed bend limiter. IF THERE IS A BEND LIMITER MISSING FROM ANY CORNER, STOP THE FIBER PLACEMENT, PRESS-ON A BEND LIMITER AT THAT CORNER, AND RESUME THE FIBER PLACEMENT. IF BENDING THE FIBER ON AN OPEN WALL MAINTAIN A 5 MM MINIMUM BEND RADIUS. THE INSTALLER MUST MAINTAIN A 5 MILLIMETER MINIMUM BEND RADIUS THOROUGHOUT THE TOTAL SYSTEM INSTALLATION TO OPTIMIZE THE INVISLIGHT FIBER PERFORMANCE. FAILURE TO DO THIS WILL RESULT IN A COMPROMISED INSTALLATION AND WILL INVALIDATE THE PRODUCT WARRANTY.

- 4.6.3 Micro-drop placement on inside bend limiters. The micro-drop must be inserted in the routing slot as shown. The insertion tool in the third image can be used to push the micro-drop into the slot.





- 4.6.4 Micro-drop placement on outside bend limiters. The micro-drop must be routed over the bend limiter as shown.



4.7 Wall Module Assembly

- 4.7.1 Adhere fiber to a point approximately 1 meter (3 feet) from the wall module. If not already in place, place spool into wall module and take up remaining slack onto the spool. Adhere fiber up to the entry point into the module. Plug the inside-end connector into top of the adapter and the EZ-Bend jumper connector into bottom of the adapter as shown.





5.0 Testing

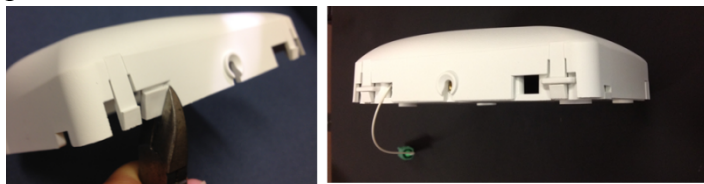
- 5.1 No active OLT - Use a power meter to record optical insertion loss of the installed EZ-Bend InvisiLight micro-drop assembly using company established testing procedure, between the Wall module assembly adapter and the fiber entry point adapter.
- 5.2 Active OLT
 - 5.2.1 Option A – Measure the received power (dBm) at the fiber entry point adapter and at wall module adapter. The difference is the insertion loss of the installed EZ-Bend InvisiLight assembly.
 - 5.2.2 Option B –Connect an EZ-Bend Jumper from the Wall Mount Module to the ONT. If the green light on the ONT is illuminated, installation passes testing.

6.0 Final Assembly

- 6.1 Press cover on module. Two latches on the bottom of the cover secure it to the base.



- 6.2 CAUTION: Knock out tabs on the cover where the fiber will enter the module should be removed to avoid pinching and breaking the fiber when the cover is pressed on to the base.



Failure to cut out the tabs may result in a broken fiber as shown below.



7.0 Trouble-shooting and Repair

- 7.1 If test results show excessive loss, inject a “red light” into the connector on either end of the Micro-Drop and the red light will visibly leak at any point where excessive loss or a fiber break exists.
- 7.2 If the fiber is broken in a section more than about 0.5 meters (1.5 feet) from a connector, replace the InvisiLight micro-drop.
- 7.3 If the fiber is broken in a section less than about 0.5 meters (1.5 feet) from a connector, cut off the connector and replace it with an OFS fusion splice-on, OFS mechanical connector, or other company approved field installable connector.
- 7.4 If the fiber is broken near the wall module and there is sufficient slack on the spool the slack may be pulled past the break and the broken end may be fusion spliced to the slack end. The fusion splice should be attached to the wall or molding, taped into place, and the remaining slack rolled back onto the spool and attached to the wall or molding with adhesive.

8.0 CONFIDENTIALITY

The Instruction is OFS Fitel, LLC (“OFS”) proprietary and confidential, the information in this instruction is furnished for use in the installation of the InvisiLight product.

The instructions shall be kept confidential and not disclosed to a third party, except to employees, agents and subcontractors with a “need to know”. Safety

9.0 SAFETY

Make sure to comply with your employer or contractor training and safety procedures and all government safety regulations.

The adhesive used with the InvisiLight™ Solution may cause allergic skin reaction.

Wear protective gloves and safety goggles and avoid breathing vapors.

Do not look into any fiber optic connector as eye damage may result.

10.0 DISCLAIMER

This installation instruction is furnished on an “as is, where is” basis. OFS disclaims any and all liability, representation or implied, regarding this instruction, its content and use to the fullest extent permitted by law.

For additional Information Please contact your Sales Representative
You can also visit our website at www.ofsoptics.com or call 1-888-fiberhelp (1-888-342-3743)
from inside the USA or 1-770-798-555 from outside the USA.